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The Kyoto Protocol

Its Development, Implication, and the Future

IGES
Institute for Global Environmental Strategies

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Editor's Note

The Kyoto Protocol was signed at the third Convention of the Parties (COP 3) in 1997, and its participating nations are now formulating national and international guidelines to achieve the protocol's goals as they wait for it to come into force. At the same time, nations not participating in the protocol are taking measures to achieve parallel goals. Collectively, such efforts have the potential to contribute not only to the reduction of greenhouse gas (GHG) emissions, but also to changes in energy demand and supply conditions, and shifts in the attitudes of people as they go about their daily lives. In Japan, the country's policy measures and guidelines to implement the Kyoto Protocol were formulated in 2002 and reviewed in 2004. In 2005, further steps to strengthning the measures to address climate change will start. At the international level, research is under way on policy regimes that are needed "beyond Kyoto," as international approaches to address climate change after 2012 are to be discussed under the United Nations Framework Convention on Climate Change starting in 2007.

Now almost seven years since the Kyoto meeting, this special issue of the *International Review for Environmental Strategies* (*IRES*) surveys the various effects of the Kyoto Protocol at the national, regional, and global levels. The aims of this issue are to ascertain the effectiveness of the Kyoto Protocol, as well as its major issues and barriers, and to offer clues for future frameworks, based on the findings and perspectives presented here.

For this issue of *IRES*, we were fortunate to receive articles from many outstanding experts, who provided us with information on current trends as well as their insightful views on issues surrounding the Kyoto Protocol. We hope our readers will find it to be a useful resource on this important topic. Though solutions to the challenges we face may not be easily found, the international community must continue to work on climate issues as well as many other environmental concerns. We at the Institute for Global Environmental Strategies (IGES) will continue to do our part to tackle these challenges, by finding and presenting sound and sustainable solutions.

While making this issue of *IRES*, we learned that the Russian Federation is now going through the process of ratifying the Kyoto Protocol. We hope this fact makes our publication timely and more meaningful to the global community. We look forward to your comments on this issue of *IRES*, as well as contributions from you, the readers, in order to keep future issues informative and useful.

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Special Feature on the Kyoto Protocol

The Legacy of the Kyoto Protocol: Its Role as the Rulebook for an International Climate Framework

Kunihiko Shimada[a]

1. Introduction

Global climate change has been one of the most contentious issues in international negotiations since the 1980s. At the 1992 United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro—popularly known as the Earth Summit—most countries of the world adopted the United Nations Framework Convention on Climate Change (UNFCCC), which obligates them to work together to achieve the aim of stabilizing the atmospheric concentration of greenhouse gases (GHG) regardless of their level of development. The UNFCCC, however, did not contain concrete plans to attain this objective.

Recognizing the necessity to fortify the international commitment, the Parties to the UNFCCC gathered at the first Conference of the Parties (COP) in Berlin in 1995 and agreed on the Berlin Mandate, which required the Parties to start negotiations and reach agreement on the legal text regarding the numerical emission reduction targets for developed countries by COP 3 in 1997. There, as the benchmark for international efforts to tackle global climate change, the Parties agreed on the Kyoto Protocol, which includes GHG emissions reduction targets for Annex I countries during the protocol's first commitment period from 2008 to 2012.[1]

At present, seven years since COP 3 in Kyoto, Japan, the protocol has not come into force, although the COP is about to mark its tenth anniversary in December 2004 in Buenos Aires. Since 1997, there have been several changes in the Kyoto framework. The largest shock to the international commitment on climate change was the withdrawal of the United States (US) from the protocol in 2001, the largest emitter of GHGs.

There have also been positive developments since Kyoto. For example, although the European Union (EU) was initially reluctant to accept the use of Kyoto mechanisms at the time, it decided to launch its EU-wide Emissions Trading Scheme (EUETS) from 2005. The EUETS is now regarded as a possible core of the international emissions trading framework to which other countries may consider a possibility of linking their own domestic systems. Many countries appear prepared to do so regardless of the future direction of the Kyoto Protocol. The withdrawal of the United States and the ambivalent

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1. For example, the European Union is required to reduce its GHG emissions by 8 percent relative to the 1990 base level, the United States has a 7 percent target, and Japan and Canada each have 6 percent reduction targets.

attitude of Russia make the fate of Kyoto uncertain,[2] however, the protocol appears to have been recognized as the foundation of climate change policies in many countries, particularly the use of the Kyoto mechanisms, such as the Clean Development Mechanism (CDM), joint implementation (JI), and emissions trading (ET), although these need further improvement.

Since official negotiations on post-Kyoto issues will start in 2005, the focus of discussions is now shifting to the international regime that will exist after the first commitment period. In order to establish a post-Kyoto regime that can accommodate the will of as many Parties as possible, it is also important to analyze whether the Kyoto Protocol framework will become the de facto international climate regime before COP 10. In order to establish a post-Kyoto international climate regime, it is important to consider its future; whether the protocol should be kept as it is now, or abandoned completely and the process started over, or whether the future regime should be constructed based on the Kyoto Protocol.

In this issue of the *International Review of Environmental Strategies* (*IRES*), various experts provide their assessments on the status of the protocol and offer suggestions for the future climate regime. This paper attempts to provide a quick review of their views. Recognizing that the Kyoto Protocol is the only international agreement that carries the name of a Japanese city, the Institute for Global Environmental Strategies (IGES), as a policy research institute in the country that hosted COP 3, wishes to provide a resource on the Kyoto regime and perspectives for a future framework.

2. Summary of the expert assessments

Seven years since Kyoto and just before COP 10 (December 2004), it is an invaluable time to review the lessons learned and the progress made since COP 3. Furthermore, from 2005, discussions on the post-Kyoto international climate regime will officially start. Under the common theme of assessing the Kyoto Protocol and related commitments, various international climate experts provided IGES with their views for this special issue of *IRES*. Table 1 is a summary of the views expressed in their articles, organized in terms of the following questions: “Is Kyoto recognized as the de facto climate regime?” and “What are your suggestions and views on a post-2012 international climate policies?”

Table 1. Summary of assessments on the Kyoto Protocol and its future[3]

Author(s) and theme of paper	Is the Kyoto Protocol (KP) the de facto climate regime?	Suggestions/views on a post-Kyoto regime
Grubb Theme: Overview (developed countries), assessment of the Kyoto	YES • All parties seem set to accept it as a reasonable compromise to tackle climate change. • The attitude of the Unites States—which rejected the KP but has not provided any alternatives as it promised—may imply that the KP is recognized as the de facto	• Russia will ratify the KP anyway. • Much of the Kyoto structure is irreversible. • In case Russia does not ratify, the EUETS will be the centerpiece of global climate action. (The link among domestic schemes and JI/CDM will be the core of the regime.) • Low carbon technologies are a key part of long-run solutions, but technology cooperation alone

2. Acording to many sources, Russia’s Duma (lower house of parliament) will soon consider ratification of the Kyoto Protocol, and if approved it will enter into force as early as March 2005.

3. IRES Editors Note: The information contained in this table and the articles for this IRES issues were written prior to the official announcement by the Russian Federation to ratify the Kyoto Protocol.

Table 1—*Continued*

Author(s) and theme of paper	Is the Kyoto Protocol (KP) the de facto climate regime?	Suggestions/views on a post-Kyoto regime
framework, and suggestions for a future regime	climate framework internationally. • US rejection of the KP made the use of the Kyoto mechanisms more attractive for the parties to the KP. • Russia may affect the fate of the KP, but	cannot form the bedrock of effective global action. • The core engine of the post-2012 regime would be the absolute emission targets for the majority of industrialized countries.
Grubb	the spirit of the KP has already been accepted globally. • 123 countries have already ratified the KP.	
Hirono and Schroeder Theme: Japan/ Germany	YES? • Even though the KP has not come into force, it has served as a benchmark for national climate strategies in many countries such as the EU's ETS. • The KP may still provide sufficient impetus for spurring effective domestic action (since it is a process) and stronger influence on the negotiated outcome.	Not available.
Zammit-Cutajar Theme: International organizations	• The KP is an economic instrument, using flexible targets and market mechanisms to achieve emissions limitation at least cost. • In terms of the use of market mechanisms in the Kyoto instruments, the KP has become the foundation of national climate strategies of industrialized nations. But the withdrawal of the Unites States from Kyoto impairs the prospects for the emerging emissions trading regime, which also lowers incentives for Russia to ratify Kyoto. • The KP created the basis of international commitment on climate change, but the period it treats is too short from the viewpoint of corporate management (creates uncertainties). • The future regime without the Unites States cannot hold for long as long as the world economy is dominated by the United States.	• The future regime should comprise a menu of emission limitation commitments, suitable for different national circumstances, and be set in a longer time frame. Adaptation should also be given importance. • Future emissions targets for industrialized countries should include cost caps. For "industrializing" developing nations, national carbon intensity commitments may be the preferred type of target. Global sector standards for major emitting industries may also be negotiated. • An "aspirational" long-term target for atmospheric concentrations of anthropogenic GHGs could be adopted as a guide to action. • Environmental interests alone do not have enough clout to move the climate change negotiations. Major economic actors must be engaged. • Climate change needs to be viewed as a global security threat (as the US Department of Defense does) as well as from the aspects of oil security and political economy of clean coal.
Kameyama Theme: Views of Japan	YES • The KP is the only internationally agreed text to address climate change. • In Japan, the KP has been effective in moving Japanese policies on climate change forward (i.e., the Global Warming Prevention Headquarters' *Guideline*). • The KP served as a justification to introduce emission mitigation policies. • The KP created and stimulated the interest of Japanese NGOs and business groups in climate change. • The KP is a learning process for	• Japan is extremely interested in the debate on post-2012 issues. • The Ministry of Economy, Trade and Industry said that the "future regime should take into account the development and dissemination of innovative technology related to mitigation of climate change." • Focus: the roles of economy (flexible instruments) and technology. • The Ministry of the Environment considers the KP to be an important first step towards meeting the ultimate objective of the UNFCCC. • Focuses: "Ensuring environmental integrity of the

Table 1—*Continued*

Author(s) and theme of paper	Is the Kyoto Protocol (KP) the de facto climate regime?	Suggestions/views on a post-Kyoto regime
	multinational negotiation.	climate regime requires global participation" and "the climate regime beyond 2012 needs to achieve the participation of all countries, including the United States and developing countries."
Petroula et al. Theme: European Union	YES • By ratifying the KP, the European Union takes the KP as the basis of its climate change policies (national and regional targets, the EUETS, national allocation plans, etc.). • The ideas of internal burden sharing and the emissions trading system in the European Union (as a party to the KP) are innovative achievements originating from the KP. • Weak points of the EU internal burden sharing under the KP include uncertainties (about actual emissions), vulnerability (emissions dependent on developments other than climate policy), and equity (national targets for some member states more difficult to achieve than for others). • In acceding countries, the KP plays a role as the basis of their climate policies, but they are not part of the 15-country EU burden-sharing agreement.	• No concrete suggestions are made in the paper regarding the post-2012 period. Despite the uncertainties and increasing pressure from some countries and sectors, EU policy makers generally keep supporting the implementation of policies aimed at complying with the KP, considering it as a first step towards more stringent emission reductions in the future. • It is widely recognized that it is difficult for the European Union to achieve its Kyoto target in the first commitment period through only domestic measures. It is likely that the flexible mechanisms will have to be used to meet the targets. As yet, few countries have taken concrete steps to put the mechanisms in practice. Also, additional measures beyond those in place today are likely to be needed.
Watanabe and Metz Theme: Germany	YES • Adoption of the KP did not have a direct impact on German climate policy, since Germany had already set a domestic emissions reduction target more ambitious than that set in the KP and developed policies and measures to achieve the target. • Nevertheless, the KP has had an indirect impact on Germany through the European Union's common and coordinated climate policies and measures, including EUETS. • Since Germany is one of the few western industrialized countries among Annex 1 Parties that managed to reduce its GHG emissions, it treats the KP as a de facto climate regime.	Not available.
Parikh and Parikh Theme: The KP and India	YES? • The KP has not come into force yet, but many Kyoto activities have already been implemented around the world. • It offers developing countries the CDM as an incentive to participate in international commitments.	• Unless the cost issue is solved, not accept any emission reduction commitments. • There should be no bilateral negotiations with Annex I Parties (on market mechanisms). • The CDM and technology transfer need to be planned based on country-specific needs and available capacity and technologies.

Table 1—*Continued*

Author(s) and theme of paper	Is the Kyoto Protocol (KP) the de facto climate regime?	Suggestions/views on a post-Kyoto regime
	• The concept of the CDM is welcome, but the US withdrawal from Kyoto lowers the attraction of the KP for developing countries. • The idea of the CDM is good, but much more is needed to improve it in order to	• A technology acquisition fund may need to be created in which all CDM projects are required to contribute (idea for negotiating economic instruments with Annex I Parties).
Parikh and Parikh	attract the participation of developing countries (now it is too costly for them!).	•
Murdiyarso Theme: Indonesia	UNCERTAIN (maybe not) • Indonesia's government has experienced difficulties in disseminating information on the progress of the KP to engage public participation. The US withdrawal gave a bad signal to the public—"Why should we bother?" • The government fails to recognize the opportunity to integrate the CDM into the national sustainable development agenda and to engage the private sectors in the CDM. • For the general public, the Kyoto mechanism is perceived as a simple transfer of funds and yet no real emissions reduction in developed countries, hence potentially introducing a further divide or dichotomy between the developed and developing worlds.	• Put more resources into the use of adaptation measures (a major issue for negotiation at COP 10). • Address the avoidance of including deforestation (not included under the first commitment period) under the new markets or a renegotiated KP. • Strengthen financial mechanisms, including the Global Environmental Facility and Special Climate Change Fund.
Kotov Theme: Russia	UNCERTAIN • Whether the KP becomes de facto or not is uncertain: There is no united view on the KP in Russia. (Russians are not fully convinced by the arguments that it would bring them benefits from commitments.) • Will Russia ratify the KP? Who knows? • Compared to the political and economic importance of Russia's entry into the World Trade Organization, the ratification of the KP is less important in Russian political and business circles.	• Need more economic interests in the future framework rather than pure environmental interests in order to obtain Russia's participation. • Strengthening emissions trading schemes and making "hot air" more valuable would be the key incentives needed for Russia to join the international community in addressing climate change.
Purvis Theme: Unites States	• There is no chance that the United States will ratify the Kyoto Protocol in its current form, regardless of who wins the next US presidential election. • The Kyoto process and in fact the FCCC negotiations generally have shown that developing countries are unwilling to make substantive emission commitments even though they are the most vulnerable to global change. • The Kyoto process led to serious discussion and innovations on such issues as emissions trading and carbon sequestration. Kyoto in this regard has	• There is a growing consensus in the United States supporting mandatory domestic carbon regulation. Progress may take several years. • The Kyoto experience demonstrates that the United States needs to start at home first before ratifying an international agreement with emissions limitations. • Even when the United States does return to the international negotiating table, it is not clear that working primarily or exclusively under the UNFCCC will be the most effective means for securing progress. • The United States might choose to work with Europe, the G8, or the Organisation for Economic

Table 1—*Continued*

Author(s) and theme of paper	Is the Kyoto Protocol (KP) the de facto climate regime?	Suggestions/views on a post-Kyoto regime
	already succeeded to a large degree. This does not mean, however, that the Kyoto	Co-operation and Development (OECD) to develop common approaches to national targets,
Purvis	blueprint should be the basis for all future climate cooperation.	emissions trading, and developing countries. • Nations interested in engaging the United States should keep an open mind about how and where to do so, rather than assuming that future climate cooperation will occur primarily in the United Nations based on Kyoto-style emission targets. • The most important thing nations can do to move the United States forward is to demonstrate their own domestic commitment to abate emissions. • When it comes to asking the United States to do more, nations should insist that it enact mandatory *domestic* emission controls. This would be far more helpful than pressing the United States to return to the Kyoto process.
Fisher et al. Theme: Australia	UNCERTAIN • The KP is an initial attempt to address global climate change problems. • It is not successful in finding an approach that is truly global. • It contains shortcomings in terms of environmental effectiveness, economic efficiency, and equity. • The KP, which was negotiated by all parties, only covers a few selected parties (no substantial commitments by the developing world). UNFCCC Articles 3.1 and 4.7 are the source of this problem. • The crucial role of technology is recognized in the KP, however, and the parties have already taken actions to enhance technology development and transfer to mitigate climate change.	• Use the currently-existing policy drivers such as energy-efficiency measures, international trade and investment frameworks, domestic counter-pollution policies, and domestic desire to deal with climate issues. • Utilize foreign direct investment (FDI) for energy-efficient technologies (development and transfer). • Include emissions trading in the future framework. • Liberalize trade flows of climate-related technologies. • Full technical diffusion needs to be integrated with trade and development strategies.
Haites and Yamin Theme: Kyoto mechanisms (overview)	YES • The Protocol establishes differentiated commitments for Parties and the mechanisms separate the burden of meeting those commitments from the implementation of emission reductions while reducing the total cost of meeting the commitments. • The mechanisms have influenced the choice of emissions trading as a domestic policy to limit GHG emissions in most Annex B Parties. • This regime will fail if there is substantial non-compliance. The mechanisms enable	No suggestions offered because this was considered beyond the scope of the article.

Table 1—*Continued*

Author(s) and theme of paper	Is the Kyoto Protocol (KP) the de facto climate regime?	Suggestions/views on a post-Kyoto regime
	parties to benefit from non-compliance. Time will reveal whether the mechanisms to limit non-compliance—the commitment period reserve and penalty—are effective.	
Michaelowa Theme: CDM (EU, Annex I)	YES? • In terms of the CDM, the KP establishes the basic incentive for governments through the concrete emission reduction targets of industrialized countries. • Governments, however, have not translated this into incentives for the private sector to invest in CDM projects. • Instead they have started to develop publicly-funded purchasing programs that are, however, insufficient to acquire enough certified emissions reductions (CERs) to cover the projected gap in their Kyoto targets.	• More private sector initiatives and commitments to the CDM are needed. • More substantial funding sources for CDM projects need to be established. (The Prototype Carbon Fund and other current sources are not sufficient to respond to needs.)
Matsuo Theme: CDM (Asia)	YES? • The CDM (KM) is a good channel and should be promoted to fill the gap between developed and developing worlds. • COP and the KP do not solve problems such as unfairness, perception of historical contribution to global warming, developing countries' commitments, and diversified attitudes of developed countries.	• Unilateral and/or South-South CDM. Non-Annex I countries can see the CERs (secondary credit transfer) *or* hold CERs in their account in the CDM Registry. • Capacity building and broadening awareness in the financial sector about carbon financing are needed.
Pearson Theme: UKETS	YES • The UK Emissions Trading Scheme was designed in line with KP commitments. • In the form of the Kyoto mechanisms, the KP enabled parties to seek low-cost options to attain their Kyoto targets.	• Negotiators for a future framework should not consider a "one-fits-all" type regime. • Emissions trading schemes, both domestic and international, should remain as a significant component of the future regime.
Shukla et al. Theme: CDM (India)	YES • The KP could be a good first step in furthering the ultimate objective of the UNFCCC (Article 2). • The withdrawal of the United States and the ambivalent status of Russia have resulted in keeping the price of CERs quite low. • Hence, the CDM market may not be big enough to really give us enough experience. • The architecture of the Kyoto regime has made climate projects peripheral to mainstream development activities in developing countries.	• The involvement of financial and consulting intermediaries should be changed and indigenized in the host country to reduce transaction costs. • Utilize technology transfer potential among developing countries (South-South technology transfer). • Development activities not directly aimed at mitigation have reduced emission levels in India and other developing countries. The Kyoto mechanisms can augment the decoupling of energy and carbon emissions. • Decoupling can be further aided by retargeting and augmenting official development assistance to help least developed countries in adaptation and supporting other developing countries in

Table 1—*Continued*

Author(s) and theme of paper	Is the Kyoto Protocol (KP) the de facto climate regime?	Suggestions/views on a post-Kyoto regime
		mitigation. • Instead of continuing with a regime that is focused on outputs, such as the emissions level, the new regime should concentrate on giving adequate incentives and wherewithal to align the economies of developing countries along rapidly declining emission intensity pathways.
Shrestha Theme: CDM (Thailand, Sri Lanka, Vietnam)	YES • The KP has opened an avenue for mutually-beneficial cooperation between developing and industrialized countries through the CDM. • The KP has boosted the expectations and interest of policy makers and planners. • The CDM is a useful concept, but there are a number of barriers to utilizing the CDM in developing countries (regulatory, FDI, financing, technologies, CDM specific risks, and uncertainty).	• In terms of cost-efficiency, fuel switching from coal or oil to gas appears to be more promising than renewable power technology options in the power sector at low CER prices. • In order to reduce CDM project costs and make implementation of CDM projects feasible, the future regime should be formed in ways that allow or help developing countries to overcome the barriers to CDM projects.
Zheng Theme: CDM (China)	YES? • The CDM/KP may provide an opportunity to transfer highly efficient, low-GHG energy supply and energy use technologies. They may help stabilize the environmental impact of economic growth at a relatively low level (China). • The CDM may assist (China) to foster its own ability to produce mitigation technology.	No suggestions made.
Mizuno Theme: CDM (Japan)	YES • Japan plans to address a 1.6% shortfall of its 6% emissions reduction target using the Kyoto mechanisms. • For now, Japan is putting emphasis on the CDM and JI. The KP is the basis of Japan's Climate Change Policy Program (1998 and 2002). • The private sector has started to become involved in the CDM and JI in order to learn the process by doing, which will be useful when they need to acquire CER credits in the near future.	• Financial mechanisms need to be established in order to boost private sector participation in the CDM (i.e., Japan Carbon Fund). • In addition, the option of the government procuring the credits obtained by private sector companies through the CDM should be considered (to boost participation).
Philibert Theme: Lessons learned and implications for the future	YES • Kyoto is just a beginning. As a beginning, it has done a good job. • Even if it does not enter into force, the KP will likely be considered in the future as an important step towards effective climate change mitigation because it introduced emissions trading into the "ballpark." • The KP's direct effects on climate change can only be small because climate change	• Options are "keeping the KP," "rejecting the KP," and "transforming KP." The latter is preferred. • A modified Kyoto structure is recommended (transforming the KP) with an emissions trading framework, fixed and binding targets, price caps, indexed targets, and non-binding targets for developing countries. • Dynamic targets—partial indexation of assigned amounts on actual economic growth. Likely to reduce risk of "double pain" in case of economic downturn or unexpected boom; Broader concept

Table 1—*Continued*

Author(s) and theme of paper	Is the Kyoto Protocol (KP) the de facto climate regime?	Suggestions/views on a post-Kyoto regime
	is a problem of a "stock" nature. • Its main strength may lie in its emissions trading feature (cost-effectiveness with environmental benefits, policy flexibility for governments). • Weakness lays in the incapacity of	than pure "intensity targets."; Aim at keeping the required "level of effort" constant if economic growth deviates from expectations. • Price caps into the international trading regime: Making supplem
Philibert	Kyoto-type targets to deal with the uncertainties surrounding climate change. • The CDM is a good concept for developing countries, but it will only play a minor role because of high transaction costs.	unlimited quantity at a fixed price at the country level (for domestic entities) and/or at the international level (for countries). All emission abatement needed to achieve the quantitative commitments would be undertaken as long as the marginal cost of abatement is lower than some agreed price. • Non-binding targets for developing countries; Allowing them to be sellers on allowance markets if their emissions are below the target; Not requiring them to be buyers to cover their emissions if above their target.

3. The next steps

After reviewing those assessments, it seems reasonably acceptable to claim that all agree that the Kyoto Protocol is an important step and has become the de facto international and domestic climate change regime. For example, as many argue, the parties to the protocol have already taken steps to comply with the Kyoto targets, such as the establishment of the European Union's Emissions Trading Scheme (EUETS) and the CDM, though at the time of writing it is still uncertain if the protocol will enter into force. Funds have been established; technological and financial transfer for mitigation and/or adaptation to climate change is being discussed internationally, and several CDM projects have already been approved and are about to be implemented. Despite the uncertainty about the fate of the Kyoto Protocol, most countries seem to view the Kyoto mechanisms positively as one of the most effective methods to attain two objectives—climate change mitigation/adaptation and sustainable development. Since the protocol contains these implications within its mechanisms, there is little disagreement over the observation that it is de facto for climate change policies.

At the same time, it is also claimed that the Kyoto Protocol is not enough to address the problems related to global climate change. Developed countries that have not ratified the protocol, especially the United States, claim that it is unfair that there is no substantial commitment required of developing countries; even though several have achieved high rates of economic growth and increased the amount of GHG emissions, they can still be eligible to receive financial and technological assistance from developed countries as their "right." On the other hand, developing countries also claim that the current Kyoto regime is inequitable. For example, some argue that it is ridiculous if developing countries need to accept a certain level of commitment while they have not emitted significant volumes of GHGs as developed countries have. These developing countries are most vulnerable to climate change (being affected the most without emitting any GHGs), thus, their basic position in negotiations is to gain as much support from developed countries as possible in terms of technologies and financial resources for adaptation and mitigation. Some of their requests have been already accepted by the Conference of the Parties, and the rules have been modified to accommodate them. As Fisher argues, the Kyoto Protocol and the current regime are still an agreement made by all Parties to the UNFCCC, however, the commitments rest on the shoulders of a few countries.

Despite criticism on the Kyoto Protocol and its regime, nobody would disagree that it is an important initial step and creates the framework for international commitments to mitigate climate change. The current mechanisms for tackling global climate change, such as the CDM, derive from the protocol. The Kyoto framework, especially the commitments to the Kyoto mechanisms, was fortified at COP 7 in Marrakesh in 2001, and now it has become the de facto of the international climate regime.

The initial time frame of the protocol, which ends in 2012, seems to be too short to observe any effects of international efforts. The “stock” nature of climate change requires a much longer-term commitment and time frame, thus the next step has to be considered. Experts, including those who provided their views for this special *IRES* issue (particularly Philibert), suggest possible forms of the future regime—namely, keeping the Kyoto Protocol as it is, abandoning it, or transforming the protocol. Further, Philibert argues, neither keeping the protocol nor abandoning it seems favorable but transforming the protocol. The option to abandon the protocol requires countries to start over all negotiations to create a new international framework or protocol on climate change. It seems impossible to repeat the process from the start. Another option—keeping the protocol as it is—seems unsatisfactory; it has already been criticized in many ways. Keeping the protocol is likely to provide a partial and weak response—which will not be valid for the long term—to the threats of global climate change. Other forms of commitment and action need to be considered.

Since the Kyoto Protocol and its framework now seems to be recognized as the de facto for international climate change policies, it is possible to argue that the next or future regime should be formed based on it (i.e., the “Transforming Kyoto” option). Currently, the IGES Climate Policy Project, in close cooperation with the National Institute for Environmental Studies (NIES) in Japan, is conducting research on the design of a future framework beyond 2012 based on the idea of transforming the protocol. Among many possible issues on the design of the post-Kyoto framework, major aspects chosen for the research are (1) institutional design, (2) legal framework, and (3) analyses of policy developments in major countries.[4] In relation to the post-Kyoto research, in order to help negotiators and policy makers design policies on the future framework, another IGES/NIES project team (AIM Team, Prospect 2050) is working on setting the goal for long and medium time frames in terms of the level of atmospheric concentrations of carbon dioxide in 2050 and 2100.[5] This kind of collaboration in research and policy planning will help Japanese as well as international policy makers formulate relevant policies and frameworks for a future climate regime.

4. For details, see http://www.iges.or.jp/en/cp/index.html.
5. Similar research has been conducted in other major countries such as the United Kingdom, Germany, and France.

Is the Kyoto Protocol the recognized de facto international climate change regime? This paper began with this question, and this whole issue of *IRES* is dedicated to the assessment of the Kyoto Protocol and its framework from various aspects. To answer this question, based on the analyses of the arguments made by the experts and my own observations, it may be fair to reply "Yes." Whether the Kyoto Protocol enters into force or not, many commitments based on the concepts embodied in the protocol have already been or are likely to be implemented. This paper, which includes a review of the articles by outstanding experts, suggests that the "Transforming Kyoto" option is the way to proceed in designing the future climate regime after 2012. Even if the Kyoto Protocol does not enter into force and the world decides to seek another framework, the spirit and legacy of Kyoto will likely live on in any new international climate regime that emerges.

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Special Feature on the Kyoto Protocol

Kyoto and the Future of International Climate Change Responses: From Here to Where?

Michael Grubb[a]

This article gives a brief overview of the Kyoto Protocol, its core features of long-term relevance, the outlook to 2012, and the options for moving forward with a new round of negotiations on international climate change responses. It is concluded that major elements of the Kyoto system are now irreversible. This is not only because of ongoing implementation and political commitments, but because they embody an inherent logic about the process of seeking to limit carbon dioxide (CO_2) emissions and then seeking international flexibility and efficiency in the way such commitments are implemented. Also, Russia is almost certain to bring Kyoto into force, at a future time of President Putin's own preference, and Kyoto Parties have to act in this context. Academic research over the past few years has scoped out many possible types of elements of future commitments: there is now a large "toolbox" potentially available. None offer convincing replacements for a system that retains quantified emission commitments for the major industrialised countries at its core, but a far richer penumbra of supporting and extending agreements will be needed. The essential requirements will be: implementation of existing Kyoto commitments; new terms of engagement with the United States, driven first and foremost by the growing domestic forces there, rather than by tinkering with international design; and a new willingness of developing countries to engage in serious discussion about their appropriate role. Plausible ideas exist that could form the basis of an effective agreement built on the established process. The crucial question is whether the political will exists to start exploring them in a new round of negotiations.[1]

Keywords: Climate change, Kyoto Protocol, International politics.

1. Introduction

This paper gives a brief overview of the Kyoto Protocol, its core features, and its political development. It then focuses upon the events since 2000 and their implications for the international process. The adoption of the Kyoto Protocol was hailed by some of those involved as one of the greatest achievements of international diplomacy in the late twentieth century, as it was set against a context of great scepticism among social scientists—and many participating governments—that the world could ever reach meaningful agreement on how to tackle such a fundamentally complex problem. Subsequent developments would appear to justify much of the initial scepticism, for the protocol is widely seen to be in trouble and the future steps highly uncertain.

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1. Note that the first part of this article is based upon a chapter by the author, titled "The Economics of the Kyoto Protocol," in Owens, A., ed. 2003. *The economics of climate change*. Also published in shortened form in *World Economics* 4(3) 2003.

This article aims to take a deeper look at the forces at play, as well as the main options, and what all this implies for whether and how global action on climate change can be taken forward.

2. The Kyoto Protocol: A technical overview

The main aim of the Kyoto Protocol is to contain emissions of the main greenhouse gases in ways that can reflect underlying national differences in emissions, wealth, and capacity, following the main principles agreed in the 1992 United Nations Framework Convention on Climate Change (UNFCCC). These include the need for evolutionary approaches and the principle of "common but differentiated" responsibilities, including leadership by the richer and higher-emitting industrialised countries. For a comprehensive analysis of the regime, see Yamin and Depledge (2004).

The emissions context

The large divergence of emissions between countries is illustrated in figure 1, below, which shows the global distribution of carbon dioxide (CO_2) emissions in terms of three major indices: (1) emissions per capita (height of each block); (2) population (width of each block); and (3) total emissions (product of population and emissions per capita = area of block).

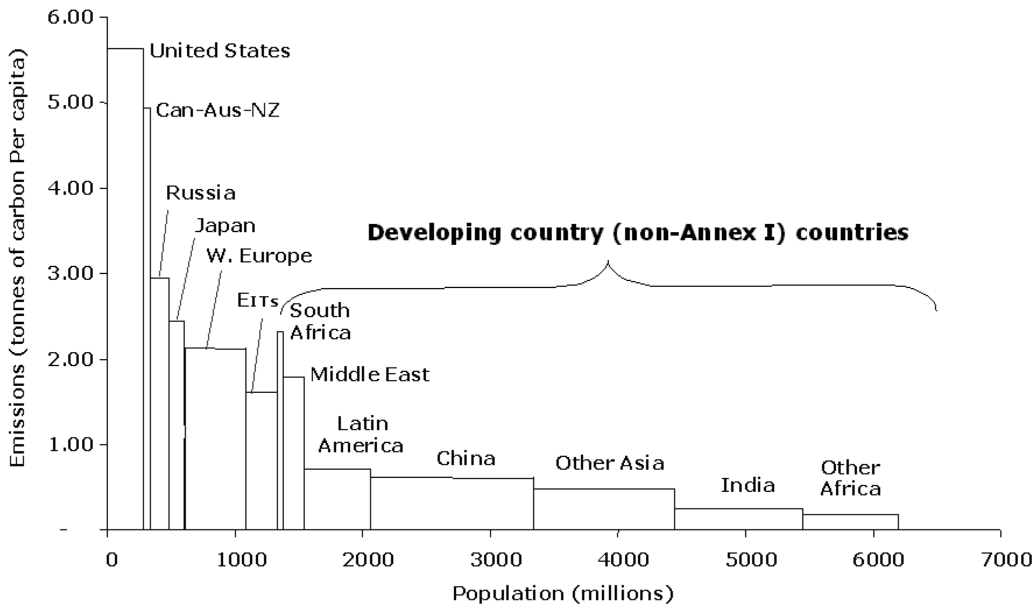

Figure 1. CO_2 emissions per capita and population by region in 2000

This figure illustrates several relevant dimensions. Per capita emissions in the industrialised countries are typically up to ten times the average in developing countries, particularly Africa and the Indian

Subcontinent. This is one of the reasons why industrialised countries accepted the responsibility for leading climate change efforts in the UNFCCC and subsequent Kyoto negotiations: unless they can control their own high emissions there is little political prospect of controlling emissions from developing countries that start from a very much lower base.[2] Following the agreed negotiating mandate,[3] in Kyoto the countries that took on quantified commitments for the first period (2008–12) are the industrialised countries as listed in Annex I to the treaty, which corresponds roughly to those with emissions in 1990 of two tonnes of carbon per capita (2tC/cap) or higher.

There are also large differences within each group: per capita emissions in the European Union (EU), Japan, and the economies in transition (EITs) are about half the levels in the United States, Canada, and Australia; whilst some individual non-Annex I countries have per-capita emissions comparable to many in Annex I (South Africa is illustrated, but it is true also for some of the "Asian tiger" economies).

At the same time, the currently low emissions and large population of the developing countries in aggregate indicate the huge potential for global emissions growth, if and as their emissions climb towards anything like levels in the industrialised world. The Kyoto negotiations were marked by big tensions on this issue. In the final agreement, in addition to provisions on national reporting and technology transfer, was the Clean Development Mechanism, which is intended to help developing countries move on to more sustainable and lower-emitting paths of economic development without these countries themselves bearing the assumed costs. The general assumption in Kyoto is that developing countries will be brought into the system of quantified commitments over time, in subsequent negotiation rounds, if and as the richer countries fulfil their first-round commitments; and the implicit threat (or bargaining counter) is that industrialised countries will refuse to take on subsequent commitments unless there is progress in this direction.

2.1. The Kyoto first-period commitments

The Kyoto "Assigned Amounts" specify allowed national emissions for the period 2008–12, subject to the adjustments that could be made through the international flexible mechanisms. The United States in its original protocol submission had proposed a second commitment period to follow the first, with an allowance for banking and borrowing of emission commitments between the two periods. The difficulties in negotiating a single set of commitments were so huge as to make this impractical. Instead, the protocol commits parties to open negotiations on a second commitment period no later than 2005, and countries that over-achieve their commitments in the first period can "bank" their unused allowances for use in the subsequent period. Suggestions that countries might "borrow" emissions from

2. Article 4.2 of the UNFCCC commits industrialised countries to adopt "policies and measures that will demonstrate that developed countries are taking the lead in modifying longer-term trends in anthropogenic emissions consistent with the objective of the Convention," with the initial "aim" of returning their emissions of CO_2 and other greenhouse gases to 1990 levels. This became the focus of attention in the years immediately after the UNFCCC was agreed, and the failure of key industrialised countries to move in this direction was a principal reason why Kyoto moved to binding commitments focused on the industrialised countries.

3. The first Conference of the Parties (COP 1) agreed that the UNFCCC commitments were inadequate and consequently to "begin a process to enable it to take appropriate action for the period beyond 2000, including the strengthening of the commitments of Annex 1 Parties, i.e., the industrialised world," to (a) "elaborate policies and measures" and (b) "set quantified limitation and reduction objectives" within specified time-frames, such as 2005, 2010, and 2020. It was agreed that these negotiations "should not introduce new commitments for developing countries," but should enhance the implementation of their existing commitments under the UNFCCC. Thus were launched the intensive negotiations that finally culminated in the Kyoto Protocol.

subsequent periods were recognised as impractical, but the idea was transformed into part of the compliance package.[4]

The negotiations never questioned that Annex I commitments should be defined in terms of changes from historic levels; proposals for other indices, such as defining emissions relative to population or gross domestic product (GDP), remained confined to academic literature as they involved changes far greater than countries were willing to contemplate. The UNFCCC had used 1990 as the base year for its non-binding aim—a date which had a huge significance as the year in which all governments, by endorsing the first report from the Intergovernmental Panel on Climate Change (IPCC), formally recognised climate change as a serious issue, and launched the negotiations that led to the Convention on Biological Diversity.[5] The 1990 base year remains as the reference point for the first-period commitments; proposals to shift the base year for Kyoto forward to 1995 were rejected on the grounds that such a change would reward those countries that had done nothing to limit emissions since the UNFCCC process was launched.[6] This has, however, raised varied issues, which will be discussed below.

As with any major international negotiations, the numbers can only be understood as the outcome of a highly political process arising from the clash between competing numerical aims, structural visions, and root conceptions of political imperative—all combined with the personal and political dynamics of the final days at Kyoto.[7] The dominant and almost obsessive focus in the negotiations was on how to distribute OECD commitments. Flat-rate emission targets appeared attractive because of their simplicity, and have indeed been a feature of the first round of several previous international environmental agreements, which have become subsequently more differentiated over time. In addition, there was no specific logical basis upon which to agree differentiated commitments.[8] The final agreement embodies a

4. With "borrowing" there would be no point in time at which a country could be assessed as being out of compliance, hence no point at which to apply any enforcement procedures—a strange interpretation of the term "binding." The United States recast its borrowing proposal in the form of a penalty for non-compliance (a deduction from allowances in the subsequent period) which was taken up in the subsequent Marrakesh Accords.

5. The convention, also known as the Rio Convention, was signed in 1992 in Rio de Janeiro at the United Nations Conference on Environment and Development (UNCED) by a large number of nations and entered into force in December 1993.

6. A 1995 base year would have made life much easier for those, like Japan and the United States, whose emissions had risen since 1990, and it would have allowed a more impressive headline figure to emerge for these countries' commitments. Arguably, it would also put the economies in transition on a more comparable footing. But it would have created a whole new set of problems for handling EIT commitments and rewarded inaction. 1990 remains as the official point of reference for when countries first accepted that climate change was a problem, and industrialised countries had already agreed under the UNFCCC to aim to return their emissions to 1990 levels as the demonstration of their commitment to lead the global effort.

7. The central clash was between the European Union's aim of flat-rate reductions for all in the range 10–15 percent below 1990 levels, and US and Japanese support for reductions of 0–5 percent, with varied ideas about differentiation and flexibility, combined with Russian sensitivities and the special circumstances of some of the smaller countries. The United States traded percentage points for increases in the degree of flexibility (e.g., inclusion of sinks enabled them to add three percentage points; after Kyoto, the United States argued domestically that in reality it had only had to concede an additional two percentage points from its original negotiating position of zero, the rest being directly tied to increased flexibilities). Japan, the third party in the internecine Organisation for Economic Co-operation and Development (OECD) debates, was dragged reluctantly along to higher commitments than it had prepared. Russia started with zero and, annoyed by the EU's opening ministerial reference to the importance of keeping the "three major Parties" at the same level, refused to budge. All this was overlaid by root political objectives and perceptions that pegged some countries' numbers to those of others. Countries with economies in transition aspiring to membership of the EU or OECD wanted to align themselves with the EU's standard-setting commitment. Canada honored its status as a G7 member by staying within the "leading"; Australia, feeling no such constraint, simply insisted on being allowed a big increase.

8. Every country that supported differentiation had a different idea of how it should be calculated. Many different indicators were proposed, relating to GDP, energy intensity, carbon intensity, historical emissions, trade patterns, etc. Most "differentiators" argued that low carbon intensity (i.e., low carbon emissions relative to GDP) in 1990 should be a basis for a weaker target; but Australia argued precisely the opposite, claiming that high carbon intensity showed an innate dependence upon fossil fuels that could only be broken at great expense. Almost the only common theme to emerge was that each country proposed indicators that would be most beneficial to itself.

small amount of differentiation among the dominant industrial powers, and wider differentiation for smaller countries.[9]

As well as the basic distinction between industrialised and developing countries, Kyoto acknowledged the need for "greater flexibility" with respect to EITs, in terms of both financial commitments (which are restricted to the OECD countries listed in the UNFCCC's Annex II) and commitments on emissions, which had in general declined by 20 to 40 percent during the process of economic restructuring. Most of the Central and East European countries agreed to go along with the EU's commitment of 8 percent below 1990 levels;[10] Russia and Ukraine, however, insisted on a right to return to 1990 levels.

2.2. The "Kyoto mechanisms"

The provisions on sinks and the various "flexibility mechanisms" in the Kyoto Protocol (discussed below) mean that countries do not have to achieve these emission targets entirely domestically—but just how much flexibility these offered in principle, especially when combined with the provisions for them, was not appreciated at the time.

Emissions trading—which under the protocol enables any two Parties to exchange part of their emission reduction commitment—proved to be one of the most controversial areas of the negotiations, though for different reasons in different quarters.[11] The bare minimum of enabling language survived in the protocol itself, and it took four years of further negotiations to elaborate this into a workable structure governing international emissions trading; the 2001 Marrakesh Accords finally established all the basic machinery for trading (inventories, reporting, monitoring, etc.), but apart from requiring governments to fulfil these, set no other significant constraints on trading.

Whilst emissions trading generated the greatest political contention, in practice the project crediting mechanisms of joint implementation (between Annex I countries) and the Clean Development Mechanism (CDM) have attracted far more institutional attention and activity. In particular, governance of the CDM has been complex in trying to secure its twin aims of helping developing countries achieve sustainable development and of generating "certified emission reductions" that Annex I Parties may then use to "contribute to compliance with part of their quantified commitments." Although the first projects have been approved, the scale of activity in the CDM looks likely to be a small fraction of the original ambitions.

9. In the central political dialogue between the United States and the European Union there was a kind of logic to equal percentage cuts from 1990 levels. The US, with per capita emissions almost twice those of most other OECD countries except Canada and Australia, was seen by others to have huge potential for reductions so that it should cut back by more than other countries. Yet internal political pressures pointed in the opposite direction: the US had the greatest difficulty in mustering any domestic support even for stabilizing emissions. Economic studies of the time varied in their estimates of which would bear the higher cost under equal reductions from 1990 levels. Equal reductions between the US and the EU seemed the only safe solution in such a peculiar political context, and the most obvious way of keeping the US commitment "in line" with the international community, in some basic psychological sense.

10. At a late stage of negotiations, Poland and Hungary moved back to minus 6 percent in protest at the weaker Russian and Ukrainian allocations.

11. Among the industrialised countries, Japan and some of the EU member states wanted to ensure that any such trading was competitive and transparent so as to prevent the United States using its political leverage to gain preferential access, particularly to the likely Russian surplus; the European Union was also particularly anxious that trading should not enable the United States to avoid domestic action as the main agent. The developing countries, however, objected more on basic principles, fearing the wider implications and that the US's overwhelming economic power would allow it to use the flexibility to its own advantage over the interests of weaker countries.

2.3. Other elements

The Kyoto Protocol contains many other provisions. These include specific commitments relating to policies and measures, in accordance with the original mandate of negotiations. Article 2.1 provides a wide list of measures, ranging from energy efficiency and subsidy reform through to technology research, development, and dissemination. Generally, these were promoted by some—notably the EU, which tabled extensive proposals on policies and measures very early on in the negotiations. Few of these gained acceptance, however, and as summarised in box 1, the final phrasing was almost entirely non-binding; countries were extremely resistant to anything that could intrude directly on national sovereignty over the choice of instruments adopted. These references, however, could provide important pressure points and hooks upon which to build subsequent negotiations on more specific actions, including international collaboration under Article 2.1(b).

Box 1. Elements of policies and measures in the Kyoto Protocol

2.1 Each Party included in Annex I... shall:

(a) Implement and/or further elaborate policies and measures in accordance with its national circumstances, such as:

- enhancement of *energy efficiency* in relevant sectors;
- protection and enhancement of *sinks and reservoirs*;
- promotion of sustainable forms of *agriculture* in the light of climate change considerations;
- promotion, research, development and increased use of *new and renewable forms of energy*, of carbon dioxide *sequestration* technologies and of advanced and innovative environmentally sound technologies;
- progressive reduction or phasing out of *market imperfections*...that run counter to the objective of the Convention, and apply *market instruments*;
- measures to limit and/or reduce emissions...in the *transport* sector;
- limitation and reduction of *methane*...through recovery and use in waste management...and [provision of] energy.

Plus one catch-all sub-paragraph encouraging “appropriate reforms in relevant sectors.”

(b) Cooperate with other such Parties to enhance the individual and combined effectiveness of their policies and measures

2.2 Pursue limitation or reduction of emissions...from *aviation and marine bunker fuels*, working through the International Civil Aviation Organization and the International Maritime Organization, respectively.

2.3 Strive to implement policies and measures...in such a way as to minimize adverse effects...on other Parties.

The protocol contains many other provisions. A number of these place requirements on all countries, including developing countries, for example, to report on national emission inventories and on policies and measures being adopted to tackle climate change. In addition, the provisions on technology transfer indicate increased attention to the importance of global diffusion of cleaner energy technologies. Many of these elements build upon provisions in the UNFCCC itself, extending and being more specific about the actions required.

The Kyoto Protocol also restates a principle of protecting countries from possible adverse effects of any of the policies and measures that may be adopted, “including the adverse effects of climate change, effects on international trade, and social, environmental and economic impacts on other parties, especially developing country parties."

Like most international treaties, the explicit consequences for non-compliance are weak compared to domestic law; the most concrete are that failure to meet the quantified commitments in the first period automatically disqualifies a country from participating in the mechanisms and it will be penalised by deductions from allowed emissions in subsequent rounds with a 30 percent penalty factor. Nevertheless, the compliance section was one of the most highly contested in the Marrakesh Accords. The restatement of the principles that the commitments are legally binding, and the establishment of an enforcement branch in the compliance committee, make the compliance package considerably stronger than in most treaties. The intense political effort put into the final negotiations on compliance, and the outcome, emphasise that most countries do not consider ratifying and then abrogating the treaty to be an option.

2.4. The Kyoto structure for the longer term

Although debate about Kyoto has tended to focus almost obsessively on the first-period commitments, the basic intent is to provide the structure for a dynamic, evolving regime that can effectively tackle climate change over the course of the century. The current set of emission targets for the first commitment period represent the first concrete step in a much longer-term process of negotiating emission commitments over successive periods. Negotiations on second-period commitments are due to start by 2005; it is generally assumed this would take the form of another five-year period, centered on 2015, though a different time span would be legally possible.

The current first-period emission targets are intended to meet the UNFCCC requirement that industrialised countries should take the lead in tackling climate change by modifying their emission trends, and to provide a period of institutional development of the mechanisms, regime architecture (such as inventories), and national programmes for tackling emissions. The first-period commitments were never intended to provide the definitive solution to climate change, indeed a moment's thought reveals that no agreement reached in the 1990s could sensibly provide a one-step solution to such a massive and long-term problem.

Second and subsequent periods are likely to require more stringent emission reduction commitments, and for a wider group of Parties, thus gradually "ratcheting-up" the protocol and its resulting environmental effectiveness. Similarly, the Montreal Protocol's initial target of a 50 percent cut in chlorofluorocarbon (CFC) emissions was far from being environmentally effective, but was progressively tightened over time to greatly increase the treaty's environmental impact. Figure 2 shows Kyoto's first-period commitments in context and underlines how the protocol's ultimate impact will depend upon the degree and scope of follow-up to this initial action. The figure also shows that global emissions in the longer term cannot effectively be contained without greatly lowering emission trajectories in developing countries as well.

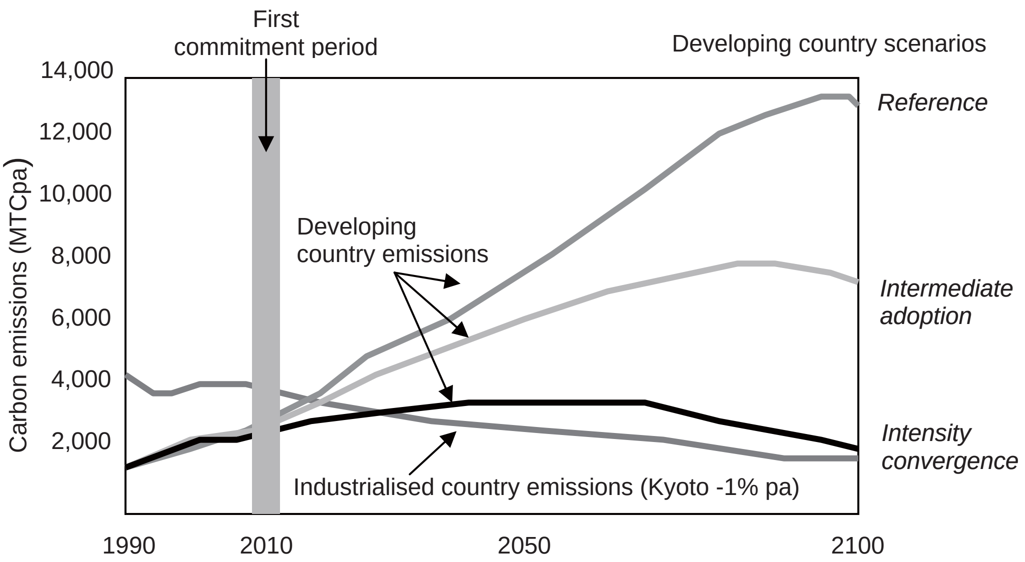

Figure 2. Kyoto first-period commitments in context of global emissions' dependence upon follow-up and spillover

Source: Grubb, Hope, and Fouquet 2002.

Note: The figure shows emissions from industrialised (Annex 1) countries, up to 2010, assuming that they meet the Kyoto first-period commitments and then follow with reductions averaging 1 percent per year in subsequent Kyoto periods. Emissions from developing countries are modeled in terms of the assumed degree of economic, technological, and political spillovers, the latter including expansion of the commitments to include more countries over successive negotiating rounds. In the "intensity convergence" scenario, aggregate developing country emission intensity (per unit GDP) converges linearly to the same level as industrialised countries over the century.

3. From Kyoto to the present

At first, the omens for Kyoto seemed good. Despite the intense controversy of the negotiations and the concessions made in its completion, all Parties seemed set to accept the deal as a reasonable compromise that preserved the essential elements required to tackle the problem. The treaty was rapidly signed by most of the countries involved. The US signature at the Buenos Aires conference a year later (COP 4, in 1998), and the adoption of the Buenos Aires Plan of Action, setting out the agenda of specific implementation issues to be resolved, set the stage for the next phase.

That stage, which culminated in the collapse of The Hague (COP 6, part 1) negotiations two years later, was a period of regression, retrenchment, and increased politicisation, for which the blame can be spread liberally. The European Union clung obstinately to a proposal to impose limits on use of the Kyoto mechanisms that alienated the rest of the industrialised world, diverting most of the negotiating effort on the trading mechanisms into bad-tempered bickering. Japan seemed frozen into a formulaic approach to its target, reflecting internal battle about the nature of the commitments and flexibilities. The final years of the US's Clinton administration achieved almost nothing in the way of domestic implementation, or even domestic understanding of the agreement, which the United States had pioneered. And the main axis of Russian engagement was with a small clique being promised gold from the trading mechanism, rather than any serious engagement on the nature of the problem and the fundamentals of Kyoto going forward. The developing world, for its part (discussed more fully in the following article) seemed captured by the Saudi demand for the unacceptable proposition that some of the most richly endowed countries on earth should be compensated for the possible slight slowdown in the rate of expansion of their oil exports—a demand that was used to hold hostage constructive engagement in relation to developing country actions. Progress on all fronts seemed small-minded and highly politicised.

The collapse of The Hague negotiations, examined elsewhere (Grubb and Yamin 2001), could have been cathartic, bringing countries back to the realities of the problem, the important issues, and their common interests and responsibilities. It also meant that the new Bush administration was faced, not with a *fait accompli* but with an essentially open agenda of negotiations on the terms for interpreting Kyoto and its wide-ranging flexibilities, or even renegotiating some elements *in extremis*.

3.1. The paradoxes of US rejection

Instead, the Bush administration's prompt rejection of Kyoto and refusal to negotiate on the basis of it, threatened the basic fruit of ten years of global negotiations, and provoked fallout that defines the landscape today. These can be seen in terms of a number of paradoxes.

The first paradox is that the United States was, in effect, rejecting its own treaty. The vast majority of the Kyoto Protocol was in the image of the US proposal of January 1997, and most other countries—in addition to accepting the basic structure as the only credible way forward—made major concessions to secure US participation. The simplest explanation of the paradox is that, in the eyes of the Bush administration, he was rejecting Clinton's treaty, and neither the rest of the world—nor the issue itself—really mattered. The Bush administration's statements at the time made it plain that they did not understand the treaty they were rejecting, describing it with caricatures that bore little relationship to reality. In its follow-up, however, the administration refused to discuss *any* structure involving binding, quantified emission targets.

The second paradox is that the US declaration of the death of Kyoto finally brought it to life. The European Union, still nursing the wounds and pondering the lessons of The Hague, found it suddenly bore the central weight of deciding whether and how to save the global effort—its transformation in the first half of 2001 was an astonishing institutional turnaround. The developing countries too were faced with the realisation that there were more important things at stake than defensive posturing around a moribund agenda of North-South conflict.

The third and related paradox is that Bush's brusque rejection of Kyoto actually raised the profile of the climate change issues and provoked, rather than deterred, stronger domestic action. This applied both internationally and within the United States. Within the US, the stark reality that the Bush administration had no significant intent to address CO_2 emissions in effect devolved the issue to the level of individual states. Indications of the response are to be found in numerous initiatives. Probably the three most important ones to address CO_2 emissions are the Californian proposals to regulate vehicle emissions; the proposals by New York and nine other Northeast states to implement a CO_2 trading system; and the coalition of clean energy funds that now comprises state-backed action in fourteen different US states. Thus, none of the most important actions in the United States involve the Bush administration, and indeed one (the Californian regulations) is being vigorously opposed by it. But the initial fallout was similar, too, elsewhere. Most notably, the European Union, stung by US criticisms that it was all words and no action, performed the politically unprecedented feat of agreeing within less than two years the Emissions Trading System (EUETS), a far-reaching measure that now, in the enlarged European Union, harnesses twenty-five countries into the first major effort to limit industrial CO_2 emissions.

The fourth paradox is that the US's rejection has arguably clarified the basic case for a Kyoto-like system. In rejecting Kyoto, the United States promised to propose an alternative. But the failure of the Bush administration—or indeed any other country—to come forward with any significant alternative, has strengthened the conclusion that the only effective approach may indeed be a structure based around sequentially negotiated national emission caps.

The short-term effects of the US rejection, in other words, were almost all positive. The outstanding question is whether it has, nevertheless, done fatal long-term damage to the global architecture.

3.2. The balance of supply and demand in the Kyoto system

The final paradox is that the US rejection of the Kyoto Protocol has made it potentially cheaper for everyone else to implement, by removing the biggest potential demand in the international trading system—whilst making progress politically more difficult.

The numerical consequences can be understood from figure 3, which represents the nearest thing to observable data on the potential "supply/demand" balance.[12] The main bars show the gap between countries' recent emissions and their Kyoto allocation. Thus, US emissions in 2000 were 300 million tonnes of carbon (MtC) above their Kyoto allowance, and would have to be reduced by 19.3 percent to get down to their original Kyoto allocation (7 percent below 1990 levels). EU emissions had roughly stabilised at 1990 levels and the gap was only 70 MtC (6.4 percent), whilst Canada faced a gap of ca. 40 MtC, the highest percentage of any due to its rapid growth since 1990.

In stark contrast, the bars on the right-hand side of the graph illustrate that emissions in the EITs had declined since 1990 to far below their Kyoto allowance. The "headroom" currently available to Russia and Ukraine (respectively, 200 MtC and about 90 MtC) is far larger than any of the individual shortfalls of OECD countries other than the United States. In total, in fact, the sum of all these data indicate that the *aggregate* emissions of Annex I countries in 2000 (including the US) were already below the *aggregate* Kyoto cap of minus 5.2 percent, but with a huge East-West discrepancy in the distribution.

12. Industrial CO_2 here refers to all CO_2 emissions from industrial activity, specifically energy-related activities. This accounts for about 80% of the total GHG emissions across all industrialised countries. Thus the absolute tonnes involved will be higher for the Kyoto basket in full than indicated in figure 4. For figure 4, every effort has been made to set the base year on the same basis as the recent emissions (i.e., industrial CO_2), and remaining discrepancies are too small to affect the main points of this analysis here.

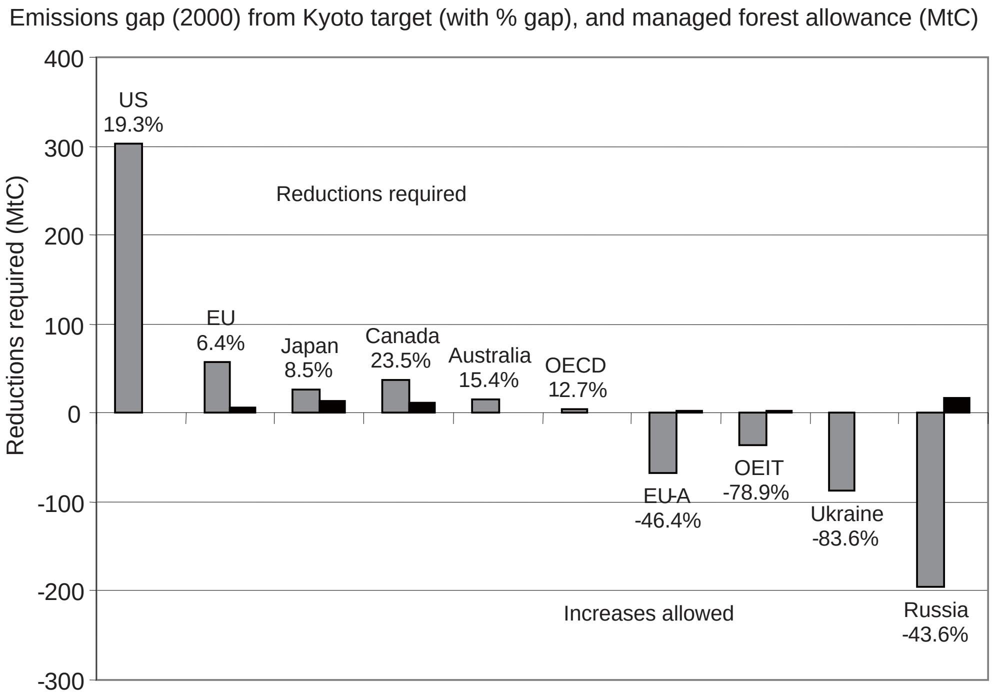

Figure 3. Kyoto commitments and trading potential

Key: EU-A = the ten Accession countries that joined the European Union in 2004; OEIT = the five other countries applying for EU membership; OOECD = all other OECD countries. Data represents total national CO_2 emissions.

Source: Grubb 2003.

Note: The main (single or larger) bars show the gap between 2000 emissions and Kyoto commitments for the principal countries/groups in Annex I. The smaller bars alongside show the maximum allowance that each can claim for carbon absorbed from managed forests under the Marrakesh Accords (excluding the US, which is not included in that agreement), which can in effect be deducted. Percent numbers show the percent cut required to get from current levels to the Kyoto targets (negative numbers indicate the corresponding percent growth from current levels for EITs).

For some years after the Kyoto agreement, the usual economic perspective was that emissions in all these regions would rise substantially in the absence of strong action to limit domestic CO_2 emissions, implying a high carbon price if countries were to cut back emissions enough to comply.

The US withdrawal obviously radically changed the situation, but it is not the only factor. Emissions—not for the first time—have failed to increase in the way projected in many economic models, and indeed have remained roughly constant in the EITs despite resurgent economic growth. Many of the earlier studies used already outdated projections and neglected non-CO_2 gases and carbon sinks, allowance for the latter having been enhanced under the Marrakesh Accords. The smaller bars in figure 3 illustrate the contribution of the carbon sink allowance for managed forests under the accords, which make a crucial contribution for Japan and Canada in particular.

The net result is to leave a large potential supply set against radically reduced demand. Economic modeling studies (e.g., reviewed in Springer 2002; Buchner et al. 2002; and Grubb 2003) now almost uniformly find that there will be a net surplus, implying an "equilibrium price" of zero. Indeed, when all aspects are considered, it seems plausible that even in the absence of Russia, the surplus in Ukraine—which ratified Kyoto in early 2004—would, along with all the other flexibilities, be sufficient to cover the likely domestic shortfall in the European Union, Japan, and Canada. Most economists have now totally reversed their assessment of a few years previously; models that treat Kyoto as a pure international trading market are interpreted as predicting that the agreement will result in hardly any real action being taken.

4. The international system out to 2012

In practice, the idea that action under Kyoto will be dissipated in a sea of valueless paper trades is no more realistic than the former assessments: countries are prioritising domestic action; the Kyoto "market" is far from fully competitive; uncertainty remains about Russian participation; and importing countries are clearly exercising "buyer sovereignty" in being cautious and discriminating about the international units they acquire.[13] Grubb (2003) argues that the result will be wide differentiation of Kyoto units, according to how the different buyers view the various types and sources of project credits and domestic trading systems:

> [P]rices for companies engaging in Kyoto-compliant projects in developing countries and EITs are likely to be in the range €10–25/tCO_2 for the smaller-scale, widely-approved projects such as renewable energy investments, and €5–15/tCO_2 for more potentially controversial (and lower cost) projects including land-use, but also for example for large-scale boiler retrofitting or gas conversion….[In] turn, the prices for large-scale transfers of AAUs between governments may be lower still; but the private sector will not be given access to these. The reason for this, fundamentally, is that although emissions trading under Kyoto has been analysed as one instrument, in reality it will be used to fulfil two quite different functions. One is the traditional role of providing market flexibility and efficiency at the margin of project investments. The other is fundamentally a redistributional function, correcting the excessively lop-sided nature of the original Kyoto allocations. The cost of making such transfers at the "market" price that would be required to sustain effective action on climate change is politically untenable. Neither "east nor west" has the market power to exact such a price, nor could the fledgling Kyoto institutions withstand the political pressures such transfers would generate. So, large-scale intergovernmental transfers, most notably for Canada, will occur at much lower prices—and domestic programmes, and the private sector, will be shielded from the malign influence that such low prices would otherwise exert on international efforts to initiate some real action under Kyoto….Thus in the "Kyoto market" there will be not be one uniform "price of carbon," but many diverse prices….This in fact is a characteristic of the nascent private sector market at present. Companies are more willing to pay for emission credits from projects that are perceived as very high quality and uncontroversial—projects to which hardly anyone is likely to object, and which seem likely to attract the approval of both governments and NGOs. Emission credits or allowances from other sources may be traded, but at a discount. For Kyoto's first period, price convergence,

13. The most obvious example of this is the EU emissions trading system and its accompanying Linking Directive, addressed elsewhere in this special issue of the International Review of Environmental Strategies.

stability and greater homogeneity could only realistically be expected both as the institutions mature and if the supply overhang were somehow eliminated to make the market much "tighter."

In this context, perhaps the most striking feature of Kyoto is its durability and flexibility. Despite the shock of the US rejection, the rest of the world proceeded to negotiate the rules for implementation, and by September 2004, 125 countries had ratified. Notwithstanding the Russian prevarications, countries have proceeded to hammer out their first significant steps in implementation, establish the domestic machinery required for participation, and, increasingly, are engaging in actual project development under the mechanisms.

It now seems clear that much of the Kyoto structure is irreversible, not only because of the institutional and political investment made, but also because it embodies a certain unavoidable logic associated with tackling emissions through quantified commitments and recognising the need for flexibility in their implementation. In outline, indeed, there now seem to be only two main types of scenario left for the international system out to 2012.

In the event that Russia does not ratify, most international engagement will be driven directly off the emerging domestic trading systems—in particular the European ETS, which would then become the centrepiece of global climate action. This would do most to define the structure and the links, not only with project investments under joint implementation (JI) and CDM-type linkages but also with emergent domestic trading systems in Canada, the Northeast US states, and potentially Japan, some Australian states, and possibly even some leading newly industrialised countries. This explains why some EU-based multinational companies that had supported Kyoto have become more nuanced in their views; the prospect of mechanisms defined and implemented through the EU trading system, rather than through the bureaucracy of the formal UN processes, has a considerable appeal to them.

There are two main variants to this scenario. If the European Union and Japan at least were to stick to their Kyoto targets, the system would actually be environmentally stronger than if Russia ratified and introduced its surplus credits. If they abandoned their national targets, of course, the system would be much weaker—but it would continue, as it is already apparent that the leading industrial countries will engage in some international investment for a host of reasons.

In practice, barring some overwhelming political shock, it seems certain that Russia will ratify, for two big reasons. The first is political. President Putin's statement following the May 2004 European Union–Russia Summit was unambiguous in stating that Russia would "accelerate the process of ratifying Kyoto," and President Putin's international promises in other fields have so far proved robust. Moreover, his statement was embedded in the context of accession to World Trade Organization (WTO) negotiations. WTO accession has certain implications for Russian energy and it will need foreign investment, and the EU wants Kyoto credit trading to be part of the incentive package surrounding its investment in Russian energy, so the two are linked substantively as well as politically. Since the Russian application to join the WTO is a one-way street—it is unthinkable that it will not eventually happen. Russian ratification of Kyoto is similarly assured. But Putin will directly control the timing.

The other reason why Russia will ratify Kyoto is that the economic gains from doing so will become more and more transparent over time. Over the next couple of years, it will become obvious that Russian emission trends are not miraculously defying the general pattern of economic transition and will indeed leave Russia with a large surplus; and the longer Russia prevaricates, the more JI investments will start to accumulate in its neighbour, Ukraine. Even if the European Union backed away from its enthusiasm to be bound by its Kyoto target, President Putin—under growing pressure from the Russian government ministries and Russian business—would not forever yield to the anti-Kyoto paranoia of his economic advisor, Andrei Illarionov. Russia will eventually bring Kyoto into force—but the timing will suit President Putin, and no-one else.

5. Structural options for going forward

Given the difficulties and traumas associated with getting Kyoto into force and implementing its first-period commitments, and the insistence of the current US administration as well as developing countries that they are not willing to consider adopting quantified emission caps, what alternatives are there for future structures? Options include those reviewed in IEA (2002), Baumert et al. (2002), and Aldy et al. (2003). Also notable is the concern that the Kyoto process became too obsessed with the issues surrounding the core Annex I commitments and trading, at the expense of a deeper understanding of the concerns of developing countries as already embodied in the UNFCCC (Najam et al. 2003).

5.1. Challenges of a technology-led international approach

Some proposals for alternatives are demonstrably unconvincing or incomplete. The current US position is to focus upon technology programmes, and it is extending these internationally through a growing number of bilateral technology cooperation agreements. Low-carbon technologies, obviously, are a key part of long-run solutions. But there are four good reasons why technology cooperation in itself cannot form the bedrock of effective global action.

Technology choice and capture. First, governments are not good at developing technology. There is a crucial role for governments, of course, but the history of government-driven energy technology programmes gives good grounds for caution. The US Synthetic Fuels Corporation and the British Advanced Gas Cooled Reactor programme each cost many billions, and the latter moved on into large-scale production of essentially uneconomic technology at a total cost exceeding US$100 billion. The fundamental reason is “mutual capture.” Large-scale government expenditure generates a community of people that depend on that finance (so they then have to play up the prospects) and a governmental bureaucracy that also has a huge stake in maintaining the programme. The result is an overwhelming bias that protects the technology from the harsh winds of commercial reality for as long as humanly possible (Cohen and Noll 1991).

The second and reinforcing problem is that such difficulties are multiplied many times in the context of *international coordination problems,* where the structural problems are exacerbated, as countries have to lock themselves into a complex set of funding commitments, and by the competitive nature of the enterprise. No country wants to give away its most valuable technological expertise. The result is that major international technology cooperation tends to occur primarily where no-one really expects any commercial returns for many decades, at best, such as with nuclear fusion.

Third is the sheer breadth and complexity of emission sources that drive climate change, and the huge variety of range of technologies for tackling them, which implies an unmanageable *negotiating complexity*. Emissions arise from the breadth of industrial activities, various end-uses in buildings and transport, and a huge variety of other personal consumption activities—that is before even considering agricultural and land-use sources. The complexity even within just industrial technologies appears prohibitive. The UK Carbon Trust, for example, as part of its role to help industry deliver on the United Kingdom's Kyoto targets, manages a list of approved energy-efficient technologies for which companies can get enhanced capital depreciation allowances. There are over 6,000 products on the list. Even if some could be grouped, the idea that international negotiations could directly drive the development and diffusion of so many different technologies betrays a fundamental misunderstanding of the nature of the climate change problem. So does the idea that countries could, or should, get together to agree on a list of products and the domestic incentive measures to promote them.

Finally, this points to the most basic flaw of the technology-led approach, namely, its *inconsistency with market economics*. The modern literature on innovation emphasises the crucial role of the private sector and market feedbacks in the innovation process, if any technology is to traverse the "technology valley of death" between government research and development finance and commercial product. It is a great irony that a Republican US administration, in its desire to find alternatives to Kyoto, risks advocating a strategy that could require a massive global bureaucratic process to try and drive the technology choices of millions of private enterprises, or at least, to try and do their research and development for them in the vague hope that they will pick up the products without any real market incentive to do so.

To be credible, therefore, technology development and cooperation needs to be built in as part of a strategy that also builds markets for low-carbon technologies and provides incentives for emitters of all sorts to adopt them and to use energy more efficiently.

For certain categories of technology, one can envisage international agreements on market promotion. There are calls for global targets on renewable energy, for example, that might be devolved into specific national programmes on "renewable portfolio standard" type legislation. This is an exception, however—and probably one that proves the rule, when one considers the difficulty of negotiating targets adapted to domestic resource and political considerations in the electricity sector, not to mention the views of countries that have emissions predominantly outside power production.

The most obvious, generic way of providing incentives for cleaner technologies is through some form of carbon constraint or pricing strategy. International agreement on carbon tax levels, as proposed by some, is obvious political fantasy for reasons I sketched more than fifteen years ago (Grubb 1989). The fiasco of the European Carbon Tax proposals in the early 1990s is proof enough of the points made there. If international action is to continue being defined in terms of overall national commitments, the fundamental metric has to be the most obvious and direct one—namely, in terms of national emissions.

5.2. Alternative ways of defining national emission targets

Kyoto focused upon absolute emission caps for industrialised countries, with the CDM and supplementary measures engaging developing countries. In fact, there is a far richer range of approaches that could be considered.

There are two main structural ways of quantifying emission targets, each of which can be implemented in several different ways (see table 1). The two quantification approaches are absolute (defining emissions in a given period) and indexed (emissions in a given period relative to some index). Indexed targets at the national level are usually discussed in relation to GDP (“intensity targets”), though in industry sector agreements they are more commonly denominated relative to an index of relevant physical quantities (e.g., per tonne of steel produced).

Several distinct issues surround the debate between absolute and intensity targets that raise the basic question as to whether GDP-indexing really has advantages, and if so what they are (beyond the purely rhetorical one of making any given reduction look bigger by comparing it to GDP growth):[14]

- The main argument is that indexing targets in relation to GDP considerably reduces the economic uncertainties and risks, based on the underlying assumption that economic growth drives emission increases. The problem with this claim is that for many industrialised countries it is just not supported by the evidence of the past few decades: once population growth is factored out, the relationship between CO_2 and GDP has been weak to non-existent. For example, CO_2 emissions per capita in both the US and the UK have remained virtually constant *since* 1950, and the surge in US GDP since the mid-1990s has had little discernible influence on its per-capita CO_2 emissions.
- GDP-indexed targets would tend to be *regressive*. They would unavoidably be *dynamically regressive* in that they would penalise countries whose economies perform less well over time; countries in recession would see their emission allowances plummet, for example (Mueller et al. 2001). And there are arguments that it is economic growth that enables upgrading with new and more efficient capital stock. Flat-rate intensity targets would also appear to be *internationally regressive* in that developing countries tend to have higher intensities and, in the earlier stages of industrialisation, slower rates of intensity improvement.
- There are significant measurement issues: unlike emissions, GDP is a measure of human construction. There has already been ill-tempered debate about the possible impact of using market exchange rate measures of GDP in global scenarios, contrasted against purchasing power parity measures (Holtsmark and Alfsen 2004). This hints at potential issues in how applying the GDP measure might make actual emission allocations vulnerable to issues of definition, currency fluctuations, or currency devaluations.
- The fourth question is whether GDP-indexed targets are compatible with the needs of an emissions trading regime for a “hard currency.” A tonne of carbon is the same unit, now or in the future. The emissions associated with a tonne of carbon per unit GDP will be contingent on future GDP. Yet, at the industrial level, emission agreements do frequently index allocations to physical units. Ellerman

14. In growing economies, any reduction will look bigger expressed in intensity terms. The US administration presumably saw a big political advantage in presenting a commitment to maintain something close to current trends as an “18% reduction in energy intensity.”

(2003) argues that it is perfectly plausible to convert such agreements into the "hard currency" needed for a trading system. The same conversion principles could apply in theory to GDP-indexed targets.

This last objection is, therefore, probably not in itself an insurmountable obstacle; the others may be.

Table 1. Options for defining national emission targets

Type of quantification	Fixed for period	Dynamic indexed
Usual reference point	Define relative to base-year emissions	Indexed on GDP growth (intensity change)
Other possible reference points	Define relative to: • base-year population • base-year GDP • decomposition hybrid (mix by sector, as in the Triptych approach) • cumulative basis (e.g., Brazilian)	Indexed on population growth (per-capita change); or emissions relative to: • population (absolute per-capita) • GDP (absolute intensity) With transitional variants (e.g., per-capita convergence)
Options for target legal status		
• Binding • Price cap[a] • Non-binding[b] • Dual[c] • One-way[d]	• Kyoto Protocol, first period, Annex B • UNFCCC "aim" for Annex I	 • US "clear skies" goal

[a]Also termed "hybrid" or "safety valve," e.g., Bodansky, in Aldy et al. (2003). From a purely economic perspective, all binding agreements are "price capped" by the extent and cost of enforcement consequences, but the legal ramifications are different.

[b]Non-binding can take a variety of degrees of commitment.

[c]Dual means a binding target, combined with a tighter target which would form a basis from which the country could sell into a trading system (Kim and Baumert 2002).

[d]A one-way target is a single target against which a country could sell, but would not be held accountable if its emissions exceeded the target; it is equivalent to a dual target with the higher of the two emission levels exceeding plausible emissions.

Targets are generally assumed to be defined with reference to historical base-year emissions, though other reference points are possible. Both "fixed" and indexed targets, however, can be defined on other bases, including absolute bases (such as rights-based approaches to emissions per capita) that do not relate at all to base-year emissions. The proposal for "contraction and convergence," technically speaking, is a transitional hybrid for moving from base-year "fixed" targets to equal per capita indexed targets over time. Note also that in the long-term context of Kyoto-like sequential negotiations, some of the features of indexed targets could be captured by "updating" the reference points of fixed targets in each negotiating round—which would almost certainly happen in practice.

In turn, emission targets can be of varied legal status. The strongest form is to make them legally binding and subject to enforcement measures, as with the EUETS and—in a slightly weakened form given the constraints of international law—in Kyoto. At the opposite extreme are explicitly non-binding targets as embodied in the original 1992 UNFCCC "aims," which were largely unobserved.

The literature on target economics, and also on the politics of US engagement, gives considerable attention to price-capped binding targets. This has a number of potentially interesting properties but also raises difficult questions about implementation of a price cap and the use of revenues. Schlamadinger et al. (2001), for example, argue for price capping with revenues put towards avoided deforestation.

The literature on possible approaches for developing countries also considers "one-way" targets, under which they could sell into a trading system in the event of their emissions being below their target, but which would not be subject to any enforcement (or the need to buy) should their emissions exceed their target (IEA 2002). A variant is a "dual target," which would also set a (higher) level that would act as a more traditional cap (Kim and Baumert 2002). Dual and one-way targets would respectively reduce and eliminate any risk of developing countries incurring net costs whilst giving them incentives to reduce emissions so as to sell into an international trading system.

In general, the academic literature has now scoped out these options fairly well. My own view is that for the developed market economies there is no strong basis for believing that any are superior to the legally-binding, absolute emission caps as embodied in the Kyoto Protocol and that form the easiest basis from which to guide emission policies and a trading system. If developing countries are to be engaged in negotiations on quantified national targets post-2012, the case can be made to consider a wider range of options, both in terms of the basis for quantification (e.g., there could be a stronger case for indexed targets concerning industrialising countries with more rapid but also more uncertain economic growth rates) and their legal status.

5.3. Sub-national and other approaches

In addition, there are numerous options for international agreements on a sub-national or (much less frequently) transboundary sectoral basis. The main options are classified in table 2, below. In principle, as instruments of international agreements, these options are likely to be less effective and less efficient than national emission target agreements, because they are less comprehensive in their coverage and give less national flexibility about how to implement the commitments. The complexities, limitations, and transaction costs of the Kyoto project mechanisms have now been widely experienced, and this leads to a search to move towards more aggregated mechanisms, notably possible 'sector CDM' agreements which would come close to sector-specific emission target agreements, but perhaps initially on a "one-way" basis—one step away from full engagement in sector-based cap-and-trade as now epitomized in the EUETS.

Whilst the options in the first three columns of table 2 still focus upon emissions, the final two columns cover agreements that define actions, not emissions directly. Because these give less flexibility, they have the potential to be politically more contentious, as well as less direct. The US has historically been extremely resistant to any agreements on specific domestic actions, seeing them as an international intrusion on its domestic legislative affairs. It has been keener on international cooperation agreements; the paradox being that these are generally ineffective without supporting domestic actions.

Table 2. Options for international agreements on sub-national, sectoral, and activity bases

Nature and coverage	Sector absolute emissions	Sector-indexed emissions	Project crediting	Domestic action agreements (PAMs)[a]	Cooperation and funding agreements
Options for reference point	• Relative to historical emissions • Relative to model-based projections	• Indexed to physical production • Benchmarked to best practice	Various baseline projection methodologies	E.g., • Subsidy reduction • Technology standards • Carbon taxation	
Examples	EUETS "Sector CDM" proposals (absolute, one-way)	"Sector CDM" proposals (indexed, one-way)	Kyoto project mechanisms (JI, CDM)	• WTO tariff agreements and subsidies code • Kyoto Protocol, Article 2, (PAMs).	• GEF[b] and other funds • UNFCCC and Kyoto technology transfer and capacity building agreements • IEA Clean Technology Initiative

[a]Policies and measures.

[b]Global Environment Facility.

Indeed, many of these options have already been explored in negotiations during the 1990s. Some did not lead far at all—the long and tortured history of negotiations on policies and measures that resulted in the oft-forgotten Article 2 of the Kyoto Protocol, for example (Grubb et al. 1999). Others delivered a bit more substance, albeit well below initial hopes, such as in the equally protracted negotiations on technology transfer and funding mechanisms. There may be a good case for extending agreements in several of these areas, and if the politics allow, the legal basis for strengthening such mechanisms already exists in the Kyoto Protocol (Article 2, on policies, measures, and general international cooperation; and Articles 10 and 11, which respectively address cooperation with developing countries on cooperative actions including technology transfer and funding mechanisms). It is hard to see any case for trying to re-invent these particular wheels from scratch.

It is clear, however, that whilst such mechanisms might facilitate a global response to climate change, as with technology-based approaches, they cannot on their own deliver credible solutions. Indeed, many of the more promising elements—such as sector-specific CDM and project mechanisms, as well as funding mechanisms—depend upon strengthened national-level commitments from industrialised countries. The point of this discussion is, rather, to show that the research community has delivered a large toolbox of possible instruments that could be adapted to national circumstances. The toolbox is sufficiently large and diverse that Sugiyama et al. (2004) suggest an "orchestra" of agreements for tackling climate change in the next phase. It is an appealing analogy, and it seems certain that to accommodate the diverse perspectives and concerns of the United States and developing countries, the mix will need to be considerably broadened. The key questions are whether the political will exists to pick up the instruments; and whether and how any process can act as "conductor" to ensure that a meaningful tune emerges.

6. Political paths forward

At present, one question dominates the future of climate negotiations, namely, that of US engagement. It is hard to imagine the rest of the industrialised world proceeding to negotiate a new round of commitments without the United States, and it is even less believable that developing countries will talk about any enhanced actions whilst the world's biggest and richest emitter remains outside.

It is easy, however, to mis-specify the nature of the US problem, or rather, problems. There are, at root, two fundamental issues. The first concerns the climate issue itself, where a combination of doubts about the seriousness of the problem and fears about the costs of emission limitations provide fertile ground for the political machinery in Washington to resist any serious emission reduction commitments. The second is the fundamental disconnect between US domestic debates and global realities, as manifest in the overall hostility of much of the Republican right to the United Nations, for example. It was the master strategy of lobbying by US industry groups in the early 1990s that connected the two and persuaded the US body politic that it should not adopt commitments without concurrent action by developing countries, whilst simultaneously lobbying developing countries to perceive any commitments as a threat to their economic growth. This twin-track strategy must rank as one of the most cynical, and successful, international lobbying campaigns in history.

It is important to note that neither of the two obstacles has much to do with instrument design. Suggestions that the US problem could be overcome by adopting intensity targets, for example, miss the point, except insofar as intensity targets could be used to dress up non-action with the appearance of action—a recipe which will not help to solve the climate problem.

The key, in contrast, is to understand in more depth the complexities and forces in the US domestic debate. Whilst partisan politics is an important feature, this also vastly oversimplifies the situation. It was authors for the heavily-Republican American Enterprise Institute that recently wrote (Stewart and Wiener 2003, 6): "The two most frequently heard options—join the Kyoto Protocol in essentially its current form now or stay out of any international agreement for the indefinite future—are both unsatisfying. Instead, we suggest a proactive but alternative approach: the US should engage China (and other major developing countries) in a parallel regime and then jointly seek to enter a suitably modified version of the Kyoto Protocol."

One would not have to look hard to find writings from Democrat sources that took a far more fundamentalist anti-climate and anti-Kyoto line. And it is a well-known fact of US political history that some of the most radical U-turns have been under Republican second-term presidents. The outcome of the November 2004 US presidential elections will certainly have an important bearing upon political tactics. It could be a massive mistake to let it fundamentally dictate global strategy in tackling a century-long problem.

A more concrete political analysis is provided by Brewer (2003). Essentially, his analysis is that Bush's brusque rejection of Kyoto stimulated political forces in the United States that are not only starting to deliver more meaningful domestic actions, but that these will culminate in overwhelming pressures that will force the successor US administration, of either political persuasion, back to the global negotiating process—providing that one still exists. Christiansen (2003) is more cautious about the timing, but reaches the same basic conclusion of potential for substantial change.

The difficulty facing the strategy proposed by Stewart and Wiener (2003) is that it assumes that China and other major developing countries will be willing to work with the United States to form an alternate regime, which can then be merged with Kyoto. There is scant evidence for this. Having defined the climate change problem in terms of developing country participation, the United States has, in a curious way, made itself hostage to developing countries' demands about the terms of such engagement. And their first demand—persistent and consistent since the climate change issue first emerged onto the international stage—is that the United States gets its own house in order before expecting poorer and weaker countries to do so.

The overarching question is then whether climate change continues to be addressed under the United Nations. Sections of American society, far more vocal under the Bush administration, are fundamentally opposed to multilateral negotiations under the one-country, one-vote basis of the United Nations. The Bush administration's position on Kyoto is, to an important degree, a reflection of this; it has made no serious attempt to propose a multilateral alternative to Kyoto but has instead developed bilateral agreements on technology cooperation.

Conversely, Kyoto represents the culmination of ten years of negotiations under the United Nations, it clearly embodies the principles agreed in the UNFCCC, and is now formally backed by 125 countries that have ratified it—most of them after the US rejection. Even Russia's most virulent critic of the Kyoto Protocol acknowledged that Russia supports the Kyoto process¸ whilst still opposing specifics of the treaty itself.

In short, proposals to discard the basic Kyoto structure as the foundation for future action are equivalent to discarding the United Nations as the appropriate forum. Neither the United Nations, nor the rest of the world, has credible proposals for negotiations under the UN that do not build upon Kyoto's foundations. And for all the problems of the UN, abandoning it is a bridge too far. No one has seriously attempted to propose an alternative negotiating forum through which the world could solve this most global of all problems. Academic suggestions for bottom-up, "let flowers bloom" approaches overlook the fundamental political need for countries to be able to argue that they are "in it together." Anyone close to business knows that forward-looking industries want government to regulate emissions, so that they can make a business case for low-carbon investments. Observers of the political debates in the European Union, Japan, Russia, and Canada know that the biggest argument against delivering action is the non-participation of the United States. To argue that these countries would continue to act without any formal international framework guiding or guaranteeing anyone's participation stretches credibility.

That does not imply that all is well with the process itself. On the contrary, the UN negotiations had already become sterile and politicised before the US withdrawal, and much more thought needs to be devoted to the question of whether and how the process can be improved. As indicated, it is not wholly impossible that solutions could emerge on the back of some regional initiatives by major actors, though this looks very difficult; the US administration has lost any credibility on the issue, and the European Union has not yet been able to project a coherent and credible foreign policy that could galvanize global action on such a global issue. Relying on either carries huge risks and represents a fallback, not a strategy, in terms of tackling climate change. The procedures need reviewing, but UN negotiations remain the only credible "conductor."

Four other things need to happen, however, before the "conductor" has much hope of getting the orchestra to produce a meaningful tune around the theme of post-2012 commitments.

First, the existing Kyoto Annex I Parties need to deliver on their current commitments. The widely-cited criticism of Barrett (2003) hinges heavily upon the claim that countries will not comply with their Kyoto commitments. His book is almost entirely based on economic perspectives and ignores many of the realities of international relations; also, his review in Aldy, Barrett, and Stavins (2003) acknowledges that, from such a perspective, compliance is a problem for almost all proposals to tackle climate change. Nevertheless, Barrett's claim that emissions trading makes the regime particularly vulnerable to non-compliance remains to be tested and it highlights the importance of embodying a culture of compliance from the outset. If Kyoto is to deliver long-run goals, it must be clearly established that violating the commitments that underpin the whole system is not a tolerable option.

To the extent possible, commitment will need to be implemented with a balanced combination of domestic action and project-based international investments, with selective use of international trading to bring countries into compliance. This will be politically far easier to achieve if Kyoto is brought into force, and may be to a degree inextricably intertwined with that. Moving towards delivery, including through international trading, will increase the incentives for Russia to finally act rather than delay; whilst the politics of the EUETS allocation process has illustrated the difficulty of getting strong enough domestic action whilst Kyoto's future is still perceived as uncertain. It is too late to unravel Kyoto, but further delay will do it further harm and increase the risks of non-compliance.

Second, the terms of engagement with the United States has to change fundamentally. This will be achieved not through tinkering with international architecture but through the gathering of domestic political forces in the United States, aided by progress elsewhere towards implementation. The US does not easily see itself as a laggard, and as one congressional aide put it, "the most powerful argument for action in the US is what the Europeans are now doing" (pers. comm.).

The modalities, however, require serious thought. There are fundamental reasons to do with US political structures why any US administration could find it hard to make and then deliver meaningful commitments. Konrad Von Moltke (pers. comm.) has argued that the United States should actually not be allowed back into the negotiations unless the administration first receives "fast track" authority from Congress to strike a deal. Should this prove impossible, another option, still more radical, could be to explore ways for the major US states to engage directly with the international process. They cannot sign treaties, but they can engage in other forms of international agreements, including contracts on emissions trading, for example. Arguably, this could be a logical extension of observations in the social sciences about the growing international importance of sub-national actors (e.g., Kanie and Haas 2004).

The process of US transformation could be either aided or impeded by international progress on technology agreements: aided, if they increase engagement and understanding that technology programmes are part of the package for delivering emission reductions; or impeded, if they reinforce the US myth that technology development and cooperation in itself offers a credible alternative. In this context, growing interest in promoting a technology-based agreement under the forthcoming UK presidency of the G8 is a doubled-edged sword; the UK's presidency has every prospect of helping to lay the foundations for US re-entry, but in the face of a second Bush presidency, that goal could not itself be secured so quickly without jettisoning everything else that matters.

The third requirement is for a major re-orientation in developing country attitudes. At present, there is a deep-rooted perversity in the system: whilst industrialised countries struggle to present their still modest actions as big steps, developing country representatives at the United Nations seem almost wishing to hide the useful steps that many are taking anyway in domestic actions, lest this be seen to conflict with their rhetorical denial of responsibility to do anything. Some of the structural problems of developing country participation laid out by Gupta (1997) still apply and have yet to be addressed. Nevertheless, politically, the mystery to a northern observer remains as to why the collected might of the G77 countries seem to let themselves be led by a Saudi Arabian shepherd.[15] The climate problem cannot be solved without action in and by the major developing countries, and they know it. Progress will be impossible until that fact is formally acknowledged and the developing countries move on to discuss what actions are appropriate.

Fourth and finally, the toolbox needs to be opened. It is not for any one author or article to propose which measures would be best matched to which groups of countries, and it is much too early to judge the potential political trade-offs. My own judgement remains that the core engine of post-2012 commitments would have to continue being absolute emission targets, for a somewhat enhanced set of industrialised countries, defined perhaps in more elaborate ways (over a longer period and/or with some price cap mechanism, for example). But to be politically feasible—and environmentally effective—these would have to be embedded in a far richer landscape of other commitments embracing at least one tier of developing countries, but possibly with several tiers of differentiation, or graduation mechanisms, regarding the nature as well as the degree of their commitments.

The toolbox for fashioning post-2012 commitments exists. If the world is to move on to the next stage of tackling climate change, the industrialised countries that have signed on to Kyoto need to deliver on their existing commitments, the basic negotiating process must be maintained, the domestic debate in the United States must either force the US administration back to the negotiating table or find ways to get around it, and the developing countries need to acknowledge their role. Then, and only then, can global negotiations start to pry open the toolbox.

15. The Group of 77 (G77) was established on June 15, 1964, by seventy-seven developing countries signatories of the "Joint Declaration of the Seventy-Seven Countries" issued at the end of the first session of the United Nations Conference on Trade and Development (UNCTAD) in Geneva.

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Special Feature on the Kyoto Protocol

The Road to and from the Kyoto Protocol: The Perspectives of Germany and Japan

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This paper aims to present, from the perspectives of Germany and Japan, some of the major issues facing the international community in reaching agreement on the Kyoto Protocol and its implementation. It also provides the background leading up to the creation of the Intergovernmental Panel on Climate Change (IPCC), the Berlin Mandate, and the Kyoto Protocol. Although the protocol was finally signed by all participating countries (except a few) after long, protracted negotiations, the Berlin Mandate, the legally-binding minimum targets set forth for reduction of greenhouse gas (GHG) emissions by 2008 to 2012, and the priorities given to domestic solutions over external measures provided some countries, notably the United States, an excuse for rejecting the protocol. During the subsequent international negotiations Germany took a lead in pushing the hard-line European Union position, while Japan tried to mediate between the European Union and the soft-line United States position to bring the two sides closer together in an attempt to bring the United States back into the protocol, get it ratified by as many signatory countries as possible, and put into effect as soon as possible. The paper concludes that while the protocol's fate appears to have ended up in the hands of Russia, the greatest hurdle for GHG emissions reduction lies ultimately in the extent to which the governments of developed countries and European economies in transition can convince their citizens, corporations, and other entities to meet those targets within the prescribed time limit.

Keywords: Scientific inquiry, Compulsory quantitative targets, Market-based options, Civil society, Environmentally sustainable lifestyle.

1. Introduction[1]

As a result of intensive consultations among the European Union (EU), Japan, and the Russian Federation, Russia's president, Vladimir Putin, has finally given his approval to send the Kyoto Protocol to the Russian parliament for ratification, which is essential for the protocol's entry into force. It is now expected that President Putin will give his formal signature to the protocol when it is returned to him from the parliament. Several assumptions have been advanced as to why Putin has taken so long to give his approval. First and foremost, Russia's "hot air" gift has dropped in value now that the United States is not expected to ratify the Kyoto Protocol and, as a result, will not participate in international emissions trading. This will bring the carbon trading prices down significantly. Second, Russia is turning the protocol into a bilateral and multilateral bargaining chip to maximize its political and

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economic interests in the short term. In fact, Russian authorities are reported to have admitted the Russian decision to ratify the Protocol partly as a political response to the EU's final agreement to Russia's application for membership in the World Trade Organization. Third, the Kyoto Protocol is feared to be a barrier to Russia's anticipated economic recovery after a long period of economic decline throughout the 1990s. Finally, the fact that with the sharp and continued rise of crude oil and natural gas prices in recent months in the global market, the annual average growth of Russia's gross domestic product (GDP) in the first half of this decade is now expected to continue to stay above 7 percent may have turned Russia around in favour of ratifying the protocol. Russia may also have recognized an adverse impact of his uncertain attitude toward the protocol on its international relations vis-à-vis both developed and developing countries.

While it is doubtful that the United States under the Bush administration will ratify the Kyoto Protocol, despite an ongoing dialogue among the European Union, Japan, and the United States, a change in the US administration, if it should happen after the presidential election in November 2004, may radically change its policy toward the protocol, now that Russia's expected ratification will certainly bring it into force in early 2005. While EU countries and Japan have been at the forefront in the quest for the protocol's early ratification and implementation, there are differences in their policy thrusts, approaches to energy policies, and in particular the greenhouse gas (GHG) emission reductions between the two. This reflects differences in the domestic configuration of vested interest groups as well as those in the public attitudes toward GHG emissions reduction.

The objective of this paper is fourfold. First, it aims to provide a better understanding of the scientific and political background of the Kyoto Protocol. Second, it attempts to analyze the process of the Kyoto Protocol negotiations, particularly the roles of Japan and the European Union in forging a consensus on the protocol by the international community in 1997. Third, it presents the protocol's institutional architecture. Finally, it assesses recent developments in Japan and the European Union, particularly in Germany, in their respective attempts and policies to reach their Kyoto targets. In so doing, German and Japanese perspectives are presented in order to find both common ground and differences in GHG emission reduction policies and approaches in the European Union/Germany and Japan, including in the governmental, non-governmental, and private sectors.

2. Climate change: Science and politics

While the history of impacts from climate variations on humankind is long, the history of influence from humankind on the global climate is rather short. The revolutionary developments in agriculture between 1650 and 1900 caused the erosion of most of Europe's old-growth forests for agricultural, pasture and urban land reclamation purposes, leading to increases in atmospheric carbon dioxide (CO_2) concentrations. A more plentiful food supply induced population growth, resulting again in growing levels of atmospheric CO_2. Also, from the late eighteenth century onward, the Industrial Revolution led to further increases in CO_2 levels from the burning of fossil fuels. Today, in addition to the already high emission levels in industrialized countries, economic growth in developing countries is expected to further increase global CO_2 emission levels during the twenty-first century.[2]

While natural climate variability has usually prevailed at a rate that maintained natural adaptation by plants and animals to these changes, such gradual development may not be guaranteed in the future. Global average temperatures are rising and weather patterns are changing faster than at any time before in the last 10,000 years. This trend, it is believed, will accelerate in the future if not reversed in time.[3] This is due to the "*enhanced* greenhouse effect" stemming from an increase in the concentration of GHGs in the atmosphere. CO_2 concentrations have increased by 30 percent, from around 285 parts per million (ppm) in the mid-nineteenth century to around 365 ppm today; methane levels in the atmosphere, although much lower by comparison, have more than doubled from around 800 parts per billion (ppb) to around 1,720 ppb in the same time period.

Rising global mean temperatures are one manifestation of this enhanced greenhouse effect. Others include changes in precipitation patterns, melting glaciers, rising sea levels, extreme weather occurrences, and even local cooling. Despite year-by-year variations and error margins, there is an unmistakable trend toward higher average temperatures. Although regional impacts of climate change are expected to vary, it is predicted that they will be the gravest in developing countries and coastal areas.

The term *greenhouse gas* was coined in 1827, when French mathematician Jean Baptiste Fourier introduced the analogy of a greenhouse to illustrate how the atmosphere traps heat and thus warms the earth's surface. Meteorological research broadened significantly from the 1950s onward. Wide-scale investment was launched, above all by the US government and US-based industry, into meteorological research, not primarily to enhance understanding of climate change but to foster technological development of jet aviation, computer science, and nuclear weaponry. This led to the establishment of a formidable research infrastructure that produced data in the following decades that came to strongly suggest substantial alterations in present and future trends of the earth's climate.

From 1970 onward, international meetings were held to build up evidence that human-induced emissions had already begun to affect the climate. In 1979, scientists appealed to policy makers to consider precautionary action concerning possible anthropogenic interference with the global climate. This new political dimension was further expanded at a conference in 1985, when scientists declared that, as a result of the increasing concentrations of GHGs in the atmosphere, a rise in global mean temperatures "greater than any in man's history" could occur in the first half of the twenty-first century. They recommended that "scientists and policymakers should begin active collaboration to explore the effectiveness of alternative policies and adjustments" (Skodvin 2000).

In addition to these developments of scientific evidence, growing environmental momentum in the 1980s in many industrial countries had spurred political action on the climate change issue. This

2. For example, China and India, which have been growing at 6 to 8 percent annually in real terms of GDP and increasing their CO_2 emissions by 3 to 4 percent annually during the last decade or so, are expected to become the second and third worst emitters in the world, only superseded by the United States.

3. Scientific uncertainty, however, still prevails: The greatest difficulty in fully understanding weather and climate systems is that the numerous variables, including temperature, precipitation, wind, humidity, cloudiness, sea-surface temperatures, and their interdependencies, are not yet sufficiently deciphered.

momentum was enhanced by a growing public awareness and presence of environmental movements in these countries, as well as the successful outcome of the ozone negotiations that culminated in the adoption of the Montreal Protocol in 1987. Based on these premises, scientists and policy makers at a conference held in Toronto in 1988 jointly set a reduction target of 20 percent of 1988 levels by 2005, with the eventual aim of reaching a 50 percent cut. This so-called Toronto Target is a landmark in terms of saliency because it was the first—and to date—the last time that policy makers agreed to a far-reaching policy proposal on climate change at an international conference.[4]

These developments finally led to the establishment of an intergovernmental body—the Intergovernmental Panel on Climate Change (IPCC)—to translate the status of the science into political prerogative. The IPCC has become the most significant, and highly accepted, science body to facilitate interaction between the science and policy communities. It incorporates not only scientists but also government officials and representatives from intergovernmental organizations (IGOs), non-governmental organizations (NGOs), and business representatives in its activities. This science body has been an integral part of the global dialogue on climate change and was a precondition for initiating the Kyoto Protocol negotiation process.

The IPCC was set up in 1988 by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) with the objective of assessing "the scientific, technical and socio-economic information relevant for the understanding of the risk of human-induced climate change" in a "policy relevant," rather than a "policy prescriptive" manner.[5] Moreover, the IPCC does not have a mandate to carry out its own research. Rather, it assesses peer-reviewed and published scientific and technical literature to produce policy-relevant, state-of-the-art scientific reports. The main bodies of the organization are the three Working Groups (WGs), the three Working Group Plenaries, and the IPCC Plenary.

The three Working Groups established under the IPCC are charged with fulfilling the following objectives: Working Group I (WG I) assesses the scientific aspects of the climate system and climate change; Working Group II (WG II) addresses the vulnerability to climate change of socioeconomic and natural systems, negative and positive consequences from climate change, and options for adapting to it; and Working Group III (WG III) assesses options for limiting and reducing GHG emissions.[6] Up to this point, the process can be regarded as almost entirely non-political.

The results of the Working Groups are debated in their respective Working Group Plenaries. Lead authors, government experts, and environmental and industry NGOs take part in the debate, in order to acquire political acceptance of the knowledge put forth by the scientists. The line-by-line, oftentimes word-by-word, negotiation of the Summary for Policymakers (SPM) exposes each document to influence on non-scientific grounds. Substantive changes to the text cannot be made, however, without consent from the lead authors, as they can veto changes they regard to be unsubstantiated. Thus, the only

4. It has to be noted that the participating government representatives came from only 48 countries that were already convinced of the necessity for policy action on an international level.

5. See the IPCC's homepage at http://www.ipcc.ch/about/about.htm.

6. Note that the organization of the Working Groups has changed several times. For a detailed account of the history of the IPCC, see Agrawala, S. 1997. Explaining the evolution of the IPCC structure and process. ENRP discussion paper E-97-05. Kennedy School of Government, Harvard University, August.

means of influencing the results is through utilizing the rules of procedure as a tool for delaying the process. Unlike the IPCC's voluminous assessment reports (some 750 to 900 pages per Working Group), the short SPMs (some 10 to 20 pages) are widely circulated and reported on by the media.

An important function of the Working Group Plenaries is that they offer a forum for an interactive dialogue between scientists, policy makers and, to some extent, civil society on the appropriate interpretation of the scientific findings and their potential policy implications. Policy makers may thus seek clarification where necessary, exchange opinions with the science community concerning potential policy implications, or discuss which future tasks the IPCC should focus on. It is important to recognize that conclusions are, by their nature, always subject to interpretation from specific interest and value perspectives.

The IPCC Panel is the main decision-making body of the IPCC and includes government representatives and experts from IGOs and NGOs. It meets in plenary sessions about once a year, and discusses and approves the IPCC's publications, including its assessment reports. The panel also decides on the mandates and work plans of the WGs and its task forces, the structure and outline of its reports, the IPCC principles and procedures, and its budget.

As climate change is a highly sensitive issue touching upon vital national and economic interests, the risk of creating serious political conflicts within and across countries in attempting to solve the problem is high. A further impediment is the fact that climate change policy generates short- to medium-term costs, though with effective long-term benefits, is hard to sell politically if governments remain in power for merely short- to medium-term periods, as is usually true for democracies. It is, therefore, extremely beneficial to have in place a broad, objective, and transparent intergovernmental process for synthesizing peer-reviewed scientific literature into authoritative state-of-the-art reports. The IPCC's assessment reports and their SMPs (published every five to six years) play a significant role in assessing the climate change issue from its various angles.

In its *First Assessment Report*, published in 1990, the IPCC's WG I asserted that the earth's atmospheric concentrations of GHGs were increasing and that this trend was largely due to human activities.[7] While recognizing that the outcome of this would be a continuing increase in global mean temperatures, the full impacts from climate change were still uncertain. Nonetheless, scientists agreed that the climate was warming faster than at any time in the last 10,000 years. If the trend continued, average temperatures were projected to rise by an estimated 2 to 5 degrees Celsius (°C) by 2100. This would be accompanied by an average sea-level rise of 30 to 100 centimeters (cm) by 2100, putting the livelihoods of low-lying coastal areas and islands into jeopardy. These findings led to recommendations in the *First Assessment Report* that an international climate change agreement should be negotiated. The report convinced many governments of the scientific grounds for a policy response. It constituted the scientific background for the adoption of a UN General Assembly resolution in late 1990 that led to the establishment of the Intergovernmental Negotiating Committee (INC) in 1991, which was charged with negotiating the Framework Convention on Climate Change.

7. For reasons of brevity only, we shall merely summarize the impacts of the conclusions from the IPCC's WG I reports dealing with climate change science and will omit those of WGs II and III.

The IPCC's *Second Assessment Report* (SAR) was circulated in late 1995 and published in 1996. The conclusions drawn by WG I were even more compelling than previously, stating that "the balance of evidence suggests a discernible human influence on global climate." This implied a strong endorsement of an assertive policy response and marked a turning point in the intergovernmental response to climate change. It put the debate over the validity of the science to a close. Although some science sceptics have remained vocal, the science has become officially recognized (Dupledge 2002).[8] The SAR estimated an average global temperature rise of about 1°C to 3.5°C and a sea-level rise of 5 to 15 cm until 2100. The change in the position of the United States between 1995 and 1996 may have been swayed by the outcome of the SAR (Schröder 2001). While the United States had remained opposed to a legally-binding protocol at COP 1 in 1995, it came to endorse this by COP 2 in 1996.

The *Third Assessment Report* (TAR) was published in 2001. Given the adoption of the Kyoto Protocol in 1997 and the acceptance of the reality of climate change, the political stakes were eased compared with when the SAR was being concluded. WG I asserts that there "is new and stronger evidence that most of the [global] warming observed over the last 50 years is attributable to human activities." The projections on global temperature rise of 1.4°C to 5.8°C were significantly higher than those of the SAR. This is primarily due to a decrease in sulfur dioxide emissions that have a cooling effect. Global surface temperatures have risen by 0.4°C to 0.8°C in the twenty-first century. This is slightly higher than the SAR findings and can be attributed to high average temperatures between 1995 and 2000. The sea level is now expected to rise by 9 to 88 cm in the twenty-first century, which is slightly lower than previously estimated and mainly due to improved modeling (Depledge 2002).

The intergovernmental status of the IPCC allows government officials to participate in the IPCC's main scientific decision-making proceedings, enabling them to contribute to the development of the knowledge base. This permits them to personally evaluate the reliability of the scientific information that they base their political judgement on. There is, however, a fine line between the positive aspects from broad participation on the one hand, and the risk of undermining the IPCC's credibility through politicization of the science, on the other. The scientific findings might then be put into question, weakening the IPCC's authority.[9]

Despite this balancing act, there is a high level of acceptance of the scientific knowledge base provided by the IPCC and its political neutrality among national delegates. A survey carried out by the United Nations University's Institute of Advanced Studies (UNU/IAS) at COP 3 (1997) and COP 4 (1998) finds that 80 percent of the delegates interviewed at COP 3, and 84 percent at COP 4, agreed that the IPCC provides scientifically credible information, while 3 percent at COP 3, and 2 percent at COP 4, disagreed. Moreover, 60 percent of the respondents at COP 3, and 57 percent at COP 4, agreed that the IPCC provides politically neutral information, while 18 percent at COP 3, and 10 percent at COP 4, disagreed (Barrett et al. 2001). Thus, it can be concluded that the involvement of policy makers and other relevant actors contributed to the overall positive evaluation of the IPCC's work.

8. See also Brack and Grubb (1996).

9. This weakness has been exploited many times in the IPCC's history, most prominently by large oil-producing countries such as Saudi Arabia and Kuwait. Their argument would be that "these scientific findings may well be true, but they have not come about in the correct manner. We can therefore not be certain that they are true, and they should therefore be deleted." See Skodvin (2000).

The extensive participatory process forms the basis of the IPCC's scientifically authoritative and officially accepted position on climate change. Without this strong linkage to science, the policy response to climate change might have been much weaker. Thus, although scientific consensus alone cannot bring about political consensus, it does form a prerequisite for the development of a policy response.

3. The road to and from Kyoto

From around 1990 onward, there has been a broad scientific consensus that global average temperatures were increasing significantly. Although a UN-sponsored multilateral process to find solutions was launched at the time, it was not until 1997 that concrete and binding reduction targets were agreed on. With the Kyoto Protocol not yet in effect, however, there is still no de facto legally-binding international treaty to regulate GHG emissions. It can only be concluded that the political process has been a difficult and protracted one that was strongly influenced by domestic interests. This chapter sheds light on the different stages of this process and the political stalemates and breakthroughs that have taken their turns.

The United Nations Framework Convention on Climate Change (UNFCCC) was completed after 16 months of negotiations and adopted in May 1992 in New York. It was opened for signature a month later at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro. Twelve years after its adoption, 188 states plus the European Community have ratified and acceded to or approved the treaty,[10] amounting to almost universal membership.

The UNFCCC sets a long-term objective, which is to stabilize GHG concentrations in the atmosphere at a level that would maintain the natural balance of the earth's climate system. It is bound neither to timeframes nor to binding targets, reflecting the political limitations surrounding the climate change issue at the time. While the European countries and the Association of Small Island States (AOSIS) in the Pacific were pushing for CO_2 reduction targets and had submitted various proposals for this purpose, the oil-producing countries (OPEC) and fossil fuel-intensive economies such as the United States were resolutely against any binding commitments.[11] Japan was generally supportive of setting reduction targets, albeit only if the United States participated in such a scheme (Kameyama 2003).

What was eventually agreed on was that the Parties should review the adequacy of commitments under the UNFCCC and subsequent protocols at regular intervals. Once the existing commitments are not found to be adequate to achieving the convention's long-term objective, the Parties are to negotiate further protocols or other legal instruments. Thus, a process was established to bring the international community together at regular intervals to reassess what strategies and measures are required to attain the convention's objective.

After entry into force of the UNFCCC in March 1994, COP 1 (in Berlin, 1995) concluded that the commitments of the convention were not adequate. In adopting the Berlin Mandate, the Parties launched a process toward strengthening the commitments of Annex I parties beyond the year 2000 by adopting a

10. For the status of ratification of the UNFCCC as of May 24, 2004, see http://unfccc.int/resource/conv/ratlist.pdf.
11. For a detailed account of the negotiations of the UNFCCC, see Bodansky (1993).

protocol or another legal instrument.[12] The Berlin Mandate established the foundation for the negotiating process leading up to the Kyoto Protocol. It explicitly ruled out any new commitments for Parties not included in Annex I of the UNFCCC in the next round. This was a compromise struck by developed countries to bring developing countries into the negotiating process under the UNFCCC, in spite of emerging rapid increases of CO_2 emissions by many fast-growing developing countries of Asia and Latin America (Hirono 2004).

The Ad-hoc Group on the Berlin Mandate (AGBM) that COP 1 had established thus embarked on negotiating further commitments. By COP 2 (in Geneva, 1995), a breakthrough was achieved in that the United States gave its support to establishing “legally-binding” emission reduction targets. During the months prior to COP 3 (in December 1997 in Kyoto, Japan), however, it seemed unclear whether the Parties would be able to agree on reduction targets given their vastly conflicting interests.

The European Union proposed that all Annex I parties should commit themselves to a flat reduction target of 15 percent from 1990 levels by 2010. Under the internal EU distribution scheme, Germany was prepared to take on a reduction target of 25 percent, while Portugal would be allowed to increase its emissions by 40 percent. The European Union negotiated for strong policies and measures (PAMs) to achieve most of the reductions domestically, rather than permitting unrestricted use of market mechanisms.

The United States demanded that all Annex I parties should commit themselves to stabilizing emissions at 1990 levels by the period between 2008 and 2012, and that developing countries should participate in the commitments. The United States sought maximum flexibility in implementing the commitments, and proposed to include joint implementation and emissions trading as cost-effective means to achieving emission reductions.

Japan’s position was that of a mediator, placing itself between the positions of the European Union and the United States, albeit closer to the US position. As the host of COP 3, its most important goal was to reach agreement in Kyoto. It set a maximum reduction target of 5 percent from 1990 levels by 2008 to 2012 for all Annex I countries, and proposed a detailed differentiation scheme that would take into consideration a country's per-capita emissions, gross domestic product, and population growth.

The developing countries were aligned under a coalition called the Group of 77 (G77) and China, comprising some 130 countries. The group’s diversity of national circumstances and interests, however, has somewhat limited its influence on the negotiation outcomes. Not surprisingly, though, the G77 and China have remained resolute on one issue: that they should not be pulled into the commitments under the Kyoto Protocol in the first commitment period.[13]

COP 3 took place from December 1 to 11, 1997, in Kyoto, Japan. With approximately 10,000 participants, it was the largest and most significant climate change conference and the largest international conference Japan had hosted thus far. After a strand of difficult negotiations, culminating in several sleepless nights and an extension of the conference by one day, it ended successfully with the adoption of the Kyoto Protocol. The compromise deal that was struck included a total GHG emissions

12. Annex I countries are the industrialized countries and economies in transition listed in Annex I of the UNFCCC.
13. For more details, see Oberthür and Ott (1999).

reduction target of “at least 5 percent below 1990 levels in the commitment period 2008 to 2012.” Annex B of the protocol listed differentiated limitation or reduction targets for each Annex I party, such as 8 percent for EU countries, 7 percent for the United States, and 6 percent for Japan and Canada, and increases of emissions for Norway, Iceland, and Australia. Furthermore, the protocol established three flexible mechanisms—joint implementation (JI), the Clean Development Mechanism (CDM), and emissions trading—and allowed parties to add certain forestation activities to their emissions reduction accounts. Moreover, the protocol included provisions for a compliance regime.[14]

These results were achieved due to negotiating flexibility on the part of Japan, the United States, and EU member states, and strong leadership and oversight by the chair of the negotiating committee, the former Argentine ambassador to China, Raul Estrada. He was instrumental in pushing through decisions on unresolved issues during the final hours of the conference, thus enabling the adoption of the Kyoto Protocol. The outcome was also influenced by high media presence and public expectations of meaningful results. By including the general public as policy constituents in the final stretch of the negotiations, the negotiators were forced to respond not only to special interests but also to the views of the general public. The details concerning the operability of the flexible mechanisms, the accounting provisions for carbon sinks, and the establishment of a compliance regime, however, remained unresolved. This “nitty-gritty” work was adjourned to future meetings.

At COP 4 (in Buenos Aires, 1998) the parties adopted the Buenos Aires Plan of Action, outlining the follow-up process in the form of a two-year action plan and establishing deadlines for finalizing the outstanding details of the Kyoto Protocol. The aim was to make it fully operational for entry into force after COP 6 in November 2000.[15] In the meantime, COP 5 (in Bonn, 1999) achieved its work plan ahead of schedule and thus concluded in an atmosphere of optimism. It adopted decisions mainly on procedural issues and preparations for decisions to be taken at COP 6. Many countries, including EU countries and Japan, announced their resolve to ratify the protocol in time for the World Summit on Sustainable Development (WSSD) in September 2002, in Johannesburg, South Africa.[16]

COP 6 (at The Hague, 2000) was meant to finalize the operational details of the Kyoto Protocol. Deadlock, however, stalled the negotiations, and the meeting was suspended (and reconvened in 2001 as COP 6, Part 2). This failure reflected lost momentum and a lack of prioritization on national and international agendas, coupled with weak leadership, as well as hardened positions and reduced willingness for compromise among the Parties. One extremely contentious issue during the final showdown was carbon sinks, especially the issue of including additional sink activities not defined in the Kyoto Protocol (but which could be added). While members of the so-called Umbrella Group—including the United States, Canada, and Japan—supported counting business-as-usual activities such as forest management in the agricultural sector as climate protection measures, this was vehemently opposed by the European Union and G77 and China. There were further contentious issues, such as sink activities under the CDM. There, too, flexibility sought by Umbrella Group members rivalled the demand for environmental integrity from the European Union and the G77 and China. But even if all the

14. For a detailed account on the Kyoto negotiations, see Schröder (2001).
15. For more details on COP 4, see Vrolijk (1999).
16. For a more detailed analysis of COP 5 from a Japanese perspective, see Kawashima (2000).

above-mentioned sticking points had been resolved, the biting issue of compensating developing countries for damage incurred by industrialized countries through climate change would have been difficult to tackle.

Conditions for agreement changed drastically in March 2001. The newly inaugurated US president, George W. Bush, unexpectedly announced the his country's retreat from the Kyoto Protocol, claiming that it was "fatally flawed" and "bad for America's economy." This produced widespread shock and anger from not only environmentalists but also governments from around the world. Japan, despite being one of America's "climate allies," was not only embarrassed but also troubled by this 180-degree turn of US climate policy. The emerging question for Japan was whether it would be appropriate to take a decision independent from the United States and help to save the Kyoto Protocol, or whether it would be better to follow its most important security and trading partner—the United States. While maintaining hope that the United States might reconsider its position, under a growing public pressure Japan eventually had to work on the United States to reconsider their position and rejoin the protocol, since it would have adverse implications on Russia's ratification if the United States did not. Japanese newspapers referred to this conflict as one between the European Union and the United States, where Japan would have to act as a mediator, or choose between the two. European newspapers, on the other hand, conveyed the issue as one between the United States and the rest of the world.

The European Union responded to this new situation, not primarily by channelling efforts to convince the United States to return to Kyoto negotiations but rather by sending a delegation to Japan, Australia, Canada, Russia, and Iran (which represented the G77 and China) to secure their support for the international accord. Japan was a major target as it was the most significant GHG emitter from among Annex I countries, after the United States and Russia, and it held a swing vote for ratification. The Kyoto Protocol became one of the most conflicting issues between the European Union and the United States.

The Japanese government and the Japanese people resolved to hold special responsibility for the implementation of the Kyoto Protocol, because it had been the host of COP 3 where the treaty was formally adopted (Simonis 2001). Both houses of the Japanese parliament unanimously adopted a resolution for Japan's prompt ratification of the protocol. This became a top priority for Japan. The European Union and Japan continued to differ on their preference for reduction strategies; the European Union maintained its position on prioritizing reductions domestically, however, while Japan preferred to rely equally on domestic measures, flexible mechanisms, and carbon sequestration.

During inter-COP negotiations, COP 6 President Jan Pronk made a concession to Japan in proposing that densely populated countries with high energy efficiency and large forest cover be allowed to claim larger credits for their forests. With around 70 percent of its land area covered by forests, Japan would be allowed to attain half of its mandated 6 percent reductions via sinks.[17]

17. See *The Japan Times,* June 13, 2001: "Bush not so dismissive of Kyoto pact: Kawaguchi," and "Pronk urges Japan to be independent of US in climate policy." This concession on carbon sinks was granted despite continuing uncertainty surrounding the issue. A report from July 2001 by Britain's Royal Society stressed again that the potential to increase carbon sinks through changes in land use is finite in size and duration. The report warned of the possibility that forests may re-emit carbon dioxide into the atmosphere after having reached their saturation points. According to the report, forests currently absorb around 40 percent of CO_2 emissions from human-induced activities. This could only be extended to up to 45 percent. For more, see Royal Society. 2001. The role of land carbon sinks in mitigating global climate change contents. Policy document 10/01, July 2001, http://www.royalsoc.ac.uk/policy/index. html.

The resumed session of COP 6 (COP 6, Part 2), held in Bonn in July 2001, concluded with the adoption of the so-called Bonn Agreement. It was a political agreement and represented a good foundation for finalizing the details at COP 7. The Bonn Conference thus succeeded in regaining valuable momentum to drive COP 7 to a fruitful closure.

While the European Union had held on strongly to its goal of maintaining environmental integrity in the Kyoto Protocol at The Hague, it was much more willing to give in after the circumstances had changed drastically since March 2001. Thus, what had changed were not so much the initial positions but the outer circumstances, and as a result, the negotiating flexibility and win-sets of the European Union. Ironically, this new momentum came to a great extent from US President Bush's withdrawal from the Kyoto process, in spite of a strong surge of civil society movements for early ratification of the Protocol by all signatory parties including Japan (Hirono 2001). The European Union showed strong leadership at COP 6, Part 2, in forging a political consensus on the outstanding details. It successfully played a mediating role, making many concessions for the sake of securing a final deal. The Umbrella Group countries, on the other hand, virtually pokered out maximum benefits in return for their promise to ratify the protocol—or at least for their *aim*, as in the case of Japan. As a result, the efforts necessary to reduce domestic emissions were reduced substantially for the first commitment period.

An agreement became possible after Japan's Environment Minister, Yoriko Kawaguchi, gave her consent to the package deal that had been forged out. Most of Japan's demands had been granted, including full demands on sinks, soft procedures on compliance, and no quantitative caps on the use of the mechanisms—the only exception being nuclear projects for JI and the CDM.[18] Thus, despite their shortcomings, the results marked an important victory—that multilateralism won over unilateralism in addressing pressing global environmental problems such as climate change.

The Kyoto Protocol was finally concluded in November 2001. The adoption of a 245-page compilation of rules and procedures, called the Marrakesh Accords, paved the way for the protocol's ratification and entry into force, concluding a protracted three-year process of negotiations of the fine print that had begun with the adoption of the Buenos Aires Plan of Action in 1998. For the Kyoto Protocol to be a solid foundation for future emission reductions it is paramount that the Annex I parties ratify the treaty as soon as possible for it to enter into force.

Prior to Russia's decision to ratify the Kyoto Protocol in October 2004 there had been a number of speculations, such as that Russia might announce its ratification of the protocol during Putin's official visit to Japan in February 2005. Another was that Russia would not ratify before the start of the first commitment period in 2008, because emission trading prices may rise sharply in Russia's favor once many Annex I parties will have failed to meet their commitments domestically and would need to resort to emissions trading with Russia. These speculations were found to be wrong. Another one, however, may have now become more probable with China's announcement in July 2004 of its completion of the necessary domestic legal and administrative measures for the CDM. Russia may have to negotiate with

18. It is said that this became possible after a phone conversation with Prime Minister Koizumi, who had just returned to Japan from the G8 Summit in Genoa.

China and other CDM target countries to not lower their emissions trading prices further, as these potential competitors would provide a huge market for industrial countries resorting to the CDM.

4. The Kyoto Protocol architecture

The Kyoto Protocol establishes that all Annex I parties are to reduce their overall greenhouse gas emissions by at least 5 percent below 1990 levels. The individual commitments of Annex I parties are listed in Annex B of the protocol and range from reductions of 8 percent for EU countries to an increase of 10 percent for Iceland.[19] The protocol adopted the concept of commitment periods to smooth out annual fluctuations in emissions arising from uncontrollable factors such as economic cycles. The first commitment period is set for 2008 to 2012, and negotiations on commitments for a second period are to start by 2005. Furthermore, each party "shall, by 2005, have made demonstrable progress in achieving its commitments under this Protocol." The wording "demonstrable progress," however, is not defined.

Annex A of the protocol lists six gases: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. The baseline for the first three main gases is 1990, while a 1995 baseline for calculating the emissions of the other three gases is allowed.[20] The gases are taken together as a basket and compared according to their global warming potential (GWP), i.e., the radiative, or warming, impact of a molecule relative to carbon dioxide within a 100-year time horizon.

The protocol includes a non-obligatory list of policies and measures (PAMs), from which Annex I parties can choose in accordance with their national circumstances. The list suggests PAMs such as improvement of energy efficiency, protection and enhancement of sinks, promotion of sustainable forms of agriculture, and reduction of fiscal incentives and subsidies that run counter to the objective of the UNFCCC. The impetus behind the inclusion of PAMs is to protect the international competitiveness of complying countries and their industrial sectors. Certain PAMs, such as the introduction of minimum standards for energy efficiency, to traded products, or the taxation of the use of the global commons for air and sea transport, can only work effectively if implemented on a global scale.[21]

The Kyoto Protocol established three flexible mechanisms to reach emission reductions cost-effectively:

1. *Joint implementation* (JI) allows emission reductions to be undertaken where they are cheapest within the group of Annex I countries. JI thus enables emissions savings or sink enhancement arising from cross-border investments between Annex I parties, generating emission reduction units (ERUs) or removal units (RMUs) through the implementation of projects. While projects starting from 2000 that meet the necessary criteria may be listed as JI projects, ERUs will not be issued before 2008. JI projects

19. Whereas the UNFCCC set a voluntary flat target for Annex I countries of stabilizing emissions at 1990 levels by the year 2000, it also mentioned the principle of common but differentiated responsibilities. This principle is reflected in the Kyoto Protocol in that developing country parties do not have any reduction commitments. The demand for differentiation can be deduced from this principle, but determining the level of responsibility of each country by calculation is a difficult undertaking.

20. The reason for this provision is that emissions of hydrofluorocarbons (HFCs) have increased in many Annex I countries between 1990 and 1995 as substitutes for chlorofluorocarbons (CFCs), which are being phased out under the Montreal Protocol. It was necessary to allow a 1990 baseline for those parties (e.g., Norway) that had already started to phase out HFCs early. Furthermore, some countries have no data on emission levels of the latter three gases before 1995. Even though 1990 is a default base year, a lot of effort had already gone into establishing inventories for 1990. See also Grubb et al. (1999).

21. See also WBGU (2002).

are most likely to be carried out in countries with economies in transition (EITs) where there are still more opportunities to reduce emissions at low cost.

At Marrakesh, the COP adopted a two-track approach for JI. The track one procedure applies when the host party meets all eligibility requirements related to the Protocol's methodological and reporting obligations. It may then apply its own procedures, issue ERUs, and transfer them to the investing party. The track two procedure, on the other hand, applies when the host country does not meet all eligibility requirements. In this case, the amount of ERUs generated by a project must be verified under a procedure supervised by the ten-member supervisory committee, which is to be set up by the COP/MOP at its first meeting.[22] This allows a host party to begin implementing projects before it meets all the eligibility requirements.

2. *Emission trading.* The idea behind emissions trading is that parties can buy or sell emission rights,[23] thus making it easier for a party facing higher costs to achieve its assigned amount under the protocol. Furthermore, emissions trading provides an incentive for countries or companies that find it relatively easy to cut emissions to go further than required under the protocol. They would then profit financially by selling their surplus to countries or companies that face relatively high reduction costs.

Emissions trading may, however, create a major loophole—the so-called hot air problem. For instance, Russia's CO_2 emissions are around 30 percent below 1990 levels and the Ukraine's are even lower, due to the sharp decline of their economies since 1990. In both cases, emission levels are expected to remain significantly below 1990 levels during the 2008 to 2012 commitment period, granting them a huge reduction surplus given their obligation under the protocol to merely stabilize their emissions at 1990 levels. This "hot air" could provide for cheap supply of emission credits for industrialized countries, and in this way prevent some countries from undertaking serious domestic action.[24] While regional emissions trading schemes can start immediately, as they are independent from the Kyoto Protocol, international emissions trading will only start in 2008.

3. *The Clean Development Mechanism.* The CDM entitles industrialized countries to fund projects in developing countries and earn credits. The host country has to verify that a project meets the objective of contributing toward its sustainable development. Also, projects must lead to emissions reductions that are additional to any reductions that would have occurred in the absence of these projects (the so-called additionality clause), and resources for the CDM cannot be diverted from existing official development aid (ODA) funds.

The CDM project cycle is composed of the following six steps. (1) After a project design document has been prepared by the project participants and submitted to an operational entity,[25] it will be reviewed and, if deemed acceptable, validated (*validation*). (2) The validated project is forwarded to the CDM Executive Board for formal registration (*registration*). (3) Participants then monitor the project by preparing a monitoring report that includes an estimate of certified emission reduction units (CERs) to

22. The Conference of the Parties serving as the Meeting of the Parties.

23. The term *emissions trading* is somewhat imprecise; it is not the emissions but rather the right to emit that is traded.

24. See Grubb et al. (1999).

25. An operational entity is an independent organization formally designated by the COP or COP/MOP and accredited by the CDM Executive Board.

be generated (*monitoring*). (4) This monitoring report is then submitted to an operational entity for verification, which, following a detailed review of the project, issues a verification report (*verification*). (5) If approved, the operational entity certifies the CERs as legitimate (*certification*). (6) The operational entity issues the CERs and distributes them to project participants as requested (*issuance*).

The advantage of the CDM over JI is that crediting for CDM projects already started in 2000, while crediting for JI projects will only begin in 2008, giving the CDM an early start over JI. Also, the CDM has the potential to play an important role in the climate change regime, as it provides a framework for North-South technology transfer, enabling industrialized countries to reduce emissions cost-effectively and employing their energy-efficient technologies abroad. Critics of this scheme argue, however, that it constitutes only short-term advantages while allowing industrialized countries to continue their energy-intensive lifestyles.

Participation in the three mechanisms will, however, only be allowed if the established eligibility criteria are met. These include that a party to the Kyoto Protocol must have satisfactorily established its assigned amount and have in place its national registry. In addition to the assigned amount units (AAUs) allocated under the protocol on the basis of national targets, emission units generated by the various mechanisms and processes under the protocol are classified as three further units. They are fungible, meaning that they are equivalent and interchangeable. This allows them to be traded on a single market, resulting in more liquidity and lower transaction costs. The units are all equal to one metric tonne of carbon dioxide equivalent, calculated using global warming potentials (GWPs). The four units are as follows:

- Assigned amount units (AAUs) allocated under the Kyoto Protocol on the basis of national targets
- Certified emission reduction units (CERs) generated by CDM projects
- Emissions reduction units (ERUs) generated by JI projects
- Removal units (RMUs) generated by JI sink projects

To grant further flexibility, parties are allowed to trade between these units as long as they are in compliance with the protocol’s provisions. Parties to the protocol can authorize legal entities such as companies to trade. However, the party itself remains responsible for meeting its Kyoto commitment. If a party fails to meet its eligibility requirements, its legal entities are excluded from trading under the accounts of that country.

Annual inventories will be reviewed by expert review teams (ERTs) that will be selected based on their expertise. An international accounting system and a transaction register administered by the Climate Change Secretariat will record all issuances, transfers, and acquisitions of credits, as well as the respective project types and countries involved.[26] This is an essential component of the regime, as it allows governments and civil society to keep track of how countries and companies meet their obligations (Goldberg and Silverthorne 2002).

Carbon sinks are carbon dioxide-absorbing ecosystems such as oceans, forests, and soils. The Kyoto Protocol allows for the inclusion of absorption by sinks resulting from post-1990 changes in forestry-

26. The Climate Change Secretariat was established in Bonn, Germany, to monitor the progress in the implementation of the UNFCCC.

related activities, including afforestation, reforestation, and deforestation, which were, however, not defined at the time. The protocol also omitted other sink sources such as agricultural soils. Furthermore, those Annex I parties for whom land-use change and forestry (LUCF) constituted a net source of greenhouse gas emissions in 1990 were allowed to include LUCF emissions when calculating their 1990 base-year emissions, treating them almost like an additional source (Yamin 1998).

The Bonn Agreement endorsed that countries could meet a part of their targets through the following four activities: forest management, cropland management, grazing land management, and revegetation. Each Annex I party is allocated a number of tonnes of carbon uptake that it may count towards its national target from forest management activities.[27] Each Annex I party is also required to provide information on its sinks activities and national "legislative arrangements and administrative procedures" to ensure that sink activities contribute to the conservation of biodiversity and the sustainable use of natural resources (Goldberg and Silverthorne 2002).

Compliance refers to the observance of the regulations and commitments contained in an international treaty. The final decision on whether the consequences of non-compliance would be binding in not only political but also legal terms was, however, not taken even during the first session of the COP/MOP in 2004. This deferral was partly due to provisions in the Kyoto Protocol, which requires that procedures and mechanisms entailing legally-binding consequences be adopted by amendment. COP 7 created the Compliance Committee, consisting of 20 members, which is divided into two branches: facilitative and enforcing. While the facilitative branch is to promote compliance with emission targets and reporting requirements, the enforcement branch is charged with seeing to it that parties remain in compliance.

5. Recent developments in Japanese and EU/German climate policy

5.1. *Japanese and EU/German policy initiatives*

In Japan, the total volume of GHG emissions in 2002 reached 1,331 million tonnes, an increase of 2.2 percent from 2001 and an exceedance of 1990 levels by as much as 7.6 percent; this is way above Japan's reduction target of 6 percent under the Kyoto Protocol. Compared with 1990, the volume of CO_2 emissions in 2002 from industry declined by 1.7 percent (from 476 million tonnes to 468 million tonnes), while emissions from the power sector declined by 0.3 percent (from 82 million tonnes to 81.7 million tonnes). In the same period, CO^2 emissions from transportation increased by 20.4 percent (from 217 million tonnes to 261 million tonnes), while emissions from the commercial and household sectors increased by 36.7 and 28.8 percent, respectively (from 144 million tonnes to 197 million tonnes and from 129 million tonnes to 166 million tonnes, respectively). The transport, commercial, and household sectors thus need to be targeted more rigorously in the near future to reduce emissions.

The European Community and Germany are both committed to reducing their GHG emissions by 8 percent under the Kyoto Protocol. Germany agreed to a 21 percent reduction commitment under the EU

27. The figures are laid down in Annex Z of the Bonn Agreement. Appendix Z can still be renegotiated until 2006, introducing considerable uncertainty. Russia insisted that the amount of carbon uptake for forest management should be nearly doubled from 17.6 million tonnes of carbon (MtC) to 33 MtC. Russia held up the conclusion of the Marrakesh meeting until it secured its full demand of 33 MtC. See also Michaelowa (2001).

burden-sharing agreement that was adopted in the aftermath of COP 3, the second highest target after Luxembourg. Germany was historically fortunate, in that reunification in 1990 allowed the country to significantly reduce emissions through closing down many of its “dirty” industries in former East Germany—the so-called wall-fall profit. This legacy is said to have significantly contributed to the country’s reduction achievement of 18.3 percent (2001) since the 1990 base year, which coincided with German reunification. After a decade of successful reductions, however, emissions have been on the rise again, mainly due to a significant increase in the transport sector of 8.7 percent (2002). This trend is also occurring at the EU level—while EU-wide emissions have increased by 2.8 percent, transport accounts for a rise in emissions of as much as 20 percent (both 2001).

Ongoing increases in Japan’s GHG emissions have led the government of Japan to renew its efforts to monitor and evaluate the progress of the implementation of some 228 policy measures that were adopted in 2002. Japan’s government is now in the midst of examining through its consultation mechanism, the Central Environment Council, if and what kinds of additional measures are required to accelerate the pace of all stakeholders to reduce GHG emissions. An increasing emphasis is now being placed on its energy policy measures, such as developing and utilizing alternative sources of energy, including solar, wind, and tidal wave energy, and fossil fuel energy-saving technology. There is also an increasing consensus among many stakeholders for introducing at the earliest possible time a national system for CO_2 emissions trading.

Japan’s government has been streamlining financial and fiscal incentives for firms using renewable energy sources, to households installing solar energy heating equipment, and to owners of automobiles equipped with electric and fuel cell engines. It has also adopted administrative measures to encourage public transportation companies to turn off engines while waiting for green traffic lights, and government directives to all government ministries and agencies to use “green” low-polluting vehicles and not to reduce air-conditioning temperature below 24°C in the summer time. A number of initiatives have been introduced to promote higher energy-efficiency in traffic demand management, including modal shift and park-and-ride systems. In addition, the government tightened a reporting requirement on eco-efficiency measures in its building code that is applicable to all commercial and industrial construction.

Germany renewed its national climate policy program in 2002. New policy goals to mitigate climate change included doubling the share of renewable energy by 2010, an expansion of cogeneration through a system of quotas, and an increase in energy productivity. Measures to these ends include an ecological tax reform, a renewable energies law to promote renewable energy, the 100,000 roofs program to promote solar panels, and financial support for measures to enhance energy conservation in buildings.

Germany recently invited the international community and all stakeholders to participate in a conference to strengthen renewable energies both in industrialized and developing countries. The conference, Renewables 2004, held in Bonn in June 2004, addressed the question of how the proportion of renewable energies used worldwide can be substantially increased, and how their advantages and potentials can be better used. The conference concluded with a political declaration by 154 participating governments that affirms the importance of renewable energy in meeting energy needs, reducing poverty, and protecting the world's climate. The declaration fails, however, to include binding targets, making it de facto a voluntary and non-binding text. The conference also produced an international action program containing 165 individual voluntary commitments by governments, international agencies, and private groups to promote the use of renewable energies. This action program is expected to mobilize investments worth some billion Euros.

The follow-up mechanisms for the conference are still being developed, but are likely to include an official monitoring process that reports to the United Nations Commission on Sustainable Development (UNCSD) in 2006 and 2007. In addition, a global policy clearinghouse is to be created to provide information exchange, analysis, and capacity building in both governments and NGOs. This can be regarded as a significant first step from which new partnerships and projects are likely to emerge that will enhance the efficiency and diffusion of renewable energies, and will gradually mark the end of the fossil fuel age.

In line with the Kyoto mechanisms, Japan's government initiated several measures to promote forest sinks to absorb 3.9 percent of Japan's CO_2 emissions. As it stands now, however, forest sink absorption of CO_2 emitted in 2010 is estimated to reach only about 3.1 percent, or 37.76 million tonnes. Sound forest management (including anti-disaster forest reserves), increased utilization of timber-based biomass, and expansion of community and social forestry are considered essential in this respect. As regards the use by private sector corporations of the CDM and JI, priority is being given to the early introduction of national incentives to private sector corporations to get involved and a national scheme to transfer CDM/JI emission credits from the corporations involved. Internationally, Japan's government appealed at both COP 8 (2002) and COP 9 (2003) to the international community the urgent need for early ratification of the Kyoto Protocol, intensified efforts for GHG emissions reductions, and internationally agreed rules for GHG emission data registration and reduction enforcement.

In June 2003 the European Union adopted a directive to establish the EU-wide Emissions Trading System (EU ETS). This marks a significant turning point for EU climate policy, as EU Member States had previously expressed considerable opposition to such a scheme. Domestic policies and measures were previously regarded as more aspiring, as they would represent true emissions reductions, and the failure to adopt the proposed EU-wide carbon tax had led to a search for alternative measures. The EU ETS is set to begin in 2005, and is expected to regulate around 46 percent of the EU's CO_2 emissions. There will be two phases: one from 2005 to 2007 and one from 2008 to 2012. In the first phase, CO_2 will be the only gas regulated, while in the second phase other greenhouse gases may be included in the scheme. Participating countries were required to draw up national allocation plans (NAPs) by March 2004 to match their respective allocations with the emissions from their installations. Installation operators may either invest in abatement technology or acquire EU allowances on the market to match their emissions, whichever is more cost-effective.

The European Union introduced the so-called Linking Directive to facilitate the integration of the other flexibility mechanisms introduced by the Kyoto Protocol (JI, the CDM, and emissions trading) into the EU ETS. The directive renders emission credits under the protocol exchangeable for EU allowances to ensure full fungibility of credits within the EU ETS. ERUs from JI projects and CERs from CDM projects will thus be exchangeable for EU allowances. This is expected to boost technology transfer to industrialized and developing countries and reduce compliance costs.

5.2. Civil society and NGOs

Japanese NGOs and civil society have for some time been pressing the government to install more stringent measures, such as a carbon tax and other economic instruments, as soon as possible to make the Japanese economy and lifestyle less energy-dependent, less polluting, and more environmentally sustainable. They have also been pressing the government to increase the national target for renewable energy.

In many local communities, the public and NGOs have been successful in rendering their local government decisions more supportive of environmental sustainability by introducing community ordinances conducive to keeping vehicles out of downtown areas, managing more orderly traffic control, and greening public and office buildings and residential areas, as well. In spite of claims by private sector interests that Japan has already achieved high eco-efficiency, the public and NGOs are concerned with the steadily increasing level of GHG emissions year after year. Reducing waste and re-using and recycling materials and products have now become a rallying cause among pupils and students at school and among ordinary people in many local communities. It will, however, take a long time before their lifestyles in Japan become sustainable.

In Germany, environmental awareness is highly advanced among the general public. Environmental concerns take a prominent position in the national parliament, and the Green Party is part of the current coalition government. German NGOs play an important advisory role in environmental legislation, and they are represented in the German delegation at climate conferences.

5.3. Private sector corporations

While supporting Japan’s 6 percent Kyoto target, the Japanese industry group, Keidanren, which often acts as the spokesperson for private sector corporations in Japan, insists upon the following principles: First, the government must leave it to the private sector to decide how they would contribute to achieving the Kyoto target of 6 percent and it should not prescribe specific targets to each industrial/business sector. Second, while each industrial or business sector may decide on its own GHG emissions target through its own industrial association, each company should be able to decide itself how it wishes to contribute to achieving the industry-wide target, taking into account its respective GHG emissions level and available technological resources. Third, each company and each industry association should monitor the progress of their respective GHG emissions reduction programs on a voluntary basis, and the government should not get involved in such monitoring. (NGOs and civil society, however, insist on government monitoring.) Finally, a private sector corporation or industry association should not be penalized for its failure to comply with the target it set for itself, but rather be given positive incentives to try its best to achieve the target.

Keidanren has laid out its own principles and guideline for its member associations to follow, but they are non-binding. There are a variety of views among corporations on the need for their compliance with the Kyoto Protocol targets. Some business leaders are more proactive in lending their support to the protocol's targets, while others tend to be less enthusiastic, even to the extent of taking a negative stance. In spite of such a complex situation, once Keidanren publishes, as it has already done, its own industry-by-industry sectoral targets for GHG emission reductions, its member corporations are morally, but not legally, bound by those targets. In monitoring the implementation of the industry-wide reduction targets, Keidanren simply collects data and information without verification from its member industry/business associations, but the publication of such data has tended to impose discipline on its members.

One of the most contentious questions facing the Japanese private sector in GHG emissions reduction in recent years has been the rising pressure from the public to levy a carbon tax on industry and households. Despite opposition from the private sector to a carbon tax, there seems to be a gradual rise in its acceptance by an increasing number of business leaders. In fact, some business leaders venture to say that a carbon tax will facilitate innovation of energy-efficient technology and products by triggering increased research and development investment in energy-saving technology and alternative sources of energy, thus leading to more environmentally sustainable patterns of production and consumption.

In 1996, leading German business sectors announced a voluntary commitment of reducing industrial CO_2 emissions by 20 percent by 2005. This target was already surpassed in 1999, leading industry to pledge a 28 percent reduction by 2005 and a 35 percent reduction of six GHGs by 2012. German industry was initially strongly opposed to a mandatory company-based emissions trading approach, as it would run counter to these voluntary commitments. Rather, it insisted on a global, country-based scheme that would offer greater incentives to participate. The German government, on the other hand, was predominantly supportive of such a scheme and it was backed by German environmental NGOs. It was not Germany but mainly the EU institutions and countries like Britain that had pushed for this initiative.

6. Summary and conclusion

The science of climate change is compelling, its politics frustrating, and its legal manifestations are cumbersome. Although it is scientifically proven and politically acknowledged that an increase in greenhouse gas concentration levels over the past 150 years has set off an enhanced greenhouse effect that is causing global average temperatures to rise and weather patterns to change faster than at any time within the past 10,000 years, the international legal framework to direct and monitor domestic policy outcomes has not (yet) come close to fulfilling its objective.

Although a strong scientific basis is paramount to an effective policy response to the issue at stake, it is by no means its guarantor. Negotiations at the international level are ordinarily interlinked with negotiations and bargaining processes at the domestic levels of the parties involved. Domestic policy actors representing vested national interests have exerted substantial influence on the international policy process, which explains why the science has not had a stronger influence on the negotiated outcome.

The Kyoto Protocol, adopted in 1997, despite containing legally-binding emissions reduction targets for industrialized countries, is still not in force as of October 2004 because the United States, Australia, and Russia have not yet ratified the treaty. Nonetheless, this evolving international framework may still provide sufficient impetus for spurring effective domestic action, since it is a process, and stronger commitments appear unavoidable in the future.

Despite the fact that the entry into force of the Kyoto Protocol in the end depended on a few final countries ratifying, the greatest hurdle for GHG emissions reduction worldwide lies ultimately in the extent to which governments of developed countries and European economies in transition can convince their respective citizens, corporations, and other entities to meet the Kyoto targets within a prescribed time limit. This achievement will essentially require not only further developments of energy-saving technologies and alternative sources of energy that are free of GHG emissions, but also a dramatic change in daily lifestyles. Success will be impossible without the fullest possible cooperation of civil society. Also, because GHG emissions, CO_2 in particular, are rising rapidly in many developing countries, such as Brazil, China, India, and Mexico, the international community will eventually have to start negotiations on repealing the Berlin Mandate and revising the Kyoto Protocol to involve such countries beyond 2012. It would too risky to depend overly on the current increase of crude oil prices to provide an impetus to achieve the ultimate objective of the Kyoto Protocol—the pursuit of sustainable and equitable development consistent with the life-support system of our Blue Planet.

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Special Feature on the Kyoto Protocol

Reflections on the Kyoto Protocol—Looking Back to See Ahead

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The Kyoto Protocol can best be understood as being an economic instrument that uses flexible targets and market mechanisms to limit greenhouse gas emissions at the least cost. Its market orientation was largely inspired by the United States, which nevertheless opposes it on economic grounds. Yet a meaningful global regime requires the participation of the world's largest economy, which in turn is a prerequisite for the engagement of large developing country emitters. Attracting the United States back into a multilateral approach will take time, during which its economic concerns must be addressed. The next phase of climate strategy should comprise a menu of emission-limitation commitments, suitable for different national circumstances, and be set in a longer time frame. An "aspirational" long-term target for atmospheric concentrations of anthropogenic greenhouse gases could be adopted as a guide to action. Moreover, resilience to climatic impacts and adaptation to climate change should be given greater importance. The environmental case for action to counter climate change has not generated sufficient traction in the economic sphere. Mobilizing commitment to an effective climate strategy will require informed economic advocacy and the involvement in negotiations of major economic actors, private and public. An approach that takes in concerns with global security and addresses the political economy of oil and coal may generate greater traction. Emission limitation pledges by private sector actors could complement governmental commitments, though governments must provide leadership and set the framework. Financial and technological incentives may be required to bring the heavyweight outsiders on board.[1]

Keywords: Climate change, Kyoto Protocol, Emission limitation commitments, Market instruments, Vulnerability and adaptation, Global security, Oil, Coal.

The essence of the Kyoto Protocol—its genius—is that it encourages recourse to the market to achieve environmental objectives at the least economic cost. The paradox of the protocol is that the main source of this genius—the United States—is also the source of the political veto that has prevented it from entering into force.

The Kyoto Protocol has been leading a strange life: alive for some as a political symbol and a guide to their action; moribund for others; a question mark for all, as the Russian Federation determines how to play the trump card that has been dealt into its hand. It now seems that the card has been played in favour of the protocol.[2] However, while the game of guessing Russian intentions has made occasional headlines, time has been passing and the big question has shifted from "What if?" to "What next?" Not whether and when the protocol will enter into force—important as that would be to protect the design of

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1. This article expresses the personal views of the author. These are not to be attributed to any institution with which he is or was associated.

2. At the time of going to press, the protocol had been forwarded to the Russian parliament for ratification.

the Kyoto mechanisms—but what the regime will be after 2012, the last year of the protocol's first commitment period. For, even with the protocol in force, negotiations on post-2012 commitments should be launched in 2005.[3]

Increasingly, reflections on global climate strategy, such as those collected in this volume, will look ahead to the next phase of negotiations—in particular to the need to ensure equitable global engagement. In doing so, the past will be scoured for lessons that remain valid, and for hints of what could have been done differently.

1. The political economy of the Kyoto Protocol

The 1997 Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC), though negotiated under an environmental banner and largely by environment ministers, can best be understood as an economic instrument. A view of global climate strategy as an issue with deep economic implications explains the 1990 initiative of the Latin American Group to remove the incipient negotiations on climate change from the ambit of science-based bodies—the World Meteorological Organization and the United Nations Environment Programme—and place them in the political framework of the United Nations General Assembly.[4] The result to date is, perhaps, the most ambitious economic regime to have been fashioned under the auspices of the United Nations since the early years of post-war institution building. The limitations on greenhouse gas emissions that are prescribed by the Kyoto Protocol reach into the heart of industrial economies, notably their energy and transport sectors. The mechanisms that the protocol envisages create new markets and offer opportunities for technological and financial innovation.

The framers of the Kyoto Protocol were attentive to the potential of market mechanisms and the needs of market operators. Flexibility thus became a key ingredient of the negotiated outcome. As regards ends, the protocol is not a substance ban nor does it seek a result at a fixed point in time. Rather, it addresses a basket of interchangeable gases and sets limitation targets over a multi-year period, initially five years. As regards means, it permits emissions to be offset by removals by "sinks," trading of emission allowances within the group of countries bound by emission caps, and buying in emission reductions from outside that group through the Clean Development Mechanism (CDM). The latter device is also to stimulate the diffusion of cleaner technologies in developing countries and thus their sustainable development.

The sensitivity of the protocol to the market was largely instigated by the negotiating positions of the United States. An important argument in the US baggage was the success of its domestic scheme for controlling sulphur dioxide emissions, in which emission trading had resulted in spectacular cost reductions. Although all the parties to the Kyoto negotiation now embrace this outcome, with greater or lesser warmth, this was not the case before and at Kyoto. For example, the European Union—now fully

3. Although it is conceivable that the Kyoto Protocol could be brought into force without Russian ratification, through one of a number of legal devices, this could only be considered useful as a prelude to a new round of negotiations.

4. This institutional shift meant, *inter alia*, that the secretariat responsible for managing the negotiating process was not beholden to either of these bodies and remained subordinate to the directives emanating from the intergovernmental process. This was in contrast to negotiations managed by the United Nations Environment Programme (UNEP), whose executive head was an assertive presence in intergovernmental decision-making.

committed to emission trading—was insistent that trading should be supplementary to domestic action to limit emissions, the latter seen as essential to the development of technologies that would open the way to a low-carbon future. The European Union also frowned upon recourse to “sinks” for the same reason and because of the uncertainties surrounding that option. Yet these were among the final make-or-break issues for the US negotiators, and it is not an exaggeration to brand the mechanisms of the Kyoto Protocol as “Made in the USA.”[5]

The bottom line, in terms of political economics, is that the Kyoto Protocol seeks to engage enlightened economic actors who accept legitimate societal aims but ask for freedom to choose the best means of achieving them. It is in harmony with the humane current in prevailing economic philosophy, accepting globalization and seeking to use it to help satisfy global needs. Why, then, is the future of the Kyoto Protocol still in doubt?

2. The position of the United States

A knee-jerk political response will blame the impasse on the resurgence of a more hard-nosed and nationalistic current of economic philosophy in the United States, a school of thought in which the global good takes a back seat. The political influence of the energy lobbies in that country will also be cited. The presidential election of 2000 was a victory for these forces, and the subsequent rejection of Kyoto a rather evident move by the incoming president to differentiate himself from both his predecessor and his challenger on an iconic but politically cheap issue. Similarly, in Russia—left unwillingly holding the casting vote—those who oppose the protocol have repeatedly advanced the argument of national interest, contriving to represent the generous emission allowance accorded to the Russian Federation as a constraint on its ambitions for economic growth.

Such analysis of politics and personalities can lead the observer to pin the future of global climate strategy on the result of the forthcoming presidential election in the United States or on the rise and fall of presidential advisers in Moscow. This may be an intriguing game but is not very useful in considering the next steps ahead.

If one goes a little deeper into the position of the United States, one has to accept that a different electoral outcome in 2000 would not have guaranteed the consent of the US Senate to the ratification of the Kyoto Protocol. The unanimous Byrd-Hagel resolution that was adopted during the negotiations on the protocol was a clear signal of legislative opposition. The grounds for that opposition—economic cost and competitive disadvantage—were echoed by President Bush in rejecting the protocol. Moreover, a Gore administration—following one that was famously dedicated to “the economy, stupid!”—could not have been insensitive to economic considerations. In fact, the US acceptance of the Kyoto deal, after Vice-President Gore’s personal intervention at the negotiating conference, remains something of a mystery in hindsight.[6] Consequently, while a change back to a Democratic administration resulting from the 2004 elections may bring in a more positive attitude to multilateral climate strategy, it cannot be

5. Though Brazil was joint inventor of the CDM.
6. It cannot be excluded that the calculations of cost that permitted the US delegation to agree to and sign the protocol did not stand up to subsequent scrutiny.

counted upon to produce a complete change of heart on the protocol. It will still be necessary to address the economic concerns of the United States. So one has to take a somewhat longer view of prospects.

Common sense suggests that a climate regime without the United States—such as the current Kyoto regime—cannot hold up for long in a global economy dominated by the US. It is already evident that the withdrawal of US demand for emission allowances under Kyoto has severely weakened the emerging trading regime—and thereby lowered the estimates of what the Russian Federation could gain as the biggest seller of such allowances. Political sense further suggests that the emerging new actors of the global economy—with China and India looming large—will not move to limit their greenhouse gas emissions until they are convinced that the United States is committed to doing so and has shown evidence of its commitment. Thus the common aim must be the construction of a global climate regime incorporating the United States, as well as the industrializing countries, in a deal that will be considered equitable by all parties. And the long view suggests that there is a long road ahead.

The reluctance of the United States to be bound by multilateral disciplines, by laws other than its own, is a deep-rooted trait of national character, pre-dating its great power status. The current multilateral landscape is dotted with examples of treaties that the US either opposes, or accepts with reservations protecting its sovereignty, or supports without being formally bound. This is not a recent phenomenon. The post-1945 history of multilateral negotiations holds examples of agreements reached with US participation from which it subsequently withheld acceptance. A telling case is that of the international trading regime: in the 1940s, the United States had taken the lead in negotiating the establishment of an international trade organization, which Senate opposition obliged the then US administration to abandon, still-born.[7] It took nearly 50 years of an interim regime—the General Agreement on Tariffs and Trade (GATT)—before the US accepted to work within the multilateral rules of the World Trade Organization (WTO). While we now live in a world that moves faster, this story hints at the nature and scale of the challenge facing climate strategists.

3. Broadening the Kyoto strategy

3.1. Time frame

One criticism that is constantly aimed at the Kyoto Protocol concerns its narrow and short-term vision. It is asserted that the emission limitations prescribed for industrialized countries will only scratch the surface of the problem of global warming and will, in any case, be outweighed by the increase in emissions from countries that are not bound by Kyoto targets. This is an unfair criticism, deliberately isolating the protocol both from the long-term aim of its parent convention and from its intent to be the first of several successive steps towards limiting global emissions.

Yet it is true that the protocol explicitly covers only a five-year period—a long time in politics, perhaps, but very short in corporate planning. Moreover, it does not indicate what should happen to

7. In 1948, the UN Conference on Trade and Employment, held in Havana, adopted the Charter of the International Trade Organization. In 1950, the US administration announced that it would not submit the charter to the Senate for ratification. Consequently, the charter—comprising a wide-ranging set of trade and economic provisions—did not enter into force. However, a group of countries had previously agreed to apply the emerging trade rules of the charter, thus giving rise to the GATT (1947).

emissions by industrialized countries after 2012, not even—as one might presume—that they should not exceed the limits prescribed by the first set of targets in its Annex B.[8] The protocol requires only that negotiations on new targets for those countries should start in 2005. Most important, it says nothing about broadening emission limitation commitments to other countries, though this is considered to be an obvious and essential part of the next round of negotiations. The developing countries remain behind the fence of "no additional comments," which they erected in Berlin in 1995 as the price of their agreement to launch the negotiations that led to the protocol.[9] An article that would have permitted "voluntary commitments" by developing country Parties fell away in the final Kyoto "trade-off." The art of the possible produced these outcomes, which left the protocol in an uneasy situation as its forward momentum flagged.

Could the negotiated outcomes have been different? Definitely not as regards "no additional commitments": this was a *sine qua non* for the Group of 77 (developing countries) at COP 1. Probably not, as regards an indication of post-2012 emission levels for industrialized countries; keeping future options open was part of the conceptual flexibility demanded by some negotiators. But hindsight suggests it might have been better to go for a longer budget period or for two periods. This would have been helpful at the present juncture and could be one of the elements in the next round of negotiations.

Related to this issue, in a sense, is the question whether it would be useful to set a collective long-term target by pinning a number on a "safe" level of atmospheric concentrations of anthropogenic greenhouse gases, consistent with the long-term objective of the UNFCCC.[10] Such a target, possibly complemented by intermediate indicators, would be subject to revision at regular intervals as new scientific evidence comes in. It would provide direction to future rounds of negotiations, as well as a frame for the allocation of responsibility for emission limitation. A similar though simpler long-term goal—"free trade"—guided successive rounds of international trade negotiations. A concentrations target would be very difficult to negotiate multilaterally, given the different starting points of the participants, differing evaluations of risk, and the distant time horizon. But one could envisage a first step whereby a politically significant group of like-minded countries would coalesce around a long-term goal and declare it to be their collective aspiration. The debate on this topic continues.[11]

3.2. Types of emission targets

A second issue concerns the nature of the emission targets in the Kyoto Protocol, which are simple, "top-down" caps. To those who are convinced that emission trading is one of the keys to a successful

8. Annex B to the Kyoto Protocol assigns emissions caps to all countries listed in Annex I to the UNFCCC, expressing these as a percentage difference from 1990 emission levels, to be achieved within the protocol's first commitment period (2008–2012).

9. See COP decision 1/CP.1, *The Berlin Mandate*, paragraph 2(b).

10. The long-term objective in Article 2 calls for a level of concentrations that would prevent dangerous anthropogenic interference with the climate system.

11. See Noble, I., J. Parikh, and R. Watson. Forthcoming. Responses to climate change. Draft chapter in *Millennium ecosystems assessment*. This paper, now undergoing peer review by experts and governments, considers a concentration limit of 450 parts per million (ppm) of carbon dioxide (CO_2) (corresponding to 500 ppm of CO_2 equivalent), which would restrain the rise of global mean surface temperature by 2100 to 2 degrees Celsius. This would limit adverse impacts to a globally manageable scale. These impacts, however, would be concentrated in the tropics and sub-tropics, and the many poor countries in those regions would need substantial assistance in overcoming adaptation challenges. For a negative view of the desirability of negotiating a concentration limit, see Pershing, J., and F. Tudela. 2003. A long-term target: Framing the climate effort. In *Beyond Kyoto: Advancing the international effort against climate change*. Arlington, VA: Pew Center on Global Climate Change.

strategy and understand that trading requires scarcity to give value to the market, a cap is the obvious and simplest instrument. A cap also gives a clear push to the technological shifts that are required. The protocol conformed to this vision.

Since Kyoto, inspired both by the protocol negotiations and especially by the rejection of the protocol by the United States, there has been a flowering of proposals for alternative types of emission commitments. Some of these proposals, such as intensity commitments and a “safety-valve” device to cap the costs of commitments,[12] appear to be compatible with an approach aimed at capping and trading emissions. Others, such as those envisaging monitored national pledges of policy effort, do not appear to fit into the cap-and-trade scheme.[13]

While the simplicity of emissions caps for industrialized country targets continues to hold appeal, one can imagine future negotiations taking in the interest of these countries in cost caps. National carbon intensity commitments may be the preferred type for engaging the “industrializing” developing countries, some of which—notably China—are already making remarkable progress in decoupling economic growth from carbon emissions. Sectoral performance standards for carbon emissions could be taken on by major corporate actors worldwide, thus building North-South bridges and allaying Northern concerns about loss of competitiveness. They could be complemented by a CDM-type project-based mechanism. Finally, non-binding emission commitments could be the soft end of the spectrum for other developing countries, including the smaller and weaker ones such as the least-developed countries and some small island states.

In short, the exploration inspired by the ground-breaking international cap-and-trade system embodied in the Kyoto Protocol could lead to a menu approach operating within the broad and permissive framework of the UNFCCC.

3.3. Not by emissions alone

The limitation of emissions is the key action needed to change the patterns of production and consumption that are increasing atmospheric concentrations of greenhouse gases at an accelerating rate. This is the focus of the Kyoto Protocol, which is intended, above all, to promote energy economy, energy efficiency, switching to cleaner energy sources, and the technological innovation required for attaining these aims. However, as envisaged by its parent convention, a global climate strategy must do more.

One additional line of action is to expand ways of lengthening the storage time of carbon sinks (e.g., through better forestry and land management practices) and removing carbon from circulation by sequestration (e.g., in disused oil wells). A group of countries led by the United States is studying this angle and may produce useful results.

12. Intensity commitments include, notably, carbon intensity commitments by country or by productive sector (the latter are also known as sectoral performance standards, e.g., standard emissions per tonne of cement or per tonne-kilometer transported). A “safety valve” would cap marginal compliance costs by providing additional emission allowances at a pre-determined price.

13. For a comprehensive but concise presentation of current proposals, see Bodansky, D., with S. Chou and C. Jorge-Tresolini. Forthcoming. *International climate efforts beyond 2012: A survey of approaches*. Arlington, VA: Pew Center on Global Climate Change.

The other angle, essential for all countries, is to strengthen the resistance of people and their livelihoods to climatic shocks and to prepare for adaptation to climate change. However strong the response to the climate challenge may be, a degree of global warming is now inevitable. Even ambitious long-term limits for atmospheric concentrations would restrain mean global surface temperature at levels above the present. There will be adverse effects.[14] It makes sense to invest in increasing the resilience of existing systems to known phenomena whose severity and frequency are expected to increase. Droughts and floods, hurricanes and heat waves, insect-borne diseases—in different degrees, these phenomena affect food production, water supplies, health services, and disaster management, for example. Such national systems need to be strengthened now. In addition, phenomena that are more specific to global warming—such as rising sea levels, shifts in agricultural production zones, or species loss—will need adaptive responses in the future.

It is no accident that the insurance industry was the first corporate sector to take on the climate change issue. But this part of the response agenda has been relatively neglected in the intergovernmental discussion. This may be ascribed to concerns of industrialized countries that they may be faced with large bills from developing countries for assistance with adaptation and, in the view of some, for their liability as the historical originators of human-induced climate change. Another cause is the dynamic of a negotiation in which the thrust of small island developing states on the adaptation front has become enmeshed with the riposte of oil-exporting countries concerned about the impact of response measures on their economies. The resulting impasse appears somewhat parochial and, by highlighting the plight of small islands, obscures much bigger cases of vulnerability (e.g., Bangladesh). Yet resilience and adaptation are global issues, in that they are of concern to all countries and need to be integrated in their economic scenarios and their development cooperation. While they do not lend themselves to the same sort of "trade-offs" as do emission limitation commitments, it will be important to give them their proper place in the agenda if a balanced global strategy is to emerge.

4. Towards constructive engagement

The foundation for such a strategy is the 1992 Convention, the UNFCCC, often overlooked in the public debate on its offspring. It has been in force since 1994. With 188 states as Parties, it is nearly universal. It binds all Parties to take climate change seriously and to cooperate in responding to it. It establishes an objective and principles to guide their response. It binds them to transparency—to exchange information about what they are doing as they move along their learning curves. It provides opportunities for exchanging "best practice" and for adopting common methods, notably methods for measuring emissions and removals of greenhouse gases. Such methods are necessary to validate emission commitments and emission trading. It recognizes that developing countries need technological and financial support to take climate change on board and makes a modest start in providing it.

The UNFCCC arose out of the first scientific assessment by the Intergovernmental Panel on Climate Change (IPCC). The second assessment of the IPCC underpinned the Kyoto Protocol. But as the political momentum behind the protocol has wavered, so too has conviction that climate change needs to

14. Though initially there may be some benefits for agriculture in temperate zones at low degrees of warming.

be dealt with now. The wealth of more immediate issues, together with a continuing campaign against the protocol and the underlying science, take their toll. Despite sustained scientific affirmation from the IPCC's third assessment, the "wait-and-see" attitude gains ground.[15]

The arguments for delay may seem unconvincing to those who are converted to the importance of climate change. But they exist and need to be addressed in terms that their proponents understand and accept. Even though the Kyoto Protocol is shaped by economics, the issue of climate change needs greater traction in the sphere of economic policy making. Good answers are needed to the question "Why should I worry?" Good arguments are needed to refine estimates of the costs of responses to the climate threat, to propagate win-win opportunities, and to demonstrate the costs of inaction—the costs of "waiting-and-seeing." And these answers and arguments need to be repeated for each generation of economic policy makers. The case in favour of "action now" cannot be taken as given. This is a challenge to existing multilateral institutions, none of which is presently equipped to perform this economic advocacy function effectively.

One generic institutional handicap is that—despite the original shift into the political sphere of the UN General Assembly, referred to above—climate strategy continues to be driven by scientists and environmentalists. Conferences of the Parties to the Convention are essentially assemblies of ministers holding their country's environment portfolio—their most visible photo opportunity on the global stage. The same constituency is in the lead when climate change is discussed in the United Nations forums on sustainable development and drives the issue in the work of the European Union and the G8. It has to be recognized that—with few exceptions—this constituency does not rank high in national political and economic clout. Yet the UNFCCC process, if it is taken seriously, is meant to be shaping nothing less than a new global energy economy! Thus, the challenges in taking the strategy forward include finding ways of broadening participation, bringing in political heavyweights even at the cost of being less virtuously "green," and raising the topic up the political agenda even at the risk of blurring the environmental image.[16]

One possible hook for a broader approach is global security. Long-term climate change will be a factor of global inequity, dumping the adverse fall-out of global economic growth on poor people least able to cope. It will thus add to global instability, if only because of its impacts on food, water, and migration. It is interesting that an institution as hard-nosed as the US Department of Defense recently carried out a study looking at climate change from the security angle.[17]

Another hook is oil security. The unpopular tactics of oil-exporting countries in the climate change negotiations are, in the end, an expression of concern about their economic security in a low-carbon economy. The same industrialized countries whose delegates bemoan these tactics are concurrently

15. The recent report of Bjorn Lomborg's *Copenhagen Consensus* (May 2004) predictably contributes to this attitude. Using economic cost-benefit analysis, a panel of eight economists ranked 17 proposals "competing" for a hypothetical fund of US$50 billion in terms of their potential to advance global welfare, in particular that of developing countries. Proposals addressing HIV/AIDS, malaria, malnutrition, and free trade top their list. Three "projects" related to climate change—the Kyoto Protocol and two versions of a carbon tax—occupy the last three places in the ranking, classified as "bad projects." Some 20 other proposals, addressing *inter alia* education, civil conflict, and financial stability, were not ranked. This selection of apples and oranges is presented as "a prioritized list of solutions to the world's great challenges." See www.copenhagenconsensus.com.

16. UK Prime Minister Tony Blair, like Margaret Thatcher before him, has included climate change in his political agenda.

17. See www.ems.org/climate/pentagon_climatechange.pdf.

negotiating with the oil exporters to secure oil supplies at affordable prices. These issues must be addressed openly if the climate negotiations are to prosper. The right people to address them need to be brought into play. Industrialized countries cannot credibly speak in one voice to members of the Organization of Oil Exporting Countries (OPEC) and in another in the UNFCCC, especially when some of their key interlocutors among the former also take part in the latter.

A third approach would address the climate change issue through the perspective of the political economy of coal. As in the case of oil, coal interests are a major source of opposition to action on climate change. This opposition needs to be addressed, not wished away. Coal will remain, for the foreseeable future, the cheapest and most plentiful source of energy, vital for industrial growth worldwide. Many major emitters, North and South, are coal producers. Many key industrial sectors, South and North, are coal users. Together, producers and users represent a significant mass of economic power. At the same time, coal is and will remain a major source of urban air pollution and the respiratory ailments this causes. For many developing countries, the health impact of coal use is a much more compelling reason to moderate it than the prospect of climate change. A dialogue on the sustainable development of coal could assemble these various interests and attempt to orient them towards a healthier, more climate-friendly future. It could explore ways of encouraging more efficient “clean coal” technologies and emission standards for coal-using sectors. And it could take on the issue of coal subsidies, thus addressing one of the well-founded concerns of oil producers.

In general, increased private-sector involvement would enhance the economic relevance of the climate change process. Corporate pledges to limit emissions could be announced, registered, verified, and monitored.[18] Indeed, some types of commitments—sectoral performance standards—would have to be negotiated with and among major corporate actors. Global corporations can be a positive force: they seek resource efficiency, need predictable global rules, and increasingly accept global accountability. In a situation where intergovernmental agreement remains elusive and fragmented systems are emerging, their global long-term vision can be a factor of integration and a source of forward thinking.

Yet, in the end, it is up to governments to exercise their responsibility for leadership and vision and to set the framework for corporate action. Those that are ready to take the lead have to persuade and encourage the others. Preaching and exhortation will not bring the heavyweight outsiders on board. Their specific concerns will have to be understood, addressed, and to some extent accommodated. They may need financial or technological incentives to move off the defensive. They may await assurance that their interests will be adequately reflected in other multilateral negotiations, notably the Doha trade round. But it is important, in any case, that all the players realize they are in the same boat. Because that is where climate change has put them.

18. The Global Greenhouse Gas Register, proposed by the World Economic Forum, is a step in this direction. See www.weforum.org and click on *Initiatives*.

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Special Feature on the Kyoto Protocol

Evaluation and Future of the Kyoto Protocol: Japan's Perspective

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The aim of this paper is to examine the repercussions in Japan wrought by the Kyoto Protocol, which it signed in 1997, and to point the way for the country's response in the next and future rounds of protocol-related negotiations. This challenge is met by first reviewing Japan's past negotiating positions at the international level and relevant movements inside the country prior to and after it signed the protocol, and then by examining the protocol's effects on Japan. This review finds that the following points are important to be aware of when attempting to understand Japan's dynamics relating to the Kyoto Protocol: (1) it is the only internationally agreed text to address climate change; (2) it is the only major multilateral environmental agreement ever adopted in Japan, giving it special significance to domestic actors; (3) the negotiation process represented a new approach to foreign policy; and (4) its negotiation was part of a learning process for Japan on multilateral negotiations on climate change. Japan has now begun to prepare for a new round of climate change negotiations, and the learning that has occurred is now reflected in two very distinct views within Japan as to the ways to move forward. As Japan's government works to merge the demands of all ministries concerned, its position in future negotiations is likely to remain vague externally; internally, on the other hand, the Japanese people will be increasingly concerned about climate change policies.

Keywords: Japan, Climate change, Kyoto Protocol, Negotiation, Third Conference of the Parties (COP 3).

1. Introduction

What are the effects of the Kyoto Protocol on Japan so far? This is a tough question to answer. At this point, it is not really practical to ask what if Japan had not ratified the protocol, and there is no way to prove what Japan would be like without it. Without Kyoto, there might have been no international agreement on addressing climate change at all; or rather, there might have been another type of agreement adopted. In this paper, the challenge to identify the protocol's effects on Japan is addressed by reviewing what has happened during the last decade in Japan, both at the international and domestic levels, and by explaining the current debate in Japan on the "post-2012" issue. The debate centers on the following question: What happens after the first Kyoto commitment period ends in 2012? Here the argument is presented that the Kyoto Protocol was effective in moving Japanese policies forward in several different ways. Such effects have given many players in Japan an interest in the next round of negotiations on climate change.

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2. History of Japanese climate policy making before and after Kyoto

Although the main purpose of this article is not to look back at the history of Japan's positions during negotiations leading up to Kyoto, it is an important exercise to examine the priorities and concerns of Japan on climate change policy in order to fully understand Japanese views on the Kyoto Protocol and beyond. Looking at the last decade, one would find between the lines different ways of looking at the climate change problem by various stakeholders in the country.

2.1. Japan and adoption of the Kyoto Protocol

Since the First Session of the Conference of the Parties (COP 1) of the United Nations Framework Convention on Climate Change (UNFCCC) in 1995 in Berlin, where Sohei Miyashita, Japan's Environment Minister at the time, announced Japan's desire to host the third or one of the later COPs, the Japanese government entertained the idea that it might bear responsibility as the host nation for the adoption of the anticipated protocol. This position created great interest in Japan regarding the negotiations on the protocol (Kawashima 2000). Especially after the formal announcement in July 1996 at COP 2 in Geneva that it would actually host COP 3 in its ancient city of Kyoto, Japan found itself in a very difficult position, as every government ministry and agency had a different agenda planned for it.

As COP 3 approached, Japan was pressured to submit a concrete proposal for an emissions reduction and limitation target, but because of the divergent interests domestically the Japanese government remained incapable of presenting a national position. In the run-up to COP 3 in August and September of 1997, relevant ministries held the final months of coordination to agree on a government position (Takeuchi 1998; Tanabe 1999).

One objective of the Ministry of Foreign Affairs (MOFA) for hosting COP 3 was to conclude a successful multilateral meeting in Japan, which in this case meant the adoption of the protocol without mishap. To do so, Japan needed to persuade the United States to agree to adopt the protocol. Inevitably, Japan would have to coordinate with other countries to bend to the wishes of the US. On the other hand, if Japan wanted to build its status as a leader in Asia, it needed to set a good example on global environment issues. Given that the European Union had been calling for a 15 percent flat rate reduction target since March the same year, MOFA felt that a reduction of 5 percent at the very least was necessary and argued for a target of 6.5 percent.

The Ministry of International Trade and Industry (MITI)—the name is now the Ministry of Economy, Trade and Industry (METI)—argued that stabilization of emissions (reducing emissions to 1990 levels by 2010) would be the most that Japan could hope to achieve because of opposition from industry. For, MITI, which is responsible for domestic energy supply and industrial policy, it was obvious that with one of the lowest per capita emissions among developed countries, Japan would find the task of reducing greenhouse gas (GHG) emissions to 1990 levels more arduous than others. MITI thus sought for some kind of differentiated targets. At the same time, it was crucial for MITI to gain US participation from the point of view of Japanese industry remaining internationally competitive.

On the other hand, the Environment Agency—now the Ministry of the Environment (MOE)—in looking at the climate change debate from a global environmental perspective, argued that Japan should propose a draft protocol that incorporated emission reduction targets ambitious enough to avoid serious adverse climate change impacts and, at the same time, were realistic enough to be agreeable. The Environment Agency used economic models to claim that a target of a six to eight percent reduction from 1990 levels by 2010 could be reached if sufficient additional measures were implemented.

This clash of opinions continued until the end of September, when the Prime Minister's Office eventually intervened. Japan's proposal was finally settled, with a basic reduction of five percent and a proviso for exceptions for certain countries, including Japan. This proposal was actually a reflection of "the differences that existed among the major domestic players and interpretations of what might be acceptable internationally" (Schreurs 2002).

During the final round of negotiations in December 1997 at COP 3, all the proposals from various countries and regions on targets and timetables on greenhouse gases became ambiguous, as fundamental conditions for quantification of targets, such as inclusion of sequestration by sinks of carbon or of other kinds of gases, shifted from time to time (Grubb et al. 1999; Oberthür and Ott 1999). In such a state of confusion, countries' positions often tend to get simplified. Japan wanted to assure US participation in the protocol and started to insist on the US position rather than its own. Japan proposed an emission stabilization target, considering that the United States would never accept an emission "reduction" target. Japan also proposed developing countries' voluntary actions to take into account the Byrd-Hagel resolution, which was adopted by the US Senate in July 1997 (Harris 2000). Not surprisingly, the group of developing countries (G77 plus China) protested strongly, and Japan found itself caught between the two camps. In the end, the G77, plus China and the United States made a deal by themselves: the US accepted the idea of no emission commitments for developing countries but succeeded in getting international emissions trading included in the text.

Negotiations were finalized with an agreement that in the five years from 2008 to 2012, the European Union, the United States, and Japan were to reduce their emissions by eight, seven, and six percent, respectively, from 1990 levels. In a way, Japan got what it demanded: participation of the United States and differentiation of emission reduction targets among Annex I countries.[1]

2.2. Japan's response to the Kyoto Protocol since COP 3

Japan was one of the countries that took action immediately after the adoption of the Kyoto Protocol at COP 3 in December 1997. The government set up the Global Warming Prevention Headquarters, which consisted of relevant ministries (Government of Japan 2002). The Headquarters drew up its *Guideline of Measures to Prevent Global Warming* in June 1998, which was characterized as a set of rigid rules that clearly allocated responsibilities to various sectors to reach the six percent emission reduction commitment as a whole. A 2.5 percent reduction was to be achieved by the industrial sector through further energy efficiency and by supplying less carbon-intensive energy. Emissions of hydrofluorocarbons (HFC), perfluorinated carbon (PFC), and sulfur hexafluoride (SF_6) were to be limited to about a 2 percent increase. Net removal by sinks under Article 3.3 and 3.4 of the Kyoto Protocol—called land use, land-use change, and forestry (LULUCF)—was expected to amount to 3.7

1. Annex 1 countries are the industrialized countries and economies in transition listed in Annex 1 of the UNFCCC.

percent. The rest (1.8 percent) was to be covered by acquiring emission permits from abroad by utilizing Kyoto Mechanisms such as international emissions trading, joint implementation, and the Clean Development Mechanism (CDM) (Government of Japan 1998). To facilitate implementation of the guideline, the Law Concerning the Promotion of the Measures to Cope with Global Warming was established the same year. The government also revised the Law Concerning the Rational Use of Energy to stimulate energy efficiency improvement in the industry sector.

The guideline seemed to light the way to meet the Kyoto emission target, but it was based on two crucial assumptions that prohibited Japan from ratifying the protocol immediately.

First, the calculation assumed that carbon sequestration by all managed forests in Japan during the first commitment period (2008–2012) would be counted under Article 3.4 of the Kyoto Protocol. About 66 percent of land in Japan is covered by forest, much of which was planted in the 1950s and 1960s. This was a disadvantageous situation under Article 3.3, which accepted only afforestation, reforestation, and deforestation *since* 1990 to be incorporated into the calculation of emissions. To meet its target, Japan was depending on being able to count on the sequestration of carbon dioxide (CO_2) by managed forests that had existed since before 1990.

The second assumption was that the Kyoto Mechanisms would be available to help Japan meet its target. Principles, modalities, rules, and guidelines for international emissions trading were to be negotiated after COP 3, and Japan could not be sure if its *Guideline* could rely on those mechanisms until those rules were agreed on at the international level.

As a new phase of negotiation under the Buenos Aires Plan of Action, started at COP 4 in 1998, Japan concentrated on making progress on the two issues mentioned above. In addition, for compliance procedures, Japan preferred a facilitative type of procedure rather than a punitive one. It was difficult for Japan to commit to an international emissions trading scheme if committing to a binding consequence were to become a condition for eligibility to participate in the Kyoto Mechanisms.

The Buenos Aires Plan of Action called for an agreement to be reached by COP 6, but no agreement was reached when it was held at The Hague in November 2000 (Grubb and Yamin 2001). In January 2001, the new George Bush administration took power in the United States, and within three months it announced its withdrawal from the Kyoto Protocol. The European Union and Japan both tried to persuade the US to return to the regime but without success.

Although there were no major disagreements between the various ministries within Japan's government on the actual conditions for early ratification, opinion was divided on the extent to which Japan should follow the United States. One side, especially those around the industry sector, considered that Japan should not ratify the protocol unless the US did so. The other side felt that Japan should stop being a follower of the US and go its own way in seeking for a sound climate, while urging the US to return. Sensing such division inside Japan, the European Union made greater concessions in the re-opened COP 6 meeting held in Bonn in July 2001. Japan's terms on the volume of greenhouse gas emissions absorbed by forests were accepted to a sufficient degree, and its views on compliance measures were also reflected in the final text. Acknowledging the major concessions made by the European Union, Japan put aside the question of how to respond to the US withdrawal for the time being and accepted the agreement. This round of negotiations was concluded at COP 7 in October/November 2001 as the Marrakesh Accords. The agreement officially allowed Japan to count sequestration by managed forests as defined in Article 3.4 for the first commitment period. It also set rules necessary for international emissions trading and the CDM to get started. Japan considered this agreement to be satisfactory and started the domestic procedure towards ratification of the Kyoto Protocol—ultimately ratifying it in June 2002.

The Global Warming Prevention Headquarters revised its *Guideline of Measures to Prevent Global Warming* in June 2002 in order to adjust domestic policies according to what was agreed in the Marrakesh Accords. The revised guideline set the following sectoral targets:

- CO_2 emissions from energy sources shall be the same level as that of fiscal 1990 during 2008 to – 2012.
- CO_2 emissions from non-energy sources, methane (CH_4) and nitrous oxide (N_2O), shall be reduced 0.5 percent from the fiscal 1990 levels during 2008 to 2012.
- An additional 2 percent reduction should be achieved by using innovative technology.
- Growth in HFCs, PFCs, and SF_6 emissions should be limited to 2 percent between 1995 and 2008 to 2012.
- Removal of CO_2 by sinks stipulated in Article 3.3 and 3.4 should be about 3.9 percent of emissions in 1990.
- The remaining gap between the 6 percent reduction target and domestic emissions is to be eliminated using the Kyoto Mechanisms.

Under these revised guidelines, various policies and measures have been implemented to reach the assigned emission goals. Even with all these new developments, however, emissions from Japan are still on the rise. The latest data show that the emissions of total greenhouse gases from Japan in 2002 were 7.6 percent more than that of the 1990 baseline (tentative). Emissions growth can be seen especially in the residential/commercial and transportation sectors. Additional measures are necessary to achieve the 6 percent reduction target. The guidelines are to be revised again by the end of this year (2004) and additional measures are expected.

3. Evaluation of the Kyoto Protocol in Japan

As reviewed in the previous section, climate policies in Japan have developed rapidly since adoption of the Kyoto Protocol. On the other hand, its actual GHG emissions are still increasing, and there are various voices being raised for re-evaluation of the protocol. This section introduces those voices.

3.1. Kyoto Protocol: The only internationally agreed text to address climate change

The first and most significant impact of the Kyoto Protocol on Japanese climate policy is its existence as a treaty agreed multilaterally. If no agreement were reached at COP 3, there would not have been any pressure to set up the Global Warming Prevention Headquarters in 1997, and without the Headquarters it would have been difficult to reach an agreement on the *Guideline* as to how to mitigate GHG emissions in Japan. All the various pieces of legislation on climate mitigation policies were established after COP 3, and these aim at achieving the 6 percent reduction target. This did not happen at the time of adoption of the UNFCCC in 1992. Without the Kyoto Protocol, with a clear emission target for Japan, such a goal could not have been agreed on at the domestic level. Thus, the protocol could be viewed as a justification for Japanese policy makers to introduce emission mitigation policies.

Japan may have reacted differently if another type of agreement had been reached at the international level. This assumption, however, is not appropriate by itself, as whoever was there negotiating at COP 3 considered the Kyoto Protocol to be the only achievable agreement at that time. Some suggest that the two years of negotiation might have been different if it was not for the Berlin Mandate, which called for a quantitative emission limitation and reduction objective for years beyond 2000. But negotiators at COP 1 found the mandate as the only achievable agreement possible in 1995. Again, the reality is that the Kyoto Protocol is currently still the only text available.

3.2. Kyoto Protocol: The only major multilateral environmental agreement adopted in Japan and its influence on domestic actors

The decision to host COP 3 in Kyoto stimulated a tremendous level of public interest in Japan. To prepare for the upcoming meeting, small Japanese non-governmental organizations (NGOs) gathered to establish a network called the Kiko (Climate) Forum in December 1996, one year before COP 3. This was the first NGO to deal mainly with climate change in Japan. The Kiko Forum later developed into the Kiko Network in April 1998, which has become the most influential environmental NGO in Japan on climate change policy. Similarly, the Japanese industry group, Keidanren, issued a report in June 1997 in which 36 industries covering 137 organizations set voluntary targets on climate-related actions (Keidanren 1997); the actions of those industries are reviewed almost every year. Both movements, those of the environmental NGOs and the industry group, were stimulated by holding COP 3 in Japan in 1997. Without the negotiating process that led to the meeting in Kyoto, such movements of domestic actors would not have occurred, and those movements still play significant roles in raising people’s awareness on the issue.

3.3. Kyoto Protocol negotiations: A new approach to foreign policy

Japanese foreign policy since the end of the Second World War in 1945 has been based particularly on maintaining good relations with the United States (Hasegawa 2004). Japan has relied on the US for its national security, and it has been one of Japan’s largest trading partners, although American industries are tough competitors for Japanese industries at the same time. For Japanese policy makers, maintaining peaceful relations with the United States was considered to be the safest way to secure prosperity. Thus, during the negotiations leading up to COP 3, the Japanese government was keen to satisfy the conditions set by the US for accepting the Kyoto Protocol. When the United States accepted a 7 percent reduction target, Japan had no other choice but to accept a 6 percent target for itself.

When the United States withdrew from the Kyoto Protocol, Japan made efforts to bring it back to the regime. When these efforts failed, internal debates started on whether or not Japan should follow the US. Those who considered traditional foreign policy to be important insisted that Japan should also withdraw and announce that it would not ratify the protocol unless the US did. Meanwhile, others said that Japan should go its own way on issues in which it had different interests from the United States. Indeed, the US and Japan face very different challenges from the climate policy point of view, such as the amount of coal and oil reserves in their respective territories and the relatively higher energy efficiency of appliances in Japan. In this sense, the Bonn meeting in 2001 was a landmark for Japanese foreign policy, where Japan began to walk its own road without the United States, which has led to a new dimension in Japanese foreign policy.

It is unknown, however, whether Japan will continue walking this new road in the future. There is always strong pressure to stay in line with the United States, and the Japanese position may return to the traditional one again in future negotiations. This element is elaborated in the next section.

3.4. The Kyoto Protocol: Part of a learning process in multilateral negotiations on climate change

There is a wide variety of sentiments in Japan towards the Kyoto Protocol at this moment. It may have been the most that was achievable at COP 3, but is it still the best seven years later. The experience of being involved in negotiating the adoption of the Kyoto Protocol and the Marrakesh Accords was important for Japan to learn how to respond to this complicated global problem.

From the environmentalist's point of view, emission targets in Annex B countries are considered only the first step of a more ambitious challenge towards mitigation of climate change.[2] The Kyoto Protocol also allows countries to use the Kyoto Mechanisms, so that the emission targets may be met by purchasing emission allowances from abroad rather than by reducing emissions at home. With the "hot air" attributed to some countries, the emission targets of the Kyoto Protocol were made even more lenient. In the case of Japan, its response to negotiations after COP 4 was also criticized, because Japan drove itself into negotiating positions that focused on minute details to reach the 6 percent reduction target by changing definitions and calculation rules, but these had little to do with actual emissions reduction in physical terms. This approach was evident in Japan's positions on the LULUCF in Article 3.4 and on the availability of the Kyoto Mechanisms. With the Marrakesh Accords it became methodologically easier for Japan to achieve the 6 percent target, but it still has no long-term national climate strategy for the years beyond 2012.

On the other hand, especially for those related to industry, the 6 percent reduction target is a tough one to achieve. Emissions are still increasing, and there are no sufficient policies agreed and measures in place in Japan to change the trend. Japanese industry is strongly opposed to a carbon tax and other means to reduce CO_2 emissions—insisting that such policies would harm the economy and that Japanese industry would lose competitiveness under the current regime, because industries in the United States and the developing countries do not face the same constraints. In addition, after the US withdrew from the Kyoto Protocol in 2001, industry called the protocol a failure for allowing the largest emitter to so easily abandon its commitment. At the time of COP 3, the Japanese government agreed to the 6 percent reduction target set by the protocol, not because it was satisfied with it but because the US agreed to a 7

2. These are the emissions-capped industrialized countries and economies in transition listed in Annex B of the Kyoto Protocol.

percent reduction target. Since March 2001, the US has stayed out of the Kyoto arena. Those critical of the protocol say that Japan should not have committed to the 6 percent reduction target if the United States was not part of the game.

The critics also view the Kyoto Protocol as an unfair treaty, because they consider that emissions from some European Union member countries had been reduced due to factors not directly related to climate, such as political and economic changes. With the enlargement of the EU, CO_2 emissions from the European Union as a whole could be further reduced at relatively little cost, especially if the base year for comparison was kept as 1990. More than just a small part of Japanese industry is unhappy with this approach that set an emission target in comparison with 1990. They insist that Japanese energy efficiency improvements and energy substitutions occurred mainly in the 1970s, in response to the two oil shocks in that decade. For Japan, it is more beneficial to compare emissions from the 1970s or compare by other criteria, such as emissions per capita.

The formation of different emotions towards the Kyoto Protocol is a kind of learning process that arose from COP 3 and later. Japanese stakeholders now have a clearer view on how the next round of negotiations should be.

4. Towards the future

Japan has been very interested in current debates on what should be done after 2012, the end of the first commitment period of the Kyoto Protocol. Such high awareness has been developed based on what was suggested as a “learning process” in the previous section. The internal debate became popular, especially after COP 8, when the timing of Kyoto Protocol’s entry into force became increasingly vague.

In July 2003, METI’s Environmental Committee, under the Industrial Structure Council, published an interim report of their debate on the future framework for climate change negotiation (METI 2003). The report asserts that there are four fundamental bases on which a future climate framework should stand: (1) the need for technological breakthrough; (2) a diversified agenda in each nation, region, and sector; (3) the tremendous global cost of mitigation policies; and (4) the reality that scientific uncertainties remain. The report emphasizes the scientific uncertainties, stating, “[T]he mechanisms and effects of climate change still have significant uncertainties.” At the same time, it says, “[P]revention of global warming will require the world to bear enormous costs for measures.” Thus, the report expresses the view that a major technological breakthrough is needed, saying that “a future framework should take into account development and dissemination of innovative technology related to mitigation of climate change.” Such technology should be developed and disseminated mainly in a voluntary manner, because “the actions required to prevent global warming may vary widely depending on the specific situation of each nation, region, and sector, and there are very significant variations in the costs for those actions.”

Japan’s MOE also requested the Global Environment Committee, under the Central Environment Council, to publish an interim report in January 2004 (Ministry of the Environment 2004). This report proposed the following seven fundamental bases for the way forward:

- maintain progress towards meeting the ultimate objective of the UNFCCC,
- bring the Kyoto Protocol into effect and fulfill commitments,

- achieve global participation,
- ensure equity based on the principle of common but differentiated responsibilities,
- build negotiations on existing international agreements,
- formulate an international consensus-building process by national governments with the participation of various actors, and
- make the environment and economy mutually reinforcing.

The report refers to the Third Assessment Report (TAR) of the Intergovernmental Panel on Climate Change (IPCC) and concluded that “relevant scientific work over several decades has reduced scientific uncertainty.” The Kyoto Protocol is considered an important first step towards meeting the ultimate objective of the UNFCCC, which is the stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. In the next round of negotiations for the years after 2012, the report considers that “ensuring environmental integrity of the climate regime requires global participation” and, therefore, that “the climate regime beyond 2012 needs to achieve the participation of all countries, including the USA and developing countries.” The level of participation needs to be differentiated based on the principle of common but differentiated responsibilities.

Both METI’s Environmental Committee and the Global Environment Committee are now engaged in deeper discussions to finalize their work by the end of 2004. There are both similarities and differences in the two interim reports that the two committees produced. Both consider the participation of the United States and major developing countries to be indispensable in the next round of negotiations; this is an aspect that the current Kyoto Protocol could not achieve. Both reports also acknowledge the roles of the economy and technology, and encourage incentives for countries and domestic actors to shift towards more climate-friendly actions. The three flexibility mechanisms (international emissions trading, joint implementation, and the Clean Development Mechanism) that were established in the Kyoto Protocol have been driving forces in Japan since COP 3. Institutional arrangements for them have been progressing independently from the protocol’s prospects for entry into force, a sign of the value that Japan sees in the economic incentives created through the protocol.

With all the commonalities, however, there is still a large gap between the two reports as to the process needed to move forward. And there is a large discrepancy between the two on perceptions of and ways to deal with scientific uncertainty, on how much equity is considered as important, and on the role of governments. These differences led to two different positions on how international society should deal with the climate problem in the future. Such divergent views are a reflection of the two different views in Japan on the Kyoto Protocol. As Japan’s government consolidates its national positions on issues by merging the demands of all ministries concerned, its position in future negotiations is likely to remain vague externally. Internally, however, the positions of domestic actors in Japan on the climate change issue will be much clearer than before. The Japanese people are becoming increasingly concerned about climate change policies and are starting to throw their support on one side or the other of Japan’s views on the Kyoto Protocol.

Many crucial moments still lie ahead for Japan. Until the United States returns to the Kyoto Protocol, or any kind of international negotiations on a future climate regime, Japan will be constantly compared to the European Union, whose positions on climate change policy have been much more proactive than Japan. And developing countries will continue to criticize Japan for not being able to reduce its own emissions. Under these circumstances, Japan's future decisions should not be formulated only through internal coordination among relevant government ministries and influential industries, but by involving all stakeholders. The nation as a whole must address the issue. It is already being affected by climate change. Just two examples: cherry trees that used to reach full bloom in April have been blooming in March in recent years, and the snowcap on Mount Fuji is shrinking and in danger of disappearing (Harasawa and Nishioka 2003). Japan's citizens need to be fully informed of the impacts of climate change on their daily lives and to come up with their own evaluation of the Kyoto Protocol and beyond. It is their voices that should be fully reflected in Japan's national positions on climate change.

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Special Feature on the Kyoto Protocol

Implementing the Kyoto Protocol in the European Community

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This paper describes the role of the European Community (EC) in negotiating the Kyoto Protocol and then focuses on the progress of the European Union (EU) towards meeting its Kyoto commitments. The EC ratified the Kyoto Protocol on May 31, 2002. It has pledged to meet the implied target of an 8 percent reduction in greenhouse gas emissions between 2008 and 2012 compared to 1990 levels. The European Union, as well as its Member States, is putting in place a set of policies and measures to achieve this. An analysis of greenhouse gas projections by the Member States themselves and Europe-wide model projections, however, show that this target is unlikely to be met with the envisaged domestic policies alone. The remaining gap would have to be closed using the Kyoto mechanisms or by developing and implementing additional domestic policies. So far, few EU Member States have yet taken concrete steps to realise this.

Keywords: Kyoto Protocol, European Union, European Climate Change Programme, Monitoring mechanisms, Emissions trading.

1. Introduction

The United Nations Framework Convention on Climate Change (UNFCCC) has as its ultimate objective the stabilisation of greenhouse gases (GHG) concentrations in the atmosphere at safe levels (EEA 1995). As a part of the processes towards this goal, UNFCCC Parties adopted the Kyoto Protocol in 1997. Under Article 3.1 of the protocol, industrialised countries (Annex I Parties) are committed to individual, legally-binding targets to limit or reduce their GHG emissions, adding up to a total cut of at least 5 percent from 1990 levels in the protocol's first commitment period of 2008 to 2012.

The European Community (EC) was one the major industrialised leaders in this international climate policy process. At the first session of the UNFCCC Conference of the Parties (COP 1), the EC succeeded in persuading the group of the developing countries (G77) to support its proposal to establish

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a negotiating process for legally-binding commitments for developed countries (Yamin 2000). If the EC had not called for these binding targets, the quantitative commitments in the Kyoto Protocol may have been significantly weaker or not agreed at all. Furthermore, if the EC had not prepared proposals on how to deal with issues that were as yet unspecified in the protocol (e.g., rules for compliance, flexible mechanisms, reporting and review), the Marrakesh Accords—the agreement that provided the final details needed to allow the Parties to begin the ratification effort (UNFCCC 2001)—may not have come into existence in 2001 (Gupta 2002). The EC and its Member States also proceeded to an early ratification of the protocol on May 31, 2002, reaffirming once more its commitment to the protocol.

By ratifying the Kyoto Protocol, the European Community agreed to reduce its GHG emissions by 8 percent in 2008 to 2012 compared to the 1990 base-year level, and started putting in place a set of policies and measures to achieve this target. The European Union (EU)[1] climate policy making process, however, has exhibited in the past strong discrepancies between declared targets and implemented action (Michaelowa 1998), as seen with several policies that have been weakened before being adopted and therefore not always effectively implemented.

In the next sections we will summarise the EU burden-sharing arrangement; the European Climate Change Programme (ECCP), designed to meet the Kyoto commitments; the GHG monitoring mechanism, developed to monitor emissions; and finally we discuss what the GHG emissions trends and projections tell us about the progress made in the European Union towards meeting the targets.

2. EU targets and burden-sharing regime under the Kyoto Protocol

2.1. The EU15

Under the Kyoto Protocol the European Community agreed to reduce its GHG emissions as a whole by 8 percent by 2008 to 2012 from 1990 levels, which corresponds in absolute terms to a reduction of 336 million tonnes (Mt) of carbon dioxide (CO_2) equivalent in 2010 with respect to 1990 (EEA 2003b). This means that as long as the European Union as a whole meets its target not all Member States will have to reduce their GHG emissions by 8 percent (EEA 2004).

This rule is commonly known as the emissions bubble and was introduced in Article 4 of the protocol due to pressure from the European Union, which wanted to differentiate targets internally (Michaelowa and Betz 2001).[2]

As such, the EC's Kyoto target is shared among 15 Member States. The so-called burden-sharing agreement (EC 2002), agreed upon in 2002, sets different emission limitations and reduction targets for each Member State according to economic circumstances and different development patterns of each (table 1). Eight Member States agreed to reduction targets by 2008 to 2012, five agreed to limit their increases, and two agreed to keep their emissions at the same level as in their base year. In all cases,

1. The European Community is a legal entity and is able to sign international treaties such as the Kyoto Protocol. The EC is represented by the European Commission. The EU exists only in the 1993 Maastricht Treaty and stands for European Community and the co-operation between its Member States. The European Union is not a legal entity.
2. In regard to the emissions bubble, under Article 4 of Kyoto Protocol all countries are allowed to conclude an agreement for a joint target equal to the sum of the targets of the participating countries.

these differences imply reduction against emissions without climate policies, as projected at the time of the negotiations (EEA 2004).

Table 1. GHG emissions limitation or reduction commitments of EU Member States for 2008–2012 in accordance with Article 4 of the Kyoto Protocol

EU Member State	Percent change[a]
EU15 Kyoto target	–8.0
Austria	–13.0
Belgium	–7.5
Denmark	–21.0
Finland	0.0
France	0.0
Germany	–21.0
Greece	25.0
Ireland	13.0
Italy	–6.5
Luxembourg	–28.0
Netherlands	–6.0
Portugal	27.0
Spain	15.0
Sweden	4.0
United Kingdom	–12.5

Source: EC 2002.

[a]The percent changes shown are compared to 1990 emissions.

The burden-sharing agreement is an innovative achievement in international climate policy and the only Kyoto mechanism that is actually operational. It could be argued, however, that there are some weak points in the agreement concerning the issues of uncertainty, vulnerability, and equity (Dessai 1999). Uncertainty regarding future emissions is a major concern because there is no room left for possible “surprises” in the EU bubble. If some Member States can not cope with their reductions, they could undermine the whole EU position. The burden-sharing agreement is also vulnerable because there is a clear reliance on particular Member States reaching their reduction targets. For example, a slower coal phase-out in Germany could increase EU emissions by 1 percent by 2010. Equity among Member States could also be questioned, mostly because of concerns about the differentiation of abatement obligations between poorer and richer countries of the European Union not going far enough (Eyckmans et al. 2000).

2.2. New EU Member States

In May 2004 the following ten countries joined the European Union: the Czech Republic, Estonia, Lithuania, Latvia, Hungary, Poland, Slovenia, Slovakia, Cyprus, and Malta. All of them also belong to the group of countries going through the process of transition to a market economy, with the exception of Cyprus and Malta. These new Member States are not included in the EU burden-sharing regime because, according to Article 4 of the Kyoto Protocol, the target of the European Union (–8 percent) would still refer to the 15 members as of 1997 (Michaelowa and Betz 2001). New Member States can not be incorporated into the EU burden-sharing agreement until 2013.

Most of the new Member States, however, have a target under the Kyoto Protocol and are members of Annex I of the UNFCCC. The Czech Republic, Estonia, Lithuania, Latvia, Slovenia, and Slovakia each have a GHG emissions reduction target of 8 percent from the base year,[3] while Hungary and Poland have a reduction target of 6 percent. Cyprus and Malta are not Annex I countries and have no targets under the protocol. All new Member States had ratified the Kyoto Protocol by January 2003. This was part of the EU environmental standards that had to be adopted by the new Member States before joining the European Union.[4]

3. Preparing for implementation of the Kyoto Protocol

In the European Union, policies and measures are developed both at the Member State level and at the level of the European Union. The policies and measures developed by the European Union, with implementation of the majority by all Member States being compulsory, are called common and co-ordinated policies and measures.

The Sixth Environmental Action Programme (EAP) for the European Union, presented in 2001, sets the environmental objectives of the European Community's strategy for sustainable development, detailing the common measures to be implemented over the next five to ten years. Tackling climate change was highlighted as one of four key objectives (EC 2001), and ratification of the Kyoto Protocol and implementation of the Kyoto target is a first priority.

3.1. The European Climate Change Programme

Within this framework, the EU's Council of Environment Ministers requested the European Commission to put forward a list of priority actions and policy measures to help the EC achieve the Kyoto target. The European Climate Change Programme (ECCP), set up as a multi-stakeholder consultative process, was launched in June 2000 to identify all the necessary elements of a strategy to implement the protocol.

Different working groups[5] identified the contribution of each sector to the set emissions reduction objective and the precise intensity of this effort based on calculations of cost-effectiveness.[6] In June 2001 the first ECCP report was published, presenting 42 emissions reduction options in different stages of preparation (ECCP 2001). On the basis of this report, a specified Action Plan outlined the priority

3. Bulgaria, Hungary, Slovenia, and Poland have a different base year than 1990 (1988, average 1985–87, 1986, and 1988, respectively).
4. Part of the preconditions to enter the European Union is the adoption of the European "acquis communautaire," which consists of the entire body of European laws.
5. The working groups are Flexible Mechanisms (with subgroups on emissions trading and JI/CDM), Energy Supply, Energy Demand, Energy Efficiency in End-use Equipment and Industrial Processes, Transport, Industry (subgroups on fluorinated gases, renewable raw materials, voluntary agreements), and Research and Agriculture.
6. The criterion "below €20€/tCO_2 equivalent" was used as a benchmark to evaluate the cost-effectiveness of each measure. Other criteria were the time frame for implementation and the impact on other policy areas.

actions of the European Commission to be implemented in 2002 and 2003. The following is a list of the 12 suggested measures categorised by their focus (EC 2003a):

- Cross-cutting
  1. Effective implementation of the Integrated Pollution Prevention and Control Directive
  2. Link joint implementation (JI) and the Clean Development Mechanism (CDM) to the EU Emissions Trading Scheme (EU ETS)
  3. Review the monitoring mechanism
- Energy
  4. Directive on minimum energy-efficiency requirements for end-use equipment
  5. Energy services directive
  6. Combined heat and power (CHP) directive
  7. Energy-efficient public procurement initiative
  8. Public awareness campaign/campaign for take-off on energy efficiency
- Transport
  9. Proposal for shifting the balance between modes of transport
  10. Proposal for improvements in infrastructure use and charging
  11. Biofuels directive
- Industry
  12. Regulatory framework on fluorinated gases

The ECCP's second report reviewed progress and updated information on policies and measures (ECCP 2003). Implementation of measures concerning the transport sector has proven to be the most difficult, and progress in this field is still slow except for the agreement between the Commission and car manufacturers to reduce the average CO_2 emissions of new passenger cars.

For the Commission's package of 12 measures, a technical reduction potential of 122 to 178 $MtCO_2$ equivalent was estimated, which could be increased by another 100 $MtCO_2$ equivalent from policies in the field of CHP and biofuels, particularly promising for the long term but not qualified under the criterion of below 20 euros (€) per tCO_2 equivalent (EC 2001). The total technical reduction potential of all policies and measures of the first ECCP report was estimated at 664 to 765 $MtCO_2$ equivalent. This is twice the emissions reduction required by the European Union in the Kyoto Protocol's first commitment period and slightly more optimistic than the estimate in the second ECCP report, which was 578 to 696 $MtCO_2$ equivalent. The legislative measures already adopted by the European Union or proposed by the Commission (some of which are presented in table 2) represent a GHG emissions reduction potential of 276 to 316 $MtCO_2$ equivalent.

It must be noted that the technical reduction potential of the common and co-ordinated policies and measures was evaluated by expert judgment without using any model. The methodologies for EU-wide projections on the effectiveness of climate policy impacts might need further elaboration, since there is the risk of double-counting because Member States might have already reported some of the potential reductions of these policies as part of their domestic policies and measures. Furthermore, the technical potential of the measures does not necessarily represent the actual emissions reduction potential.

Whether this potential can be realized will depend on how swiftly Member States implement European Community legislation, as well as a number of other factors such as acceptance by the public and other stakeholders, and other factors determining the effectiveness of implementation (EC 2003d).

Table 2. Key measures, their estimated GHG emissions reduction potentials, and their status of implementation

Measure	Status	Estimated technical potential	Reference
Directive establishing a scheme of GHG emissions trading within the European Community	Adopted by Council and Parliament	Not applicable	2003/87/EC from 13/10/03, OJ L275, 25/10/2003, p.32-46
Implementation of energy efficiency in the Integrated Pollution Prevention and Control Directive (IPPC) directive on pollution prevention and control in large industrial and agricultural installations to achieve co-benefits from air quality improvements for GHG reductions	Work on an IPPC reference document on generic energy efficiency techniques started in 2003	60–70 $MtCO_2$ equivalent	http://www.europa.eu.int/comm/environment/ippc/index.htm
Linking project-based mechanisms to GHG emissions trading	Proposal adopted by the Commission	Not applicable	COM(2003)403 of 23/07/03
Review of the monitoring mechanism	Proposal adopted by the Commission	Not applicable	COM(2003)51 of 05/02/2003
Directive on improving the energy performance of new buildings as well as larger existing buildings when they undergo major renovations	Adopted by Council and Parliament in 2002	35–45 $MtCO_2$ equivalent	2002/91/EC, OJ L 001 of 04/01/2003, p. 65–71
Directive on the promotion of electricity from renewable energy (RES-E Directive), with an indicative target of a 22% contribution of renewable energy sources to gross electricity consumption by 2010	Adopted by Council and Parliament, implemented in 2001	100–125 $MtCO_2$ equivalent	2001/77/EC, OJ L 283 of 27/10/2001, p. 33–40
Proposal for a directive on combined heat and power to promote high efficiency cogeneration, with an indicative target of 18% contribution to electricity production from CHP by 2010	Proposal adopted by the Commission in 2002	65 $MtCO_2$ equivalent	COM(2003)416,OJ C 291 E of 26/11/2002, p. 182–209
Motor Challenge Programme, an EC voluntary program to improve the energy efficiency of motor-driven systems in industrial companies	Launched in 2003	30 $MtCO_2$ equivalent	http://energyefficiency.jrc.cec.eu.int/motorchallenge/index.htm
Proposal for a framework directive on eco-efficiency requirements for energy using products	Proposal adopted by the Commission	180 Mt CO_2 equivalent	COM(2003)453 of 23/07/03
Agreements between the Commission and car manufacturers (ACEA, JAMA, KAMA) to reduce the average CO_2 emissions of new passenger cars to 140 grams/kilometer by 2008/09	Implemented before the ECCP, monitored through yearly report	75–80 $MtCO_2$ equivalent	COM (1998) 495 final COM (1999) 446 final

Table 2—*Continued*

Measure	Status	Estimated technical potential	Reference
Proposal for the promotion of biofuels in the transport sector	Adopted by Council and Parliament	35–40 $MtCO_2$ equivalent	2003/30/EC, OJ L 123 E of 17/05/2003, p. 42–46
Landfill Directive to recover gases from biodegradation of waste	Implemented before the ECCP	41 $MtCO_2$ equivalent	Council Directive 1999/31/EC
Proposal for a regulation on certain fluorinated gases	Proposal adopted by the Commission	23 $MtCO_2$ equivalent	COM (2003) 492 of 11/08/2003

3.2. The European Community Emissions Trading Scheme

The European Union had historically been rather sceptical of the use of flexible mechanisms in the process of negotiating the Kyoto Protocol. In recent years, however, this position has changed. The proposal for the Directive on Emission Trading Scheme (ETS), adopted in 2003, is an example of this.

Christiansen and Wettestad (2003) argue that there is a synergistic and multilevel mix of explanatory factors for this change, including developments at the international, European Union, and Member States levels. At the international stage, slow progress in the Kyoto process and increasing uncertainty about its ratification by the United States opened up a political window of opportunity for moving emissions trading up on the EU agenda. At the EU level, the failure to get a carbon tax adopted served as reinforcement for more acceptable policy instruments, such as emissions trading, to be successfully adopted. Also, the fact that domestic trading systems began to appear at the Member State level, and the perceived risk of having in place a patchwork of schemes with different rules and modalities, provided further incentive to the Commission’s efforts to develop and implement a harmonised EU trading scheme.

The aim of the proposed emissions trading directive is to reduce GHG emissions in a cost-effective way, including the introduction of GHG emissions ceilings and trading. The EU ETS is designed to be compatible with international emissions trading rules under the Kyoto Protocol. During the first phase of the trading scheme (2005–2007), it will apply only to CO_2 emissions. The cap-and-trade scheme will initially cover emissions from large industrial and energy activities (e.g., combustion plants), which will capture approximately 45 percent of the total CO_2 emissions projected in the European Union for 2010.[7] Smaller emissions sources not captured by the emissions trading system could be covered by equivalent policies and measures, with the option of trading into the regime via credit creation. The European Commission will decide on extending the directive to cover other sectors and GHGs in 2004 (EC 2003b).

Member States are responsible for allocating permits and therefore the total quantity of allowance (cap) to companies covered under the directive. Between 2005 and 2007, Member States will grant permits free of charge in accordance to national allocation plans (NAPs) approved by the Commission. Companies that fail to limit their emissions according to their allocated permits and do not buy credits to

7. The installations to be covered are combustion plants, oil refineries, coke ovens, iron and steel plants, and factories making cement, glass, lime, brick, ceramics, pulp and paper.

make up for any shortfall will have to pay a penalty of €40/tCO_2 for non-compliance. From 2008, countries can agree to auction 5 percent of the allowances, while the remaining 95 percent should be given for free. The penalty for non-compliance from 2008 will increase to €100/tCO_2. New entrant companies would be allocated permits on similar terms as those established for companies in the same sector (INFORSE 2004).

Credits from Kyoto mechanisms projects are not explicitly included in the ETS. Therefore, a new directive linking the ETS to JI and CDM projects (a measure under the ECCP) was agreed upon in April 2004 (ENDS 2004). The directive will allow companies in the ETS to use the credits from JI/CDM projects up to a percentage of their allowed emissions, which will be decided by each Member State. Exempted are credits from nuclear energy projects and (until 2006) credits from carbon sinks (EC 2004a).[8]

Environmentalists argue that this directive could weaken the effort for making domestic emissions cuts the primary means for achieving the Kyoto target. Action must now be taken at the Member State level to agree upon a harmonised cap on the use of Kyoto project credits (CAN 2004). On the other hand, combining the two systems will considerably reduce the compliance costs for the European Union as a whole, and JI projects—a powerful strategy to integrate the new Member States into the EU climate policy strategy (Jepma 2003)—as well as CDM projects would be given an important boost for development (EC 2004a).

4. "Community greenhouse gas emissions" monitoring mechanism

The European Union established a mechanism for monitoring community CO_2 and other GHG emissions in order to annually assess the progress of Member States in GHG emissions reductions towards their commitments under the UNFCCC and the Kyoto Protocol (EC 1999). The European Council's Decision of 1999 (EC 1999) was revised in 2004 (EC 2004b).

The 2004 revision reflects the new reporting obligations and guidelines for the implementation of the Kyoto Protocol. This includes the insertion of new monitoring and reporting requirements for land use, land-use cover, and forestry activities (LULUCF) and flexible mechanisms. Provisions on projections of GHG emissions will be strengthened, since experience with the current provisions has shown that there is a need for more comprehensive and detailed data in this area.

Member States are required by January 15 each year to submit inventory data for the previous year and any updates of previous years (including the 1990 base year),[9] and by March 15, 2005, and every two years thereafter they must report their most recent projected emissions for the years 2005, 2010,

8. Human induced activities in the land use, land-use change and forestry sector, which may lead to additional sequestration by the terrestrial ecosystems, are known as carbon sinks.

9. Member States have to report annually their inventories to the Commission by January 15 of the year X, as follows: their anthropogenic emissions of GHGs listed in Annex A to the Kyoto Protocol—carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF_6) during the year before last (X – 2); provisional data on their emissions of carbon monoxide (CO), sulphur dioxide (SO_2), nitrogen oxides (NOx), and volatile organic compounds (VOC) during the year before last (year X – 2), together with final data for the year three years previously (year X – 3).

2015, and 2020 (EC 2004).[10] Reporting under the monitoring mechanism is voluntary for acceding and candidate countries but becomes mandatory once they join the European Union.[11] The Central and Eastern European countries, however, are already required to report their GHG emissions and national programmes to the UNFCCC (EEA 2003b). Based on the data provided by the Member States, the European Commission compiles every year the Community Greenhouse Gas Inventory.

5. Greenhouse gas trends and projections in Europe

The European Environment Agency (EEA) supports the Commission in this task with an annual environmental issue report, titled *Greenhouse Gas Emission Trends and Projections in Europe* (EEA 2003b), and its background technical report, *Analysis of Greenhouse Gas Emission Trends and Projections in Europe* (EEA 2004). The EEA reports prepared for the year 2003 are the main sources of information for the results discussed here. The reports evaluate the actual progress and the projected (future) progress of Member States. On one hand, actual progress is assessed by an annual analysis of EU GHG emissions starting in 1990.[12] The evaluation of actual progress is performed by comparing the latest annual GHG emissions (in 2003 this means 2001 data) with values of emissions interpolated between 1990 and their commitment for 2008 to 2012 (the so-called linear target path).[13] On the other hand, projected progress is assessed by identifying the gap (over-delivery or shortfall) between emissions projections in 2010 and the Kyoto targets. Two types of projections are considered: (1) with (existing) measures projections and (2) with additional measures projections.

5.1. Actual progress of the EU15

a. Actual progress of the EU15 as a whole

GHG emissions in the European Union decreased by 2.3 percent from the 1990 base-year level in 2001 (figure 1) and reached a level of 4,108 $MtCO_2$ equivalent. The reduction is approximately one-quarter of the EU's Kyoto target for 2010. After an initial decrease in total GHG emissions of more than 4 percent in the early 1990s, emissions fluctuated in the second half of the 1990s between reduction levels of 1 percent and 4 percent compared with the 1990 base-year level. Assuming a linear target path from 1990 to 2010, total EU GHG emissions were 2.1 index points, the distance-to-target indicator (DTI), above this target path in 2001 (figure 1).[14]

10. Member States have to report information on national policies and measures that limit and/or reduce GHG emissions by sources or enhance removals by sinks, presented on a sectoral basis for each GHG, and national projections of GHG emissions by sources and their removal by sinks as a minimum, organised by GHG and by sector.

11. The countries that joined the European Union on May 1, 2004, were known until that date by the term *acceding countries,* and the countries that have applied to become members of the European Union are known as *candidate countries* (Bulgaria, Romania, Turkey).

12. For the fluorinated gases most Member States have indicated they have selected 1995 as their base year, as allowed for under the Kyoto Protocol. Therefore, for the purpose of this analysis of EU GHG emissions trends, 1995 is used as the base year for fluorinated gases for all Member States.

13. The target path is used to analyse, for example, how close 2001 emissions were to a linear path of emission reductions or allowed increases from the base year to the Kyoto Protocol target, assuming domestic measures are used (including emissions trading within the EU).

14. The distance-to-target indicator (DTI) measures the deviation of actual emissions in 2001 from the (hypothetical) linear burden-sharing target path between base-year emissions and the burden-sharing target in 2010. A positive value suggests an under-achievement and a negative a value an over-achievement in 2001. The DTI gives an indication of progress towards the Kyoto and Member States' burden-sharing targets. It assumes that the Member States meet their target entirely on the basis of domestic measures.

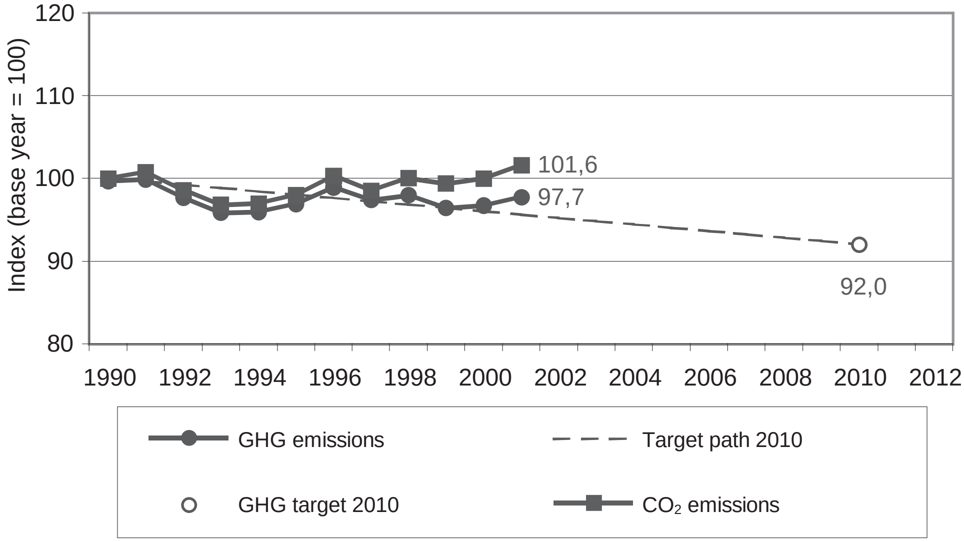

Figure 1. EU15 greenhouse gas emissions compared with the Kyoto target for 2010 (excluding land-use cover and forestry)

Source: EEA 2003a, 2004.

GHG emissions per unit of gross domestic product (GDP) decreased by 21 percent from 1990 to 2001. Figure 2 shows the development of the main driving forces of CO_2 emissions from fossil fuel combustion. Energy consumption increased by 10 percent between 1990 and 2000 but decoupled from GDP between 1990 and 2001. CO_2 emissions from fossil fuels were slightly above 1990 levels in 2001 but also decoupled from both GDP and energy consumption.

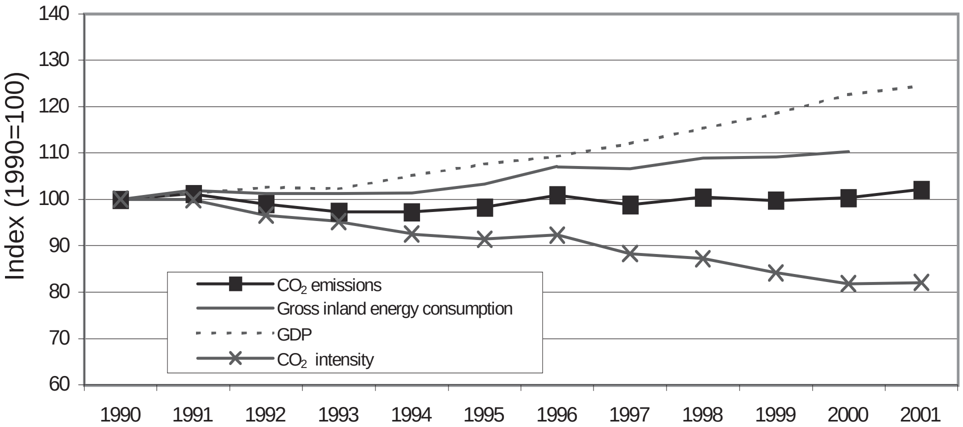

Figure 2. GDP, gross inland energy consumption, CO_2 emissions from fossil fuel combustion, and CO_2 intensity of GDP (as an index) for the EU15

Source: EEA 2004.

CO_2 emissions increased from 1990 to 2001 mainly because of growing transport demand. Most of the other greenhouse gases have been reduced since 1996. Methane (CH_4) emissions account for 8 percent of total EU GHG emissions, and these decreased by 21 percent between 1990 and 2001. The main reasons for declining CH_4 emissions were the decline of coal mining (mainly in France, Germany, and the United Kingdom), reductions in solid waste disposal on land, and declining cattle populations. Nitrous oxide (N_2O) emissions are responsible for 8 percent of total GHG emissions and these decreased by 16 percent. The main reason for the large cut in N_2O emissions was the reduction measures instituted in the chemical industry (reduction of emissions from adipic acid production). Fluorinated gas emissions account for only 1 percent of total GHG emissions. Hydrofluorocarbons (HFC) emissions increased by 11 percent between 1995 and 2001, mainly because of the phase-out of ozone-depleting substances such as chlorofluorocarbons under the Montreal Protocol.

b. Actual progress by sector

Energy industries represent the largest sector accounting for 28 percent of total EU GHG emissions.[15] Between 1990 and 2001, emissions declined 2 percent largely due to efficiency improvements in German coal-fired power plants and to switching fuels in the power industry in the United Kingdom. Transport accounts for 21 percent of total EU GHG emissions. In 2001, CO_2 emissions increased by 20 percent compared to 1990, mainly due to road transport growth in almost all Member States. Increases in N_2O emissions from transport are mainly because of the increased use of catalytic converters. For newer catalytic converters, however, N_2O emissions have been reduced dramatically (figure 3).

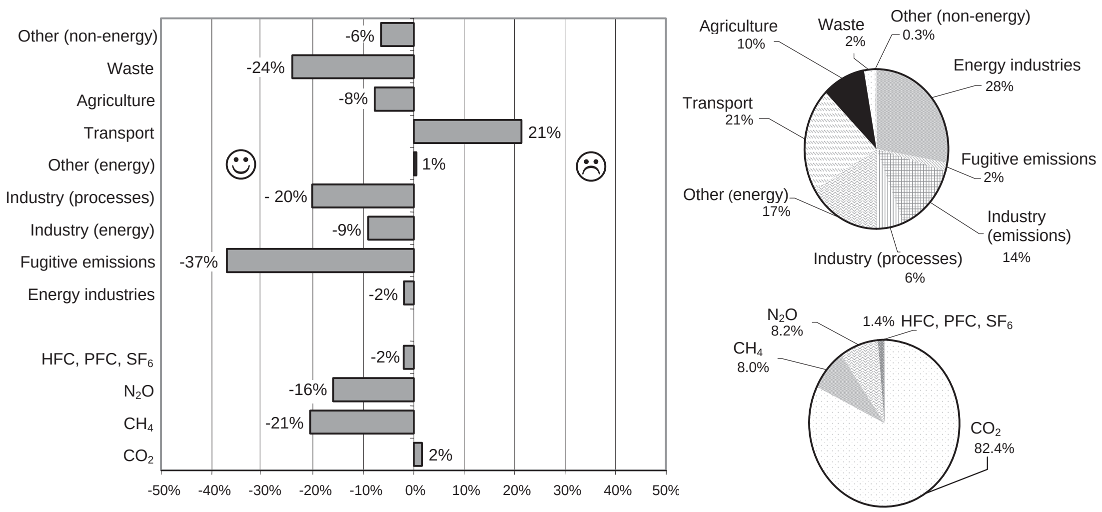

Figure 3. Change in sectoral greenhouse gas emissions of EU15 from the 1990 base year to 2001 and share of sectors and gases in 2001

Source: EEA 2003b.

Note: The sector "Other (energy)" includes use of energy by households, small commercial businesses, and services.

15. The sector includes emissions from electricity and heat production, oil refineries, and manufacturing of solid fuels.

Households and services represent the third largest sector (17 percent of total EU GHG emissions). Emissions were 1 percent above 1990 levels in 2001, but they fluctuate to a certain extent according to annual changes in outdoor temperature. Industry (energy) emits 14 percent of total EU GHGs. Emissions decreased 9 percent from the 1990 level largely due to the restructuring of industries in Germany and efficiency improvements after German reunification. Industry (processes) in the European Union accounts for 6 percent of total GHG emissions. Emissions decreased by 20 percent mainly due to reductions in N_2O emissions. Agriculture accounts for 10 percent of total EU GHG emissions. Emissions decreased by 8 percent mainly due to a decline in the use of nitrogenous fertilisers and manure and a decline in the cattle population.

c. Actual progress of the EU15 Member States

The overall trend of GHG emissions in the European Union is dominated by Germany and the United Kingdom, the two largest emitters, which account for 40 percent of total EU GHG emissions. These two Member States have achieved a total reduction in GHG emissions of 313 million tonnes compared to the 1990 base year. The main reasons for the favourable trend in Germany are increasing efficiency in power and heating plants and the economic restructuring of the five new Länder established after German reunification.[16] The reduction of GHG emissions in the United Kingdom was primarily the result of liberalising the energy market, the subsequent fuel switches from oil and coal to gas in electricity production, and N_2O emissions reduction measures in the chemical industry.

In general, the trend in GHG emissions from 1990 to 2001 range between the 15 Member States from –44.2 percent to +36.4 percent. If the GHG emissions of the Member States are compared with their linear target path for 2008 to 2012, the following conclusions with regard to actual progress of Member States could be drawn (figure 4):

- Five Member States (United Kingdom, Sweden, Germany, Luxembourg, and France) were near or below their Kyoto target paths, thus fully on track towards fulfilling their Kyoto-targets.
- Ten Member States were well above their Kyoto target paths (with Ireland, Spain, Portugal, Austria, Denmark, Italy, and Belgium by more than 10 index points).
- Belgium, Greece, the Netherlands, Denmark, Italy, Portugal, Ireland, and Austria were above their target paths in 2000 and they moved further away from their target paths in 2001.
- Compared to 2000, only Spain reduced its emissions in 2001. Sweden was the only EU country that moved further below the hypothetical Kyoto target path in 2001. Emissions reductions were substantial within the Spanish energy industries (CO_2 emissions decreased by 5 percent) mainly due to reduced coal use in thermal power production and increases in electricity production by hydro power plants.
- France and Finland were both below their target paths in 2000, but one year later they were above their paths.

16. Germany is a federation of 16 states called Länder or Bundesländer.

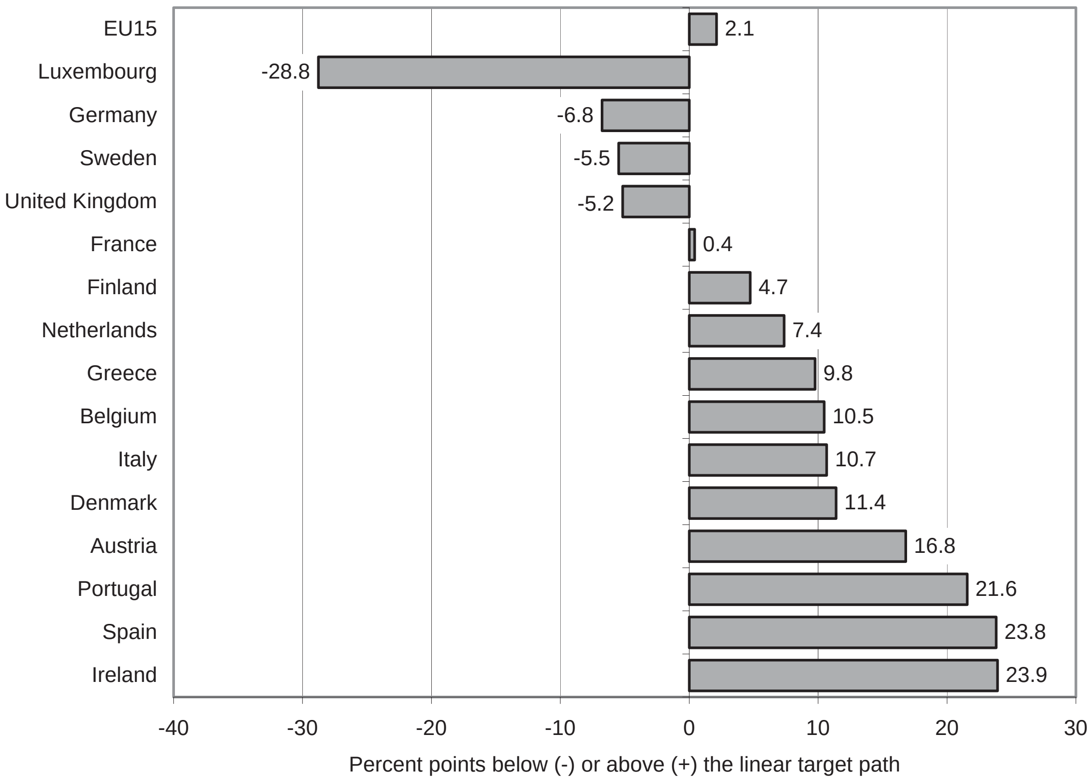

Figure 4. Distance-to-target (burden-sharing targets) for the EU15 Member States in 2001 (with domestic policies and measures)

Source: EEA 2003b.

5.2. Actual progress of the new Member States and candidate countries

The restructuring or closure of heavily polluting and energy-intensive industries led to a significant decline in total GHG emissions in the new Member States and candidate countries between 1990 and 2001. Nine countries were below their Kyoto target path, with distance-to target indicators ranging from –14.4 index points to –56.4 index points. Only in Slovenia were emissions above the target path (+6 index points) (figure 5).

Although the GDP data are not available for all countries for the whole period, it can be said that GDP is growing faster than GHG emissions in all countries. The increasing gap between emissions and GDP shows that energy use must have decoupled considerably from economic activities. Gross inland energy consumption shows the same trend as CO_2 emissions. CO_2 intensity was almost 40 percent below 1990 levels in 2000 (figure 6).

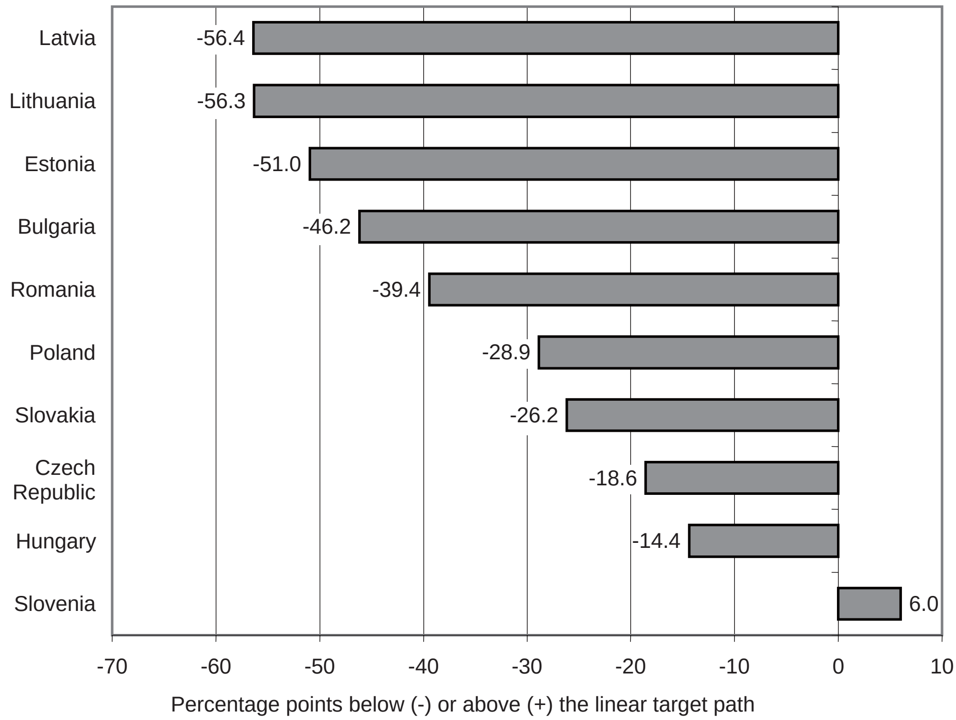

Figure 5. Distance-to-target indicators (in index points) for the Kyoto Protocol of the new Member States and candidate countries in 2001

Source: EEA 2004.

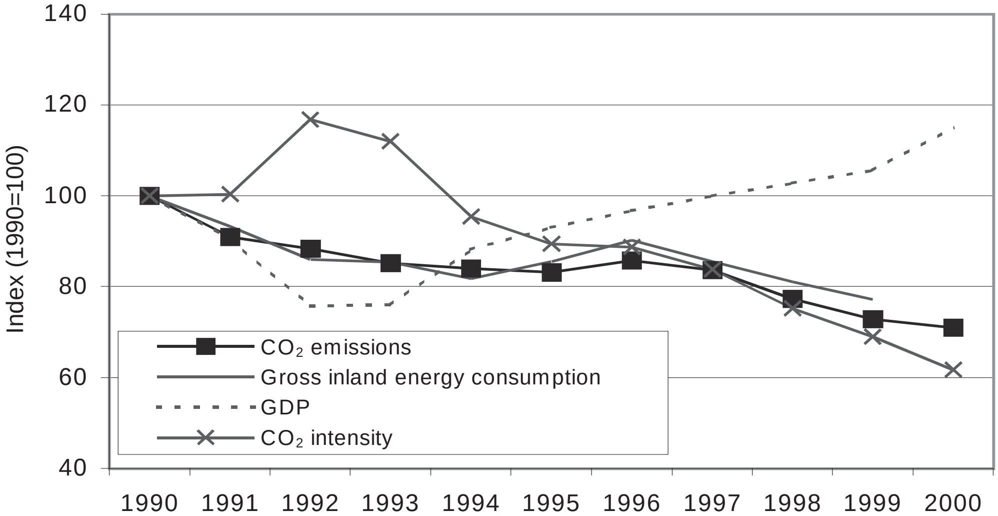

Figure 6. CO_2 emissions of the new Member States and candidate countries in relation to GDP[a] and energy consumption[b] (excluding land-use cover and forestry)

Source: EEA 2004

[a]It is difficult to calculate consistent GDP values for economies in transition for the whole period from 1990 to 2001. In most countries the GDP calculation methods changed in the years 1992, 1993, and 1994. The GDPs for earlier years are not always available (Baltic countries, Slovenia, Slovakia) or they were estimated retrospectively.

[b]Data on gross inland energy consumption provided by Eurostat are not complete for all years and countries, therefore the presented trend is indicative only.

In the European Union, CO_2 is the most important greenhouse gas (about 80 percent); second comes methane (CH_4), and third is N_2O. Fluorinated gas emissions are not yet reported consistently in most of the new Member States and candidate countries, but in general they do not contribute more than 1 percent to national totals. Figure 7 shows that emissions decreased in all sectors except transport (+4 percent). CO_2 emissions from transport decreased by 19 percent between 1990 and 1995 but increased afterwards. In 2001, GHG emissions from transport were above 1990 levels for the first time (4 percent). Most significant decreases occurred in the sectors related to fossil fuels combustion (from –32 percent to –58 percent). Changes in agriculture (–24 percent), industry (–26 percent), and waste (–26 percent) were significant as well.

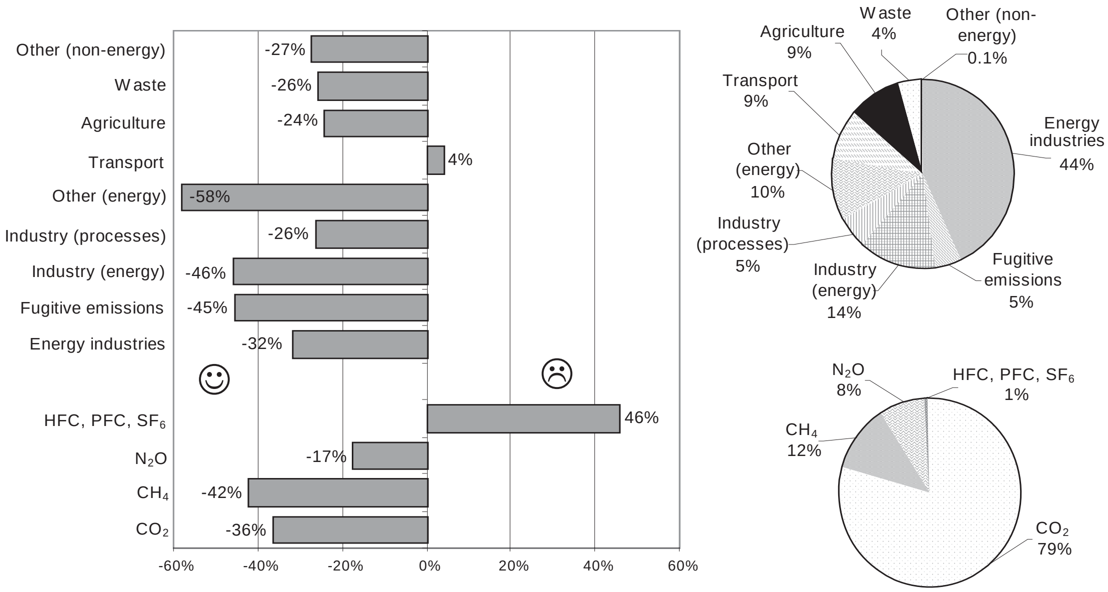

Figure 7. Change in sectoral greenhouse gas emissions in ten new Member States and candidate countries from the base year to 2001 and share of sectors and gases in 2001

Source: EEA 2004.

5.3. Projected progress of the EU15

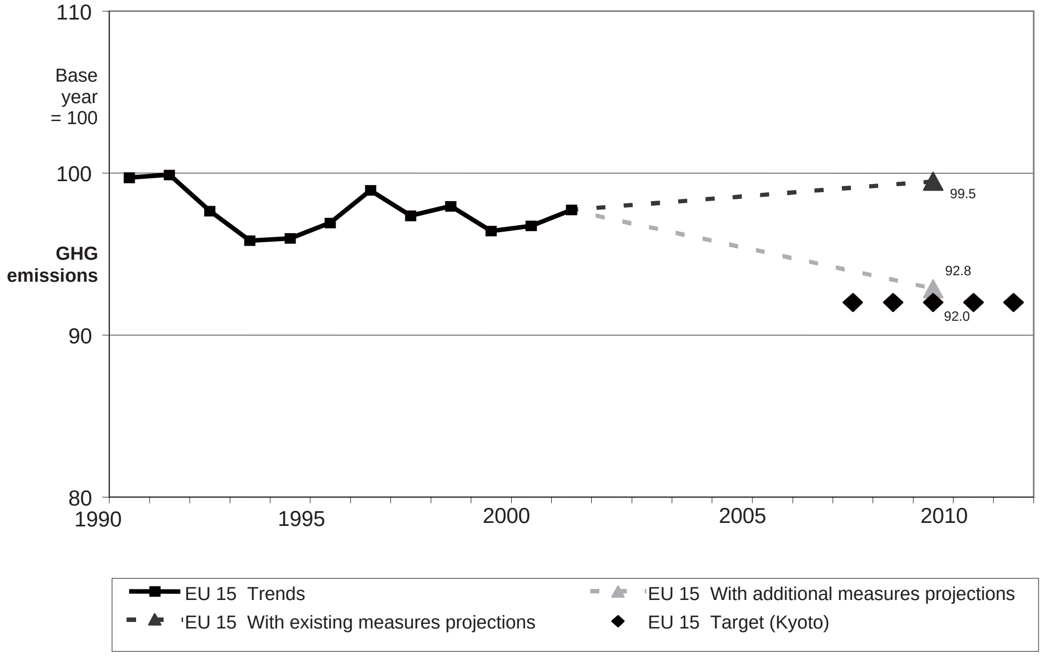

Figure 8. Greenhouse gas emission trends and projections for the EU15

Source: EEA 2003b.

a. Projected progress with existing measures of the EU15 as a whole

Figure 8 shows the aggregated *with (existing) measures* projections for the EU15 as a whole in 2010, which shows emissions rising to just 0.5 percent below 1990 levels in 2010. This leaves a shortfall of 7.5 percent to reach the EU's Kyoto commitment in 2010 compared to 1990 levels. The gap is significantly larger than that calculated for the year before, because Germany has updated its projections under a monitoring process of its existing policies and measures with assumptions that some consider conservative.

Under the *with measures* projections, EU CO_2 emissions are projected to increase by 4 percent, while CH_4 and N_2O are expected to fall by 32 percent and 12 percent, respectively, for those countries that reported information on these gases. EU fluorinated gas emissions are forecast to increase by 98 percent, although their total contribution to total EU emissions will remain small.

The aggregated projections for the European Union under the *with measures* scenario show that GHG emissions from the energy sector (excluding domestic transport) will probably increase by 2 percent between 1990 and 2010.[17] EU domestic transport-related GHG emissions are projected to increase by 34 percent if no additional policies and measures are introduced. EU agricultural (–11 percent), process (–2 percent), and waste emissions (–51 percent) are all projected to decline between 1990 and 2010.

17. The aggregate total is based on only those Member States that provided disaggregated projections by sector and therefore represents the trends for only part of the European Union.

EU-wide projections of CO_2 emissions, calculated using the PRIMES model (EC 2003c),[18] were in line with the aggregated Member State projections (increase of 4 percent between 1990 and 2010). There are, however, significant differences in the two sets of projections for individual Member States and for specific sectors. Significant differences (more than 10 percent) are observed for Luxembourg and Spain, where the EU-wide projections are higher than those projected by Member States, and also for Denmark, Finland, and Belgium, where the Member States project a greater increase in CO_2 emissions.

There are a number of reasons why the projections do not agree, including differences in sector coverage (e.g., approach on dealing with bunker fuels), base-year data, emission factors, types of models, and key assumptions such as GDP and population changes (EEA 2004).

b. Projected progress of the EU15 Member States with existing measures

Looking at the projections at the country level (figure 9), the situation varies significantly between Member States. The United Kingdom and Sweden are the only ones to project that existing policies and measures will be sufficient to meet their burden-sharing targets. Their relative gap share is about –3 percent and –1.4 percent, respectively, meaning that these countries may even over-deliver on their targets. If the United Kingdom and Sweden meet but do not exceed their targets, the gap for the European Union as a whole increases to around 7.8 percent.

Denmark, Spain, Ireland, Austria, Belgium, Finland, the Netherlands, Portugal, and Greece are all projected to be significantly above their commitment on the basis of their *with measures* projections. The relative gaps for these Member States range between more than +30 percentage points for Denmark and Spain to slightly below +10 percentage points for France and Italy.

c. Projected progress with additional measures of the EU15 as a whole

Figure 8 also shows the aggregate with additional measures projections for the EU15 in 2010. Savings from additional policies and measures being planned by Member States would result in total emission reductions of about 7.2 percent from 1990—almost sufficient to meet the shortfall for the European Union projected on existing domestic policies and measures. Assuming that all additional domestic policies and measures will actually be implemented and will have the expected effect, this would lead to only a small shortfall of 0.8 percentage points in meeting the target of –8 percent.

As not all Member States have provided *with additional measures* projections, aggregated projections with additional measures for the European Union for the assessment by sector and by gas must be treated with caution.[19] Under the *with additional measures* scenario EU GHG emissions from the energy sector (excluding domestic transport) are projected to decrease by 6 percent between 1990 and 2010. EU domestic transport-related GHG emissions are projected to reduce the increase of 34 percent to 22 percent, at the least. EU agricultural (–13 percent), process (–22 percent), and waste emissions (–54 percent) are all projected to decline further between 1990 and 2010.

18. PRIMES is a modelling system that simulates a market equilibrium solution for energy supply and demand in the European Union Member States. It is currently used by Transport and Energy as well as Enviroment Directorate General when energy related questions are analyzed. For details, see http://www.e3mlab.ntua.gr/models.asp?title=primes.

19. In most sectors only eight Member States have reported projections. The aggregated projections by sector are mainly based on the data provided by these countries.

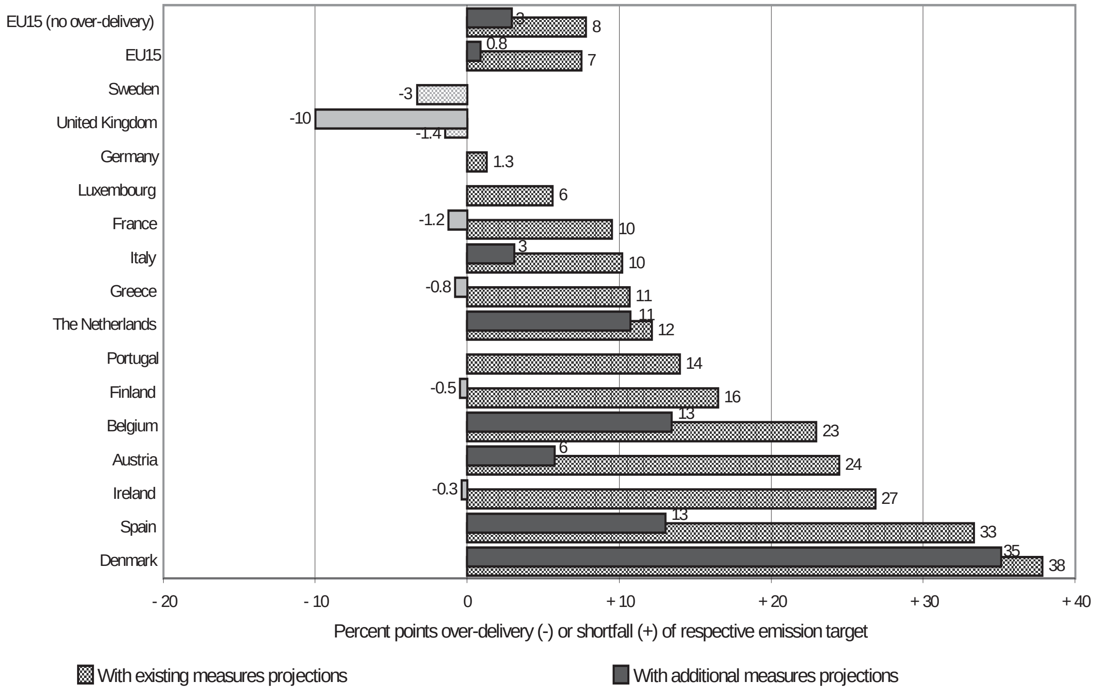

Figure 9. Relative gap (over-delivery or shortfall) between projections and targets for 2010 for EU15 and Member States

Source: EEA 2003b.

d. Projected progress of the EU15 Member States with additional measures

Finland, France, Greece, Ireland, Sweden, and the United Kingdom project that with their additional domestic measures they can either meet or exceed their burden-sharing targets (figure 9). If all these countries, which under the *with additional domestic measures* are projected to exceed their targets, are assumed instead to meet but not to exceed their targets, this would mean for the European Union a reduction below 1990 emissions of 5.1 percent and thus a 2.9 percent shortfall on the EU target. For Austria, Belgium, Denmark, Italy, the Netherlands, and Spain the savings identified from planned domestic policies and measures are not sufficient to achieve their burden-sharing targets. Germany, Luxembourg, and Portugal have not yet reported quantified savings from any additional domestic policies and measures that they are considering.

The largest relative effect of additional domestic policies and measures is for Ireland (gap decreases from a 27 percent shortfall to a very small surplus). Absolute reductions achieved with additional domestic policies and measures are largest for the United Kingdom, France, Spain, and Italy, ranging from 64 to 37 million tonnes of CO_2 equivalent.

5.4. Projected progress of the new Member States and candidate countries

The analysis of projections for the new Member States and candidate countries is based on the third national communications to the UNFCCC. Seven countries (Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Poland, and Slovakia) had submitted their third national communications by June 2003. In addition, Slovenia has produced its first national communication. Figure 10 shows the relative gap between projections based on existing domestic policies and measures, and with additional domestic policies and measures, and with the Kyoto commitments.

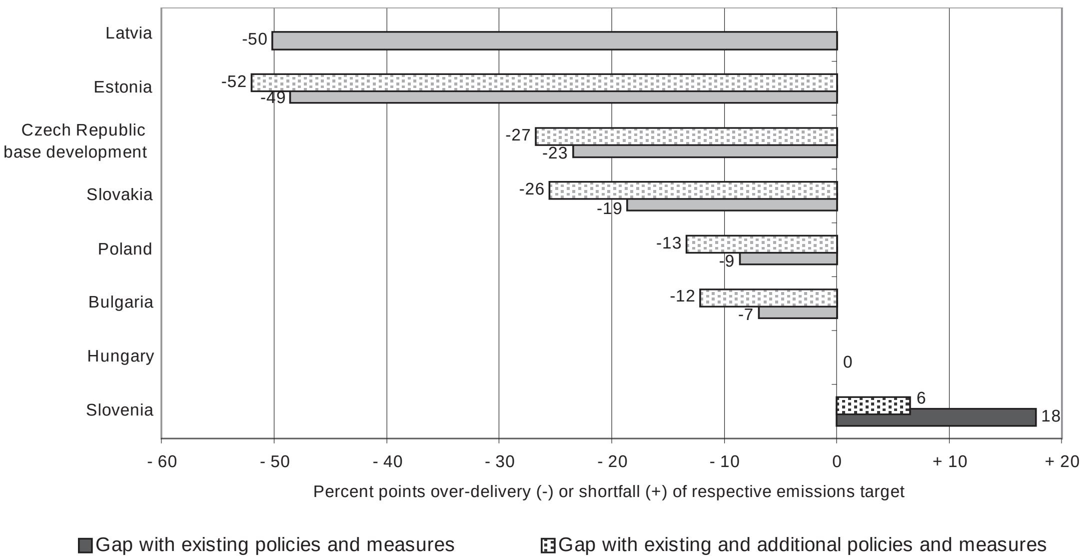

Figure 10. Relative gap (over-delivery or shortfall) between projections and targets for 2010 for new Member States and candidate countries

Source: EEA 2003b.

All *with measures* projections, except for Slovenia, result in emissions in 2010 to be lower than the Kyoto commitments. For Estonia and Latvia, emissions are projected to be significantly lower than in 1990. The new Member States and candidate countries project that they will meet their Kyoto commitments with existing domestic policies and measures. Slovenia is still not expecting to meet its Kyoto commitment even under the *with additional measures* projection.

5.5. Policies and measures

An analysis of the types of policies and measures being used by the EU15 Member States shows that, across all sectors, regulatory and fiscal policies and measures are the most popular and are projected to generate the largest proportion of GHG reductions. Education and information appear to be significant only in the transport sector. In the new Member States and candidate countries, a whole range of types of policies and measures is used, although the use of voluntary agreements is limited (EEA 2003b).

a. Effects of national policies and measures

Figure 11 provides an overview of the estimated effects of national policies and measures on total EU GHG emissions in each of the main sectors. For the EU Member States that have provided information, policies and measures in the energy sector (all energy-related emissions except transport) account for 62 percent of the total savings from implemented measures and 58 percent of the planned measures savings for the European Union as a whole. Savings from policies and measures acting on energy supply are the most significant, accounting for 70 percent and 40 percent of savings in the energy sector from implemented and planned measures, respectively. The high contribution of this sector is because the majority of both implemented and planned policies and measures are targeted at moving to cleaner fuels, renewable energy, and more efficient energy production or energy use.

Transport measures are expected to deliver the second highest savings, followed by the effect of measures on industrial processes. As transport is the most rapidly growing source of GHGs, the measures implemented and planned by Member States only go a small way to addressing this, providing 14 percent and 23 percent of the total savings from implemented and planned policies and measures, respectively.

Finally, savings from measures in the waste and agriculture sectors in 2010 are expected to be small.

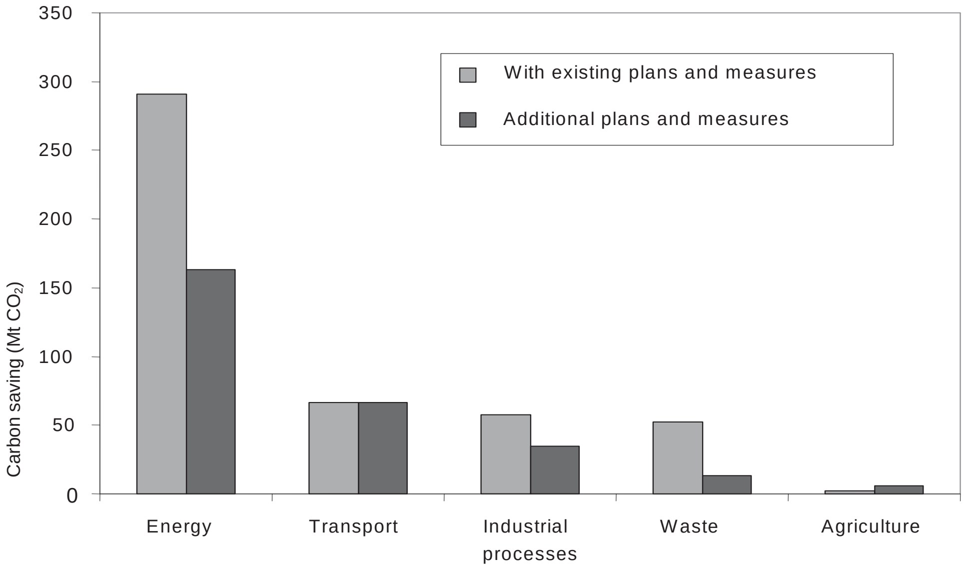

Figure 11. EU15 projected greenhouse gas savings by sector in 2010

Source: EEA 2004.

In general, there are six broad areas of policy that are widespread among Member States that could be considered as key policies and therefore very important in helping the European Union achieving its emission reduction commitments. In the energy supply and use sectors these were the use of renewable energy, CHP, energy-efficient appliances and building standards, the EU-wide ACEA (European

Automobile Manufacturers Association) Agreement in transport, and for the waste sector, the Landfill Directive. Three of the energy policies were adopted under the ECCP. Out of the six policies, for the Member State that provided information, renewable energy seems to have the highest impact for the additional measures projections, as is the case for implemented policies.

For the new Member States countries, all have policies and measures in place to reduce GHG emissions. These are primarily aimed at energy use and waste management, but there are a limited number of policies and measures in other sectors. Policies and measures implemented or proposed in most of the AC/CCs include clean air legislation to reduce air pollution, energy market liberalisation, changes in building regulations to improve energy efficiency, measures to reduce traffic growth, and limits on the disposal of biodegradable waste in landfills. The most important reason, however, for the projected reductions in most of the new Member States and candidate countries is the result of the economic restructuring that has already occurred in these countries.

Harmonisation with EU environmental legislation is also ongoing in most of the AC/CCs. In the Guide to the Approximation of EU Environmental Legislation, however, climate change does not appear as an individual chapter (Armenteros and Michaelowa 2003). Thus, the AC/CCs have to comply with all EU directives that are relevant to reduction of GHG emissions, not in the context of the implementation of the Kyoto Protocol but on a directive-to-directive basis.

b. Taking into account flexible mechanisms and sinks

Eight Member States—Austria, Belgium, Finland, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom—have provided information (so far by 2003) on their intended use of the flexible mechanisms of the Kyoto Protocol (Kyoto mechanisms) to achieve their targets in the commitment period 2008 to 2012. The Netherlands projects that it will achieve its target by a combination of 50 percent domestic policies and measures and 50 percent by the use of Kyoto mechanisms.

The initial limited information available shows that so far around 21 MtCO_2 equivalent of savings per year of the commitment period from the flexible mechanisms under the Kyoto Protocol have been identified. These result from quantification delivered by the Netherlands (20 MtCO_2 equivalent/year) and Portugal. The Netherlands have made the greatest progress in the implementation of JI projects with industrialised countries with economies in transition, and CDM projects with developing countries, and allocated one of the largest budgets (€225 million for the five-year commitment period). Other Member States also started pilot projects and allocated budgets for JI or CDM projects (Austria, at a maximum €288 million; Finland, €8.5 million). Sweden is also exploring this possibility (€37.5 million budget allocated), but from the projections of GHG emissions for 2010 presented above, it is one of the two countries indicating that they will be able to reach their burden-sharing targets only through domestic measures.

Eight Member States—Austria, Belgium, Finland, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom—have provided information (so far by 2003) on their intended use of carbon sinks to achieve their targets by 2008 to 2012. The initial limited information available shows that so far the removal potential from forestry activities by 2008 to 2012 is estimated to be about 10 MtCO_2 per year, and from agricultural activities an additional 3 MtCO_2 per year. These removal estimates represent almost 4 percent of the total reduction required by the European Union by 2008 to 2012 (336 Mt). The European Climate Change Programme estimates that potentially 93 to 103 MtCO_2 could be sequestered through the enhancement of sink activities in the agricultural and forestry sector (ECCP 2003).

6. Discussion and conclusion

The European Community has been a key force behind the agreement of the Kyoto Protocol, and hence has felt a strong obligation to meet its commitments since the protocol was adopted. The European Union established the ECCP to evaluate the technical potential of mitigation options with costs below €20/tCO_2 equivalent and identified emission reduction options of up to 664 MtCO_2 equivalent, while 336 MtCO_2 equivalent is needed to reach the Kyoto target. Nevertheless, an analysis of the projections of the individual Member States, as well as Europe-wide model projections, shows that just with envisaged domestic policies it is very uncertain if the targets can be met. The gap between the projected emissions and the Kyoto target at the EU15 level is dependent on assumptions with respect to policies implemented by Member States additional to those in place today, as well as the accounting for over-delivery of a few Member States. Even taking into account additional envisaged domestic policies and accounting for over-delivery, a gap still remains, which would have to be met by using the Kyoto mechanisms. There appears to be a large gap between the technical potential identified at the European level and the actual potential in the various countries and sectors. As for use of the Kyoto mechanisms, even if their own projections suggest that neither Member States nor the EU15 as a whole will meet the Kyoto targets through domestic policies alone, only few countries have seriously taken action to put the mechanisms in practice.

The reasons behind the difficulties encountered in meeting the Kyoto targets are various and complex. Many Member States are slow with adopting and implementing EU directives and developing and implementing domestic policies. As a consequence, for example, targets in the area of renewable energy and CHP may not be reached. Emissions in the transport sector are increasing rapidly, and few concrete and feasible options appear to be available to stop this growth. The European Union has adopted an interesting emissions trading system, which could minimise the costs of emissions reductions across the participating emissions sources. Currently, Member States prepare allocation plans, which still have to be agreed by the Commission. The main criterion for the allocation of emission permits is that the total quantity of allowances should be consistent with the obligation of the Member State to limit its emissions under the EU burden-sharing agreement and the Kyoto Protocol (EC 2003b). There appears to be the risk, however, that if allocations are too generous in relation to the Kyoto targets, the burden of emissions reduction could move to sectors not participating in the trading regime, such as transport, small industries, and consumers. An evaluation of 18 NAPs, which were submitted at the time of writing this article, showed that, with some exceptions, the caps imposed by Member States are below the expected business-as-usual emissions, but they are less strict than would be required if these sectors were to make an equal contribution to meeting the Kyoto commitments as other sectors, or if no use of the Kyoto mechanisms was envisaged (Gilbert et al. 2004). Another potential problem in these 18 NAPs is related to the fact that not all countries use the same definition of installations to be included in the system. This means that the same installations can fall under the trading system in some countries, but not in others, giving rise to competitiveness problems (Gilbert et al. 2004). Nevertheless, in the ETS directive, provisions have already been made for other sectors' participation in a later stage, and in principle the potential cost reductions of the scheme are considerable.

Another reason for the slowness of developing and implementing policies that would help meeting the Kyoto targets could be the uncertainty about the entering into force of the protocol. Even though at the highest political level the European Union has pledged to meet its commitments without such entering into force, the non-ratification of the protocol by countries such as the United States and (at the time of writing this paper) the Russian Federation boosts the protests of adversaries of the protocol in European countries, such as industries which fear competitive disadvantages. Politicians in several EU countries (e.g., Finland, Italy, and Spain) have recently voiced their concerns about this situation. In general, the perceived importance of environmental issues has decreased in most Member States since the Kyoto Protocol was agreed, due to economic downturn, security issues, and other priority problems that have gained political importance since 1997. Even the exceptionally warm years in the 1990s, continuing into the new century, did not appear to have a significant impact on the perceived risk of climate change and the willingness to respond with action to reduce emissions.

An interesting question is to what extent European energy and climate policies were affected by the Kyoto Protocol agreement. Because of serious concerns in Europe about climate change in the 1980s and early 1990s, and perceived opportunities for meeting broader environmental objectives and boosting energy efficiency, the European Union and several of its Member States not only played a proactive role in the international negotiations but also started to develop and implement measures to control GHG emissions well before the protocol was agreed. The agreement of the Kyoto Protocol, signing and ratifying it, facilitated the development of the ECCP and a number of "common and co-ordinated policies," such as the Landfill Directive, targets for renewable energy in power production and transport fuels, and a voluntary agreement with international car manufacturers. Additionally, economic measures such as the liberalization of the gas and electricity markets also had a major impact on GHG emissions reduction. It is hard to judge if these environmental measures would have been taken anyway as part of the general EU environmental policy even without the Kyoto Protocol. Within the European Union, some countries such as Germany, the Scandinavian Member States, and the Netherlands have played a proactive role, while other countries such as some southern European countries have acted more reactively. Many of these proactive countries still play a stimulating role in the current debate about the possible strategies to meet the Kyoto targets. Also for these countries, however, 1997 is quite some time ago, economic growth is slow, and political changes in many countries have reflected a decreasing importance of environmental problems such as climate change.

Nevertheless, the EC continues to support the implementation of the set of policies, measures, and instruments that have been developed under the Kyoto Protocol in order to accomplish its set objectives. That the necessary emissions reductions are technically possible is relatively undisputed. It is as yet uncertain which share of the commitment will be achieved through domestic policies and which share through international mechanisms. At this moment, it appears quite possible for the EC to meet the objectives and demonstrate that GHG emissions can indeed be reduced in industrialised countries without necessarily having a destructive impact on their economies. Whether or not this will be realised will depend on the actions that will be taken in the next few years and the political will of the EU governments to use the opportunities available.

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Special Feature on the Kyoto Protocol

The Development of Climate Change Policy in Germany

Rie Watanabe[a] and Lutz Mez[b]

Germany is the leader among countries belonging to the Organisation for Economic Co-operation and Development (OECD) in reducing its emissions of the Kyoto basket of greenhouse gases (GHGs), having accomplished an emissions reduction of 18.9 percent from 1990 to 2000. This paper aims to explain the reasons for this success and to examine the impacts of the adoption of the Kyoto Protocol on the development of Germany's climate policy. In order to identify the factors that determined this outcome, we divide our examination of the policy process in Germany since 1987 into five periods and will evaluate it with a focus on policy measures implemented and actors as well as the institutions involved. It concludes that domestic factors, including the participation of the Greens in the coalition government, mainly determined Germany's success in developing advanced climate policies and measures to reduce its GHG emissions. The paper also highlights the importance of the linkage of climate policy with other policies, which provided incentives to those who would otherwise have opposed or remained neutral on the development of climate policy. As such, the adoption of the Kyoto Protocol did not have a direct impact on climate policy development in Germany, but it did have an indirect impact in that it triggered the development of common and coordinated policies and measures at the European Union (EU) level in order to achieve its quantified GHG reduction target of 8 percent committed to under the Kyoto Protocol, as seen in the introduction of an EU-wide emissions trading scheme.

Keywords: Climate policy, Germany, European Union, Issue linkages, the Greens, Kyoto Protocol.

1. Introduction

In 1990 Germany ranked as the fourth largest carbon dioxide (CO_2) emitter in the industrialized world, with 1,014 million metric tons (tonnes) of CO_2 emissions and 7.4 percent of total emissions of Annex I parties of the Kyoto Protocol.[1] Since the reunification of the country in 1990, CO_2 emissions have been on the decline (see figure 1). Total greenhouse gas (GHG) emissions fell from 1,222.8 million tonnes in 1990 to 991.4 million tonnes in 2000.

In the framework of the Kyoto Protocol and based on the European burden-sharing agreement,[2] Germany committed to reduce its GHG emissions by 21 percent from the 1990 base year by the

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1. The United Nations Framework Convention on Climate Change (UNFCCC) divides countries into two main groups: Annex I, which is the industrialized countries, including the relatively wealthy ones that were members of the OECD plus countries with economies in transition (EIT), and Non-Annex I, which is developing countries.
2. The member states of the European Union agreed on a burden sharing agreement, which divided the EU's 8 percent EU emissions reduction target into member states' differentiated national reduction targets, first politically in 1998 and then legally in 2002 (Council of the European Union 2002). Based on the agreement, Germany is responsible to reduce its emissions equal to over three-quarters of the total European GHG emissions reduction committed in the protocol.

protocol's first commitment period (2008–2012). In addition, in 1995 the government spelled out a 25 percent reduction of CO_2 emissions by 2005. By 2000 Germany had already achieved a reduction of about 18.9 percent, corresponding to 231.4 million tonnes of CO_2 equivalent.

Why has Germany succeeded in reducing its GHG emissions to this extent? This paper aims to explain the reasons for this accomplishment and to examine the impact of the adoption of the Kyoto Protocol on the development of climate policy in Germany. In order to identify the determining factors for this achievement, we evaluate the policy process since 1987 by dividing it into five periods, with a focus on policy measures implemented and actors as well as institutions involved.

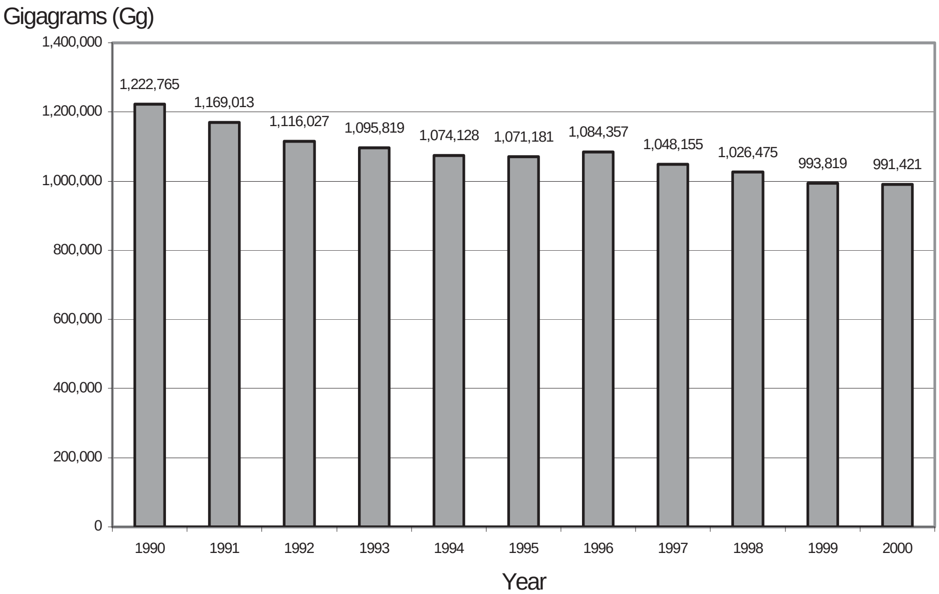

Figure 1. Greenhouse gas emissions in Germany, 1990–2000

Source: UBA 2003.

2. Climate policy development process

In this section, key measures and actors that have played a crucial role in the development of climate policy in Germany are presented and analyzed.[3]

For this analysis a criterion for categorizing the processes must be determined. Since the program drafted by parties that have won the majority of election votes and form the government provides a basis for the development of future policies, we use the election term of the Bundestag (the first chamber of

3. Before going into an analysis, the definition of climate policy used in this paper needs to be clarified. Looking at the agenda of the UNFCCC, the topic of climate policy includes measures for the mitigation of all six GHGs (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride), for adaptation, for international cooperation between developed and developing countries, and research and development. In this paper, however, we use *climate policy* as term for policies and measures to mitigate energy-related CO_2 emissions and institutional arrangements for climate policy decision-making, since energy related CO_2 emissions amount to 90 percent of total GHG emissions in Germany (BMU 2002).

Germany's parliament) as a criterion to categorize the process. Based on this, we split the climate policy development process into the following five government periods:

1. 1987–1990, The Christian Democratic Union (CDU), Christian Social Union (CSU), and the Free Democratic Party (FDP)
2. 1990–1994, CDU/CSU/FDP
3. 1994–1998, CDU/CSU/FDP
4. 1998–2002, Social Democratic Party (SPD)/the Greens
5. 2002–ongoing, SPD/the Greens

This criterion is also useful to identify the impacts of the Kyoto Protocol on the development of German climate policy, since it highlights the differences of climate policies before (from the first to the third periods) and after adoption of the protocol (the fourth and fifth periods).

2.1. The first period: 1987–1990

Germany paid little attention to the climate change issue until the middle of the 1980s (Cavender and Jaeger 1993). When international negotiations for the Montreal Protocol started in December 1986, Germany became markedly more proactive towards the climate change issue as well. In June 1986, the Ministry of Environment, Nature Conservation, and Nuclear Safety (Bundesministrium fuer Umwelt, Natureschutz, und Reaktorsicherheit, BMU) was established under the initiative of Chancellor Kohl, who realized the need for a ministry in charge of environmental issues, based on the recent experience of the Chernobyl nuclear power plant accident. The establishment of the BMU strengthened the position of those in the administration calling for stronger regulatory policy on ozone layer protection and other global environmental issues. Since then the general attention on the climate change issue has dramatically increased and climate change has become an important political issue in Germany.

Reacting to this pressure, the head of Germany's government at the time, Chancellor Helmut Kohl, in March 1987 called for national and international action to address the global threats to the Earth's atmosphere. When Germany took over the European Community (EC) presidency in 1987, ozone layer protection was put at the top of the EC's agenda. At the national level, the Committee for the Environment, Nature Conservation, and Nuclear Safety of the German parliament agreed to establish the Enquête Commission on Preventive Measures to Protect the Earth's Atmosphere (Climate Enquête Commission), with the mandate to study the ozone problem as well as the climate change problem and to make proposals for action. The Interministerial Working Group (IMA) on CO_2 Reduction was also established, which provided an institutional basis for the future development of climate policies.

a. The first Climate Enquête Commission

The German Bundestag resolved to establish the Enquête Commission on October 16, 1987, for the eleventh election period.[4] The objective of this commission was to facilitate the parliamentary discussion of possible precautionary measures concerning the changes in the Earth's atmosphere caused by humans and their impact on world climate and the environment.

4. Enquête commissions are constituted of parliamentarians and scientific experts, in order to facilitate the parliamentary discussion on complicated and long-term issues, pursuant to Article 56 of the Parliamentary Procedure of the German Bundestag.

The Climate Enquête Commission was chaired by Mr. Schmidtbauer of the CDU, and published its first report on November 3, 1988. The second report was published on May 31, 1990, and the commission completed its work on October 2, 1990, with the publication of its third report, *Protecting the Earth*. This report explained that the Earth and its atmosphere are being endangered by GHGs and ozone depletion, and that it is necessary to address both issues as soon as possible. It recommended the goals of a 30 percent reduction of CO_2 emissions by 2005 and 80 percent by 2050, both relative to the 1987 base year level. The commission further recommended the introduction of a new energy policy in Germany (German Bundestag 1991).[5]

b. Interministerial Working Group on CO_2 Reduction

On January 15, 1990, Chancellor Kohl sent a letter to the BMU requesting a study on the target of CO_2 abatement as well as policies and measures for achieving it. In response, the BMU conducted a feasibility study and concluded that a 30.5 percent reduction of CO_2 emissions would be feasible based on the knowledge provided by the Enquête Commission and Germany's federal environmental agency (Umweltbundesamt, UBA) (Beuermann and Jaeger 1996). On June 13, 1990, the federal government agreed to the target of a 25 percent reduction of CO_2 emissions in former West Germany by 2005 relative to the 1987 level, and it set up the Interministerial Working Group (IMA) on CO_2 Reduction with the task of compiling proposals for a 25 percent reduction of CO_2 emissions and of examining possibilities for a further reduction of energy-related GHGs. Within the framework of the IMA, chaired by the BMU, the following five sub-working groups were established (see figure 2):

1. Energy Supply, chaired by the Ministry for Economics and Labour (Bundesministerium fuer Wirtschaft und Arbeit, BMWA)[6]
2. Transport, chaired by the Ministry of Transport, Building, and Housing (Bundesministerium fuer Verkehr, Bau- und Wohnungswesen, BMVBW)
3. Buildings, also chaired by the BMVBW
4. New Technologies, chaired by the Ministry for Research and Technology (Bundesministerium fuer Bildung und Forschung, BMBF)
5. Agriculture and Forestry, chaired by the Ministry for Consumer Protection, Food, and Agriculture (Bundesministerium fuer Verbraucherschutz, Ernaehrung und Landwirtschaft, BMVEL).

In addition to the five subgroups, another group on emissions inventory was established in October 2000. Senior BMU officers were eager to develop and implement climate policies, but it was difficult for the BMU to do so, since climate change was relevant to environmental as well as other policies. The decision by the chancellor's office to set up the IMA enabled the BMU to take the initiative in

5. This report recommended a 30 percent reduction for Germany by 2005 of CO_2 and methane (CH_4) and an 80 percent reduction by 2050 for both gases in comparison to the 1987 base year. The commission analyzed the following three energy scenarios to achieve the targets: (1) the Energy Policy Reduction Scenario, a two-stage reference scenario where energy policy removes all major obstacles preventing efficient energy use and the application of renewable energies, and fuel prices are approximately doubled in real terms by the year 2005; (2) the Nuclear Energy Phase-Out Scenario, characterized by intensified application of efficient energy use, contribution by combined heat and power generation, a considerable increase in the application of renewable energies, and a great rise in the use of natural gas; and (3) the Increasing Nuclear Energy Use Scenario, entailing the additional construction of ten nuclear power station blocks of 1,300 megawatts each, which could lead to a drop of 31.2 percent in GHG emissions without any further CO_2 reduction measures. With the third option, it was not possible to reach consensus among the committee members. The CDU/CSU and FDP supported this option, while the SPD opposed it.

6. The Ministry for Economic Affairs (BMW) changed its name to the Ministry for Economic Affairs and Technology (BMWi) in 1999 and to the Ministry for Labour and Social Affairs (BMWA) in 2002 due to changes of its responsibilities.

developing climate policies and measures. Some have said, however, that the BMU just played a coordinator role, since it did not chair any subgroup at the beginning (Beuermann and Jaeger 1996; Bang 2000).

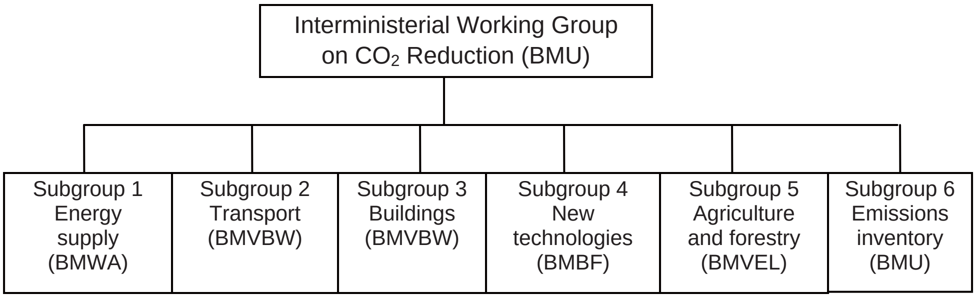

Figure 2. Structure of the Interministerial Working Group on CO_2 Reduction

Source: IMA CO_2-Reduktion 2000.

c. Summary

Since the late 1980s, in response to heightened awareness of the climate change issue at the domestic as well as international levels, the Climate Enquête Commission was constituted to compile scientific knowledge on climate change issues, and the Interministerial Working Group on CO_2 Reduction was established to compile proposals for achieving a 25 percent reduction target. Promoters of the Enquête Commission included Chancellor Kohl, the Bundestag, scientists, and the members of Enquête Commission, including its chair, Dr. Schmidtbauer of the CDU. Chancellor Kohl, Environment Minister Klaus Toepfer, and BMU officers also played crucial roles in establishing the IMA, which functions to provide an institutional basis for making decisions on climate policy.

2.2. The second period: 1990–1994

After the collapse of the Berlin Wall on November 9, 1989, the reunification of East and West Germany was undertaken at a much more rapid pace than expected, and on October 3, 1990, Germany became re-unified. The rapid reunification process and reconstruction of the former East Germany partly distracted attention from environmental and climate issues (O'Nell 1997). Although the progress of climate policy might have been slowed down because of the reunification process, it still continued with developments during this period such as the publication of the IMA's first report, the work of the second Climate Enquête Commission, the promotion of renewable energy, and the promotion of energy efficiency in the former German Democratic Republic (DDR).

a. The second Climate Enquête Commission

After the first Climate Enquête Commission completed its work with its third report for the eleventh election period in 1990, another commission was established, the Enquête Commission "Schutz der Erdatmosphaere" (Protection of the Global Atmosphere) for the twelfth election period. It completed its work with its final report, titled *Mehr Zukunft fuer die Erde: Nachhaltige Energiepolitik fuer dauerhaften Klimaschutz* in 1994 (German Bundestag 1995). The second Climate Enquête Commission was not as successful as the first, a fact mainly attributed to its focus on implementation, while the first one mostly dealt with the natural science aspect of climate change (Beuermann and Jaeger 1996; Vierecke 1999).[7]

b. The IMA's first report

The IMA presented its first report on November 7, 1990,[8] and on its basis the federal government reaffirmed the 25 percent reduction target for energy-related CO_2 emissions in the former West Germany and to a considerably higher percentage reduction in the new East German federal states by 2005 relative to the 1987 base year. Concerning more specific measures, it recommended market instruments, the inclusion of ecological costs in energy prices, energy saving and emission-control regulations in the buildings sector, district heating, combined heat and power generation, the utilization of industrial waste heat, and opening up of the long-term economic potential of renewable energies.

c. The Electricity Feed-in Act

Measures to promote electricity generation from renewable energy sources became an issue in the German Bundestag in 1990. Under the initiative of members of parliament from different political parties, the Electricity Feed-in Act (Stromeinspeisungsgesetz, StrEG) was drafted and adopted by all political parties. The Electricity Feed-in Act entered into force on January 1, 1991. It set feed-in tariffs for electricity from renewable energy sources not owned by utilities and an obligation for grid operators to purchase electricity from renewable energy sources.

Together with direct subsidies provided by the federal government for the production of renewable energy, the Electricity Feed-in Act largely contributed to an increase of wind power capacities by a factor of around 42 times from 1990 to 1998.[9]

d. Measures to promote energy efficiency in the former East Germany

The reconstruction of the former East Germany, whose economic level was lower than West Germany and with a considerable lack of infrastructure, required the transfer of enormous financial resources from the West. The official figure is 1,000 billion deutsche marks (DM) (500 billion euros [€]), part of which was used for the reconstruction and privatization of the energy sector, such as restructuring and privatization of brown coal mining, establishment of a competitive market for private companies in the oil sector, the shutdown of nuclear power plants, establishment and privatization of local power plants, abolishment of energy price subsidies, improvement of energy efficiency in buildings,[10] and

7. Apart from the issue discussed, Beuermann and Jaeger raised the differences of charpersons and working processes between the first and second Enquete Commission as reasons for this (Beuermann and Jaeger 1996).

8. The IMA published its second report on December 11, 1991, the third report on September 29, 1994, the fourth report on January 6, 1997, an interim report on July 26, 2000, and its fifth report on October 8, 2000. BMU officers mentioned that the IMA published its reports to coincide with important international conferences such as COP 1, COP 3, and COP 6.

9. In 1994, DM 10 million was budgeted for promoting energy from renewable resources. This program operated from 1995 to 1998, and provided direct investment of DM 0.1 billion for wind, solar energy, and the installation of biogas and biomass systems.

10 In former East German states, modernization of regional heating programs was also undertaken by the federal as well as regional governments. It was estimated that the modernization rate amounts to 4.5 to 5 percent per year and that DM 3 billion had been spent on this program by 1995.

implementation of environmental regulations.[11] These instruments and a migration of population from East to West Germany was one of the reasons for unified Germany's success in dramatically reducing CO_2 emissions (Schleich et al. 2001). Although some argue that the reduction of CO_2 emissions was a "free lunch" resulting from the reunification process, Germany actually had to spend hundreds of billions of euros for it. The share of policy measures in emissions reduction is estimated at about 50 percent and the other half is attributed to reunification (ibid.; Fraunhofer Institute for Systems and Innovation Research 2001).

e. Summary

During this period, German reunification was the main focus of the political agenda for both the government and parliament. Some argue that the development of climate policy was slowed down because of the reunification process and that a decrease in support from the Greens in the 1990 federal election was evidence of this, while others explain that the decrease in support from the Greens was attributed to its negative attitude towards Germany's reunification and the late integration with its East German sister party, the Alliance 90 (O'Nell 1997). Due to these factors, climate change might have attracted fewer people's attention than in the previous period. The above examination, however, reveals that climate policy was developed even during this period, as seen by the IMA's first report, the promotion of renewable energies, and the improvement of energy efficiency in the former East Germany.

Chancellor Kohl and Environment Minister Toepfer of the CDU played crucial roles in promoting climate policies. A diversification of actors was also observed in this period. For example, the Bundestag was the main promoter of renewable energy sources, supported by the Bundesrat.[12] During the reunification process, the Ministry of the Interior (Bundesministerium des Innern, BMI) acted as a promoter as the ministry in charge of reunification policy. The BMU, BMW, and new states also contributed to the inclusion and implementation of energy efficiency policies and environmental policies in the reunification process. Evidence of this can be seen in the fact that the BMW as well as the BMI were promoters of each measure, primarily aiming to promote their primary interests of energy and reunification policy.

2.3. The third period: 1994–1998

Germany succeeded in steadily reducing CO_2 emissions during this period. Bolstered by this success, it played a leading role in climate policy at international and the European Union (EU) levels, including inviting the first Conference of the Parties (COP 1) to Berlin in 1995. In order to appeal to Germany's willingness to address the climate change issue as the host of COP 1, the federal government, again led by the CDU/CSU and FDP, strengthened its target to reduce CO_2 emissions by 25 percent by changing the base year from 1987 to 1990. The Federation of German Industries (Bundesverband der Deutschen Industrie, BDI) announced their voluntary commitment to reduce CO_2 emissions. During this period, energy policy was largely reformed to respond to adoption of the EU directive concerning common

11. An ordinance on large combustion plants contributed to closing down brown coal power plants and the subsequent reduction in CO_2 emissions.

12. The Bundesrat (federal council) is the representative body of the 16 federal states. The Bundestag is the first chamber of the Parliament while the Bundesrat is the second chamber.

rules for the internal electricity market on December 19, 1996 (96/92/EC), which had both negative and positive impacts on climate policy development.

a. Declaration by German industry on climate protection

Responding to the government's request, the BDI announced a voluntary commitment on March 18, 1995, to reduce CO_2 emissions "up to minus 20 percent" by the year 2005 relative to the 1987 level with the expectation that the government would refrain from introducing additional measures. Subject to criticism from various sides, the agreement was amended on March 27, 1996, by the modification of base year from 1987 to 1990 with dropping "up to" from the target and the introduction of monitoring by a third party, the Rheinisch-Westfaelisches Institut fuer Wirtschaftsforschung (RWI). Following the BDI announcement, the federal government announced it would refrain from introducing additional measures such as the heat usage ordinance and the CO_2/energy tax.

b. Amendment of the energy act

In autumn 1996, the German government made an attempt to deregulate the energy law and introduced a draft into the legislative process, backed by the reform requirements discussed in the drafting process for the EU directive 96/92/EC concerning common rules for the internal market in electricity adopted December 19, 1996. The reform's main goal was to induce the reduction of electricity and gas prices in order to strengthen the international competitiveness of German industry. After controversial debate within parliament and with stakeholders for more than a year, the Revised Energy Sector Act (Gesetz zur Neuregelung des Energiewirtschaftsrechts) was passed, which amended the Energy Sector Act (Energiewirtschaftsgesetz, EnWG), the Monopolies Act (Gesetz gegen Wettbewerbsbeschränkungen, GWB), and the Electricity Feed-in Law (Mez 1997). It entered into force on April 29, 1998. The basic principles of the energy law reforms are the end of demarcation agreement, the full opening up of the network for all suppliers, and the free choice of supplier for all consumers. Disregarding the scope provided by the EU directive, the new Energy Sector Act does not stipulate priority for combined heat and power (CHP) or renewable electricity sources. Moreover, by abolishing the demarcation and concession agreements, the Act contributed to stimulating competition among power companies and grid operators, which, ironically, enhanced further oligopoly and hindered the promotion of environmentally benign but high-cost energy sources, including CHP as well as renewable energies.

c. Summary

In order to show its willingness to address the climate change issue as the host of COP 1 in 1995, Germany's federal government strengthened its national target to reduce CO_2 emissions by 25 percent compared to the 1990 base year instead of the 1987 level. Furthermore, a voluntary commitment was declared by industry. In April 1998, the energy sector law was revised as Germany's implementation of the EU directive concerning common rules for the internal electricity market. In the revision, demarcation and concession agreements were abolished. Subsidies for coal also started to be reduced (BMU 2003c).[13] The Revised Energy Sector Act and the reduction of coal subsidies were developed

13. In March 1997, the Coal Subsidy Law was enacted, which stipulated that the subsidy to hard coal be reduced from €4.76 billion to €2.71 billion from 1998 to 2005.

primarily from an energy policy perspective; therefore, they did not always have positive effects on the development of climate policy.

In terms of making voluntary commitments, Chancellor Kohl, Environment Minister Angela Merkel, the Ministry for Economic Affairs and Technology (BMWi), and industry launched an initiative, which was mainly a result of industry's intention to avoid the introduction of more drastic measures by appealing for a collaborative attitude in promoting climate policy. The basis of this arrangement—the voluntary commitment of German industry—was propagated by these associations as the royal road of environmental policy.

The BMWi took the initiative in revising the Energy Sector Act and the reduction of coal subsidies, which resulted in both a positive and negative influence on emissions reduction, since it was developed mainly from the energy policy development perspective.

As characterized in the case of energy sector law, this period highlighted the complexity of climate policy, where the various interests of actors and policy perspectives at the national level as well as the EU level were intertwined.

2.4. The fourth period: 1998–2002

After the federal election in September 1998, the SPD and the Alliance 90/the Greens formed a new coalition government in October. Due to the participation of the Greens, the new coalition government strengthened environmental policy in its coalition agreement. The major elements of the agreement included plans for green tax reform, the further promotion of renewable energies as well as energy-efficient technologies, and the phase-out of nuclear energy. While the government succeeded in introducing an eco-tax, enacting a renewable energy sources act, and the phase-out of nuclear power plants, it could not carry out drastic reforms in the reduction of coal subsidies and the introduction of a CHP quota.

a. Ecological tax reform and the Act on the Continuation of the Ecological Tax Reform

Although ecological tax reform has long been discussed in Germany, the CDU/CSU/FDP government failed to introduce an eco-tax.[14] This was partly because Chancellor Kohl promised, along with Mr. Henkel (BDI) and Mr. Strueber (BASF), not to introduce one as long as he was in office (Reiche and Krebs 1999).

The Greens advocated an eco-tax and the phase-out of nuclear power in their campaign pledge for the 1998 election with the support of non-governmental organizations (NGOs) (Reiche and Krebs 1999). Nevertheless, few expected the introduction of an eco-tax. Against the expectations of most, in their October 1998 coalition agreement the SPD and the Greens agreed on an ecological tax reform that was to be implemented in three steps.[15] The mineral oil tax on heating oil and natural gas was to be increased in a series of steps and a tax on electricity was to be introduced. The total revenues were to be used to

14. For further details on discussions on the eco-tax, see Reiche and Krebs (1999), Schreurs (2002), and Mez (2003).

15. It was a significant decision that the SPD selected the Greens and not the FDP as its coalition partner. The right wing of the SPD (the Schroeder wing) was seen as a more pragmatic choice, so many expected the SPD to lean towards the FDP. As it turned out, Oscar Lafontaine, who was SPD leader and belonged to the left wing of the SPD, brought the coalition with the Greens into reality.

reduce additional social insurance costs. Renewable energy sources were to be exempt from the tax on electricity, and energy-intensive industries were to be levied a reduced tax rate due to the consideration of international competitiveness.[16] The SPD's interest in reducing social insurance burdens as well as the participation of the Greens in the government were seen as reasons for introducing an eco-tax at this time (BMU 2003b).[17]

The first stage of the Eco Tax was passed by the Bundestag and the Bundesrat after two hearings of the parliamentary finance committee, and it came into force on April 1, 1999. It stipulated an increase of 6 pfennig (3.07 Euro cents) per litre of the mineral oil tax on fuels, 4 pfennig (2.05 cents) per litre on light heating oil, and 0.32 pfennig (0.16 cents) per kilowatt-hour on natural gas, as well as the introduction of an electricity tax of 2 pfennig (1.02 cents) per kilowatt-hour. The DM 8.3 billion (€4.24 billion) in revenues for 1999 almost entirely went to reducing pension contributions (by 0.8 percent).

In summer 1999 the details of the next stages of the Eco Tax were published. On January 1 of each year from 2000 to 2003, the petrol tax was set to rise by 6 pfennig (3.07 cents) per litre and the tax on electricity by 0.5 pfennig (0.26 cents) per kilowatt-hour. Specifics of the reform included a temporary exemption from the mineral oil tax for gas and steam power plants and for CHP, as well as a reduction of the mineral oil tax for diesel fuel for local public transport.

b. The National Climate Policy Programme

In the National Climate Policy Programme of October 2000, indicative sectoral reduction targets were published for the first time. With a 2005 reduction target of 50 to 70 million tonnes of CO_2 emissions, 20 to 25 million tonnes would have to be reduced by energy supply and industry, 18 to 25 million tonnes by households, and 15 to 20 million tonnes by transport (IMA CO_2-Reduktion 2000).

c. The Renewable Energy Sources Act

After several reviews of the Electricity Feed-in Act, the necessity of scrutinizing the framework conditions for the promotion of renewable electricity was recognized.

The April 1998 Revised Energy Sector Act also included amendments to the Electricity Feed-in Act, which, on the one hand, was intended to spread the burden of financing feed-in remunerations more evenly among grid operators. On the other hand, it put a cap on further market expansion, particularly of wind energy, by limiting remunerated feed-in amounts to 5 percent of a distributor's sales. Criticism of this law grew louder as electricity prices decreased, and remunerations coupled to averages prices were expected to decrease as well. Furthermore, in some coastal supply areas the 5 percent limit had already been passed. In order to address the issues identified, legislation on granting priority to renewable energies (Renewable Energy Sources Act, or RESA) was enacted under the initiative of the parliament (and not primarily the government) on March 29, 2000. It came into force on April 1, 2000, and replaced the Electricity Feed-in Law.

16. A reduced rate of 80% applied to the manufacturing sector and forestry and agriculture, given the fact that they pay the minimum amount of tax (€511 per energy source based on electricity and heating fuels). For the manufacturing industry, there is the additional option to apply for a tax cap ("Spitzenausgleich"), through which companies will get refunded the full differential amount if the burden from increased tax rates (disregarding the mineral oil tax on motor fuel and heating oil) is 1.2 times greater than the tax relief from the reduction in pension contributions.

17. Apart from these two factors, a BMU senior officer mentioned that speed was essential, as it would be more difficult to introduce an eco-tax if more time was allowed to consider it (BMU 2003b).

The law's underlying aim is to achieve a substantial increase in the percentage contribution made by renewable energy sources to power supply in order to at least double the share of renewable energy sources in total energy consumption by the year 2010 (Fraunhofer Institute for Systems and Innovation Research 2001.

In addition to wind energy feed-in provisions, it also provides fixed remuneration for electricity from biomass and photovoltaic sources, as well as geothermal and small-scale hydropower. Although remuneration will decrease according to a fixed schedule over the years, it starts at high and economically worthwhile levels, and it is meant to function as a market transition program for new technologies.

According to the promotion of renewable energy sources, renewable electricity generation contributed 44 terawatt-hours (TWh) in 2003, and its share increased from 5.4 percent in 1998 to 7.9 percent (Wittke and Ziesing 2004).

d. Revision of the Voluntary Declaration by German industry

German industry addressed the climate change issue mainly with its Voluntary Declaration, published in 1995 and then revised in 1996.

The third monitoring report on the CO_2 emissions of Germany industry (published in November 2000) revealed that a number of sectors had either almost reached their target or exceeded it at about the half-way point between the base year and target year (Buttermann and Hillebrand 2000). Bolstered by this success, German industry published another revised declaration on November 9, 2000, in accordance with the federal government's publication of its fifth climate protection program on October 18, 2000. In the declaration, German industry aimed at a 28 percent reduction in specific CO_2 emissions by 2005 and a 35 percent reduction of emissions for the six greenhouse gases until 2012 (BDI 2000).[18]

e. Promotion of the co-generation of heat and power (the CHP Law and the CHP Expansion Law)

Another law aimed at re-regulating the electricity market is the CHP Law (the Gesetz zum Schutz der Stromerzeugung aus Kraft-Wärme-Kopplung) of May 12, 2000. The unexpectedly rapid decrease in wholesale electricity prices on the deregulated German electricity market resulted in high cost pressures on CHP power station operators (Fraunhofer Institute for Systems and Innovation Research 2001), which counteracted the original policy target of doubling cogeneration by 2010. Realizing the necessity for a legal support scheme to industrial self-producers as well as municipal utilities affected, the CHP Law guaranteed a feed-in remuneration for existing CHP power produced for public supply of 1.53 euro cents /kWh as of January 1, 2000,[19] and made all plants generating for public supply eligible for support. The law expired when the CHP Expansion Law came into force.

Since the CHP law was designed as a pure stranded cost recovery regulation, it neither counteracted the shutdown of industrial CHP plants nor integrated environmental criteria of eligibility. Therefore, the

18. After the BDI published its 1995 and 1996 declarations, the federal government announced that it would refrain from introducing additional measures on the condition that industry reduces CO_2 emissions accordingly as stipulated in the declarations. The 2000 revision was signed by representatives of industrial associations (BDI, BGW, VDEW, and VIK), Chancellor Schroeder, Environment Minister Juergen Trittin, and Economic Minister Werner Mueller.

19. To be reduced by 0.26 ct/kWh each year.

drafting of a further regulation in the frame of a comprehensive CHP program was put on the governmental agenda. According to a cabinet decision, the legislation introducing a tradable quota system was originally planned to be passed by the end of 2000. This scheme was to be open to all CHP producers, which were to be assessed primarily according to environmental efficiency standards. Strong opposition was levied by the large electricity companies and, more silently, from a number of municipal utilities. They wanted to avoid the additional cost burdens expected to arise from such a support scheme and, maybe even more important, feared losing market share to industrial self-generators because of the potentially large amount of economically- and environmentally-effective CHP expected to be mobilized. Industrial producers in turn were not natural promoters of self-managed CHP production as long as low energy costs could be maintained for their industrial production processes. In spring 2001, a customer-financed bonus system was discussed, based on strict environmental standards that would be increased over time. The Environment Minister, Juergen Trittin, and his Green parliamentary faction supported it, while the Minister of Economic Affairs and Technology, Werner Mueller, despite heavy criticism from scientific advisors, was in favor of a negotiated CO_2 reduction agreement with the large electric companies.[20]

After long negotiations between the government, the SPD, the Greens, and industry, the new CHP law came into force on April 1, 2002, protecting CHP plants for public supply and providing incentives for their modernization. Further support is given to small-scale CHP plants and fuel cells. Until December 31, 2010, expenses are expected to total €4.5 billion and CO_2 emissions should be reduced by 11 million tonnes. Industrial CHP plants are not affected by the new law, which replaced the CHP law of May 2000.

f. The ordinance to improve energy efficiency in buildings

The government's fifth climate protection program also proposed measures to improve energy efficiency in the buildings sector, where CO_2 emissions have been increasing. Under initiatives taken by Minister of Economics and Technology, Werner Mueller, and Minister of Transport, Building and Housing, Kurt Bodewig, the Buildings Energy-Efficiency Ordinance (Energieeinsparverordnung) was brought into force February 1, 2002, with the objective to reduce CO_2 emissions by up to 25 million tonnes. The law is designed to reduce energy consumption in new buildings by nearly one-third, while it requires the introduction of insulation in older houses and the replacement of up to two million inefficient domestic boilers over five years. New houses will also require energy certificates in the future. The method for calculating energy consumption based on energy sources favors the use of energy from renewable sources, and the use of electric heating will be penalized.

g. Summary

After the autumn 1998 federal election, the SPD and the Greens formed a new coalition government after a 16-year-long CDU/CSU government, which was successful in introducing the Eco Tax and promoting renewable energies as well as energy efficiency in the buildings sector.

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20. In a plan devised by the large electric companies suggested carrying out efficiency measures in their plants to reduce CO_2 emissions. More than half of the reductions presented in their detailed plan, however, did not meet the standards of the economic minister's scientific advisors, because included were measures accounted for in the voluntary agreement for reducing CO_2 emissions, as well as other unacceptable measures like refurbishing lignite-fired plants and relying on public subsidies.

In regard to the introduction of the Eco Tax, the Greens, with the support of NGOs and the BMU, were its promoters, while industry and the BMWi opposed it. The SPD decided to position itself on the promoter side because of the tax's social policy benefits, which are consistent with the SPD's policy as socialist and with the interests of SPD's main supporters, namely, workers. Therefore, the SPD as well as Chancellor Gerhard Schroeder switched from supporting it to being neutral, even close to being negative, upon the revision of the Eco Tax, when it became unpopular among general public. In contrast, the Ministry of Finance (Bundesministerium der Finanzen, BMF), which was neutral at the introduction of the tax in 1998, became promoter after realizing that the tax was a stable revenue source.

With the Renewable Energy Sources Act, the Greens and the SPD played a vital role as promoters, while power companies as well as the BMWi acted as opponents.

In regard to the CHP quotas, the Greens and Environment Minister Juergen Trittin were the main promoters, while the BMWi and the Minister of Economics and Technology, Werner Mueller, with most companies, opposed it. The positions of the main actors were almost the same as with the Renewable Energy Sources Act, apart from the position of the SPD. Both Chancellor Schroeder and the SPD had difficulties in taking decisive action on this issue because the coal industry as well as the German state of North Rhine Westphalia (the largest coal producing state)—strong supporters of the SPD—fiercely opposed the introduction of CHP quotas (BMU 2003a).

Although the BMWi opposed the above measures, it was a promoter along with the BMVBW of the introduction of the energy-efficiency ordinance in the buildings sector.

This period saw the further development of climate policies and measures, mainly due to the participation of the Greens in the government, as shown in the case of the Eco Tax and the promotion of renewable energy. The cases of the Eco Tax and the buildings energy-efficiency ordinance also highlight the importance of issue linkages, which gave the BMF an incentive to support the Eco Tax and the BMWi as well as BMVBW to take initiatives on the ordinance to improve energy efficiency in buildings. Backed by the development of domestic climate policy, the German parliament unanimously ratified the Kyoto Protocol in March 2002 with the aim of entering the protocol into force in time for the Johannesburg summit, the tenth anniversary of the United Nations Conference of Environment and Development (when the United Nations Framework Convention on Climate Change was opened for signature).

2.5. The fifth period: Since 2002

During the fall 2002 federal election campaign, it was reported that the CDU/CSU was predominant due to the existing economic recession, an increase of unemployment, and the return to conservative governments in other European countries such as France and the Netherlands. After massive flooding in August 2002, however, environmental issues recaptured the general public's awareness, which resulted in the Greens winning its largest number of votes at the federal level since its establishment and elevating it to being the third-largest political party in Germany. In October 2002 the SPD and the Greens formed a second-term coalition government. With the Greens' gain of negotiating power in the coalition government, they succeeded in shifting the responsibility of renewable energies from the

BMWA to the BMU and strengthening environmental policies in a new coalition agreement, which included the medium-term target of reducing GHGs emissions by 40 percent by 2020, support of a draft directive on the EU's GHG emissions trading scheme, and measures to further promote renewable energy sources.

a. The Act on the Further Development of the Ecological Tax Reform

Although the Eco Tax, which was introduced and revised in the first "Red-Green" coalition government, contributed to the reduction of Germany's CO_2 emissions, it was criticized mainly due to a number of exemptions. After considering the criticism, the new coalition government introduced the Act on the Further Development of the Ecological Tax Reform, which entered into force January 1, 2003.

The discussion of tax reform focused on the exemptions granted to industry (BMU 2003a), which resulted in revisions such as an decrease of the eco-tax reduction rates for the manufacturing industry as well as for agriculture and forestry from the previous 80 percent to 40 percent, and the modification of the tax cap from the previous 100 percent to 95 percent of the excess tax.[21]

A review for the year 2004 is foreseen to assess if and how the Eco Tax will be further developed according to environmental aspects, considering the environmental impacts, oil prices, macro-economic developments, the competitiveness of German industry, and the social impacts of such taxation.

b. Implementation of the EU directive on establishing GHG emissions trading

Responding to a Green paper on establishing a scheme for greenhouse gas emission allowance trading within the Community (COM[2000]87) published in March 2000, Germany's government decided to establish a working group on emissions trading within the framework of the climate protection program published on October 18, 2000, with the BMU as the chair. Members of the group included a number of state and federal ministries, members of parliament, companies, industrial associations, unions, and NGOs (AG Emissionshandel 2002).

While the BMU, with the backing of some companies including British Petroleum and Shell, was in favor, the BMWA and most industries opposed the introduction of mandatory emissions trading at the EU level for the first phase, from 2005 to 2007, mainly because of concerns about the friction that would be caused by adjusting its existing measures, including the voluntary agreement (BDI 2001; BDI 2002). Considering industry's opposition, Germany made proposals on voluntary participation, opt-out,[22] and pooling to exempt its industries from the emissions trading scheme for the first phase.[23] In the end, however, it agreed on adopting the EU directive (2003/87/EC), which included very limited opt-out and pooling, therefore different from what Germany originally intended. This was mainly because a draft proposal of the emissions trading directive was submitted as an environmental directive based on Article 175 and 251 of the Treaty Establishing the European Community, therefore, it could be adopted

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21. For details on the exemptions, see footnote 19.

22. The difference between the mandatory/voluntary scheme and opt-out is that country, sector, or individual installations can decide whether to participate in the scheme under the voluntary scheme, while opt-out allows them to be excluded from the scheme by fulfilling certain conditions under the mandatory scheme.

23. The pooling described in Article 28 of the emissions trading directive is the system to allow operators of installations to form a pool of installations and to take collective responsibility to surrender allowances equal to the total emissions from installations in the pool; while the pooling which Germany originally proposed was the mandatory one in which the government can decide on the participants in the pooling with the aim of maintaining its voluntary declaration.

with the qualitative majority-voting rule.[24] Under the situation that most member states were willing to introduce emissions trading in order to efficiently reduce their emissions from their energy supply and industrial sectors, Germany could not help but agree to the adoption of the directive at the Council (Watanabe 2004a, 2004b).

The National Allocation Plan (NAP) was submitted to the European Commission on March 31, 2004 and the Emissions Trading Act (Treibhausgas-Emissionshandelsgesetz, TEHG) as well as the Allocation Act (Zuteilungsgesetz, Zug) were passed by parliament in April and August, respectively. The total planned budget allocated for 2005 to 2007 (including a reserve for new entrants) is 1.497 million tonnes of CO_2 equally distributed over three years. The emissions budget for installations under the emissions trading scheme was set politically and is less than the voluntary agreement target of German industry for the energy supply and industrial sectors (Fraunhofer Institute 2004).

c. Summary

In 2002 the SPD and the Greens formed a second coalition government. Backed by the strong position of the Greens, climate policies have been further developed, as shown in the shift of ministerial responsibility for renewable energy from the BMWA to the BMU.

Regarding the revision of the Eco Tax, the Greens, the BMU, and the BMF made an effort to abolish the exemption treatments, a move opposed by industries and the BMWA. The SPD and Chancellor Schroeder were not in favor of revising the tax, because it was unpopular among the general public, which blamed the tax for the rise of oil prices.

This period observes the European Union’s increasing influence on the development of climate policies in member states as characterized in the EU directive on establishing a scheme for greenhouse gas emission allowance trading within the Community.

Regarding the EU directive, again it was the Greens and BMU, backed by some industries that promoted its adoption, while it was opposed by the BMWA and most companies. Despite the opposition, the directive was adopted, mainly due to pressure from other member states and adoption procedure of the directive.

3. Conclusion

Germany is one of the few industrialized countries among the Annex 1 Parties to the UNFCCC that has succeeded in reducing its GHG emissions. The above examination revealed that this success was mainly due to domestic factors. Germany set its national target to reduce CO_2 emissions by 25 percent at a very early stage, and in order to achieve this target it developed climate policies and measures.

Following the 1997 adoption of the Kyoto Protocol, further development of climate policies occurred in Germany, such as the introduction of the Eco Tax and renewable energy promotion policy.

24. Under the qualified majority voting rules, 62 votes among 87 votes (Belgium, 5; Denmark, 3; Germany, 10; Greece, 5; Spain, 8; France, 10; Ireland, 3; Italy, 10; Luxemburg, 2; Netherlands, 5; Portugal, 5; United Kingdom, 10; Austria, 4; Finland, 3; and Sweden, 4—making a total of 87) constitute a qualified majority, while 26 is a blocking minority. This means that the five larger states cannot outvote the smaller seven and also that two large states cannot by themselves constitute a blocking minority. The number of votes will be changed in November 2004 due to the accession of ten new countries.

Nevertheless, these developments are mainly attributed to the change of government from the CDU/CSU to the SPD/Alliance 90-the Greens, not the adoption of the protocol. Apart from the change of government, the linkage of issues is identified as one of the most important factors contributing to Germany's success, as seen in the cases of the Eco Tax, improved energy efficiency in the building sector, and the reunification process. The actors involved decided their positions based on their primary interests and their mandates, which have rarely changed (Jung and Loske 2000). The German success highlights the lesson that it is very important to link climate policy with other policies in order to provide incentives to potential opponents and especially neutrals to cooperate in promoting climate policies.

As mentioned above, the adoption of the Kyoto Protocol did not have a direct impact on Germany's climate policies, but it did have wide-ranging indirect impacts. The major difference seen when comparing the situation before and after Kyoto is the development of climate policy in the European Union, one of the signatories to the protocol, with its commitment to an 8 percent GHG emissions reduction. In order to achieve the commitment as a community, the European Union has made considerable efforts to develop common and coordinated policies and measures, whose influence on climate policies in member states has been increasing—as the case of emissions trading directive clearly demonstrates.

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Special Feature on the Kyoto Protocol

The Kyoto Protocol: An Indian Perspective

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This article describes the Clean Development Mechanism (CDM) policy of India, provides estimates of potential for a few sectors, and voices India's concern about the CDM. In particular it covers the problems of determining CDM baseline, transaction costs, and risks that have to be borne by the developing countries and determining a fair price for carbon dioxide (CO_2). It argues for more effective technology transfer and points out that, if interpreted incorrectly, CDM rules can discourage climate-friendly policies in developing countries. It suggests that the developing countries should learn how to play the CDM game in order to secure better deals.

Keywords: CDM game, CDM baselines, CDM transaction costs, CDM risks, India's CDM policy and potential. [1]

1. Introduction

The 1992 United Nations Framework Convention on Climate Change (UNFCCC), although not fully satisfactory, was important for developing countries. It recognized the need for their development and the need to curtail greenhouse gas emissions (GHGs) in order to reduce the threat of climate change. Subsequently, the 1997 Kyoto Protocol brought developing countries closer to the ambit of GHG reduction by making it attractive for them with the proposal of the Clean Development Mechanism (CDM). Despite the fact that the protocol is not yet ratified, a number of activities have already been launched in many countries. These range from the establishment of institutions like the CDM Executive Board at the UNFCCC, the designated national CDM agencies in various countries, and a number of consulting firms that deal with issues ranging from GHG reduction issues to identifying CDM projects and methodologies for baselines and so on. Each year, numerous training programs, workshops, and consultations take place involving policy makers, experts from public and private sectors, non-governmental organizations (NGOs), and academic organizations. The effort invested into these activities suggests that the Kyoto Protocol is seen as worthwhile.

As for India, the impact of the Kyoto Protocol has to be assessed in the context of the following questions:

- What GHG emission reductions can be obtained from the country's key sectors?

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1. The authors are grateful to the Ministry of Environment and Forests (MOEF) for supporting a CDM project at IRADe which provided some ideas about the issues and contents for this article. The views expressed are the personal views of the authors and not of the MOEF or the Planning Commission.

- What could be the impact of India's domestic policy on GHG emissions reduction?
- What new technologies has India obtained so far?
- What and how much additional resources have flown into India?

2. India's approach

2.1. Warming up to the CDM

Given these basic issues, here we quickly recap the thinking of the Government of India on the CDM. After initial reluctance to even join the pilot project phase of activities implemented jointly (AIJ), and after great deliberation on participation in AIJ,[2] the Government of India decided to set up the AIJ Working Group under the Ministry of Environment and Forests (MoEF), and issued a set of guidelines for submission of AIJ projects to the government. After lengthy debate since 1997 on the issues and options, a broad consensus seems to be emerging in regard to operationalizing the CDM. This is reflected in the much thinner consolidated text that emerged after the twelfth session of the Subsidiary Body on Scientific and Technological Advice (SBSTA-12) in June 2000. The government set up the Expert Group on Kyoto Protocol mechanisms to crystallize the views in the country.[3]

There has been a shift in India's stance towards accepting the CDM, conditional on the clarification of the principles and modalities of its operation. A joint statement between India and the United States in March 2000 underlines this shift in "cooperation on energy and environment." Stressing the desire to promote clean energy, it called for development of cleaner and more energy-efficient technologies. The statement said that by 2012 the Government of India hoped to increase the share of renewable energy to 10 percent of the capacity addition in electricity generation.

The following are the key elements of India's stance on the CDM:

1. The use of flexible mechanisms to meet commitments should be supplemental to domestic effort and an upper limit to their use should be defined.
2. Carbon sinks should not be included in the CDM.
3. Criteria for CDM projects:
   - The host country should be the sole judge of its own national sustainable development criteria.
   - Project activities should promote the transfer of technology.
   - Capacity building should be incorporated into all CDM projects.
   - Baselines will be defined on a project-to-project basis.
   - Funding for project activities shall be additional to official development assistance (ODA), Global Environmental Facility (GEF), and other financial commitments of developed country Parties.
4. The "share of proceeds from certified project activities" shall be a stipulated percentage of the differentials of the costs incurred by the developed country in reducing GHG emissions through

2. J. Parikh was a member of this committee.
3. J. Parikh was a member of this committee as well.

project activities in a developing country, as well as of the project costs that would have been incurred had the GHG reduction activity taken place in the developed country funding the project(s).

5. The terms and conditions for sharing certified emissions reduction (CER) credits and funding will be mutually agreed upon by the developed and developing country parties.
6. The operational entities that certify emission reductions shall be designated by the COP/MOP.[4]
7. A national system of monitoring, verifying, and reporting under the CDM shall be established.

India established its own designated national agency (DNA) cell in 2003—called the National Clean Development Mechanism (CDM) Authority—within the Ministry of Environment and Forests, with representatives from other government ministries. The process of attracting CDM projects has begun and is now picking up steam. Every year a number of workshops are held to build awareness and capacity in support of project preparation, and there is now considerable interest among policy making bodies, the business community in the public and private sectors, NGOs, as well as universities and research institutions.

2.2. CDM projects in India

The status of CDM projects forwarded by India to the Executive Board is shown in table 1.

Table 1. Key information on CDM projects forwarded by the GOI (as of August 2003)

Project name	Credits purchaser	Project description	Total GHG reduction (tCO_2 eq.)[a]
Biomass-based (bagasse)[b] cogeneration power plant, Karnataka	Unknown	Biomass co-generation in sugar mill; 26 MW	696,167
Suzlon Wind Project	CERUPT	Wind 15 1-MW turbines; 15 MW	360,000
Tamil Nadu Wind Project	CERUPT	Wind; 17 0.85-MW turbines; 14.45 MW	308,030
Enercon wind farm	CERUPT	—	2,000,000
Tamil Nadu Biomass Project	Swedish Energy Agency	Biomass (cotton stalks, rice husks etc); 18 MW	800,000
Biomass project, Maharashtra	CERUPT	Biomass; agricultural waste power plant; 7.5 MW	378,000
Kalpataru Biomass Project, Rajasthan	CERUPT	Three biomass plants, on mustard crop residues; 20 MW	1,150,000
OSIL waste heat power project	Japan Ministry of Environment	10-MW waste heat recovery	314,404

[a]Tonnes of carbon dioxide equivalent.

[b]Bagasse is a by-product of sugar cane production.

4. Conference of the Parties to the Convention, serving as the Meeting of the Parties to the Kyoto Protocol.

As can be seen, only six projects have been forwarded. Of these three are wind power projects and three are biomass projects using agricultural wastes to generate power. The total CERs generated add up to 5.41 million tonnes of CO_2 equivalent. Since these CERs are calculated over the lifetime of the plants (i.e., ten years) the reduction in GHG emissions is only 0.06 percent of India's comparatively very low emissions.[5]

The total value of the CER credits at US$3 per tonne of CO_2 is $16.23 million dollars over the lifetimes of the projects. Thus, so far the inflow of resources is meager.

Have these projects led to any technology transfer? This is not clear as India already has a vigorous wind power program, and burning biomass waste in a gasifier is also not likely to involve much high-technology content.

This is, however, just a beginning and the future scope may be large. There are a number of barriers that need to be overcome. However, if CDM projects are to make any sizable impact, and that can only happen after large-scale activities occur in various domains such as fuel-switching in the cement, transport, and service sectors (i.e., hotels, hospitals, and so on).

3. CDM potential in India

India holds considerable potential for CDM projects. We illustrate this with case studies of two sectors: cement and wind energy.

3.1. GHG emissions mitigation potential in the cement sector

Recent average economic growth rates in India is above 6 percent. Such rapid development leads to a construction boom when the growth rate ranges from 8 to 10 percent. Thus, although India emitted a total of about 778 million tonnes (Mt) of CO_2 from all activities in 1995 and about 1,000 Mt in 2000, the share of the cement industry to the total CO_2 emission increased from 4 percent to about 5 percent. The present annual growth rate of the industry (8 to 10 percent) and its trend suggests that the growth in CO_2 emissions might continue. The expected massive upsurge in the long-sought development of infrastructure in the coming years, however, may lead to a quantum jump in growth of cement capacity and production levels. This will provide opportunities to use the CDM to reduce CO_2 emissions on a large scale.

There are a number of ways in which the greenhouse gas "intensity" of cement could be reduced. Thus, cement manufacture could potentially be a fruitful target area for CDM projects.

The main steps in cement manufacture are (1) preparation of the raw materials, (2) production of an intermediate clinker, and (3) grinding and blending of clinker with other products to make cement. Clinker production is the most energy-intensive of these steps and is also the source of process CO_2 emissions, which can account for half or more of total emissions from cement manufacture.

5. $100 \times 5.41 \div (10 \times 251 \times 44 \div 12) = 0.06$ %.

Potential CDM project types in the cement sector can be divided into two broad categories: energy-related and non-energy related. Energy-related GHG emissions from clinker manufacture could be reduced by doing the following:

- increasing the energy efficiency of cement production, e.g., optimizing heat recovery or installing an efficient pre-heater;
- changes in the production process, e.g., changing the process by which raw materials are ground, mixed, and fed into kilns from wet to dry; or
- changing the input fuel, e.g., using an increased proportion of waste fuels or other forms of renewable energy.

In addition, process CO_2 emissions per tonne of cement produced could be significantly reduced by blending (mixing) clinker with an increased proportion of other products (additives) in cement. This can be done in some cases without incurring significant incremental costs, and potential GHG reductions from cement blending may outstrip those from energy-efficiency projects by a significant margin.

To estimate the potential for GHG reduction from the cement sector, six scenarios are proposed to calculate accumulated CO_2 emissions from India's cement industry up until 2015. The scenarios are made under two alternative assumptions of growth in cement production: one is business as usual (BAU) at 8 percent and the higher end is at 12 percent. Two energy-efficiency scenarios are developed for each of these cases.

Table 2 presents the projected cumulative carbon emissions from 2000 to 2015 under the six scenarios with BAU and high growth rates in cement production. With a BAU growth rate in cement, an emissions reduction of around 10 percent is possible by undertaking a conservative energy improvement strategy. A reduction of emissions of around 27.5 percent can be achieved by the end of 2015 by adopting a more rigorous target for energy-efficiency improvement. With a high growth rate in cement production, however, total emissions with BAU energy-efficiency measures would reach 2,255 Mt of CO_2, which can be reduced to around 1,925 Mt with a conservative energy-efficiency improvement program. A higher energy-efficiency target would aid in bringing down these emissions by around 31 percent to 1,556 Mt of CO_2. In both growth-rate scenarios, cumulative process-generated emissions are found to be higher than emissions from energy use. The process-generated emissions in the high-growth scenario are around 60 percent higher than in the BAU scenario.

Increasing efficiency in the construction industry by optimizing the use of materials as well as by implementing technologies that use less energy-intensive materials could be important in reducing CO_2 emissions. The use of conventional construction techniques has the potential and technologies available to reduce the use of energy-intensive materials, thereby reducing CO_2 emissions. The gain in terms of emissions reduction through the use of these techniques, which use less brick and cement, is around 21 percent.

Generally, less energy-intensive techniques are more labor-intensive. In a country like India, where cheap labor is widely available, less energy-intensive techniques can be used. This will have the dual advantage of reducing construction-related emissions while generating employment.

Table 2. Total CO_2 emissions from 2000 to 2015 in the six scenarios, in millions of tonnes[a]

	BAU growth in cement				High growth in cement			
Year	BAU[a]	Scenario I[b]	Scenario II[c]	Process-generated emissions	BAU_H[d]	Scenario III[e]	Scenario IV[f]	Process-generated emissions
2000	43.63	42.90	41.07	68.57	47.67	45.47	43.63	72.23
2001	90.93	88.73	84.33	143.00	100.47	95.70	90.93	152.53
2002	141.53	137.50	129.07	223.30	160.23	151.80	142.27	242.37
2003	196.17	189.93	176.37	309.83	227.70	214.50	198.73	343.93
2004	254.83	245.30	225.13	403.33	304.33	285.27	261.43	459.43
2005	317.17	303.97	275.73	503.80	391.97	365.20	330.73	590.70
2006	384.27	366.30	328.53	612.33	492.07	456.13	407.37	740.67
2007	456.50	432.67	383.90	729.67	606.10	558.43	492.43	911.53
2008	534.23	503.80	441.47	856.17	736.27	674.30	586.30	1,104.77
2009	618.57	580.07	502.33	993.30	883.30	804.10	690.07	1,324.03
2010	709.50	661.47	565.77	1,141.43	1,050.13	950.03	803.73	1,571.17
2011	808.50	749.47	633.23	1,302.03	1,238.23	1,112.83	928.40	1,850.20
2012	916.30	844.80	704.37	1,476.20	1,450.17	1,295.07	1,064.80	2,163.70
2013	1,034.37	947.83	779.90	1,665.77	1,688.50	1,498.57	1,214.03	2,516.07
2014	1,163.43	1,059.67	860.57	1,871.47	1,956.17	1,724.43	1,376.83	2,910.60
2015	1,305.70	1,181.77	946.73	2,094.77	2,255.37	1,975.23	1,553.57	3,350.23

[a]BAU = Business-as-usual (BAU) growth in cement production and BAU-specific energy consumption
[b]Scenario I = BAU growth in cement production and a conservative target for specific energy consumption
[c]Scenario II = BAU growth in cement production and an optimistic target for specific energy consumption
[d]BAU_H = High growth in cement production and BAU-specific energy consumption
[e]Scenario III = High growth in cement production and a conservative target for specific energy consumption
[f]Scenario IV = High growth in cement production and an optimistic target for specific energy consumption

Using an elaboration of this model, Tiwari et al. (1996) have explored the possibilities of substituting cement for reducing CO_2 emissions and increasing employment. This shows that the potential for substitution is large and also that the potential for CDM projects is large and quite varied.[6]

3.2. Wind power

a. Potential for wind power in India

A comprehensive wind power program was launched in India in the mid 1980s. Active involvement of electric utilities and industry has led to the creation of an industrial base and infrastructure that has contributed to the large-scale commercial development in this sector. India is now recognized as a leading country in the world for the development and utilization of renewable energy, particularly wind power. In fact, wind power generation has emerged as one of India's most successful programs in the renewable energy sector.

6. The substitution of cement is discussed in detail later in the paper.

India’s wind power potential was assessed at around 20,000 megawatts (MW) by initial estimates (TERI 2000). It has since been re-assessed at 45,000 MW, assuming 1 percent of land availability for wind power generation in potential areas (MNES 2003). The present exploitable technical potential is limited, however, to 13,000 MW, on account of the limitations of grid capacity in the state electricity grids, because penetration of more than 20 percent could result in grid instability. The technical potential will go up with the augmentation of grid capacity in the potential states.

With an installed capacity of over 1,700 MW, India is the fifth largest wind power-producing nation in the world (MNES 2003). Most of this capacity, 1,639 MW, has come about through commercial projects from private investment. Based on the experience gained so far, the addition of another 1,500 MW of wind power capacity is planned during the nation’s tenth five-year plan (2002–2007). The GHG savings accrued from using renewables must be examined in comparison to corresponding electricity generation from fossil fuel-based power plants.

b. Baseline determination

Thermal power plants are direct sources of GHG emissions in the power generation sector, whereas hydro and nuclear plants do not contribute (directly) to GHG emissions. Thus performance analysis of thermal power plants is essential to more accurately estimating an emissions baseline for wind power projects. The performance of thermal power plants varies widely, even among those of the same type and using the same quality of fuel and technology. The parameters that influence the emissions of individual plants essentially involve the type of fuel used; its heat rate, measured in kilocalories per kilowatt-hour (kcal/kWh) or specific fuel consumption; and auxiliary consumption of fuel. The availability of data on these parameters along with others is critically important for the accurate estimation of an emissions baseline.

CO_2 emissions from thermal power plants have been estimated here using (1) heat rate and (2) specific fuel consumption. Heat rate data followed by the specific coal consumption for the year 1996/1997 has been used. In cases where these values were not available, then the values of heat rates recommended in the Central Electricity Authority (CEA) norms were used. In the case of gas-based power plants, the heat rates provided in the CEA norms were used for estimation of CO_2 plant emissions. It is evident that use of these norms would lead to a conservative estimate of emissions, since in practice the heat rates or specific fuel consumption values for power plants are normally higher than the norm. Furthermore, the emissions resulting from secondary fuel consumption, in the case of coal power plants, is not used in baseline estimations, as they constitute only 2 to 3 percent of emissions from primary fuel.

The baseline CO_2 emissions for the northern, western, southern, eastern, and northeastern regions are estimated to be 1.07 kg/kWh, 1.02 kg/kWh, 1.02 kg/kWh, 1.38 kg/kWh, and 0.63 kg/kWh, respectively. Based on these estimates the CERs for wind power generation in India has been estimated and presented in table 3. The CERs that can be generated are nearly 82.59 million tonnes of CO_2 equivalent per year. This potential can be realized, however, only if an appropriate policy environment is created at local, national, and global levels.

Table 3. Certified emissions reductions (CERs) on the basis of the technical potential of wind power generation in India

No.	State	Region	Potential: Gross potential (MW)	Potential: Technical potential (MW)	Baseline emissions ($kgCO_2$ /kWh)[a]	Certified emissions reductions per year: Gross potential (tCO_2 eq.)[b]	Certified emissions reductions per year: Technical potential (tCO_2 eq.)
1	Andhra Pradesh	Southern	8,275	1,750	1.02	14.79	3.13
2	Gujarat	Western	9,675	1,780	1.02	117.29	3.18
3	Karnataka	Southern	6,620	1,120	1.02	111.83	2.00
4	Kerala	Southern	875	605	1.02	1.56	1.08
5	Madhya Pradesh	Western	5,500	825	1.02	9.83	1.47
6	Maharashtra	Western	3,650	3,020	1.02	6.52	5.40
7	Orissa	Eastern	1,700	680	1.38	4.11	1.64
8	Rajasthan	Nothern	5,400	895	1.07	10.12	1.68
9	Tamil Nadu	Southern	3,050	1,750	1.02	5.45	3.13
10	West Bengal	Eastern	450	450	1.38	1.09	0.80
	Total		45,195	12,875	1.38	82.59	23.52

[a]Kilograms of carbon dioxide per kilowatt-hour.

[b]Tonnes of carbon dioxide equivalent.

4. The issues

A complex institutional structure to implement the CDM is now in place in India, but a number of problems exist. These relate to the present paradigm, baseline setting, high transaction costs, the difficulties of getting small projects approved, the problem of getting a fair CER price in a world of asymmetric information, poor technology transfer, and the disincentives these provide for effective climate policy. Before we look at these issues, next we briefly describe the institutional set up.

4.1. The commercial paradigm

When joint implementation and activities implemented jointly (JI/AIJ) were first proposed, there was initially an element of cooperation and partnership between the developed and developing countries. Increasingly though, this arena is being left to market forces where the commercial approach is taken, such that CER buyers come only to purchase credits and do not participate in projects. In such a market-based framework, both sides need information and fair pricing and trade volumes to effectively sustain the markets. Some of the problems identified with the current paradigm are as follows:

a. The onus of proposing CDM projects is on the host country, i.e., developing countries. In fact the entire burden—starting from filling out forms, to ensuring that projects meet all criteria, as well as getting projects certified and monitored—rests also on the developing countries. What was meant to be a cost-effective way of reducing the burden on the industrialized countries is turning out to be a transfer of that burden to developing countries, i.e., the seller of CER credits.

b. There exists considerable asymmetry in information and bargaining power, so the outcome can be highly inequitable if the CDM project is not properly implemented.

c. Developing countries are bound to reveal all of their costs to potential CER buyers from industrialized countries. On the other hand, not even minimal information is sought from the purchasing countries. As a result there is complete asymmetry in the system, where the industrialized countries (i.e., CER buyers) know details about the developing country's costs, while the industrialized countries reveal nothing about their own costs. The developing countries often do not have the vaguest idea about buyers' needs and costs. Fair markets cannot function in such an environment of asymmetric information, and sellers are left open to exploitation. Moreover, the entire consumer's surplus is likely to be kept by the industrialized countries, as there are no guidelines on sharing the benefits.

d. Under the current procedure, there is no guidance about what amount needs to be paid to the developing country. While all the information is sought from the seller about costs, the seller does not know the *value* of it. For example, diamonds or crude oil are not sold at the cost of extraction; their value is another matter altogether.

e. Most of all, a big potential buyer, the United States, is currently outside the system. If the US enters the market it is expected that the present market price of about $5 per tonne of carbon could be $25 per tonne.

f. When it comes to local environmental governance, e.g., regarding air and water pollution, the rules in these very same countries are fairly strict and enforced on all, i.e., polluters must pay. When it comes to global pollution (GHG emissions), however, the rules are neither voluntarily accepted nor does a mechanism exist to discipline defaulters.

g. Hundreds of CDM consultants, project advisors, traders, and certifiers are waiting in the wings to get a piece of the CDM pie by providing services. They should be paid fees on the basis of percentage of the surplus accruing to the developing country and not the stated value of their time. Only then will they work to get a fair deal for their developing country clients.

Should one rush to implement the CDM before the rules are fair and a system of global governance is established? One hopes that there is clarity about the system so that a fair and fast way to reduce emissions is established.

4.2. Baseline setting

For the trade in GHG credits between an Annex I country and a developing country the determination of a baseline has many pitfalls. As per the UNFCCC, developing countries do not have any GHG emissions reduction obligations nor any emission quotas. Any emissions reduction that qualifies for trade is measured from a hypothetical baseline.

If a national level baseline is decided, then that determines a national level quota, but developing countries are not willing to accept such commitments not required by the UNFCCC. There is yet another problem: What should be the economic growth rate on which the baseline is projected? While India's growth rate over the past decade has been a bit more than 6 percent per year, India aspires to a double-digit growth rate. This is not unrealistic. China has had such a rate of growth over a couple of decades.

India's baseline would be very different if a 6 percent growth rate is assumed instead of a 10 percent growth rate. If the baseline is set on the present trend growth rate of 6 percent, India's ability to grow faster would be compromised, which would be contrary to the spirit of the UNFCCC.

Baseline determination by sectors such as steel, cement, etc., have different problems. Painuly (2003) has shown how the guidelines presently in force lend themselves to different interpretation. For example, the range in CERs for a 60-MW wind power project in Zafrana, Egypt, was shown to vary from 1,475 to 1,843 for a ten-year credit period, depending on whether the average of all plants, the last five years' plants, or the most expensive plants were considered as being replaced. The Intergovernmental Panel on Climate Change (IPCC 2001a) reports that the range of uncertainty in estimates of emissions reduction—because of the counterfactual nature of the baseline (based on a number of AIJ energy sector projects)—to be between ±35 percent and ±60 percent, depending on the project type. Baseline determination also involves trade-offs between the transaction costs of certification, adjustments for increased emissions at other locations caused by the project (leakage), moral hazard, and changes over time in contextual economic, technological, and institutional conditions (IPCC 2001b).

It makes a big difference whether one takes average emissions, marginal plant emissions, or the emissions of the worst plant. The problem of baseline setting is also tied up with the problem of transaction cost. The choice between project-specific and multi-project approaches involves a trade-off between transparency, error, and transaction costs. The project-by-project approach results in relatively low error, but it can also lead to lower transparency and high transaction costs. On the other end of the scale, national-level benchmarks may result in high error but are also relatively transparent and involve low transaction costs. There is also a trade-off between environmental stringency and investor incentive. The greater the complexity of baseline methodologies, the higher will be the associated transaction costs and, consequently, the lower will be the incentive to develop and invest in CDM projects.

4.3. High transaction costs

Table 4 shows the transaction costs involved in reducing GHG emissions and the burden they impose on the host country, i.e., developing countries. It is also worth noting that under the system of CER trading, most of the costs of getting CERs certified fall on the host country. The purchaser merely comes and buys them after they are generated.

High transaction costs are particularly critical for small renewable energy projects, which otherwise have significant benefits for the host country. Absolute transaction costs are relatively independent of project size but would be proportionately lower for large CDM projects. For small projects, in particular, the transaction costs associated with a lengthy and elaborate project approval process could outweigh the benefits from the CERs generated (IEA/OECD 2001).

Administrative costs can be reduced by bundling similar small projects into a single project that is still eligible for fast-track procedures (e.g., bundling together 15 projects of 1 MW each).

Appropriately designed fast-track procedures can help improve administrative feasibility (including monitoring and reporting requirements) and reduce transaction costs, but they cannot completely eliminate such costs. Even with the use of simplified baselines and simplified project design documents, registration and measurement and verification (M&V) costs would still need to be incurred. The development of simple and standardized baselines for renewable energy projects, however, will help developing countries like India maximize the potential opportunities available through the CDM by encouraging priority projects that meet national environmental and developmental goals, as well as technology needs. Simplification of baseline assessment for small projects is an important means of reducing the transaction costs for a CDM project.

Table 4. Transaction cost components

Transaction cost components	Description
1. Project based (JI, CDM): Pre-implementation	
Search costs (H)	• Costs incurred by investors and hosts as they seek out partners for mutually advantageous projects
Negotiation costs (H)	• Includes those costs incurred in the preparation of the project design document that also documents assignment and scheduling of benefits over the project time period. It also includes public consultation with key stakeholders
Baseline determination costs (H)	• Development of a baseline (consultancy)
Approval costs (H)	• Costs of authorization from host country
Validation costs (H)	• Review and revision of project design document by operational entity
Review costs (H)	• Costs of reviewing a validation document
Registration costs (H)	• Registration by the UNFCCC Executive Board/JI Supervisory Committee
2. Project based (JI, CDM): Implementation	
Monitoring costs (H)	• Costs to collect data
Verification costs (H)	• Cost to hire an operational entity and to report to the UNFCCC Executive Board/Supervisory Committee
Certification costs (H, I)	• Issuance of certified emission reductions (CERs for CDM) and emission reduction units (ERUs for JI) by the UNFCCC Executive Board/Supervisory Committee
Enforcement costs (H, I)	• Includes costs of administrative and legal measures incurred in the event of departure from the agreed transaction
3. Trading	
Transfer costs (H, I)	• Brokerage costs
Registration costs (H)	• Costs to hold an account in national registry

Source: PricewaterhouseCoopers 2000; Dudek and Wiener 1996.

4.4. Risks borne by the host country

In the CER trading regime almost all the risks—project risk, financial risk, baseline risk, price risk, CER market risk, and future price of CERs—are all borne by the project developer in the host country. The CDM is an activity full of risks and low margins for a host country. In going from the previous cooperative-type ventures between North and South to commercial agreements, most of the risks have been gradually transferred to the host countries. These include the following:

- *Risk of project rejection*. The extensive preparatory work is not rewarded.
- *Risk of baseline reduction*. This reduces CDM benefits and compromises economic viability by reducing margins. Once the baseline is agreed, it should not be revised subsequently for the same project.
- *Financial risk*. The host country has to raise the capital. Fluctuations in interest rates pose risks, which have to be borne by the host country. Such risk may be high for a long-term activity like the CDM.
- *Risk of project failure*. Project failure risk is also borne by the host country if GHG reductions do not materialize due to unexpected circumstances. This can happen because of equipment failure, forest fires, and legal disputes on GHG savings.
- *Policy risk*. When government policy changes, project viability may be affected—a risk also borne by the host country.

4.5. Asymmetric information—Getting a fair price

Figure 1 shows what kind of price and gains could result from trading. In the figure, line OQ represents the amount of emissions reduction commitment of Annex I countries.[7]

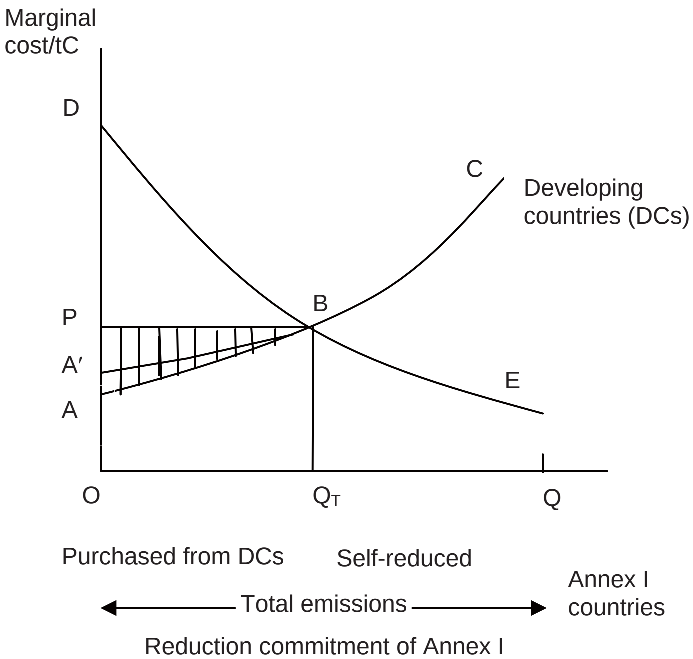

Figure 1. Carbon trading: Who gains what

7. Annex I countries are the industrialized countries and economies in transition listed in Annex I of the UNFCCC.

As the developing countries have many low-cost opportunities to save GHG emissions (the "low-hanging fruits"), their marginal cost-curve is relatively flat, as shown by curve ABC, which is a supply curve for CERs. For Annex I countries the marginal cost of abatement is given by EBD when reductions are measured from Q to O.

- Under a competitive market, B, Annex I countries will abate emissions themselves by the amount QQT, and the amount OQT will be traded at market price P
- Developing countries would get a producer surplus of area ABP
- Annex I countries will get a consumer surplus of PDB
- In a bilateral project-by-project negotiation, where the developing country project developers know little about the opportunity costs of Annex I country buyers, they are likely to get only AA′B. The rest will accrue to the industrialized country.

Painuly (2000) has argued that developing countries are likely to get only about 20 percent of the total producer and consumer surplus even in a competitive market, and much less under bilateral project-by-project trading.

Should the developing countries then not opt for such trading? That would be a wrong conclusion. If technical progress in the future lowers the demand drastically, then these low-hanging fruits would bring even less. The low-hanging fruits would then just appear to have rotted. In any case, money in the bank now is better than the same amount in the future. Developing countries, however, can themselves use these low-hanging fruits in the future, so their long-term opportunity cost may be higher than the short-term marginal cost. To account for such opportunity costs, they should insist on the development of a futures market, so one can know how much the low-hanging fruits are going to be worth in the future.

The developing countries should resist bilateral negotiations between project parties. This is because in the current system the entire details of CO_2 savings in the host countries are made public. The developed countries know fully the marginal costs of developing countries, but the developing countries do not know the true opportunity costs of developed countries. A well-functioning market, along with a futures market, is their best bet to get a good price, but development of such a market will take time. Meanwhile, a global carbon price floor should be announced for emissions trading, and all developing countries should not trade below this price. India may do so unilaterally for its own projects.

4.6. Perverse policy incentives

A major problem arises from the concept of *additionality* of costs and emission reductions. At present, only those reductions qualify that are not a part of the policy of a country. Thus, for example, if India takes a policy decision that 10 percent of new power generating capacity has to come from renewables, then a renewable power plant would not qualify as a CDM project. The same plant in another country that does not have such a policy can earn CER credits for it. There is, thus, a perverse incentive not to follow globally environmental responsible policy. It thus discourages a country like India from following environment-friendly policy and encourages countries to play strategic games.

For example, India has large potential for wind power generation, and the number of CERs that can be generated could be nearly 82.59 million tonnes of CO_2 equivalent per year, as shown in table 3. The government's push for renewables may be motivated by a desire to not be too dependent on imported fossil fuels—and is in effect subsidizing this push in various ways. Disqualifying renewables from gaining CDM benefits punishes the very initiatives needed to create a supportive policy environment, a necessary condition for producing the desired multiplier effects. Therefore, policy decisions taken after ratification of the Kyoto Protocol should be exempt from such disqualifications.

4.7. Technology transfer

India's government has placed major emphasis on technology transfer. The reasons for linking the CDM with technology transfer are obvious. One of the major purposes of the CDM is to initiate the process of emissions reduction and awareness about the climate change problem in developing countries, but the project-by-project approach of the CDM may not lead to significant reductions compared to the large increases in emissions anticipated in developing countries. Thus, fossil fuel-efficient policies and processes should be institutionalized through technology transfer. To ensure this, each CDM project should have a training and capacity-building component built in to acquire CERs. A CER should be credited if efforts are expended in such a way that the developing country could operate and even replicate the technology. In the absence of this, incentives to bring in successively new technologies will not be there. In fact, "semi-efficient"—and not the very best—technologies might be repeatedly installed even in the same country but at different places. If the CDM allows profiting from technology diffusion, there will be a temptation to profit as much as possible from the same technology. Technology innovation needs to be ensured by considering how many CERs can be given for the same technology or up to what period, so that at the end of that period even better technologies may be introduced. One way to ensure this is by suitably changing technology baselines upwards gradually. Other concerns regarding the CDM could be that there will be greater demand for fossil-fuel saving technologies. This may increase the price of efficient technologies. Thus, "green" technologies may be more expensive, as they will be more in demand over "brown" technologies. To ensure their wide adoption—rather than making them expensive—there should be incentives such that they are adopted widely. If barriers are created around the projects and people are allowed to earn a premium, then rent-seeking behavior may occur (Parikh 1998).

For completeness, we summarize the various steps involved in the process of technological change and upgrading. The main components are need assessment, technology selection, technology transfer, utilization of technology to its designed performance, adaptation of technology to specific conditions, improvements in technology beyond its designed performance, and development of new technologies.

With this scheme in mind, let us now examine the issues relating to technology transfer and what kind is needed. So far, to a large extent, discussions on the transfer of environmentally-sound technologies have mirrored earlier debates centering on legal, institutional, and financial arrangements governing the access of developing countries to the technologies developed in the industrialized world.[8] As a result a whole range of issues have been downplayed or ignored, such as the following:

8. Northern countries have generally stressed the need to ensure adequate financial compensation to inventors (i.e., recognition of IPRs); that technology be provided on non-concessional (commercial) terms; that the range of technologies under consideration be limited, in particular by separating the climate change convention from other issues; and a preference for working through existing institutions to channel funds to support technology transfer activities, particularly the GEF.

- the type of needs of a developing country
- the requirements of appropriate or better technologies to meet those needs
- the available expertise, i.e., the capacity building needed to ensure effective transfer
- the factors affecting adoption, assimilation, and adaptation of imported technology

A key constraint facing developing countries is the difficulty of matching their needs with appropriate technological solutions that reduce GHG emissions. These constraints are all the more binding in new and emerging fields where trends in technology development are uncertain, corporate secrecy prevails, and sources of supply may span several industrial branches.

In their early critiques of technology transfer, the developing countries focused mainly on reducing what they considered the excessive costs of technology transactions and the many restrictive clauses imposed on recipients by the suppliers. Increasingly, the focus of attention has shifted from the costs and characteristics of imported technologies to include the factors affecting the creation and maintenance of technological capabilities in developing countries.

Two factors are crucial in determining the extent to which technology transfer contributes to building indigenous technological capabilities. First is the intensity of contact between the supplier and the recipient. Active and ongoing contact between the two is crucial to the effective transfer of skills and knowledge. This does not mean that direct equity involvement of suppliers is essential. Far more important than the contractual form of a transfer is the extent of knowledge acquisition and training. Unfortunately, recipient firms and countries too often undermine or ignore training. The second factor in strengthening local capabilities is the strategic orientation of the recipient enterprise. These efforts require sound knowledge before transfer, a rigorous search for sources, and intensive participation at all stages of project planning and implementation.

Thus the ultimate goal of any action in the field of transfer of environmentally sound technologies should not be just to apply particular technological solutions, but also to enhance the capabilities of developing countries to assess their needs and then select, import, assimilate, adapt, and develop the appropriate technologies. This is a matter of enhancing "generic" technological capabilities rather than pursuing actions related to specific environmental technologies. In fact, provision for capacity building in the long run should be made mandatory in any technology transfer, with crosschecks built-in for verification.

Sound technology choice is the backbone of any strategy for effective international technology transfer. Unless developing countries have the proper knowledge to make informed choices among technological options, there is a risk that the efforts to promote international technology transfer may become overwhelmingly supplier-driven and geared more to transferring technologies that are available, rather than being geared to technologies actually required by developing countries. Among the disadvantages that developing countries face is the information available to them as well as their technical capacity to evaluate particular technologies.

To summarize, we need to think about potential answers to the following questions:

- What are the GHG-reducing technologies that may be most useful to developing countries?

- What are the various steps involved in effective technology transfer? How can they result in capacity building in developing countries?
- If technology tranfer has generated significant capabilities, what are the barriers/factors militating against their widespread diffusion?

With this perspective, we see that the CDM is unlikely to bring any real and significant technology transfer unless special steps are taken. Also, pricing of technology is critical and we should try to introduce competition here. We suggest the creation of a technology acquisition fund for bringing in new technology and competitive pricing. Every CDM or JI project should be required to make a specific contribution to the technology acquisition fund of the host government, which is free to buy technology from anywhere in the world. This can not only moderate excessively high charges for technology but also bring in new technology.

5. Conclusion

What are the implications of this analysis? India has embraced the CDM and is now looking beyond small-scale projects such as renewables and thinking of large emissions projects in cement, power, transport, and so on.

In conclusion, the impacts on developing countries of the commitments of Annex I countries to comply with emissions reduction targets *prima facie* are marginal. Economies importing capital-intensive products from Annex I countries are likely to have adverse second-order impacts. In such a scenario, there is a case for increased South–South trade, with increased flows from countries with a large industrial base. Higher costs in Annex I countries will have a two-fold effect on developing economies in the long term: (1) more rapid evolution of their indigenous industrial base, and (2) positive environmental transitions that accompany development.

In order to make sure that even the few projects undertaken under the CDM promote sustainable development, host countries need to set up domestic institutions and build capacities to vet, approve, and monitor projects. This needs to be done in a way that does not create bureaucratic bottlenecks and hurdles that discourage projects. Maintaining a designated national agency office is likely to be an additional managerial burden on developing countries, which may be worthwhile for only handful of countries.

Mechanisms with well-defined rules and procedures with specified thresholds seem to be the most attractive. A country could even set a threshold price for CERs. The current CDM regime does not establish fair pricing, due to the asymmetry of information that host countries have about the purchasing countries. On the other hand, all details from the host countries are available to the purchasing countries.

Baseline determination should leave room for incentives. When a climate-friendly policy framework is created by a host country, it loses the benefits it would have enjoyed without that framework. This situation is problematic. All GHG-favorable policy decisions taken after 1997 should be rewarded rather than being disqualified from the CDM.

The high transaction costs of CDM projects preclude many small projects. This is a great handicap to developing countries, particularly small countries. Mechanisms need to be evolved to approve a bundle of many small projects at once.

Effective technology transfer through CDM projects requires special efforts. It's important to note that not all CDM projects involve high technology. A technology acquisition fund could be created in which all CDM projects are required to contribute. The host country could then use these funds to buy technology from anyone, not necessarily from the project sponsor.

The developing countries should realize this and try to make the best of a poor bargain. Trading in CERs is like trading any other commodity, and to trade in a commodity market requires expertise. Developing countries need to learn the CER trading game. To do so would require participation in the CDM. This capacity will be useful later.

In the end, developing countries have only one path to get a fair deal: Be economically strong, unite among themselves, and negotiate from strength. Only then, is the simplest solution of equitable allocation of global environmental space likely to be accepted by the world community.

The CER market for the foreseeable future will be a buyer's market. If "hot air" is traded too, it will be even more so; developing countries should therefore resist the inclusion of "hot air."[9] They also should not compete with each other in a "race to the bottom."

A global system of fair allocation of tradable emission quotas for all is required. The only fair allocation of the global environmental space is on a per capita basis. The desirability of distributing permits (quotas) on a per capita basis is recognized at least in the long run (Manne and Richels 1993). The belief that "all men are created equal" was voiced eloquently in the US Declaration of Independence and was a message "heard around the world." If a new climate agreement is negotiated so that population counts are fixed in the year of that agreement, the South will not benefit from population growth thereafter, and the North will have an incentive to not procrastinate in negotiations—but to try to arrive at an agreement as early as possible.

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Special Feature on the Kyoto Protocol

Implications of the Kyoto Protocol: Indonesia's Perspective

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Despite good intentions to get a solid grasp of various technical issues and put in place policy instruments related to the implementation of the Kyoto Protocol, Indonesia's government still faces tremendous challenges in terms of disseminating information on the progress of climate treaty negotiations and gaining as wide public support as possible. This is evident in the lengthy process of ratifying the protocol. On the brink of the government's next parliamentary sessions, the issues have yet to reach a broad audience, except for workshops, seminars, and the like that have resulted in a relatively small critical mass; hence, convincing the parliament will be another challenge. The general public perceives the Kyoto Protocol, more than anything else, as just one of the international agreements avoided by the United States' White House. Meanwhile, government agencies have so far failed to recognize the opportunity to integrate the Clean Development Mechanism (CDM) into the national sustainable development agenda and to engage the private sector. Various studies carried out by research agencies, universities, and individual scientists clearly merit further crafting in order to promote meaningful dialogues. Experiences from the Activities Implemented Jointly (AIJ) pilot phase and other strategic studies did not sufficiently build capacity, partly because of a lack of institutional memory. Learning from a real project at a certain scale may enhance the sense of urgency and help build confidence in the Kyoto Protocol and its processes.

Keywords: Ratification, Sustainable development, Forestry, Renewable energy, Learning-by-doing.

1. Introduction

There is no question about the scale of impact that the Kyoto Protocol has had since it was negotiated and finally adopted in Kyoto in December 1997. The third session of the Conference of Parties (COP 3) of the United Nations Framework Convention on Climate Change (UNFCCC) was perhaps one of the largest international environmental agreements of the century. The debate on curbing climate change did not automatically cease with the creation of the protocol, however, and is getting more complicated when touching upon broader issues dealing with rules or procedures and modalities to implement it.[1] It has taken nine-and-a-half COPs, and still the protocol has not entered into force. The decision of the United States to withdraw from the Kyoto Protocol in March 2001 stirred up the entire process of negotiations, especially since it is the largest emitter of greenhouse gases (almost five gigatonnes of carbon dioxide in 1990, or 36 percent of global emissions). One of the common public responses in Indonesia to this situation, which is not easy to counteract, is: "If such a wealthy nation with the largest

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1. See e.g., Ramakrisnha (2000).

emissions decided to oppose the Protocol, why should we bother?" If this kind of response were scaled-up, the rest of the world would certainly be lacking leadership (Baumert and Kete 2001).

The downstream impact of the withdrawal of the United States from ratifying the Kyoto Protocol in some developing countries is quite significant because they are losing trust in the process. In addition, the market for carbon credits has shrunk since the largest potential buyer left the table. Right from the outset of the Kyoto Protocol, the government of Indonesia immediately adopted it in 1998 and started to prepare for the necessary capacity-building activities by hosting various projects, including the Activities Implemented Jointly (AIJ) pilot phase, a national action plan, institution strengthening, assessment of technologies, national strategy studies, and the completion of the First National Communication. These were supported by both multilateral and bilateral public funders—including the World Bank, the United Nations Development Programme (UNDP), GTZ,[2] AusAID,[3] and the Japan International Cooperation Agency (JICA)—and feasibility studies carried out by private corporations (Ministry of Environment 2002, 2003).

The processes have largely involved various stakeholders, but there was a strong notion of rivalry from the perspective of public policy making. This led to delays in producing the necessary documents on time, and it has become more complicated since decision-making authority was designated to be shared with local governments with the enactment of Indonesia's Law on Decentralized Government in early 2000. As a result, the emerging institutional and regulatory barriers could potentially discourage the implementation of CDM projects.

To date it is not known whether the current government will be able to ratify the Kyoto Protocol, but it would be a real drawback if the overall processes have to be repeated with a new government and parliament to be installed by the end of 2004 before COP 10 (December 6–17, 2004 in Buenos Aires). Regardless of whether or not the protocol is ratified in the near future, this paper critically reviews the development of national climate-related policies in Indonesia and analyzes possible public and private engagements, mainly in the energy and forestry sectors, which have been largely identified by previous studies and initiatives. With relatively slow market development and high transaction costs, it is suggested that non-Kyoto mechanisms should be explored, including adaptation measures that are not legally binding.

2. The development of national policies: A long learning process

Since the adoption of the Kyoto Protocol, the government and private entities in Indonesia have hosted a number of AIJ projects and feasibility studies covering three sectors—energy, forestry, and waste—with funding from various agencies (see table 1). Among them are small-scale energy projects that are eligible for fast-tracking as agreed at COP 7 in Marrakesh in 2001. The four ministries involved were the Ministry of Environment, Ministry of Energy and Mineral Resources, Ministry of Industry and Commerce, and Ministry of Forestry. However, lessons learned by the hosting agencies were not adequate and institutional capacities were not significantly strengthened. It continues to be difficult,

2. Deutsche Gesellschaft Für Technische Zusammenarbeit (GTZ).
3. AusAID is the Australian government's overseas aid program.

however, to assess the development of institutional capacity because government personnel are frequently changed. The only avenue open to consolidation and developing a national policy is the office of the National Focal Point for the UNFCCC, with its supporting unit in the Ministry of Environment.

Table 1. AIJ pilot phase projects and CDM feasibility studies carried out in Indonesia

Project type	Location	Emission reduction (kt CO_2/yr)[a]	Investor
AIJ projects			
Hybrid energy	East Nusa Tenggara	1	E7[b]
	South Sulawesi	21	E7
Micro-hydro	South Sulawesi	163	E7
	Irian Jaya	22	Australia
Solar energy	Irian Jaya	–	Australia
Solid waste management	South Sulawesi	4.8	Australia
	West Java	91	Japan
Waste heat capture	West Java	8	Japan
Reforestation	West Java	–	Japan
CDM feasibility studies			
Geothermal	North Sumatra	2,890	National company
	East Nusa Tenggara	72	National company
	Central Java	5,400	Multinational company
Solid waste management	North Sumatra	153	National company
	East Java	20	National company
Reforestation	East Kalimantan	–	Japan
	North Sumatra	–	Japan

Source: Ministry of Environment 2001.
[a]Kilotonnes of carbon dioxide per year.
[b]Consortium of seven energy companies from G7 countries.

The next level of study was the National Strategy Studies (NSS), administered by the World Bank, that were carried out in the energy and forestry sectors with funding from the German and Australian governments, respectively. Considering the outputs produced by the studies, they had relatively low transaction costs and generated a wide range of interactions among stakeholders. Analysis of market potentials and barriers in the existing institutional and regulatory frameworks are among the outputs that increased awareness among stakeholders. It was estimated that the annual Indonesian sale to the CDM market was 25 megatonnes of carbon dioxide (Mt CO_2) (Ministry of Environment 2002). In addition, a number of projects have been reviewed and are potentially ready to be put in the pipeline when the appropriate national rules and modalities become available. These projects are shown below in table 2.

It is obvious that not all AIJ and on-going studies and projects were identified nor included in the pipeline. It is also interesting to note that only one energy project (waste heat capture/energy efficiency) is eligible as a small-scale CDM project and deserves fast-tracking, but it will not reduce emissions by more than 15 kilotonnes of carbon dioxide (kt CO_2) per year. In addition, all forestry projects put in the pipeline are not eligible as a small-scale forestry project unless the project documents are redesigned accordingly. Based on the current status of the agreement, their sequestration rate should not exceed 8 kt CO_2 per year.

Table 2. Potential projects identified by the national strategy studies on the Clean Development Mechanism

Name of project	Location	Emission reduction (kt CO_2/yr)	Status/ intermediary
Energy sector			
Geothermal power plant	Sarulla, North Sumatra	2,890	Feasibility study
Geothermal power plant	Ulumbu, East Nusa Tenggara	72	Feasibility study
Micro-hydro	Irian Jaya	22	Feasibility study
Rural electrification	East and West Nusa Tenggara	21	Completed (AIJ)
Small hydro power plant	Sulawesi	163	Feasibility study
Coal drying	Suralaya, West Java	37	Concept
Paper sludge and solid waste recycling	Bekasi, West Java	91	Completed (AIJ) - in construction
Waste recycling and methane (CH_4) emission capture	Ponorogo, East Java	20	Concept
Use of palm oil waste to co-generate electricity	Torganda, North Sumatra	86	?
Use of palm oil waste to co-generate electricity	Pangkalan Brandan, North Sumatra	67	?
Energy efficiency in textile industry	West Java	8	Feasibility study
Forestry sector			
Community forest	Tanah Datar, West Sumatra	231	NGO
Community forest	Pasaman, West Sumatra	801	Local govt.
Community forest	Jambi	459	University
Community forest	Lampung	87	NGO
Community forest	Bogor, West Java	34	Govt.-owned co.
Community forest	Kuningan, West Java	118	NGO
Community forest	Yogyakarta	235	Local govt.
Community forest	South Kalimantan	327	Local govt.

Source: Ministry of Environment (2002); recalculated by the Ministry of Environment (2003).

Results from the two NSSs recommended that Indonesia's Designated National Authority (DNA) should be established as soon as possible, in order to expedite the approval process and move ahead with the necessary formalities. The process is now underway through intensive consultations with stakeholders. The DNA is likely to take the form of an interdepartmental committee, with the support of a technical team and an expert group that are governed by an agreed-upon mission statement and code of conduct for resolving conflicts of interest. The day-to-day operations of the DNA will be handled by a secretariat hired by the DNA on a contractual basis, who then reports to the DNA chair. It is worth noting that although a stakeholder forum will be formed and stakeholders will be invited to participate in the process of approving the Project Design Documents (PDD) submitted by project developers, the structure of the DNA will be heavily dominated by government officials. The approval process is expected to be guided by sets of criteria and indicators prepared for various sectors.

The activities described above, which were started in 1998, should be sufficient in enhancing national capacity to draw up consolidated national climate policies that would speed up the political process of ratifying the Kyoto Protocol. For one reason or another, however, ratification of the protocol has not received much attention as the government's parliamentary session approaches its end. As a result, most stakeholders do not yet have the confidence to implement any CDM projects. On the contrary, a number of recently enacted regulations could potentially create barriers for the implementation of CDM projects. These include regulations that provide a negative list of foreign investments and disincentives for promoting the development of renewable energy and payments for environmental services. Even if the Kyoto Protocol is ratified, a number of issues, such as regulatory inconsistencies, lack of sufficient institutional memory, and rivalry or competition between government agencies could potentially create bottlenecks.

The situation seems to have become more complicated since the government started to share its authority with local governments in 2000. It is very likely that more bureaucratic formalities will be encountered at this level, meaning that more regulatory barriers should be anticipated besides additional transaction costs. Local governments, for example, have the right to generate income from projects implemented in their jurisdiction. Moreover, capacity building for local governments is adding new challenges to address.

3. The Kyoto Protocol: Make or break?

The general public in Indonesia perceives that the Kyoto Protocol and its mechanisms have introduced a dichotomy between developed and developing countries in the context of common but differentiated responsibilities. The opportunity costs of domestic actions in developed countries are far more expensive compared with the activities implemented in developing countries. Therefore, the market price of carbon credits offered to the developing countries is considered as realistically unequal. The initial deal before COP 6 (late 2000) was estimated at around US$48 per tonne of carbon (tC). Then this dropped to $29/tC due to the inclusion of sinks under Article 3.3 and 3.4 of the Kyoto Protocol (Blanchard et al. 2002). The market price of the CDM, such as those offered by CERUPT of €5/tC and \$5/tCO_2 by the Prototype Carbon Fund (PCF), are obviously far too low.[4]

There is no inherent plan in place on how the energy sector could benefit from CDM projects not only through additional funding but from the perspective of technology transfer. The argument for having renewable energy and energy efficiency in the national energy program is not terribly strong enough to convince the public that the issues of technology transfer are addressed in the context of the Kyoto mechanisms. There are still opportunities, however, to link potential projects with sustainable development objectives through proper planning, where stakeholders are involved, as expected, in the project approval process. A priority analysis of renewable energy and energy efficiency projects in relation to their costs is shown below in figure 1.

4. CERUPT stands for Certified Emission Reduction Unit Procurement Tender.

From the supply side, prioritizing renewable energy will create an opportunity to promote it, and from the demand side, energy efficiency may be prioritized. The choice of technologies merits further study to determine the trade-offs with emission reduction targets (Pearce 2000).

	Low priority	Medium priority	High priority
High cost	• Geothermal power plants • Solar thermal		• Improvement in palm oil boilers • Gas turbines • High-temperature cogeneration • Biomass steam power plants
Medium cost		• Hydro power plants • Use of variable-speed motors	• Utilization of flared gas • Cogeneration in the textile industry • Waste management in starch factories • Waste management in pulp and paper plants
Low cost	• Substitution of incandescent lamps with fluorescent lamps		• Combine gas cycle • Mini hydro power plants • Low-temperature cogeneration

Figure 1. Renewable energy and energy efficiency projects that could possibly be prioritized along with a possible range of costs

Source: Ministry of Environment 2002.

Meanwhile, in the forestry sector the concepts of additionality and project eligibility have been little communicated.[5] Generally speaking, sink projects are perceived as business-as-usual in forestry activities. These could include forest plantation and conservation that either sequester or store carbon. Moreover, the CDM is often considered as being a way of throwing a heap of money at solving mounting forestry problems. Being one of the largest countries in the world with a high percentage of forest cover, Indonesia is yet to gazette areas for land use, land-use change, and forestry (LULUCF) activities eligible under the CDM or non-Kyoto mechanisms. Besides the difficulty in gaining considerable additionality, Indonesia should take into account worldwide refusal of including large-scale plantations (Buitrón 1999; Lovera 1999; Sepúlveda and Verscheure 1999; van der Maesen 1999; Kill 2001). Instead, small-scale LULUCF activities should be explored to encourage community participation. As it is expected that numerous small-scale projects would entail high transaction costs, however, it is therefore suggested that intermediaries could play active roles in bundling a number of similar projects together in order to reduce costs and increase economic viability. In addition, biomass energy is another area where technology transfer may be beneficial (de Andrade 2000; Larson 2000; Kartha and Larson 2000; Kammen et al. 2001). Forestry authorities could expedite the process by joining forces on a technical team, instead of creating new layers of bureaucracy that may entail transaction costs and complicate the approval process. One should realize that the 1 percent cap on

5. For Joint Implementation and Clean Development Mechanism projects, emissions reductions must be additional to those that would otherwise occur. *Additionality* is when there is a positive difference between the emissions that occur in the baseline scenario and the emissions associated with a proposed project.

maximum importable credits for sinks through the CDM, which was expected would ensure domestic actions, did not help to "improve" the market price.

On the other hand, the private sector sees the administrative processes on the host side as far too slow, especially for those having experience with other countries. They tend to avoid complicated procedures because they may entail high transaction costs. Some energy projects could be hosted by several agencies with different agendas, although this may complicate project design. For example, the Netherlands-based buyer, CERUPT, expressed interest in investing in 4 Mt worth of CO_2 credits in a geothermal project involving Unocal and two government-owned companies (PLN and Pertamina). The fate of this project is still not clear, however, even though it was endorsed by the government a few years ago.

National environmental non-governmental organizations (ENGOs) are usually not in favor of sink projects, with no specific reasons given. In general the refusal is associated with the fear that natural old-growth forests will be cleared before the projects are implemented (Baltodano 1999; Greenpeace International 2000). Such a fear has no basis if the definitions of reforestation and afforestation projects eligible under the CDM are well understood (Michaelowa 2001). There is also a concern that no differentiation will be made between Kyoto and non-Kyoto mechanisms.

Most of those in the private sector still tend to employ the business-as-usual strategy without too much consideration for sustainability issues. This is to say that gaining profits or economic benefits is the main business objective, regardless of the associated environmental and social impacts that business activities may cause. This could potentially generate conflicts, especially for projects that involve large areas and numbers of people such as the LULUCF projects. Stakeholder consultations and the participatory approach are likely to be introduced to reduce risks. For example, fire is one of the potential risks that cannot be handled by fire fighting brigades alone without understanding the underlying causes (Murdiyarso et al. 2002). Land-ownership, which must be listed in the PDD, should be supported by valid documents by which the boundary of a project could be verified.

So far, there is no methodological way to challenge the operational entities and expert panel on the CDM Executive Board. Technically speaking, no method has been tested out or has confidence been built, since no single project has been executed to gain experience. And the lessons learned during the AIJ pilot phase cannot be easily cited to claim host readiness. The bottom line is that there is no actual project in existence that has built the confidence of the host, therefore it is important to start with an easy one so that there is an opportunity of learning by doing.

From the perspective of developed countries, in regard to involvement through Official Development Assistance (ODA) in the "preparatory" phases—specifically that provided by Germany, Japan, and Australia—it is very likely that German investors will be following up projects in the energy sector. This is understood as being that the European Union member countries and their stakeholders are less interested in investing in sink projects in developing countries. And besides their interest in the energy sector, potential Japanese investors are also very keen in the forestry sector. A number of feasibility studies have already been conducted by former logging companies that have long-standing relationships with their Indonesian counterparts. As far as the involvement of public entities, psychological barriers could emerge because of the negative images perceived by the public. The involvement of Australian investors is largely uncertain, since this depends on whether or not the Australian government ratifies the Kyoto Protocol in the near future. Their involvement in the AIJ and NSS in the forestry and waste sectors could possibly lead to the development of real projects.

Indonesia could use the Kyoto Protocol as an international treaty that is integrated with its domestic sustainable development objectives. Clean energy, renewable energy, and energy efficiency could be used as a starting point. More complicated carbon sink projects could follow after a certain level of experience has been gained. But this can be all halted if the Kyoto Protocol is used only to serve narrow-minded interests or short-sighted sectoral approaches. Large-scale forestry projects that raise controversial social and environmental issues could easily break the protocol (WWF 2000).

4. Beyond Kyoto

It is very likely that the Kyoto Protocol will continue to evolve after its first commitment period is over in 2012, when progress will be evaluated and a strategy to achieve a new target will be set. Indonesia's current emission reduction target of 5 percent from the 1990 base level is considered a small but important step. Within the UNFCCC, negotiations on the second commitment period are expected to start in 2007. Even now assessments of the situation "beyond Kyoto" are already underway among academics and practitioners. Several issues are likely to be revisited to achieve the ultimate goal of the convention, which is stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. These include the use of adaptation measures under the UNFCCC and the avoidance of deforestation under the new markets, or possibly a renegotiated Kyoto Protocol.

It was in the Bonn Agreement (agreed at the completion of COP 6 in July 2001) where the financial mechanism under the UNFCCC was recalled as one of the elements of Decision 5/CP.6 to implement the Buenos Aires Plan of Action (BAPA). It is basically to reiterate the commitments of the Annex II Parties under Article 4 of the convention, which are to replenish and increase the fund managed by the Global Environmental Facility (GEF); to create a new fund, called the Special Climate Change Fund, by Annex I Parties to support adaptation measures, technology transfer, and economic diversification; and to facilitate bilateral and multilateral flow of funds.[6] The dichotomy in the provisions of the UNFCCC and Kyoto Protocol related to adaptation and mitigation of climate change was identified and discussed in COP 8 in New Delhi in 2002. There was also a strong notion that adaptation measures should be revisited to support non-Annex I Parties in anticipating changing climate. It is very likely that the issue will materialize in the upcoming COP 10.

Deliberately enhanced sinks to sequester atmospheric carbon may become saturated over the next three decades (Noble and Scholes 2001). In the meantime, only small portions of foregone opportunities have been utilized. This may be understood as being that many developing countries are not ready to

6. The UNFCCC divides countries into two main groups: Annex I, which is the industrialized countries, including the relatively wealthy ones that were members of the Organisation for Economic Co-operation and Development (OECD) in 1992, plus countries with economies in transition (EIT), and Annex II, which is the OECD members of Annex I (EITs not included).

pay the opportunity costs while running sink projects with such a long time frame. To this end, the discussion on the Brazilian proposal on activities aimed at avoiding or slowing deforestation in developing countries, which are excluded in the first commitment period of the Kyoto Protocol, may be discussed again for the second commitment period. New, voluntary markets may emerge and allow conservation activities for carbon credits that may be bundled with the benefits from other services provided by ecosystems, such as biodiversity values, watershed functions, and natural beauty. The pathways to the emerging voluntary markets for conservation activities and incremental markets for adaptation measures are shown in figure 2.

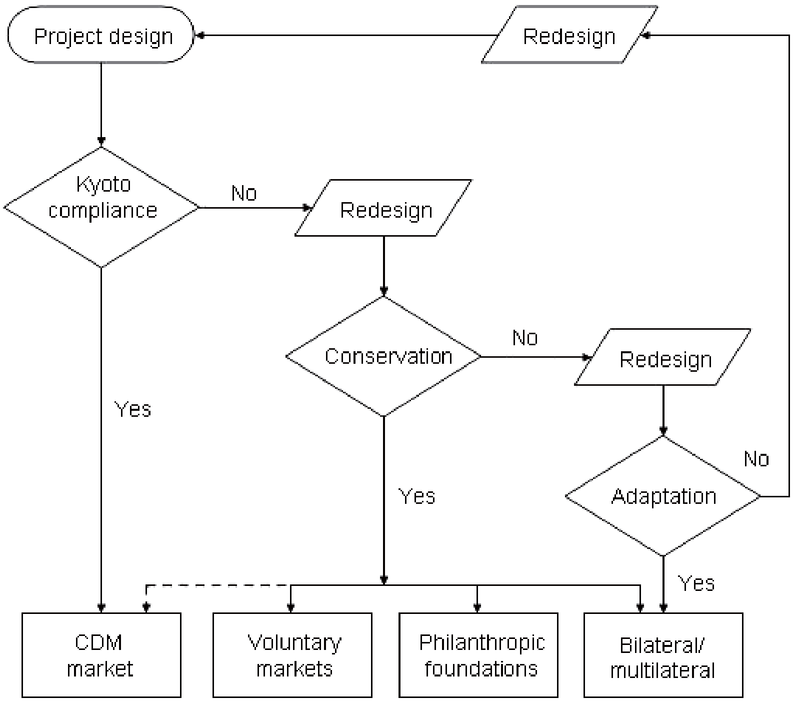

Figure 2. Possible pathways to access carbon markets through the Kyoto mechanisms, voluntary markets, and incremental mechanisms for conservation activities and adaptation measures

5. Concluding remarks

The Kyoto Protocol is seen as an international treaty that can be exclusively related to sectoral activities to reduce greenhouse gas emissions and enhance carbon sinks. As a result, the broader sustainable development agenda is being missed out on. It would be a failure if the protocol were ratified to merely invite new investments. The CDM as the only Kyoto mechanism that developing countries can participate in may be revisited as part of the sustainable development objectives by which promotion of energy efficiency, renewable energy, and sustainable forestry programs could be implemented in an integrated fashion.

After going through a lengthy process of capacity building, Indonesia is facing a critical time in ratifying the protocol. Realizing the amount of lessons learned, there are more reasons to make rather than to break the Kyoto Protocol. A number of issues related to local capacity are yet to be sorted out, however, because authority is shared between the federal and local governments. Facilitating the implementation of small-scale and relatively "easy" projects should be done in the near future in order to build the confidence of both investors and hosts.

The upcoming COP 10 is not only expected to be the first Meeting of the Parties when the Kyoto Protocol enters into force but also the avenue where adaptation measures will be further negotiated. This implies that the payment mechanisms under the convention will be diversified and that the market for carbon credits will not just be limited to the mandatory one, and new, voluntary markets will be allowed to emerge.

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Special Feature on the Kyoto Protocol

The EU-Russia Ratification Deal: The Risks and Advantages of an Informal Agreement

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During the last years, when the entry into force of the Kyoto Protocol became dependent on its ratification by Russia, the protocol's prospects appeared quite uncertain. To a great extent this uncertainty was reinforced by the contradictory declarations of Russian officials—promises of imminent ratification that alternated with critiques of the Kyoto regime, including comments that it is discriminatory in character and unacceptable for Russia. The decision-making process on ratification in Russia has not been transparent and elements of uncertainty are dominant. How has the situation changed as a result of the European Union–Russia Summit held in Moscow in May 2004? The answer to that question suggested in this paper is based on the fact that the compromise reached at the summit had the following impacts: (1) it placed the ratification process within a new institutional framework; (2) it had a number of positive implications for facilitating ratification, speeding it up, and reducing uncertainties and risks; (3) it consolidated the positions of the supporters of the Kyoto Protocol in Russia and weakened its opponents; (4) at the same time, the new institutional framework for ratification has led to a number of new uncertainties and risks that may hinder ratification; and (5) the problem, so far, is that that the new risks are not yet fully recognized and protocol supporters continue to counteract the former threats without realizing that the new front lines deviate significantly from the former ones.

Keywords: Kyoto Protocol, Ratification, Climate policy, World Trade Organization, Informal agreement, Risks.

1. A new period in the Kyoto Protocol ratification process: A positive perspective

After the European Union–Russia Summit held in Moscow at the end of May 2004, the Russian and Western press presented wide coverage of its results. Remarkably, the majority of comments agreed that "a deal" was made by the European Union (EU) and Russia: the EU agreed to back Russia's bid to join the World Trade Organization (WTO) with no formal agreement on Russia ratifying the Kyoto Protocol (Baker 2004; Russian Federation 2004; Melikova 2004; Samotorova 2004; Shapovalov 2004; European Union 2004). Its promise to ratify the protocol was one of the most important developments among the set of decisions agreed during the summit. Thus, it represented a serious shift in Russia's position on ratification.

The most important signals coming from Russia about its stance on ratifying the protocol were provided by Russia's president, Vladimir Putin, during the press conference held after signing the major documents of the summit. The most attention was attracted by his three main statements:

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- “We support the Kyoto process.”
- “The EU has met us halfway in talks over the WTO and that cannot but affect positively our position on [the] Kyoto Protocol.”
- “We will speed-up Russia’s movement towards the Kyoto Protocol ratification” (Kolesnikov 2004; Denisov 2004; Ratiani 2004).

Until today, the president’s statements regarding the Kyoto Protocol and its ratification had not been as certain and positive as at this occasion, and this can only be regarded as *extremely positive* for the future of the protocol. From this author’s point of view, it is the most serious guarantee that Russia is able to provide at present regarding its plans for ratification. The uncertainties in deciding on ratification that have existed over the recent period should be reduced to a great extent, but due to a number of technical reasons such uncertainties cannot be reduced to zero right up to the moment of finalizing the ratification procedure.

As is well known, the summit documents do not contain any formal obligations for Russia regarding ratifying the Kyoto Protocol. Moreover, President Putin even mentioned that there were no links between the jointly agreed conditions for Russia’s entry into the WTO and its promise to ratify the protocol: “We do not tie up the WTO and the Kyoto Protocol” (Kolesnikov 2004; Denisov 2004; Ratiani 2004). Before the summit, information filtered into the press that the European Union was insisting upon including ratification of the protocol in the official summit, but Russia objected, saying that this item was not on the originally agreed agenda. Thus, it is reasonable to ask if the regulations agreed on at the summit might result in new uncertainties and risks replacing the former ones and whether the structure of the entire deal is solid enough. This article will look at this issue only in the context of Russia’s commitments. There is a need to find answers to the following two questions: (1) To what extent are President Putin’s motives serious enough to speed up the ratification process? (2) Does he possess the capacities necessary to meet this goal?

2. Motivation mechanisms

During the EU–Russia Summit, ratifying the Kyoto Protocol turned into a matter of bargaining a deal between the two parties. It is well known that this kind of deal is routine diplomatic practice and not at all extraordinary. Both Russia and the European Union demonstrated through this deal that they had common interests and that they were capable of finding ways to realize them. It is also well known that the *interests of the parties participating in this kind of deal are not of equal importance to each of them*; by taking part in such a deal each participant exchanges less important interests for more important ones, and thus both parties benefit. Hence, the ratification deal is not a zero-sum game where one participant gains a benefit at the expense of the other.

It was obvious that in this particular case it was important for the European Union to secure ratification of the Kyoto Protocol and simultaneously get access to Russia’s market, which absorbs a substantial volume of EU exports, and also to provide considerable and sustainable energy flows to the European Union.

As for Russia, it was important to assure access to WTO markets and remove discriminatory barriers. Besides this obvious goal, Russia, through its entry into the WTO, might provide the solution of a number of problems that are no less important. Putin's convictions make him a right-wing rather than a left-wing politician, and this is revealed in particular by his views on economic policy; the prospects of joining the WTO fully correspond to right-wing ideas. First, membership in the WTO will not only help entrench the transformation of institutional structures that already took place over the last decade but also to program their implementation in the necessary direction for the future, beyond 2008, when his term in office as the Russian Federation's president will be over. Second, the entry of Russia into the WTO would allow it to embed the economic structures that were established during the 1990s, but were weakened by the elements of monopoly and corruption into a competitive space provided by the WTO, and to oust the criminal and monopolistic structures from domestic economic sectors. Third, WTO membership will permit the linkage of these institutional changes with an acceleration of economic growth. According to the recommendations of right-wing politician and economist Egor Gaidar, the integration into a wider economic space could be primarily the main way of speeding up growth of gross domestic product (GDP) in Russia. Fourth, through ratification of the Kyoto Protocol, Russia becomes a participant in an international regime that provides the use by its members of flexible mechanisms, further enhancing additional possibilities for technological changes.

3. Impact on the positions of ratification supporters and opponents

Membership in the WTO is not considered by everyone in Russia as something totally valuable; there are far more opponents to Russia's WTO entry than supporters of ratifying the Kyoto Protocol. The role that the Russian Federation's president plays in its ratification, however, and the way he understands national interests (in the context of entry into the WTO) can play into the hands of both the supporters of ratification and the supporters of Russia's membership in the WTO.

Opponents of the protocol in Russia have been emphasizing that its ratification has economic disadvantages for the country and thus should be rejected. Nowadays, however, the chances for such declarations are shrinking considerably, because by rejecting the protocol they block Russia's entry into the WTO along with its economic benefits. In case the Kyoto opponents are at the same time among the WTO antagonists,[1] they also turn into opponents of the clearly defined position of President Putin, who actively supports Russia's membership in the WTO. If they enter into a conflict on the issue, which is of high importance on the president's priorities scale, however, it might result in them losing most of their influence. Opening, through ratification, access to the WTO for Russia puts an end to the wrestling tactics against Kyoto as infringing on *national economic interests*. Besides, for bureaucrats in the government service such tactics become not only pointless but risky as well. As a result, anti-Kyoto forces in Russia might thin out in the near future. Hence, implementation of such a deal reinforces and consolidates the positions of protocol supporters in the Russian establishment, and it reduces uncertainties and risks within the ratification process.

1. Note that not all opponents of the Kyoto Protocol have the same position.

4. The role of Russia's president in the ratification process

The Kyoto Protocol is a multilateral intergovernmental agreement that will become binding for the Russian Federation only after its ratification. The importance of Putin's recent statements on the protocol is intertwined to a great extent with the decisive role played by the presidency institution within this kind of agreement. The Russian federal law "On International Agreements" assigns a decisive role in this process to two institutions: (1) the Federal Assembly (the State Duma and the Federation Council)[2] and (2) the President (Russian Federation 1995). A draft law on ratifying an international agreement cannot be submitted to the State Duma for ratification without the signature of the president. And, again, it cannot come into force after approval by the Federal Assembly without the signature of the president (who can decline the law). Besides, the federal government is responsible for carrying out the process of submitting the draft law on ratification, and its activities (as are those of the federal executive authorities) are directed by the president.

In addition, it is necessary to take into account that the political party Unified Russia won the majority in the State Duma in the 2003 elections, and this party is supporting the president's political course. In fact, via this party, President Putin has acquired wide opportunities for control over adoption of the most important laws by the State Duma.[3] So any big surprises are unlikely after he submits the draft law on ratifying the Kyoto Protocol.

This means that in this stage of ratification, Putin is in a crucial position for determining the fate of the Kyoto Protocol. Thus, while earlier (i.e., in the 1990s to early 2000s), when it was mainly mid-level government officials and policy makers that determined Russia's climate policy, now a new influential actor (i.e., the president) is involved in the development of Russia's climate policy. And this actor has publicly announced his positive position on ratification of the Kyoto Protocol.

5. Ratification and national interests

In September 2003 Putin already indicated the principles that would determine the decision on ratification of the Kyoto Protocol with the following statement: "The decision will be made…in accordance with Russia's national interests" (Leskov 2003). The choice of the term "national interests" as the key decision criterion changed the approach to the resolution of this issue; ratifying the protocol was moved up onto the agenda of "Big National Policy."

The ratification issue is a point where various interests are concentrated and collide—not only the interests of climate policy as such but interests rooted in the policy of economic growth, social policy, energy and structural policies, as well as foreign policy. It means that, according to this approach, the ratification goal can be subordinated to the other goals whose priorities will be regarded as higher. According to this approach, ratification is no longer the subject of climate policy as such, and the decision on ratification cannot be made only within the framework of climate policy itself. The decision will be made on other (higher) levels of competence by actors who have other interests and motivations.

2. The upper and the lower chambers of the Russian parliament.
3. The Unified Russia party has the constitutional majority in the parliament.

Inclusion of the ratification issue into a package agreement with the European Union signified the practical realization of such an approach; ratification of the protocol seemingly belonging solely to environmental or climate policy was subordinated to the national interests through its linkage with entry in the WTO, i.e., an issue which is completely beyond the environmental domain. The possibility of realizing such an approach was created by a legislative structure that assures the decisive role of the president in decision-making on ratification. But the economic priorities formed within contemporary Russian society will still play an important role in the final decision.

6. Ratification of the Kyoto Protocol and the priorities of Russian society

The structure of priorities in Russian society has some specific features that seem to be different today from those typical in the West. One of its key characteristics is the low ranking given to ecological concerns. The consequence is that ecological considerations are not playing a lead role in the ratification process in Russia (Kotov 2002).

The elections to the State Duma in December 2003 once again highlighted the miserable situation with public awareness of environmental problems that emerged in the early 1990s, and this has been evident for more than a decade. The political parties that paid top-priority attention to environmental problems won a very small percentage of votes.[4] In contrast to the end of the Soviet era in the late 1980s—particularly right after the Chernobyl nuclear power plant disaster, when tens of thousands of people quickly and readily gathered for environmental meetings—the significance of environmental problems in the public mind has declined drastically during the post-Soviet period. In the last election the problems of poverty and economic growth, rather than the environment, were the top-priority problems for the Russian public, although the state of the environment is very poor.

Clearly, President Putin has taken into account in his policies the expectations and preferences of Russian society: his 2004 election platform focused on the fight against poverty and the acceleration of economic growth, and his presidential address to the Federal Assembly focused again mainly on these same two issues. The goal of spurring economic growth resonated particularly with public perceptions. Under these conditions, obviously, there is little possibility that climate policy instruments can be realized in Russia if they are in direct conflict with economic growth. It seems that in the near future climate policy and its instruments are unlikely to have a direct impact on economic growth aims, but even though climate policy is likely to be subordinated to the prevailing economic growth policy there is still a path for its implementation through measures such as increases in gas and electricity prices and cutting off supplies to non-payers—issues which today face active social opposition.

Thus, the absence of environmental concerns among the top priorities of the Russian public inevitably had some impact on the ratification process; ratifying the Kyoto Protocol does not have strong support due to a general lack of concern about ecological issues among the public and political parties. So far, the chances for success of ratification are to be attributed to be economic rather than environmental interests. The key role of economic considerations in the interests of Russian society in

4. The ecological party, named Kedr, received less than 0.5 percent of votes during the parliamentary elections and it failed to get elected into the Duma.

the context of a significant benefit for Russia has the chance of attracting the public and the actors of the ratification process to the camp of ratification supporters. The specific balance of various interests seems to have been realized in an optimal manner within the WTO/Kyoto Protocol ratification deal.

7. New uncertainties and risks

Will the European Union–Russia deal remove all barriers to ratifying the Kyoto Protocol? What are other possible implications of this deal for perspective ratification? Can new risks and uncertainties evolve as a result of the embedding of the ratification process into new institutional frameworks?

The new institutional structures that have emerged as a result of the deal between the European Union and Russia are not able to entirely solve the problem of the uncertainties and risks attached to ratification, although the ratification process is currently based on a much more solid foundation than before. It is not possible, however, to exclude the emergence of new problems in this field, some of which are outlined next.

First, there are two major circumstances that might press the partners of the deal to artificially maintain some uncertainties into the future. For Russia, this includes the fact that it has not yet become a WTO member, and until its accession there is no way to ensure 100 percent certainty in the outcome of the Kyoto Protocol ratification process. And because the protocol has not yet been ratified by Russia, the problem is directly mirrored in the European Union.

This line of behavior of the partners is predefined by the technical specifics in the performance of this deal, which is an informal agreement—within this game the cards being played by the European Union and Russia remain valid and are only able to be used only while a certain level of uncertainty in the actions of each is preserved. Application of such strategies can be clearly documented in the parties' behavior during recent years of negotiations. The European Union had been repeatedly promising its support for Russia's entry into the WTO, along with exaggerated demands conditioning such entry. In turn, Russia has repeatedly promised to ratify the Kyoto Protocol in the near future, but simultaneously made public the results of scientific symposiums, where scholars of the Russian Academy of Sciences presented their arguments against ratification. In the near future, playing such games by both parties might continue. It would not be correct, however, to assess this as exhibiting a desire to break the deal; rather, it can be regarded as technical means for realization of the agreement. It is important, however, to promote bilateral control over the process in order not to cause unnecessary turbulence in the course of heading towards a common goal and to exclude inadequate reactions from each party.

Second, additional risks might be caused by a possible desire to "attach" a number of unresolved issues to the already agreed deal. Indeed, some newspapers in Russia interpret the deal between the European Union and Russia as a package that also includes solving the transit problem in Kaliningrad, relaxation of the EU visa regime for Russian citizens, etc. Expanding the basket of items to be resolved might significantly increase the uncertainties and risks and, in case of further escalation, might lead the ratification process to a dead-end. The same situation might be developing within the unfinished negotiations on Russia's entry to the WTO.

Third, the government of the Russian Federation has to implement some preparatory measures before it can approve ratification by law. In its meeting on April 11, 2002, the government made a decision to *prepare* for ratification. Elaborating the drafts of normative acts to be used as a legal basis for domestic implementation of the Kyoto Protocol was determined as one of the obligatory steps of this preparatory process (Russian Federation 2002). The materials produced for this preparatory government meeting included proposals of concrete legal acts to be further elaborated, including the following items:

- a law on governmental regulation of GHG emissions and sinks in Russia;
- a law on ownership of emission quotas, certification of emission reduction, and establishing an emissions trading market; and
- a governmental bill on a national system for monitoring and registry of GHG emissions and sinks.

There might be serious conflicts between the federation and individual regions in the process of legally instituting the framework for implementing the Kyoto Protocol. The formation of such structures (particularly relating to legal procedures) should be a kind of prelude to the ratification process. Many actors within the group of regional bureaucrats are interested in the economic benefits of emissions trading, and their primary task is to put quota allocation mechanisms under their control. In order to achieve this goal, regional authorities have tried to spread their ownership of the regions over types of natural resources such as nature’s capacity to absorb GHG emissions. On the contrary, the federal authorities wanted to secure this as federal property; the functions of the future quotas market regulation were supposed to be concentrated at the federation level (Institute of Energy Strategy 1999). There was a reasonable apprehension that the regional authorities would regard the financial resources that would be generated by the sale of quotas as an administrative rent that they rightfully owned, and that not much of the revenues would be invested in energy saving. Besides, the Russian Federation was allocated its emission quota under the international climate change regime, with the federation, in particular, responsible for complying with the obligations of the Kyoto Protocol. In support of their claims the regions point to the federal law on environmental protection, which considers the natural resources in the regional territories to be under state ownership, and according to the Russian Federation’s constitution, the state is defined as the federation as well as the regions. Environmental regulation is also to be jointly shared by the federation and the regions.

The activity of regional officials in forming climate policy forced the federation to face a very complex dilemma. Either the federation made concessions to the regions and recognized their right of control over resources that it considered federal property (which would create an unpleasant precedent for the whole complex of relations between the federation and the regions in terms of the division of natural resource ownership) or it should get involved in a prolonged battle for the division of these rights, along with the prospect of legal actions instituted by the regions and a worsening of relations between it and the regions. Neither of these prospects is acceptable to the federal authorities. Therefore, the prospects of newly aggravating the conflict between the federation and the regions in the context of ratifying the Kyoto Protocol can create new uncertainties and risks for the ratification process. The greatest trouble could be in store for the protocol, primarily if these instruments become the focus of the struggle between the federation and the regions.

After the European Union–Russia Summit, ratification of the Kyoto Protocol entered a new stage. The particular characteristic differentiating this one from the previous period, which was hampered by uncertainties and delays, is that now Russia's position is principally defined. From now on, Russia will not only be involved in the ratification process but its movement along this path is also going to be accelerated. President Putin has strong motivation for doing so—Russia's entry into the WTO is among the highest priorities in his political and economic strategy. He did not make any promises about deadlines, and Russia has not made any official commitments. Putin's statement indicates only the "speeding up" of Russia's movement towards ratification. So far the question remains open regarding the meaning of this acceleration. It might signify a shift away from uncertainty and stagnation and a transition from the absence of any dynamics in this area to performance of at least the initial steps towards ratification. As the ratification procedure is strictly regulated in Russia by law, speeding up the process by cutting out particular formal procedures is impossible.

Currently, the Kyoto Protocol is at the very beginning of the ratification process in Russia. Before the draft law on ratification is introduced to the State Duma by the president, the ratification issue must be discussed by the government of the Russian Federation, which has not yet finalized its part of the job. It had to formulate its conclusions on ratification at its meeting on May 20, 2004 (the very eve of the summit). But in response to a request by the Federation's Ministry of Industry and Energy (MIE), the agency responsible for this agenda item so far, its discussion was removed from the meeting agenda and postponed for three months. Among the reasons cited for the delay was the negative conclusion on ratification produced by the Russian Academy of Sciences (RAS), which became involved in assessing the implications of ratification on the request of President Putin.[5] The MIE's position on ratifying the Kyoto Protocol differs from the RAS position; it has long supported ratification.

It is quite difficult at the moment, however, to determine whether the State Duma will be in a hurry to decide on ratification. It has its own process for ratifying international treaties, incorporating them into the working plans of its sessions, discussion in Duma committees, putting them on a particular meeting agenda, etc. Here certain reserves for both speeding up or slowing down the ratification process are believed to exist. A slowdown, or even the slight possibility of rejecting ratification, could take place if some parliamentarians from the pro-president party consider that the interests of the regions are infringed upon under the emissions trading regime to be adopted,[6] or in the course of defining property rights over emission quotas, and thus they would be inclined to violate party discipline and resist ratification.

Such a slowdown might be significant if the regions that are willing to realize their own interests within the Kyoto Protocol manage to incorporate into the "slowdown" campaign not only the protocol's opponents but WTO antagonists, as well. Today, the Russian public is not yet fully aware of the contents of the 400-page protocol along with the conditions of Russia's entry into the WTO.[7] It might happen that with the considerable general benefits from WTO accession, especially related to

5. The results of the assessment by the Russian Academy of Sciences were presented May 18, 2004.
6. Especially in the case that they are dependent on the regional administration and are under pressure from it, for example, in a re-election campaign.
7. Negotiations with many other WTO partners are also not finalized to date.

acceleration of economic growth, some economic sectors might be seriously damaged due to external competition.

In this case certain vulnerabilities might evolve in the new institutional structure that made ratifying the protocol dependent on Russia's entry into the WTO. In general, this structure is expected to contribute positively to the prospects of ratification, but at the same time it might induce the emergence of new risks. WTO opposition, particularly from potential sectoral losers—including, for example, automobile manufacturing, which involves a huge number of workers, and the insurance sector with its considerable capital—and especially if supplemented by a consolidation of efforts of entrepreneurs, regions, and trade unions, might target the derailment of Kyoto Protocol ratification in order to block Russia's entry into the WTO. Personally, this author believes that the Russian Federation's president does possess enough levers to counteract such a strategy. But, nevertheless, it might result in certain delays in ratification.

Ratification supporters unfortunately had not recognized the shift in the ratification process and were using the wrong strategy to counteract the arguments of their opponents. They have concentrated most of their efforts on proving that Russia will not reach its Kyoto emission target during the first commitment period (2008–2012). Meanwhile, in the context of the European Union–Russia deal, this issue has lost its relevance to a great extent; indeed, the economic benefits for Russia from WTO entry exceed by several-fold its potential losses from surpassing the Kyoto targets. Ratification supporters chose the defense strategy and have tried to prove that ratification will not result in losses for Russia. Employing such a strategy seems to be a mistake. Today the outcomes of ratifying the Kyoto Protocol do not depend on whether or not Russia achieves its emissions reduction target during the first commitment period. It depends on whether or not the supporters of ratification are able to counteract the new risks emerging as a result of the European Union–Russia ratification deal. The front lines in the ratification campaign have changed.

Given the prevailing poverty, Russia's society will accept the decision on the Kyoto Protocol ratification if it generates a considerable economic benefit, i.e., it will be ultimately accepted for economic reasons. And the society perceives that such a benefit will be generated by Russia's accession to the WTO, rather than by the Kyoto Protocol as such. The link between the Kyoto Protocol ratification and the WTO radically changed the context of ratification—ratification is no longer connected with impeding the growth; on the contrary, its proposed aim is to open up the way to accelerated economic growth. At the same time, we should not forget that Russia has not yet completed its negotiations with such partners as the United States, Brazil, and China, and we can expect new surprises here. We cannot, however, also exclude the possibility that serious disagreements concerning the domestic climate policy might emerge within the pro-president party. These disagreements might stem from the differences in the interests of the federation and the regions and might result in slowing down of the ratification process.

8. Conclusion

Recently the above assessment of the prospects of Russia ratifying the Kyoto Protocol seems to be the most probable scenario. Long before the EU–Russia Summit in Moscow this scenario appeared for me to have the highest chances of occurring, and the outcome of the May summit proved this out.[8] At this point, additional evaluation of the prospects of Russia ratifying the protocol needs to be undertaken, but not to counteract the opponents to ratifying the protocol in Russia, however, because the critical factor right now is neither the ratification opponents nor the protocol itself. The core issue now is the response to the terrorist acts staged against Russia in August-September 2004. Today Russia appears to be at the threshold of important system changes aimed at counteracting terrorism. Although the major details of these changes are still being developed (they can only be thoroughly assessed by the end of 2004), it is becoming probable that there might be radical shifts (1) in Russia's development priorities, (2) in its political system, (3) in mechanisms of interaction between federal and regional authorities, and (4) in major reorganization of institutions of executive authorities. It seems that national security will be the highest priority for Russia from now on. As a result, the development of Russia might be channeled along a path with other priorities and also within a new institutional framework. In this case the ratification process might also be channeled into another framework. In the case that Russia's national development priorities and the approaches of the major actors might be considerably modified under the impact of new factors, this new context requires additional assessment. The time for such analyses has not come yet. The chances of ratification still appear to be high.

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Special Feature on the Kyoto Protocol

The Perspective of the United States on Climate Change and the Kyoto Protocol

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Convincing the United States to mitigate its greenhouse gas emissions is critical to spurring a stronger and more durable international response to climate change. This paper focuses on current US action on climate change and the potential for future US emissions targets in both domestic and international arenas. Five topics are covered: (1) the evolving politics of climate change in the United States; (2) the impact of climate change on the US presidential election; (3) lessons learned from the Kyoto process; (4) the prospects for the United States re-engaging internationally; and (5) how to design an international regime that would encourage US participation. While federal mandatory emission targets will take more time, a great deal is happening in the United States at the state and local level. These actions are changing the politics of climate change in the United States in ways that lead many US experts to believe that a stronger national policy is inevitable. Even so, climate change is not playing a significant role in the November 2004 US presidential election campaigns, although a related issue, energy policy, features more prominently. Regardless of who wins the election, the United States will not ratify the Kyoto Protocol and may not return to the Kyoto process to negotiate emission targets beyond 2012. To secure US participation, any international climate treaty must build on prior US domestic regulation and start with exceptionally modest targets for the United States that become more stringent over time. Countries seeking to engage the United States on climate change should keep an open mind about non-Kyoto approaches, given lingering skepticism in the United States about the United Nations and the Kyoto process. The international community should encourage the United States to do more by making good on the emission mitigation pledges they have undertaken and by giving priority to convincing the United States to act at home rather than negotiating a new international treaty.[1]

Keywords: Climate change, United States climate policy, Kyoto Protocol, US presidential election, International climate cooperation

1. Introduction[2]

In this paper I would like to share some thoughts on what is happening in the United States on the issue of climate change, and then to speculate about the implications for US international policies.

I am sympathetic with people who, when they purchase a book, like to turn to the last page to discover how the story ends. So let me share with you my conclusion up front, as that will provide a little bit of

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1. This paper is an edited transcript of a speech on climate change policy in the United States given by the author in Tokyo, Japan, September 9, 2004, at a conference sponsored by the publishers of this journal, the Institute for Global Environmental Strategies (IGES). Mr. Purvis served as a senior climate change negotiator in the Clinton and Bush administrations, including most recently as Deputy Assistant Secretary of State for Oceans, Environment and Science.

2. This paper is an edited transcript of a speech on climate change policy in the United States given by the author in Tokyo, Japan, September 9, 2004, at a conference sponsored by the publishers of this journal, the Institute for Global Environmental Strategies (IGES). Mr. Purvis served as a senior climate change negotiator in the Clinton and Bush administrations, including most recently as Deputy Assistant Secretary of State for Oceans, Environment and Science.

context for my remarks along the way. There is a lot happening in the United States on climate change and this is reason for optimism that US climate policy will improve. More has happened at the state, local, and federal levels than one might have predicted after President Bush's rejection of the Kyoto Protocol in 2001, and that is quite encouraging.

At the same time, I believe that it is unlikely that the United States will be returning to the protocol anytime soon. I think it is unlikely that the United States will join that kind of broad multilateral approach for quite some time, regardless of who wins the presidential election.

I would like to cover five topics in this presentation: (1) a the evolving politics of climate change in the United States; (2) the impact of climate change on the US presidential election; (3) some of the lessons learned by the United States from the Kyoto process; (4) the prospects for the United States re-engaging internationally; and finally, (5) some thoughts about how an international regime could be designed in a way that would encourage US participation.

2. The evolving domestic politics of global warming in the United States

Here, we should acknowledge that although the Bush administration's policies are not nearly as ambitious as they should be, they in fact represent several small steps forward in a few areas. The Bush climate change plan establishes the first purely domestic emissions reduction goal. As many of you may know, it is a non-binding pledge to see an 18 percent improvement in carbon emissions per unit of gross national output by 2012. To put the target in perspective, in a business-as-usual scenario, the United States expects a 14 percent improvement in carbon intensity over the same period. The Bush target is not ambitious but it is not "do nothing" either.

In addition, the Bush administration has increased funding for climate science, as well as for clean technology research and development (R&D). The administration has drawn needed attention to the long term potential of hydrogen fuels and geological sequestration of carbon, as well as to immediate benefits of addressing methane and black soot emissions first. While these ideas are not revolutionary and do not alleviate the need for addressing carbon emissions too, they are appropriate additions to the climate debate. Even more R&D funding is necessary and R&D funding alone will not solve the problem. Yet, US funding levels have increased slightly and the United States continues to lead international climate science and clean energy research.

The third achievement in the last few years is that the United States has taken a step toward requiring mandatory reporting of carbon emissions. Mandatory reporting will be an essential element of a serious emissions reduction effort. So the Bush plan, without acknowledging it, lays the foundation for a future and more ambitious approach.

Perhaps even more importantly, there is a lot happening at the state and local levels in the United States. The first policy I would like to describe is the cooperation that is occurring in the Northeast of the United States, involving states like Massachusetts, Connecticut, New Jersey, and New York. They are designing their own regional emissions trading program, which is still in its early stages but is quite a significant development. The governors of those states are in the process of negotiating emission goals that have the potential to be quite ambitious. New York has proposed returning to 1990 emission levels by 2010 and to 10 percent below 1990 levels by 2020.

Further, California (which accounts for an enormous part of the US economy) is moving forward in requiring automakers to cut tailpipe emissions of carbon dioxide by 29.2 percent by 2015. Because 10 percent of the automobiles sold in the United States are destined for California, the California market has the potential to "drive" the entire US auto fleet. As manufacturers do not want to create one car for California and another car for the rest of the United States, all cars are likely to meet the California standard. Efficiency improvements of this type will translate into quite large reductions in carbon emissions.

California is also considering imposing its own cap on power plant emissions. Both of these actions, for the automobiles and for power plants, are being challenged by US industry, and so their fate is uncertain. But what is happening in New York and in California suggests that there is a lot of activity and interest at the state and local levels in having more ambitious national policies.

At the federal level, there have been some interesting developments in the Congress as well. Senator John McCain, a Republican member of President Bush's own political party, has joined with Senator Joseph Lieberman, a Democrat and Al Gore's vice presidential nominee in the previous election, to support mandatory carbon emission caps for the United States. The McCain-Lieberman bill, as the legislation is called, is still before the Congress. There was a first vote in the Senate on the legislation just last year. Now, while the legislation did not pass, it attracted far more support from Republicans and Democrats alike than was anticipated. So even in the Congress—particularly in the Senate, which tends to be more responsible and less partisan than our other legislative body, the House of Representatives—there is growing support for a national carbon cap with corresponding emissions trading.

Furthermore, there are significant developments happening in our legal system, and I'd like to just mention two. The first is that several governments are initiating lawsuits against power companies because of their carbon emissions, claiming that the emissions are a nuisance that cause significant ecological and economic damage. In the largest of these lawsuits, eight states and New York City are jointly suing five large electric companies that account for 10 percent of all US emissions. So there is the potential for a large legal liability for power plants as a result of these lawsuits.

The second point is that investors are waging shareholder proxy campaigns against fossil fuel companies and power plants for failure to disclose the potential economic impact of carbon regulation in their financial offering documents. The US Securities and Exchange Commission, which regulates the financial markets, is also considering action. In other words, there is a growing recognition that carbon regulation in the United States is a sufficient enough business risk that it needs to be disclosed to investors. These two legal developments are putting pressure on US companies to develop more positive climate change policies.

Furthermore, thirteen US states have officially adopted renewable portfolio standards, or what is sometimes called a renewable energy standard. These states have pledged to meet a particular percentage of their electricity generation from renewable energy. The targets vary a great deal among them, but the acceptance of this idea of sector-specific goals for the power area is growing in popularity.

Some of the largest and most significant states, including most notably Texas, President Bush's home state, are pursuing this approach.

Taken together, these actions are environmentally significant. If one combines the emissions from the northeastern US states together with California, they alone would be the world's sixth-largest global emitter of carbon dioxide (CO_2)—larger than Germany; and that if one looks only at the northeastern states, they are the eighth largest emitter in the world. So while there is not a national goal in the United States, the action that is occurring is on an environmentally meaningful scale.

Despite the environmental implications of what is happening, however, perhaps the most important developments are political. Businesses, more than ever, see the downside risk about the uncertainty of US climate regulation. They know that they will be subject, if they are multinational companies, to climate regulation in other countries. They are concerned that the eventual national legislation might be too stringent if it is adopted perhaps at a later time when the science is more urgent and under a Democratic congress. Companies are increasingly concerned about possible trade and other sanctions that other nations might impose as a result of US-produced products not being subject to climate regulation. So the attitudes of business, while they have not shifted enormously, are evolving in what I think is a very positive direction.

In addition, the Republican Party, which has traditionally been the anti-Kyoto party in the United States, is now becoming quite divided on domestic climate regulation. As I mentioned, Senator McCain, a possible future candidate for president of the Republican Party, supports national legislation. He is joined by other Republicans in the United States, including Governor Arnold Schwarzenegger in California; Governor George Pataki in New York; as well as Senator Richard Lugar, who is the chairman of the Foreign Relations Committee in the Senate; and others who are considered to be popular Republican figures with significant national power. And because the president is a very skilled politician, he is unlikely to allow himself to lose control of his own political party on the issue of climate change. This provides reason to believe that the Republican Party as a whole may soften its opposition to action.

In addition, the general public, while not particularly well-informed about the president's policy, when asked in polls, believes that climate change is a serious issue and that more needs to happen. The American public attaches the same overall importance to climate protection as the European public, according to reliable polls.

These forces together are creating an environment where there is ever increasing pressure for stronger US action. In Washington, consensus is growing that federal regulation is inevitable. I believe the United States will adopt mandatory carbon regulation sometime this decade.

Let me say a little bit about what a mandatory US climate policy would look like. There are some issues on which there is significant agreement and there are some other issues on which there are some quite healthy discussions.

There is widespread consensus that when a federal system is adopted, it will include emissions trading. The Brookings Institution, at which I work, recently convened a high-level international conference involving most of the major US politicians who are active on climate change, including Senator McCain, Secretary of Energy Spencer Abraham, and many other notable figures. What was interesting about that conference was that while there was still a very strong divide between those for and against a national emissions ceiling, there was consensus that if the United States were to adopt a national cap, then it should pursue emissions trading. In sum, emissions trading will be an inevitable part of the US approach when it occurs.

In addition, there is a growing sense that it is a very heavy political lift to get a national mandatory emissions law adopted. Therefore, the initial emissions target will need to be exceptionally modest at first; far more modest than the Kyoto Protocol, which would have required something akin to a 35 percent reduction from business-as-usual emissions.

There are some important design issues that are still open. Foremost among them is the timing for when carbon regulation should occur. To gain as much time as possible many businesses still say it is unnecessary, although I believe that privately they know mandatory action is inevitable. The second open issue is how the emissions target should be designed to protect the economy. I refer to the many possibilities of indexing the emissions target, adding an economic “safety valve” that would excuse non-compliance if the costs rise too high, and other options of this type. There is a sense among some in business that greater cost certainty than existed in Kyoto is essential, and yet some in the environmental community oppose any movement away from absolute emission caps of the type included in Kyoto.

There are some open questions on the issue of the coverage of national law. Will the US domestic law be economy-wide or will it cover only certain sectors, such as the power sector? This we do not know yet. In addition, it is unclear whether the law will be implemented what we call “upstream”—which means at the place where emissions are most easily tracked, such as at power plants and at ports of entry for fossil fuel imports—or whether the law will apply “downstream” at the consumer level, such as a carbon tax at the petrol station. This is an issue on which there is continuing discussion.

3. Climate change and the 2004 US presidential election

The first point I would like to make is that something related to climate change—energy policy—is in fact a very important issue in the election. John Kerry in particular has been talking a great deal about energy and its implications for US security and jobs. And because Kerry has been successful with this issue, President Bush has started to talk more and more about his desire to see the United States improve its energy security. In fact, there is significant agreement between both candidates on the issue of research and development of clean energy technologies.

The candidates differ in that President Bush has tended to favor what one might call a supply-side approach to energy—additional exploration for fossil fuels, stepped-up infrastructure projects such as pipelines, and similar steps to ensure that an abundant supply of fossil fuel reaches the market safely. Whereas John Kerry, in a speech in August 2004, announced his support for mandatory federal environmental standards in the energy area and called for 20 percent of all US electricity to come from renewable sources by 2020. Kerry also called for a 20 percent of US transportation fuel to come from biomass, such as ethanol. These are significant departures from President Bush’s policies. Obviously, these policies would alter US emissions, but they are not described to the American public as climate policies per se.

The issue of climate change itself is really not an issue in the election at all, except to the extent that the Kyoto Protocol is used by both parties to illustrate a broader point that they wish to make about their opponent. Bush says that Kerry's consistent support for the Kyoto process is evidence that he is economically reckless, whereas Kerry says that Bush's unilateral withdrawal from the Kyoto Protocol shows that he is out of step with the international community and that he, John Kerry, would re-engage the United States in international climate talks. Now, very importantly, when Kerry says that he would re-engage the United States in international climate talks, he does not provide any further details about what precisely that would mean or how that would occur, and the American public has not asked for those details. John Kerry also says that the specific target in the Kyoto Protocol is no longer feasible for the United States, that too much time has passed—that we have missed that train. So while the preceding is evidence of the broader approaches to foreign policy that the candidates have, climate change itself is not an issue in the presidential election.

Well, does it matter, then, who wins the election? Here the answer is mixed. On one hand, it matters a great deal. We see that the policies of the candidates are really quite different. Bush would be likely to stay the course he has charted, which is on voluntary programs and focusing on research and science; whereas Kerry, if he were to win, could win a mandate for the kind of energy policies that I described here—mandatory requirements on biofuels, mandatory standards for renewable energy, etc. On the other hand, there is reason to believe that the election will not be decisive in the national policy debate on emission limits. The control of the Congress is unlikely to change. In fact, most people think that the Republican Party may widen its control over both houses of the Congress. Because a national emissions limitation would require the support of the Congress, the politics of climate change is not likely to change quickly.

While the business views are evolving, as I mentioned earlier, they're not evolving so rapidly as to suggest that the election in November will make an immediate difference. And while the public is asking for stronger climate change action and is not entirely supportive of President Bush's approach, climate is a very low priority. In fact, the issue of environment barely makes the top 15 issues in the presidential election. The issue of climate change is not even on the radar screen for most voters as an election issue. So the public is not clamoring for additional action.

4. Lessons learned from the Kyoto process

The first lesson learned from the Kyoto process is that the United States needs to start at home. On this there is great agreement from conservatives and liberals alike. Mandatory domestic action must precede any new international treaty that involves the United States. This is important for a number of reasons, not the least of which is that the United States will not be credible as an international partner if it returns to the negotiating table without having established its own domestic policies. If we are going to ask more of other countries, including developing countries, we need to show that we have in fact taken important steps ourselves.

In addition, when it comes to environmental treaties, US practice is generally to act first at home and then to build on that approach at the international level. If one looks at the Montreal Protocol on ozone-depleting substances, that successful treaty was based in part on pre-existing US domestic laws. Because US industry was already subject to national regulation, it did not view the international treaty as a threat. In fact, it saw it as the way to create a level playing field for foreign competitors. We need to create the same dynamic in the United States when it comes to climate change by enacting domestic regulation first. Then you will have the support of the business community and the environmental community in rejoining an international effort. I think therefore that the United States is unlikely to be engaging at the international level until it takes the kind of step proposed by senators McCain and Lieberman in developing a national policy.

There is also a sense that perhaps the United Nations (UN) is not the ideal forum for the United States. Unfortunately, the US Congress tends to be very skeptical about actions taken in the UN as they relate to the environment. We, the United States, are not a party to many treaties that are universally accepted otherwise. The 1992 Convention on Biological Diversity is an example. In fact, it was perhaps quite unusual that the United States was one of the first to sign the Framework Convention, but that may have more of a political explanation than a substantive one. So the UN process is one that remains quite difficult for the United States politically.

In addition, treaties themselves, regardless of whether they're negotiated in the UN or not, are also difficult for the United States. The United States tends to be fairly slow in approving treaties, regardless of where they're negotiated. So a non-UN and non-treaty-based approach, or at least a non-environmental-treaty-based approach, may be more promising for engaging the United States.

5. Prospects of re-engaging the United States internationally

I think there is a consensus in the United States that the Kyoto process and in fact the Framework Convention negotiations generally have shown that developing countries are unwilling to make substantive climate commitments even though they are the most vulnerable to global change. It is unlikely that the approach taken by the Clinton administration—which called on developing countries to adopt legally-binding emission targets—would have succeeded even if the Clinton administration had continued for an additional four years. There was not a lot of traction with that approach. Developing countries are quite firm in their opposition. Therefore, it is going to take some time to bring developing countries on board. The implications for the United States are two-fold. First, it should soften its demands on developing nations. Second, it should also ensure that its domestic programs are sufficiently modest so as not to harm the competitiveness of US firms.

And also, there is a sense that the Kyoto approach—an effort to simultaneously create a complex legal regime where little existed before — which I would describe as a "Big Bang" — is not the best approach for the United States. A more incremental approach that proposed a step-by-step effort would be easier for the United States to accept. The United States would be far more likely to ratify an agreement with Europe, Canada and others on emissions trading or a bilateral agreement on energy technology with China than to convince the U.S. Congress to support a new Kyoto-style treaty.

In that regard, it is worth asking the question: If those are the lessons learned, what are the prospects for the United States returning to Kyoto? Here, as I began my presentation by saying, I remain somewhat skeptical about whether the United States can in fact return to the Kyoto process and secure a ratifiable agreement. Any new effort would require the support of 66 percent of the Senate and a majority in the House of Representatives. Given the very bitterly divided political bodies that we have now, that is a very high bar.

6. Ideas on how an international regime could be designed to encourage US participation

The United States is much more likely to take what I would describe as a bottom-up approach. That is a step-by-step approach that would build incrementally on action that was undertaken in the United States. The initial stringency of that action is likely to be quite modest and the United States would probably be more inclined to explore with its partners, such as Japan and Europe, non-UN fora where the United States might have a better chance of securing a favorable outcome that would be supported by the Congress.

The lesson that may be worth examining is the model of the World Trade Organization (WTO), where the international community started with the General Agreement on Tariffs and Trade. It was a remarkably small group with a very small number of simple rules. Over time, that system has become larger and more complex. Only recently have its institutions and compliance procedures been strengthened. The rules were designed so that there would be incentives for membership and disincentives for acting contrary to the rules. In this way, the international community was able to create the sense that the WTO was a very valuable club. That may be a useful model for thinking about climate cooperation. If we can in fact build a model that brings in countries that are willing to act and creates incentives for other countries to join with fairly straightforward rules, then that might create a political dynamic that would be positive.

7. Conclusion

What are the implications for other nations? US action is inevitable and the structure of that action is foreseeable, but US action will happen faster if Japan and Europe themselves act. If you meet your own targets under Kyoto or if you adopt other policies that move your nations forward, it will make a difference. The United States, while often resistant to international pressure, is not oblivious to the perceptions of other nations, and America sees itself as a leader in the world. Stronger international action will influence the United States.

That said, our allies in Japan and in Europe and elsewhere need to be mindful of US domestic realities. It would be more productive for our allies to approach the United States and ask it to undertake action that has a politically realistic chance of success than to ask for the impossible. By that I mean to suggest that the international community should insist that the United States adopt mandatory domestic climate emission laws rather than brow-beating the United States back to the Kyoto negotiating table. An international treaty is nothing more than a promise to act, and the time has come for the international community to insist on action rather than asking for more promises.

In closing, I would like to encourage Japan and others to keep an open mind about non-Kyoto alternatives. As I said, I'm a great supporter of the Kyoto process. I think that the Kyoto process had many positive elements insofar as it created a platform for serious discussion and led to innovations such as emissions trading and carbon sequestration. Kyoto in this regard has already succeeded to a large degree. However, emission reductions are what is required, and it may very well be the case, as I have suggested, that the best way to achieve those emission reductions, at least in terms of cooperation with the United States, would be to look to non-Kyoto approaches.

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Special Feature on the Kyoto Protocol

Alternatives to the Kyoto Protocol: A New Climate Policy Framework?

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Under the United Nations Framework Convention on Climate Change, the international community has sought to find a policy framework to address the threat of human-induced climate change. The most significant action to date has been the adoption of the Kyoto Protocol in December 1997. Given Russia's recent decision to ratify the protocol it is now likely to enter into force early in 2005 despite its repudiation by the United States. The protocol includes legally-binding emission reductions for some countries over the period 2008 to 2012. It has not yet been possible, however, to find an approach that is truly global and that is aligned with the long-term environmental goal of reducing global greenhouse gas emissions to a "safe" level. A framework for action that addresses these shortcomings is developed in this paper. The underlying tenets are environmental effectiveness, economic efficiency, and equity. The importance of an appropriate timeframe for action is acknowledged, and involvement by all major emitting countries is facilitated. Importantly, this last point includes participation by developing countries in a way that accommodates their aspirations for economic growth. The crucial role of technology is recognized and is drawn into the solution. Together these elements allow a response that minimizes costs and maximizes the environmental outcome while at the same time enhancing the growth prospects of developing countries.

Keywords: Atmospheric concentrations, Climate change, Greenhouse gas emissions, Greenhouse gases, Climate change policy.

1. Introduction: Understanding the problem

In the past, the earth has periodically undergone large fluctuations in surface temperatures as a result of natural phenomena, causing changes in climate and sea levels (Plimer 2001). Recently, evidence has emerged that human activity also has the potential to alter the Earth's climate (IPCC 2001).

Since the Industrial Revolution, human activities such as burning fossil fuels and agricultural and industrial production have led to growing emissions of greenhouse gases and their increasing concentration in the atmosphere (table 1). A problem arises because, it is argued, these higher concentrations increase the natural greenhouse effect, potentially leading to environmental and economic damage.

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Table 1. Atmospheric concentrations of carbon dioxide, methane, and nitrous oxide

	Carbon dioxide	Methane	Nitrous oxide
Pre-industrial concentration	~280 ppm[a]	~700 ppb[b]	~270 ppb
Concentration in 1998	365 ppm	1,745 ppb	314 ppb

Source: IPCC 2001, p. 38.

[a]parts per million by volume.

[b]parts per billion by volume.

A number of factors make the problem a global one. First, no matter where emissions occur their effect is broadly the same, because the major greenhouse gases are well mixed in the atmosphere. Second, any resulting climate change is likely to affect all countries (although with differing specific impacts). Third, projections indicate that, while countries belonging to the Organisation for Economic Co-operation and Development (OECD) will remain major emitters, the greatest growth in emissions will come from developing countries.

Responding to the climate problem poses several challenges. A key one is to design policies that balance the cost of any damage from climate change with the cost of actions to reduce that damage. The significant uncertainties surrounding the causes, nature, and impacts of possible climate change magnify the challenge. A second challenge will be for countries to manage adaptation, which could involve major investments and managing economic and social change. A third challenge will be to engage all major emitters in meaningful efforts to reduce emissions. Emission abatement may involve reduced or more expensive energy use, which may hamper the development prospects of many countries. Achieving meaningful emission reductions will involve complex trade-offs between environmental and economic objectives.

The Kyoto Protocol, negotiated under the United Nations Framework Convention on Climate Change (UNFCCC), is an initial attempt to address the climate problem. The protocol is flawed, however, because it fails to meet the three principles, discussed in the next section, required for an effective response. A new path forward without the pitfalls inherent in the process that led to the Kyoto Protocol must be found.

2. Principles for effective policy

A policy framework to deal with the potential threats of human-induced climate change without compromising countries' capacity for development must adhere to the following three fundamental principles: it should be (1) environmentally effective, (2) economically efficient, and (3) equitable.

2.1. Environmental effectiveness

Two elements are important for environmental effectiveness.

a. Focus on the right environmental objective

In taking action to combat global warming it is essential to keep in mind the environmental objective. As it is the atmospheric concentrations of greenhouse gases that are understood to drive changes in global climate, the focus of the policy response must ultimately be on reducing these concentrations and not simply on the emissions of a select group of developed countries over a relatively short timeframe.

b. Involve all large emitters

A particularly important point in environmental effectiveness is that all major emitters need to be included in any policy response. Excluding any major emitters undermines the environmental effectiveness of abatement action in the following two ways:

1. The total extent of action undertaken is reduced or the share to be done by others to achieve a given environmental goal is increased. Ultimately, controlling the growth in atmospheric concentrations of greenhouse gases will not be possible without the involvement of all large emitters.
2. Emitters that do not take part in abatement action may gain a competitive advantage in production, inducing movement of emission-intensive industries to these countries from countries where emission constraints do apply. This emission "leakage" partly offsets abatement undertaken elsewhere and increases the economic costs of participating in any emission reduction process.[1]

2.2. Economic efficiency

Policies that are economically efficient deliver the objective at a lower cost than those that are not. For climate change response policy, this means that the overall welfare impact can be minimized in meeting the objective of a safe level of greenhouse gases in the atmosphere. There are six important elements of an economically efficient policy framework.

a. Embrace all opportunities for mitigation

Opportunities to reduce emissions of greenhouse gases exist in many sectors of economies, and there is potential for sequestering carbon dioxide in soils and vegetation, as well as for geological and ocean sequestration. The greater the scope of included activities, the greater the potential for reducing the cost of abatement. The lower the marginal cost of abatement, the more can be achieved environmentally for a given total economic effort.

b. Facilitate market-based solutions

Although most governments will adopt a portfolio of policies and measures to reduce greenhouse gas emissions, it has been shown that market-based solutions are generally less costly than command-and-control approaches to abatement (Tietenberg 1985; Hahn and Stavins 1992; Fisher et al. 1996).

c. Recognize the role of technology

Globally, and for most countries, the underlying demand for energy is rising strongly over time (IEA 2002b). There are various ways to mitigate the growth in net greenhouse gas emissions under such circumstances: (1) reduce economic growth and therefore energy use, (2) discourage the use of

1. For a detailed discussion of carbon leakage, see Hourcade et al. (2001, 542–3).

emission-intensive technologies by increasing their cost relative to less emission-intensive technologies, and (3) encourage development of cost effective and less emission-intensive technologies. This can be done, for example, by increasing the technical efficiency of fossil fuel-based energy production through investments in new technology, by capturing and geologically sequestering carbon dioxide, or by developing new renewable sources of energy. In practice, governments might choose a combination of approaches but, given the importance of energy in driving economic growth, a technological solution is required to make a significant impact on greenhouse gas emissions without hampering development prospects. Some technology options and some issues associated with technology development and uptake are discussed later in this paper.

d. Take action over the appropriate timeframe

Many components of the existing stock of energy capital have long life spans.[2] Both replacing existing infrastructure and developing new technologies require time—perhaps 20 years or more for development, and longer for successful commercialization. Manne and Richels (1995) demonstrate the economic costs of premature retirement of capital compared with a more efficient policy designed to achieve the same environmental outcome.

e. Be flexible in light of new knowledge

Making projections about greenhouse gas emissions based on expected rates of economic growth, the cost and availability of technologies, and the pattern of consumer demands is complicated and uncertain. Current understanding of global warming and of associated climate changes and potential impacts is limited, but the scope for improved understanding over time is high. Given the long time horizon over which action will be required, it is essential to build flexibility into any response so that strategies can be varied as knowledge improves.

f. Include adaptation strategies

Even immediate, severe emission abatement would not avert some degree of global warming. It follows that strategies for adapting to change will be required.

A fundamental underlying aim in developing a policy response to global warming must be to achieve the maximum benefit from mitigating the adverse impacts of climate change while, at the same time, striving to minimize the total cost of the action required and the adaptation that will inevitably need to take place.

2.3. Equity

Because the problem of climate change transcends national boundaries, it requires an international response and a framework that is perceived as fair. An equitable framework would have three elements.

a. The strategy needs to be consistent with sustainable economic development

The UNFCCC recognizes that environmental objectives need to be met in a way that facilitates countries' expectations of future economic growth and development: "[All] countries…need access to

2. See, for example, IEA (2002b, 82).

resources required to achieve sustainable social and economic development and that, in order for developing countries to progress toward that goal, their energy consumption will need to grow" (UNFCCC 1999, 4). Without this, countries will not participate in an international regime.

b. There should be no coercion

Forcing countries to agree to mitigation activities is unlikely to prove successful in the long run. A legally-binding framework can reduce the incentive for global participation, and the threat of punishment for failure provides an incentive to withdraw altogether if meeting some tightly defined target becomes impossible. In the long run, international agreements need a strong element of cooperation to remain successful.

c. Facilitate technology transfer

Technology exists today that can put developing countries on a lower emissions trajectory than their developed country counterparts were at the same stage of economic development. Despite the apparent win–win associated with technology transfer from developed to developing countries, there are a number of barriers that impede large-scale transfer. It will be essential to work toward reducing these barriers in order to enable equitable access to existing and new technologies. These issues are discussed more in-depth later in the paper.

3. The current policy framework scorecard

Reflecting widespread concerns about potential climate change, the great majority of national governments have chosen to become parties to the UNFCCC. The convention commits parties to taking action aimed at achieving the ultimate objective of the convention of stabilizing "greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system"

The Kyoto Protocol to the convention, adopted in 1997, is the most significant outcome of the international negotiations on climate change response policy so far. It includes legally-binding requirements for some parties in the first commitment period (2008 to 2012) to reduce their emissions relative to a 1990 base. The Kyoto Protocol has not yet entered into force and cannot do so without ratification by either the United States or the Russian Federation, which is necessary to meet the requirement that 55 percent of 1990 Annex I carbon dioxide emissions be covered by the ratifying countries.[3] The United States has withdrawn from the protocol, but the recent decision by the Russian Federation to ratify means that the protocol is likely to enter into force in early 2005.

Some 12 years after the initial 155 countries signed the convention, we have, in the protocol, an agreement that would do little to curb global greenhouse gas emissions or to move toward stabilizing atmospheric concentration of these gases. Given the extent of activity that has taken place under the convention, this outcome is surely not for lack of resources or international negotiating efforts. Why has the process failed the environment so far, and can things improve?

3. The UNFCCC divides countries into two main groups: Annex I, which is the industrialized countries, including the relatively wealthy ones that were members of the Organisation for Economic Co-operation and Development (OECD) in 1992, plus countries with economies in transition (EIT), and Annex II, which is the OECD members of Annex I (EITs not included).

Repudiation of the protocol by the United States in March 2001 significantly reduced the emissions reduction that the protocol could achieve. The opportunity this provided for reflection on the direction of global climate policy was unfortunately lost as a result of the prevailing attachment by many to Kyoto as "the only game in town" and a "first step." But does it represent a first step along a pathway toward an effective global regime, or is it a dead end? Before considering that question, it is worth reflecting on what the convention, and under it, the protocol, have achieved.

International awareness of the potential of global climate change has certainly been greatly heightened over the past decade. The convention has provided a forum for exchange of information and ideas. A range of non-binding actions have been promoted and techniques for measuring and reporting emissions have been developed. Unfortunately, negotiations have often been conducted in a divisive atmosphere that has strained international relations—hardly conducive to progress when so much depends on collaboration.

Clearly, the policy framework has several significant shortcomings. Some of these are inherent in the nature of the United Nations (UN) negotiations; others have been built into the detail of the convention and the protocol. Bodansky (2001) enumerates some of the lessons to be learnt from the Kyoto process.

Bodansky first points to the complexity of the protocol and its elaborate architecture. The institutional support required to maintain the many aspects of ensuring that parties meet their targets is enormous. In addition, there is a very large number of players involved in any UN negotiation, and they have a diverse range of interests and agendas. Progress is therefore cumbersome and slow as a result of the difficult logistics—and often also the politics.

Bodansky's second point is even more important. He suggests that, contrary to typical practice in treaty making, the Kyoto Protocol does not involve a mutual exchange of promises among parties but, rather, commitments made by a select number of the parties, yet done according to rules negotiated by all the parties, including those to whom they would not apply. Developing countries participated fully in the process yet were specifically absolved from taking on emission reduction commitments. The origin of this problem is inextricably embedded in the convention itself: it contains a number of clauses that have been used by the developing country bloc to justify their unwillingness to accept mitigation commitments.

Article 3.1 of the convention contains the principle that "Parties should protect the climate system…in accordance with their common but differentiated responsibilities and respective capabilities," and that "developed country Parties should take the lead."

Developing countries have interpreted this to mean that developed countries must reduce their emissions before developing countries will take on any emission reduction commitments of their own, and, in fact, that developed countries must first have made demonstrable progress in reducing emissions.

Article 4.7 states that developing country commitments "will depend on the effective implementation by developed country Parties of their commitment under the convention related to financial resources and transfer of technology."

Coupled with the reference in Article 3.1 to "respective capabilities," this has been used to underpin the developing countries' argument that they cannot take on mitigation unless and until developed countries provide the resources to increase their capacity to do so. Article 4.7 also contains the phrase: "[E]conomic and social development and poverty eradication are the first and over-riding priorities of the developing country Parties."

Developing countries argue that they cannot afford to divert any resources to mitigation activities—development will always be the priority. And this, of course, is a reasonable argument, but enshrining this and related principles in the convention has inevitably led to many unproductive hours of North–South debate in the negotiations.

Thus under the current framework not only is there no emission abatement required by developing countries but also there is little prospect of any way forward being found for their future engagement.

4. A possible new framework?

The framework that led to the Kyoto Protocol has not led to, and is unlikely to lead to, effective policy outcomes. What, if any, economic and political framework could lead to policy outcomes that meet the principles outlined earlier? The answer depends on finding a framework that more effectively aligns the national interests of major emitters with globally optimal environmental outcomes than is the case under the Kyoto Protocol.

4.1. Existing policy drivers

There is a range of existing drivers that could move countries toward reducing greenhouse gas emissions without resorting to an over-arching multilaterally negotiated framework.

1. *Economic*. There are generally a number of options within economies for energy efficiency improvements that can reduce costs over time. Energy savings often emerge as a result of broader economic reforms. An example is the economic reforms in China that have led to energy efficiency improvements in coal-fired power generation and industry, as well as a decline in direct household use of coal (and a shift to electricity).
2. *International trade and investment*. Some forms of trade and investment can lead to reduced greenhouse gas emissions. For example, investment in transferring technology to developing countries offers potentially valuable long-term commercial relationships for the investor and also potentially more energy efficient production processes in the developing country.
3. *Domestic pollution*. Many developed countries have introduced regulation and mandatory standards for levels of air pollution such as the sulfur dioxide legislation in place in many US cities. A number of developing countries are also increasingly taking action to address some local pollution problems. For example, in India the judicial system is taking action to enforce previously ignored legislation dealing with air pollution. In many cases these actions have led indirectly to reduced greenhouse gas emissions.
4. *Domestic desire to deal with the climate problem*. A number of developed countries already have domestic policies specifically designed to reduce greenhouse gas emissions. The United States, for example, has a target of reducing the emission intensity of its economy by 18 percent between 2002 and 2012 and is investing large amounts of money in technology development (White House 2001).

A number of European countries had implemented a range of abatement actions before the European Union's ratification of the Kyoto Protocol. Some developing countries too have demonstrated a desire for domestic emission abatement. For almost all countries there are likely to be negative economic consequences of climate change in the long term. There is, therefore, an underlying economic incentive for most countries to mitigate the impacts of climate change to the extent that it is cost-effective in conjunction with adaptation activities.

The existence of domestic drivers that work toward improved climate outcomes is critical for an effective global policy framework. These drivers can provide a basis for actions that address the climate problem and are consistent with national interests, including economic interests. Each country has different domestic drivers to different degrees, reflecting the diverse structures and circumstances of economies.

4.2. Leveraging existing abatement drivers for further action through international cooperation

It is well recognized that international trade and cooperation can deliver mutual economic benefits to the parties. It may be possible to develop an international framework under which countries cooperate to achieve more cost effectively the goals that are the basis for domestic abatement drivers, thus leveraging existing domestic drivers to achieve emission reductions.

International trade and cooperation have the potential to deliver mutual economic benefits to all involved parties. Working on this presumption it may be possible to develop an international framework under which countries cooperate to more cost effectively achieve the goals that are the basis for domestic abatement drivers. Under such a framework, trade and cooperation would be used to lever existing domestic drivers to achieve greater emission reductions at a reduced cost.

One way forward is through bilateral agreements that facilitate and promote cooperation between concerned countries in achieving national interest goals that are also consistent with positive climate change outcomes. These agreements could cover a number of areas, including the following examples:

- Facilitation to increase foreign direct investment in alternative or more energy efficient technology
- Facilitation of investment flows that assist in dealing with adaptation to climate change
- Facilitation of investment flows that generate capital structures more consistent with meeting domestic pollution reduction objectives
- Provision of assistance in the adoption of economic reforms that result in reduced greenhouse gas emissions
- Liberalization of trade flows to ensure that production is taking place in regions employing resources more efficiently
- Sharing of scientific and economic data and exchanges of relevant climate and technological expertise
- Some form of emissions trading that builds on countries' desire to meet emission reduction objectives but at least cost

5. Technology: A key element for success

As previously discussed, the increasing global demand for energy means that technology must play a crucial role in any significant abatement in global emissions. Appendix 1 provides some examples of the possibilities afforded by new and existing technology options for achieving emission reductions. Key issues in ensuring that technology provides a useful cornerstone to a future policy framework includes ensuring that incentives exist for technology research and development (R&D) that are appropriate to the policy environment. It is also important that appropriate mechanisms are in place to enable the transfer and adoption of technologies in developing countries.

5.1. Investing in technology

The importance of technology in any future framework that seeks to address the climate problem without hindering economic development has already been stressed. A logical progression is to examine the factors that should be taken into account when making technology choices and when attempting to make investment decisions on R&D.

There are several rationales for government involvement in, and funding of, R&D activities. Perhaps the most compelling is that, if left entirely to the private sector, the public good nature of some R&D—and the risk and uncertainty associated with R&D outcomes—would result in under-investment in innovation activities. Hence, there is often a case for government funding of R&D activities where the net present value of the investment to society is positive but would not be undertaken by the private sector on account of private returns being less than the hurdle rate. Where government is involved in funding R&D activities, there are several considerations to take into account.

First, the R&D funding allocation for a given technology should be considered in light of total budget constraints. Research funding will be most effectively spent where the potential payoffs from each unit of funding are highest. Given that there are diminishing returns to investment, allocating a large share of funding to a limited range of technology options may not be optimal. In making investment decisions from one year to the next, however, consideration should be given to the fact that there may be sunk investment costs associated with a given research area and costs associated with the irreversibility of committed resources.

Second, investment in a given technology in one period will affect its cost into the future. Thus it is important to ensure, from a risk management perspective, that a range of technologies is supported; otherwise, past investment decisions could result in lockout effects. Supporting a range of technologies is especially important given the uncertain environment that characterizes the climate debate. Over time, changing preferences regarding environmentally acceptable technologies and new information about the potential threat posed by different greenhouse gas concentrations may require a shift from existing technologies to alternatives. If technologies that are likely to play important roles in such a future scenario are left off the development list, then it may be expensive to switch to such technologies in the future.

Niche applications are another reason to ensure that a wide range of technologies is supported. For example, while options such as photovoltaics may not be currently cost-competitive with natural gas combined cycle generation in many applications on a per-unit generation cost basis, photovoltaics may be cheaper for distributed generation in remote locations than natural gas combined cycle generation, which has an associated high cost requirement to be grid-connected.

This is a key point across the breadth of the potential energy/technology portfolio. While average costs of generation may imply one technology is more cost-competitive than another, costs are highly site specific, and locational differences in fuel prices and resource availability may greatly alter the relative cost profiles of technologies.

The nature of the policy environment will also have an influence on the direction and focus of R&D finance. For example, if a government has a quantitative emissions restriction in place to achieve a given level of emissions reduction, then an incentive exists to encourage privately optimal improvements in energy efficiency. Any improvement in abatement efficiency that reduces the marginal cost of emissions reductions will also generate a net gain to society under these conditions.

More generally, the impact of investment in R&D activities may be to reduce the overall cost of each type of emission-reducing technology or to change the relative cost of technologies in relation to each other. Typically, development activities and learning effects will reduce the cost of individual technologies, while research breakthroughs that realize the full potential of fledgling technologies typically alter the cost of different technologies in relation to each other. The mix of investment in abatement activities will depend on expected success rates, adoption costs, a need to ensure that a stream of new technology options continues to become available over time, and the overall broad climate change policy setting.

5.2. Technology drivers and impediments

Technology transfer and related investments are likely to be important parts of any bilateral agreements on climate change—especially for those between developed and developing countries. In developing such agreements it will be important to understand the forces driving technology changes and any impediments to those changes. Some of these are discussed below.

a. Drivers

To understand how best to facilitate the diffusion of energy technologies between countries, it is important to recognize that drivers of technological innovation, adoption, and transfer vary between developed and developing countries. In developed countries, technology may be adopted in response to regulations and energy taxation, and the level of technical innovation tends to be proportionate to the breadth of R&D portfolios where corporations and government finance research. In developing countries, technical advancement is more often the product of diffusion from more developed countries and an outcome of trade agreements. In less developed countries, there is typically less focus on environmental concerns and greater emphasis on getting technologies into place quickly so as to improve the potential for economic growth.

The timing of investment decisions also has important implications for adoption and transfer. Because there are crucial feedback mechanisms between the market and further technical developments, technological “lock-in” may occur if one form of technology gains a temporary advantage that results in market uptake. Once a technology has been integrated into a given process, investment costs have been sunk, and supporting infrastructure has been developed, then technological adoption can be difficult and expensive to reverse.

Once technology has been adopted, learning effects and associated efficiency improvements may also reduce the cost of the technology, making it attractive to additional investors and further increasing market share. The OECD provides estimates of progress ratios, whereby changes in the costs of electricity generated from different technologies are estimated under the scenario that market size doubles (OECD 2003). In this setting, the cost of photovoltaic electricity is reduced to around 65 percent of its previous value, wind power to 82 percent, biomass electricity to 85 percent, and supercritical coal and natural gas combined cycle to around 96 percent of their prior values. Thus the cost-related effects of learning by doing and market uptake are greater for newer technologies and taper off for those technologies that have been in use for some time.

b. Impediments

Technology adoption and transfer is not affected only by these drivers, however. There are many important barriers to the diffusion of energy sector technologies that tend to impede or slow their adoption. Any attempts to promote the diffusion of technologies will need to address such barriers using a comprehensive approach, while recognizing that impediments will manifest themselves differently in different countries and that identification and prioritization of barriers needs to be country specific (IPCC 1999).

Concerns about intellectual property rights represent a key impediment to technology transfer. An example is the restrictions on foreign ownership of energy sector assets, which reduce firms' control over the price received for their outputs and also their ability to protect their intellectual property. The response of foreign direct investment to stronger intellectual property right protection has been shown to increase as the level of industrialization increases (Lesser 2002). Seyoum (1996) found that in newly industrializing countries, the strength of intellectual property rights protection (as represented by patents, trademarks, and copyrights) accounted for almost half of the observed variation in foreign direct investment, while in less developed countries the corresponding figure was only 13 percent.

Macroeconomic conditions greatly influence the potential for success of technology transfer. High inflation, fluctuating exchange rates, and incomplete pricing of materials, labor, energy, and other inputs—as well as trade policies that impede the free movement of capital—all act as disincentives or impediments to effective transfer by significantly increasing the risk associated with investment and reducing credit availability. Risk also increases the discount rate, thereby affecting the attractiveness of investments.

Inadequate human and institutional capacities may also hamper diffusion of new technologies. Lack of knowledge, skills, and practical experience within the local labor force reduces productivity and impedes the effective implementation, operation, and maintenance of technology. Since the overall level of productivity within an economy also influences the lending rate, this has important flow-on effects for credit availability. Capacity is also an issue in relation to labor having the skills required to undertake technological needs assessments, cost-benefit analyses, and environmental impact assessments, which are necessary in procuring, managing, and financing technology (UNEP 2003).

Institutional capacity is not only important from the perspective of providing adequate intellectual property rights but also in relation to providing effective linkages between technology providers, users, and developers. Institutional intermediaries are essential in ensuring coordination between various information sources, partnerships, and networks to improve technical dissemination.

Inadequate infrastructure can also impede investment, as projects can be dependent on external infrastructure such as gas pipelines or electricity grids. If the infrastructure is unreliable or of poor quality then the project will be less likely to go ahead.

Taxation regimes can deter investment if issues such as double taxation are not adequately dealt with. Market interventions, such as tax and subsidy distortions, have the potential to alter the relative prices of energy and may distort incentives for fuel-switching to low-carbon fuels.

It is essential that technology adoption and diffusion be considered in the context of complex market factors with respect to alternatives such as the appropriateness of technologies for local environments and potential energy and cost efficiencies. In other words, a technology deemed suitable in one place and time may not be as appropriate in another place and time, as a consequence of changing preferences and perceptions, for example, about real and perceived environmental risks.

Many such barriers to technology transfer could potentially be significantly reduced if governments—acknowledging the economic and environmental benefits—worked together to overcome them.

c. Encouraging technology adoption and transfer

It is evident that technology has the potential to deliver a major shift in the emission intensities of economies. Injecting technology into developing countries and continuing the development of the next generation of technologies, however, requires significant investment and supporting policies.

According to the Climate Technology Initiative (2001), processes that promote favorable environments for energy technology transfer include the following:[4]

- establishing collaborative partnerships between key stakeholders for the purpose of enhancing technology transfer,
- undertaking a needs assessment that evaluates priorities for technology transfer and available alternatives,
- designing and implementing specific technology transfer plans and actions,
- evaluation and refinement of the actions and plans as an ongoing process, and
- dissemination of technology information.

Based on the experience of practical technology transfer programs, there are also specific actions that foster technology diffusion. Institutional support and training, in particular, for the assessment,

4. The Climate Technology Initiative (CTI) is a multilateral initiative, operating as an implementing agreement under the International Energy Agency (IEA). Its mission is to bring countries together to foster international cooperation in the accelerated development and diffusion of climate-friendly and environmentally sound technologies and practices. The CTI was established at the first Conference of Parties to the UNFCCC in 1995 by 23 IEA/OECD Member Countries and the European Commission. In 2003, the CTI gained new status as an IEA Implementing Agreement.

development, and management of new technologies is useful in enhancing government efforts to stimulate the market and improve coordination. It is essential that effort is expended on building local skills and knowledge, including through the sharing of information and through strengthening of the technical capacity of the labor force (IEA 2001b).

These actions may be facilitated by long-term collaborative arrangements for capacity building, foreign direct investment, and joint ventures through collaboration on research and demonstration, or through international programs for cooperation and assistance in R&D.

Often the human capital necessary to operate and maintain a technology efficiently through all stages of operation is a function of learning that is not easily or simply injected into developing countries. For this reason, it may be useful for successful technology transfer for technologies to be developed and implemented in developing countries concurrently with developed countries' implementation.

The level of maturity of a given technology, however, will play a significant role in determining the appropriate policy to pursue, since different stages of development present different problems for transfer. For example, whether the technology is commercial, near commercial, under development, or speculative will determine whether the technology should continue to be developed and commercialized in developed countries, or whether the new technology can be developed jointly in developed and developing countries.

Compulsory licensing, whereby governments grant licenses to domestic manufacturers who then pay royalties to intellectual property right holders is one way to facilitate technology transfer that is also associated with the generation of beneficial learning effects (Ogonowski et al. 2004). Other options for improving information sharing include international collaboration for intellectual property rights, whereby both developed and developing countries pledge resources to an international institution that coordinates and develops new technologies, which are then shared with participating countries (Ogonowski et al. 2004).

6. Advantages of the proposed framework

It can be seen from the discussion above that technology investment, transfer, and adoption are not "one-size-fits-all" processes—solutions must be tailored to suit individual circumstances. There is a wide range of factors that influence the rate of technological change, potentially making it less than optimal. Clearly, there is a role for governments to play in addressing many of these influences. This makes the international framework proposed here a particularly suitable one for focusing on technology while at the same time helping to address the climate change problem.

The voluntary bilateral framework outlined in this paper has a number of other advantages. Under a set of cooperative bilateral partnerships, the extent of commitment would be a question for each partner to answer rather than being determined by a larger group. This is in contrast to the UNFCCC consensus-based approach to negotiations, which is not conducive to outcomes tailored to particular countries' circumstances.

In the case of climate change, 12 countries—if the European Union is counted as a single unit—gave rise to almost 80 percent of global greenhouse gas emissions in 1999 (figure 1). Together, China and the United States are likely to account for 40 to 50 percent of global carbon dioxide emissions by 2050. Significant progress could be made in abatement, if agreements could be struck between these countries. This is not an argument for excluding smaller emitters—which should be free to engage in discussions at any time—but an argument for focusing on agreements between key players that meet the conditions of environmental effectiveness, economic efficiency, and equity.

Such a bilateral framework avoids the demanding global negotiating and legal framework; a large international bureaucracy is not required to police actions. Negotiating efforts can be focused where they brings results rather than being dissipated by side issues and obstructionism. The network of bilateral relationships that form could be multilateralized at some later date. This would not be essential, but it might be a natural evolution if mutual benefits were found.

Under this framework, the individual circumstances of each country can be addressed and leveraged to maximize the climate change response. Reasons for participating will differ between countries. The importance of technology in finding a solution to the climate problem cannot be over-emphasized. An approach such as the one outlined in this paper could potentially address some of the key current barriers to the transfer of technology. Importantly, because the nature of any technology transferred is the subject of bilateral arrangements only, parties are free to choose the investment that best meets their needs.

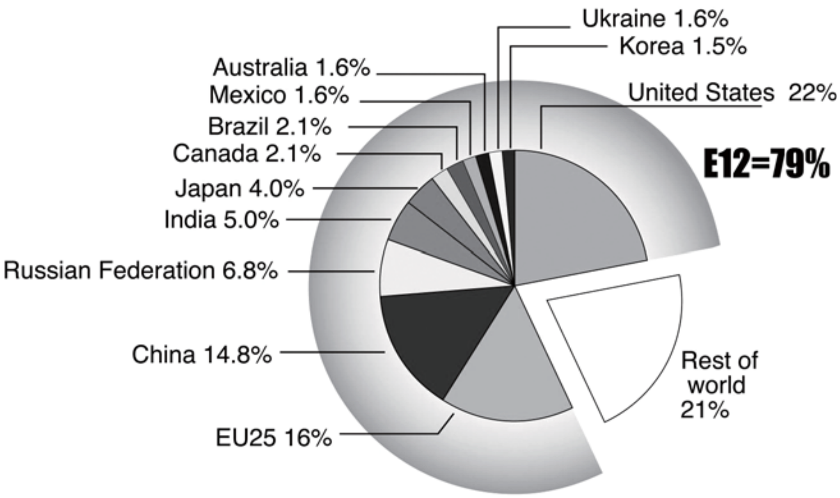

Figure 1. Share of global greenhouse gas emissions for selected regions 1999

Note: CO_2 equivalent calculated using the IPCC Second Assessment Report's 100-year global warming potentials (GWP).

This approach relies on market forces and domestic policy drivers, rather than a multilateral regime enforced under international law. A set of bilateral partnerships to reduce greenhouse gas emissions is not inconsistent, however, with the continued existence of the UNFCCC. The convention offers a useful forum for the exchange of scientific knowledge and sharing data and technical information.

It should be noted that there are existing bilateral agreements that focus on funding and capacity building, but this is often not sufficient for technology transfer. Full technological diffusion will inevitably be integrated with trade and development. For this reason, policies that promote economic reforms that are also consistent with reduced greenhouse gas emissions are an essential component of any international arrangement focused on technology diffusion.

7. Conclusion

The approach to the climate problem to date—one based on mandatory targets and culminating in the Kyoto Protocol—has an enticing appearance of environmental certainty. The targets, processes, and disciplinary focus create the illusion of achievement. But the reality is that such an approach is unlikely to work. The withdrawal of the single largest emitter, the United States, from the protocol is a clear signal that another approach needs to be considered despite the fact that the protocol will now enter into force.

Although all countries have a long-term interest in finding a solution, not all have the same means at their disposal to take action, and not all can have the same effect on the outcome. An approach such as the one outlined here acknowledges that and builds on actions that relate to national interests, while at the same time recognizing that it is essential to have developing country participation if the climate problem is to be addressed. Most importantly, because the actions are the subject of bilateral arrangements without externally-imposed regulation, parties can choose the best investments for their needs.

The approach postulated moves away from the punitive approach brought by some parties to the Kyoto negotiations and seeks to rely on positive drivers for change. Everybody can be better off, which encourages participation and allows the action to develop its own momentum, without expensive negotiations that end in international stand-offs. Coercion is not required if there are demonstrable and shared benefits for developed countries, developing countries, and the environment.

Appendix 1: Some potential technology opportunities

Advances in technology present opportunities for emissions abatement throughout the economy while still allowing economic growth and development. Moomaw et al. (2001) refer to technology options for reducing emissions in the buildings, manufacturing, and energy sectors, and in the agriculture and waste industries.

Significant technological advances designed to reduce greenhouse gas emissions are occurring in the industrial sector, which currently accounts for approximately 41 percent of global carbon dioxide (CO_2) emissions (IPCC 1999). For example, technological advancements in the iron ore and steel industry that reduce carbon dioxide emissions include improvements in process energy efficiency and the recovery of CO_2 from blast furnace gas.

The aluminum industry is also experimenting with the use of inert, non-carbon anodes that potentially reduce carbon dioxide emissions by around 10 percent. Using drained/wettable cathodes is another new technology that has the potential to reduce electricity use in aluminum smelting by between 10 and 20 percent, but these technologies are unlikely to be implemented prior to 2010. It is expected that once each of these technologies has been demonstrated, then the focus will move to combining the two types of technology to give not only greater energy savings but also eliminate anode emissions. The combined savings would result in close to a 35 percent reduction in CO_2 emissions per tonne of aluminum produced for manufacturers relying on electricity generated using fossil fuels.

Technological improvements that could have beneficial impacts in the transport sector include hybrid gasoline-electric cars, which can improve fuel efficiency by between 50 and 65 percent compared with conventional vehicles, and fuel cell vehicles powered by hydrogen, which could potentially reduce carbon dioxide emissions by 45 percent compared with conventional engines, depending on the source of hydrogen used (IEA 2000).

Examples of technologies that could reduce emissions in the buildings sector, which alone contributes to approximately 31 percent of global greenhouse gas emissions (IPCC 1999), include the installation of more efficient heating, cooling, and lighting equipment, and advanced window and insulation retrofits, which significantly improve the energy efficiency performance of buildings.

One of the major opportunities for global emissions abatement is from technological improvements in electricity generation. In 2000, the generation of electricity for use by sectors throughout the economy accounted for approximately 40 percent of global carbon dioxide emissions (IEA 2002b). There are three main technological options for reducing greenhouse gas emissions from electricity generation:

1. Efficiency in electricity generation

The average global thermal efficiency of installed coal- and gas-fired generation is approximately 33 percent (IEA 2002b). A number of emerging technologies, however, offer significant efficiency improvements compared to standard subcritical pulverized coal plants and simple cycle gas turbines.

For example, supercritical and ultra-supercritical pulverized coal plants combust coal at higher temperatures and pressures than in subcritical plants, achieving thermal efficiencies of around 45 and 55 percent, respectively.

Combined cycle turbines offer efficiency improvements over conventional coal and gas technologies by employing waste heat or gas to drive a steam cycle. This generates additional electricity, supplementary to that generated when gasified coal or natural gas is first burned in a gas turbine and used to generate electricity.

Integrated gasification combined cycle (IGCC) coal plants are a relatively new technology that are undergoing demonstration at several projects in Europe and the United States. Natural gas combined cycle (NGCC) turbines are more advanced and currently account for over 50 percent of the market for new generating capacity worldwide (IEA Clean Coal Centre 2003). The International Energy Agency (IEA) expects that the average efficiency of new IGCC plants and new NGCC plants will rise to 52 percent and 62 percent, respectively, by 2030 in OECD countries (IEA 2002b).

New NGCC plants generally have lower initial capital costs than pulverized coal and IGCC plants (IEA 2003b). By 2030 it is expected that IGCC capital costs will be lower than for pulverized coal technologies but still greater than NGCC technologies (Cottrell et al. 2003). Typically, NGCC plants have the lowest electricity cost, followed by ultra-supercritical and IGCC plants.[5] Costs will vary, however, between countries as a result of the availability, quality, and price of fuels and capital.

2. Fuel-switching in electricity generation

A transition from coal to gas technologies, particularly in regions with competitive gas pricing, may reduce emissions growth, but this is unlikely to produce significant long-term reductions in global emissions as a result of the rising demand for electricity and subsequent expected increase in emissions (Freund 2002).

A significant reduction in global greenhouse gas emissions could, however, be achieved by widespread switching from fossil fuels to low- or zero-emission technologies such as renewables, nuclear power, or hydrogen (if produced from carbon-free materials).

Currently, the average costs of non-hydro renewables are not widely competitive with fossil fuel-based wholesale electricity generation. Renewables do, however, offer cost-competitive generation in some specific applications and regions (IEA 2003a). Significant declines in the cost of non-hydro renewables are expected as capacity increases and incentives are implemented to encourage low-emission electricity generation. Wind and biomass are expected to have the lowest cost and greatest installed capacity of non-hydro renewables by 2010. The projected costs of these technologies, however, are still unlikely to be competitive with coal- and gas-based technologies for some time (IEA 2003a; Cottrell et al. 2000).

Although the operating costs of nuclear power plants are similar to coal-fired plants (IEA 2001a), investment in new nuclear plants is projected to be limited because of public resistance and increasing competition from alternative technologies.

5. See, for example, Audus (2000) and David and Herzog (2000).

Hydrogen can be used to generate electricity by direct combustion in a gas turbine or in a fuel cell. Currently, over 90 percent of hydrogen is produced from fossil fuels. It is not expected that technologies allowing carbon-free hydrogen production and subsequent low-emission electricity generation will be practical before 2050 (IEA 2003b).

3. Carbon capture and storage

The capture and subsequent storage of carbon dioxide emissions from power plants would allow near zero emissions from electricity generation. Carbon-capture facilities can be retrofitted to existing plants or installed in new installations. The three main options are flue gas separation technologies, pre-combustion techniques, and oxygen recycling.

Once captured, carbon dioxide must be transported to a permanent storage site by land pipelines or ocean vessels. It can be stored in a variety of geologic or ocean sites, including active and uneconomical oil and gas reservoirs, saline aquifers, and deep and un-minable coal seams. It has been estimated that the capacity for geologic storage is so great that hundreds of years of global emissions at current emission rates could be sequestered (IEA 2002a).

Carbon capture and storage is typically expected to increase electricity costs by about two to three cents (US$) per kilowatt-hour compared to conventional generation without carbon capture and storage (IEA 2003b). The higher costs are associated with additional investment and operating costs, transport and injection costs, and a decline in electricity generation efficiency. The costs of carbon capture and storage, however, are extremely site specific and will vary between regions.

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Special Feature on the Kyoto Protocol

Overview of the Kyoto Mechanisms

Erik Haites[a] and Farhana Yamin[b]

This paper provides an overview of the three Kyoto mechanisms—joint implementation, the Clean Development Mechanism (CDM), and international emissions trading. These mechanisms enable parties to the Kyoto Protocol with emissions limitation commitments for 2008 to 2012 (Annex B parties) to meet those commitments at lower cost. Projects under the CDM also contribute to the sustainable development of the non-Annex B host parties. At present only the CDM is operational. The other mechanisms will begin operation after the protocol enters into force. After documenting the progress in implementing the Kyoto mechanisms, features common to two or more of them are discussed. Then each mechanism is described. The paper concludes with an overview of the key features of the three mechanisms.

Keywords: Kyoto mechanisms, International emissions trading, Joint implementation, Clean Development Mechanism.

1. Introduction

The Kyoto Protocol, if it enters into force, will limit the greenhouse gas emissions (GHG) of Annex B parties for the period 2008 to 2012.[1] Each party's commitment is expressed as a percentage of its base period, usually 1990, emissions. The commitment is called the party's "assigned amount" and the party receives assigned amount units (AAUs) of one metric ton (tonne) of carbon dioxide equivalent (tCO_2e) equal to its assigned amount.[2]

To meet its commitment an Annex B party can reduce its emissions, enhance its eligible sinks, and trade Kyoto units (AAUs, CERs, ERUs, and RMUs).[3] Each Annex B party must prepare an annual inventory of its GHG emissions and changes in the carbon stocks of eligible sinks. To comply with its commitment, an Annex B party must retire Kyoto units equal to its actual net emissions (emissions less the net increase in the carbon stocks of eligible sinks) during the 2008–2012 period.

The protocol establishes three mechanisms for the creation and transfer of Kyoto units:

- Joint implementation (JI), Article 6, governs the issuance of emission reduction units (ERUs) for emission reduction and sink enhancement projects in Annex B parties.

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1. Annex B parties are the industrialized countries and the European Community that ratify the Kyoto Protocol.
2. Where the CO_2 equivalence of other GHGs is determined by their 100-year global warming potential (GWP) values.
3. A sink is a process that removes a GHG from the atmosphere. Human actions, such as planting trees, can enhance natural sinks and so increase the amount of carbon stored. Carbon can also be released to the atmosphere by sinks (e.g., if trees burn or decay), so the carbon removed from the atmosphere is measured as the net change in the carbon stock during a given period.

- The Clean Development Mechanism (CDM), Article 12, governs the issuance of certified emission reductions (CERs) for emissions reduction, afforestation, and reforestation projects in non-Annex B parties.[4]
- International emissions trading (IET), Article 17, governs the transfer of AAUs and acquired ERUs, CERs, and removal units (RMUs) from one Annex B party to another.[5]

Parties may allow their legal entities to participate in these mechanisms.

Articles 6, 12, and 17 of the Kyoto Protocol provide only a basic skeleton outline of the respective mechanisms. The rules, institutions, and procedures governing the Kyoto mechanisms are set out in a series of decisions adopted by the Conference of the Parties at COP 7 in 2001 as part of the Marrakesh Accords.[6] Matters related to afforestation and reforestation projects in the CDM were agreed at COP 9 in 2003. As a result the rules, institutions, and procedures governing the Kyoto mechanisms are spread among the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol, and more than a dozen COP decisions (see table 1).

The Kyoto mechanisms are forms of emissions trading. They are a means of facilitating compliance with a party's commitment and do not change the commitment.[7] Kyoto units are a means of tracking compliance with emission limitation commitments, not a property right.[8] Use of the mechanisms is intended to be supplemental to domestic actions in meeting Annex B party commitments.[9] Each of the Kyoto units is equivalent for compliance purposes.[10]

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4. The CERs issued for afforestation and reforestation projects under the CDM are subject to special provisions to deal with the non-permanence of the sink enhancements and are called tCERs or lCERs (defined later). Unless stated otherwise, CERs include tCERs and lCERs.
5. RMUs are issued for sink enhancements achieved by Annex B parties.
6. The decision-making body for the United Nations Framework Convention on Climate Change is the Conference of the Parties (COP). When the Kyoto Protocol enters into force, its decision-making body will be the Conference of the Parties serving as the Meeting of the Parties to the protocol (COP/MOP). The rules relating to the Kyoto mechanisms must be adopted by the COP/MOP, but since that body does not exist yet the rules have been adopted by the COP as recommended draft decisions forwarded to the first meeting of the COP/MOP for formal adoption. The Marrakesh Accords are a 245-page compilation of rules and procedures agreed by the Parties to the UNFCCC COP 7 in October/November 2001 in Marrakesh. These rules and procedures provided sufficient clarity on implementation of the Kyoto Protocol to enable its ratification by many countries.
7. The Marrakesh Accords state that purchases or sales of Kyoto units do not change a party's assigned amount for the commitment period, its emissions limitation commitment. For additional clarity the Marrakesh Accords provide that additions and subtractions of Kyoto units to a party's assigned amount do not alter its emissions limitation commitment. Articles 3.10, 3.11, and 3.12 of the protocol discuss additions to and subtractions from an Annex B party's assigned amount. The Marrakesh Accords state that Kyoto units are not "added to" a party's assigned amount until it designates those units to be used for purposes of meeting its commitment, which will be done after the end of the commitment period. Prior to that time all units are simply held in national registries and can be transferred subject to the relevant rules.
8. The Marrakesh Accords state that the "Kyoto Protocol has not created or bestowed any right, title or entitlement to emissions of any kind on Parties included in Annex I."
9. Whether an Annex B party has met this supplementarity condition will be assessed qualitatively. Each Annex B party submits information on its use of the mechanisms and its domestic action as part of its national communications. This information is reviewed by an independent expert review team. The Facilitative Branch of the Compliance Committee will address questions raised by the supplementarity assessment. The Marrakesh Accords also provide that Annex B parties "shall implement domestic action in accordance with national circumstances and with a view to reducing emissions in a manner conducive to narrowing per capita differences between developed and developing country Parties." The Secretariat will prepare a report on the implications for per capita emissions each time the review process relating to Annex B parties' national communications is completed.
10. Each of the Kyoto units is equal to one tonne of carbon dioxide equivalent calculated using agreed GWP values. The rules governing banking vary for the different units. RMUs, tCERs, and lCERs cannot be banked, and banking of CERs and ERUs is limited to 2.5 percent of a party's assigned amount. There are no restrictions on banking of AAUs. Retiring RMUs, tCERs, lCERs, CERs, and ERUs first and banking any surplus AAUs limits the potential adverse impact of the banking restrictions on the fungibility of the units.

Table 1. Articles and decisions relating to the Kyoto mechanisms

Issue	UNFCCC/KP[a] Article	COP Decision[b]
Accounting of assigned amounts	KP: 7.4; 3.7; 3.10-12	8/CP.4; **15/CP.7; 19/CP.7; 24/CP.8**
Activities implemented jointly (AIJ)	FCCC: 4.2(d)	5/CP.1; 8/CP.2; 10/CP.3; 6/CP.4; 13/CP.5; **8/CP.7**; 14/CP.8; 20/CP.8
Carry-over of Kyoto units	KP: 3.13	**19/CP.7**
CDM	KP: 12, 3.12	7/CP.4; 14/CP.5; **15/CP.7; 17/CP.7** Guidance to CDM Executive Board (EB): 21/CP.8, 18/CP.9 LULUCF projects: **19/CP.9**
Compliance	KP: 18	8/CP.4; 15/CP.5; **24/CP.7**
Emissions trading	KP: 17, 3.10-11	7/CP.4; 14/CP.5; **15/CP.7; 18/CP.7**
Joint implementation	KP: 6, 3.10-11	1/CP.3; 7/CP.4; 14/CP.5; **15/CP.7; 16/CP.7**
Land use, land-use change, and forestry (LULUCF)	KP: 3.3, 3.4, 3.7	1/CP.3; 8/CP.4; 9/CP.4; 16/CP.5; **11/CP.7; 12/CP.7** Croatia: 22/CP.9
Methodologies under the UNFCCC	UNFCCC: 4.1(a), 4.2(c)	4/CP.1; 2/CP.3
Methodologies under the Kyoto Protocol	KP: 5	2/CP.3; 8/CP.4; **20/CP.7; 21/CP.7; 20/CP.9**
Reporting under the Kyoto Protocol	KP: 7 (Annex B parties only)	8/CP.4 (Annex B) Guidelines (Annex B): **22/CP.7**; 22/CP.8
Review of emission inventories under the UNFCCC (Annex B): Procedures/guidelines	UNFCCC Article 12	2/CP.1; 6/CP.3; 6/CP.5; 19/CP.8; 12/CP.9
Review of national communications under UNFCCC (Annex B): Procedures/guidelines	UNFCCC Article 12	2/CP.1; 6/CP.3
Review process under the Kyoto Protocol (Annex B): Guidelines	KP Article 8	8/CP.4; **23/CP.7; 22/CP.8; 23/CP.8; 21/CP.9**

Source: Yamin 2004, table 1. Adapted from Yamin and Depledge 2004.

[a]Kyoto Protocol.

[b]How to read this column: i.e., 8/CP.4 means Decision 8 by COP 4. Those in bold are the most significant decisions.

2. Progress in implementing the Kyoto mechanisms

As of June 2004 only the Clean Development Mechanism is operational. The other mechanisms will begin operation after the Kyoto Protocol enters into force. The Marrakesh Accords initiated a prompt start for the CDM because certified emission reductions during the period 2000 through 2007 can generate CER credits.[11] A CDM Executive Board (EB) was elected in November 2001 to supervise implementation of the CDM.

A CDM project must use an approved methodology, be validated by a designated operational entity (DOE) and be approved by the designated national authorities (DNAs) of the parties involved.[12] As of

11. Article 12.10 of the Kyoto Protocol. Until the protocol enters into force the COP exercises the responsibilities of the Conference of the Parties serving as the Meeting of the Parties to the protocol (COP/MOP).
12. The roles of the EB, DOEs, and DNAs are discussed later together with the requirements for registration of a CDM project.

late June 2004, 64 methodologies had been submitted to the EB. Of these, 13 have been approved, 15 have been rejected or withdrawn, and 36 are still under review. The project categories with the largest number of methodologies approved or under review are energy efficiency, renewable energy, landfill gas recovery, and emissions reduction by industry, biomass, and methane recovery.

Twenty-five entities had applied for accreditation as DOEs by June 2004. One application has been withdrawn and the remaining 24, including four from non-Annex B parties, are still under review. An entity's accreditation covers specific project types (scopes) and functions (validation and/or verification). Four entities have been accredited and provisionally designated for validation of various project types, so most potential projects can now be validated.

Just over half of the countries that have ratified the Kyoto Protocol have established a DNA, making a total of 63 DNAs established by Annex B parties (12), non-Annex B parties in the Asia-Pacific region (24), Latin America and the Caribbean (18), Africa (7), and economies in transition (2).

Thus, enough of the CDM infrastructure is in place to enable the validation of some types of projects located in countries with a DNA. As of June 2004 a total of 27 proposed CDM projects have been made available for public comment as part of the validation process. Thus, the first CDM projects are likely to be registered within months and the number of registered projects is likely to increase rapidly as the infrastructure expands.

3. Common features of the Kyoto mechanisms

A number of features—including eligibility requirements, participation of legal entities, stakeholder participation, national authorities, annual inventories, registries, compliance procedures, and review of modalities—apply to two or more of the mechanisms, although the requirements may differ for each of them.

3.1. Eligibility

The decision by a party to participate in a mechanism is voluntary; however, in order to participate a party must meet the requirements for that mechanism. Participation in the JI and IET is limited to Annex B parties.[13] All Parties to the 1992 United Nations Framework Convention on Climate Change (UNFCCC) may participate in CDM projects until the Kyoto Protocol enters into force; thereafter host countries must be a party to the protocol. Other eligibility requirements are discussed below in the context of each mechanism.

3.2. Legal entities

Realization of the full economic benefits of the Kyoto mechanisms requires participation by legal entities. To minimize the cost of meeting the overall emissions limitation commitment of the Annex B parties requires that the cost of reducing or sequestering an incremental tonne of CO_2 equivalent emissions—the marginal abatement cost—be the same for all sources in all countries. This can occur

13. They must have ratified the Kyoto Protocol. Non-parties, such as the United States and Australia, that establish domestic emissions trading programs can unilaterally decide to allow the use of Kyoto units by participants for compliance with such domestic obligations.

only if individual sources are able to use the Kyoto mechanisms for compliance with their domestic policy obligations.[14]

Each of the mechanisms allows parties to authorize participation by legal entities.[15] A party that authorizes legal entities to participate in the mechanisms remains responsible for fulfillment of its obligations under the protocol and must ensure that participation by its legal entities is consistent with the mechanism's modalities.[16] Legal entities may only transfer and acquire Kyoto units if the parties affected by the transaction meet the participation requirements for the mechanism.

3.3. Stakeholder participation

The modalities for JI and the CDM support participation by stakeholders and require that specified information be made public to facilitate such participation. A stakeholder means the public, including individuals, groups, or communities affected or likely to be affected by the JI or CDM project.

3.4. National authorities

A party that wishes to host a JI or CDM project must have a national authority responsible for such projects. A party involved in a JI project must inform the Climate Change Secretariat of its designated "focal point," while the CDM modalities require all parties to designate a "national authority for the CDM." The functions of these bodies are explained below.

3.5. Annual inventories and other information

Each Annex B party must implement a "national system" for estimating its GHG emissions and removals.[17] The term *national system* refers to the institutional, legal, and procedural arrangements needed to ensure that the party can adequately estimate, report, and archive its GHG inventory data. Guidelines for national systems and review processes to ensure that they are sufficiently robust to meet the needs of the mechanisms have been agreed as part of the Marrakesh Accords.

Each Annex B party must submit a pre-commitment period report that contains all the information needed to calculate its assigned amount.[18] This report is subject to review by an expert review team. Thereafter, each Annex B party must submit a complete and accurate annual inventory of its GHG emissions and removals. Each annual inventory is reviewed by an expert review team, which may propose adjustments for missing or inadequately justified data. When a proposed adjustment is disputed by a party, the matter is decided by the Enforcement Branch of the Compliance Committee.

3.6. Registries

The Kyoto units only exist in electronic form. To track holdings of Kyoto units each Annex B party is required to establish a national registry with specified accounts, including an account for each legal

14. Haites and Aslam (2000, 24).
15. A legal entity is a company or other body established by the laws of the country in which it is located.
16. The Kyoto Protocol is an international agreement among sovereign nations. It cannot impose obligations on legal entities, so parties remain responsible for meeting their commitments under the protocol.
17. It must be implemented no later than January 1, 2007.
18. This report must also describe the party's national system for estimating GHG emissions and removals and its national registry.

entity authorized to hold Kyoto units. Each account lists the units held by unit type and serial number. The registry for CERs held by governments or entities of non-Annex B parties will be maintained by the Secretariat.

Technical guidelines for registries to ensure that Kyoto units can be transferred internationally without difficulty have been agreed by the COP. International transfers of Kyoto units are subject to checks by an independent transaction log maintained by the Secretariat. The transaction log verifies, *inter alia*, that the parties are eligible to engage in international emissions trading, the units have not been retired or cancelled, the serial numbers are valid, and the selling party is in compliance with its commitment period reserve requirement.

3.7. Compliance procedures

The Kyoto mechanisms can reward non-compliance if an Annex B party does not meet its commitment after selling units to other parties.[19] The compliance procedures aim to prevent non-compliance by Annex B parties through an early warning system that leads to deployment of facilitative approaches. When those approaches fail, a quasi-judicial process is used to correct the non-compliance and restore the environment.

The Compliance Committee will be established at COP/MOP 1 after the protocol enters into force. The Committee consists of twenty members, ten each in the Facilitative Branch and the Enforcement Branch.[20]

- The Facilitative Branch acts as an early warning system for potential non-compliance and provides advice and facilitation to parties in implementing the Kyoto Protocol. The Facilitative Branch deals with all compliance matters not expressly assigned to the Enforcement Branch.
- The Enforcement Branch determines whether Annex B parties are in compliance with their quantified emissions limitation commitment, the methodological and reporting requirements, and the eligibility requirements for the mechanisms.[21] It is also responsible for authorizing adjustments to Annex B inventories in the event of a dispute between a party and the expert review team.

Determination by the Enforcement Branch that a party does not meet the eligibility conditions for a mechanism leads automatically to suspension of the party's (and any legal entities authorized by the party) ability to undertake transactions related to that mechanism.[22] Since the effects of being unable to

19. The rules for the mechanisms—eligibility conditions to participate in the mechanisms, the technical guidelines for national registries, and the transaction log—help limit the scope for non-compliance due to lack of administrative capacity. The commitment period reserve limits the scale of potential non-compliance.

20. Each branch consists of ten members with "recognized competence relating to climate change and in relevant fields such as the scientific, technical, socio-economic or legal fields" serving in their "individual capacities" elected by the COP/MOP using the membership formula as the Executive Board of the CDM. The basic procedures of the Compliance Committee are set out in the Marrakesh Accords and include rules concerning a quorum, the adoption of decisions, and frequency of meetings. The committee reports to the COP/MOP on its activities, applies any policy guidance received from the COP/MOP, submits administrative and budgetary matters to the COP/MOP, and develops any further rules of procedure that may be needed. The committee has a bureau consisting of the chair and vice-chair of the two branches. The bureau is likely to focus on organizational and procedural matters, the most important being the allocation of questions of implementation to one of the two branches.

21. The Enforcement Branch has limited discretion to impose consequences. This ensures legal certainty and decreases the chance of political interference. The consequences to be "automatically" applied by the Enforcement Branch are also defined to suit the type of commitment that has not been fulfilled. The consequences applied must aim at the restoration of compliance to ensure environmental integrity and to provide an incentive to comply.

22. An Annex B party that does not meet the eligibility conditions for IET cannot engage in transactions relating to any Kyoto units until eligibility is reinstated.

use the mechanisms could be very significant for some parties, specially expedited procedures were agreed to speed-up the assessment and reinstatement of eligibility by the Enforcement Branch.

3.8. Review of the modalities

The three mechanisms contain virtually identical review provisions, which provide the following:

- Any future revisions of the modalities, rules, and procedures for a mechanism shall be decided in accordance with the rules of procedures of the COP/MOP.
- The first such review will be carried out no later than 2013.
- Further reviews shall be carried out periodically thereafter.

To provide legal certainty for project investors, the modalities for the CDM and JI clearly indicate that changes to the modalities will not be applied retroactively to existing projects.

4. The Clean Development Mechanism

The CDM enables emissions reduction and afforestation/reforestation projects in non-Annex B parties to earn CERs that can be used by an Annex B party to help meet its emissions limitation commitment. The quantity of CERs earned by a project is equal to the difference between its actual emissions (sink enhancement) and the approved baseline scenario of the emissions (sink enhancement) that would have occurred in the absence of the project. The environmental integrity of the mechanism depends upon the credibility of the baseline. A project must use a baseline methodology approved by the EB that has been validated as being appropriate for the project by an accredited “operational entity” and has been subject to public comment.

A CDM project may be financed in a variety of ways. A legal entity in (or the government of) the non-Annex B host country may implement the project and sell the resulting CERs to the government of (or a legal entity in) an Annex B party (unilateral model). An Annex B government or legal entity may invest in a project in return for some or all of the CERs (bilateral model).[23] Or an international financial institution may invest funds contributed by Annex B governments and entities in CDM projects and distribute the CERs to the contributors (multilateral or portfolio model).

4.1. The CDM project cycle

The project cycle for a CDM project consists of five steps. The first two must generally be completed before the project is implemented and the last three occur after the project is operational.

a. Step 1: Project description

The project participants describe the proposed CDM project using the project design document (PDD) format approved by the EB.[24] The PDD includes a description of the project, the baseline methodology, the duration of the project, the crediting period chosen, the monitoring plan, an illustrative calculation of the emissions reductions together with an estimate of the anticipated reductions, the environmental

23. The investor also could be the government or an entity in another non-Annex B party or in a country that is not a party to the Kyoto Protocol.
24. A project participant can be a government of or an entity authorized by a party to participate in the project.

impacts of the project, and stakeholder comments. The PDD also contains information on the respective roles of the project participants, including how CERs arising from the project are to be distributed and who is authorized to communicate with the EB and the Secretariat.

The project participants must obtain written approval for the project from the DNA of each party involved, including confirmation by the host party that the project activity assists it in achieving sustainable development. Each host party can establish its own procedures for approving proposed CDM projects.

b. Step 2: Validation and registration

The project participants must retain a DOE accredited by the EB to validate the proposed project. Validation ensures that the proposed project meets the eligibility requirements, has the approval of the host party, appropriately uses baseline and monitoring methodologies approved by the EB, and meets any other requirements established by the EB.

A project that wishes to use a new baseline or monitoring methodology must first submit the new methodology to the EB for approval. Only after the new methodology has been approved by the EB can a project using it be submitted to a DOE for validation. Submission of new methodologies is likely to be more frequent during the early stages of the CDM.[25]

Registration is the formal acceptance by the EB of a validated project as a CDM project. Registration is automatic for any project validated by a DOE unless objections are raised by any of the parties involved or at least three members of the EB.[26]

c. Step 3: Monitoring

As the project becomes operational the project participants must implement the approved monitoring plan. The plan should collect and archive data on actual emissions, what the baseline emissions would have been, leakage, and other information needed to calculate the emissions reduction or sink enhancement achieved by the project.

d. Step 4: Verification and certification

The project participants periodically retain a DOE to review the monitoring data and other relevant information to verify the emissions reduction actually achieved by the project.[27] The DOE must then certify that the project achieved the verified emissions reduction during the specified period.

e. Step 5: Issuance of CERs

A certification report by a DOE constitutes a request to the EB to issue CERs equal to the verified emissions reduction. The EB instructs the CDM registry administrator to issue the specified number of CERs. Enough CERs to cover the share of the proceeds for administrative expenses and adaptation are

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25. The CDM is using a “bottom up” approach to approving baseline and monitoring methodologies. A methodology must be approved before it can be used by a project, but an approved methodology can be used by any project. The EB may revise approved methodologies over time. Revised methodologies apply only to projects registered after the date of the revision, not to previously registered projects.

26. A review is limited to issues associated with the validation requirements and must be finalized no later than the second meeting of the EB following the request.

27. The DOE that validates a project may not verify or certify the emissions reductions achieved except in the case of small-scale projects with the approval of the EB.

transferred to the appropriate accounts, and the remaining CERs are transferred to the registry accounts specified by the project participants.

4.2. The CDM Executive Board

The CDM Executive Board's (EB) main functions are to accept validated projects as CDM projects, issue CERs, and accredit operational entities pending their designation by the COP/MOP. These functions are carried out using the rules and guidelines agreed as part of the Marrakesh Accords and changes approved by the COP/MOP.[28]

The CDM is supervised by the EB subject to the authority and guidance of the COP/MOP. The COP/MOP provides guidance on strategic issues such as the geographical distribution of projects, while the day-to-day administration of the CDM is the responsibility of the EB. Until the entry into force of the Kyoto Protocol, the COP serves as the COP/MOP.[29] This enables the "prompt start" of the CDM envisaged in the protocol and agreed in the Marrakesh Accords.

The EB is composed of ten members, each representing a specified group of countries. Members are nominated by their groups and elected by the COP/MOP. Each member has an alternate elected in the same manner.[30] Alternates enjoy most of the rights of members, but may vote only if the member is absent. Members and alternates must possess appropriate technical or policy expertise and act in their personal capacities. They must not have a "pecuniary or financial interest" in any CDM project or designated operational entity. And they are forbidden from disclosing any confidential or proprietary information relating to their work even after leaving the board.[31]

The EB must meet at least three times a year, but has met six times per year since its establishment.[32] A meeting requires a quorum of at least two-thirds of the members, including a majority of Annex B and non-Annex B members.[33] The country groups that nominate the members are such that a majority usually will be from non-Annex B parties.[34] Decisions are taken by consensus where possible, but may be taken by a three-fourths majority of members present and voting.[35] Together with the quorum

28. The EB can recommend changes to its rules of procedure to the COP/MOP. Recommended changes were approved by the COP, fulfilling the responsibilities of the COP/MOP, at COP 8 in New Delhi in 2002.

29. All the decisions taken by the COP, the EB, and designated operational entities will be confirmed and given full retrospective effect by the COP/MOP after the Kyoto Protocol enters into force.

30. Members and alternates are elected for a period of two years and are eligible to serve a maximum of two consecutive terms. Half of the members and alternates are elected each year to ensure continuity. Each year the members elect a chair and vice-chair for a term of one year. The chair must rotate between a member from a developing country and a member from an industrialized country. When the chair is from an industrialized country the vice-chair must be from a developing country and vice versa.

31. All EB members and alternates must take a written oath of service confirming their adherence to these stipulations before assuming their duties. The board may suspend any member and recommend to the COP/MOP that his/her service be terminated, if that member is found to be in breach of the oath or fails to attend two consecutive EB meetings without proper justification.

32. Meetings are broadcast live over the Internet and to a nearby room for a maximum of 50 observers. Observers are not permitted in the room where the EB is meeting except when invited by the chair to make a presentation to the board. The chair and other board members often brief the public after EB meetings.

33. Alternates count toward the quorum only if they are replacing an absent member.

34. The cost of participation by developing country and transition economy members and their alternates are covered by the EB budget.

35. This means the members, and alternates representing an absent member, present at the meeting and casting an affirmative or negative vote. The CDM rules also include procedures for electronic remote voting, if the chair judges that a decision cannot wait until the next meeting.

requirement this means decisions must have the support of a majority of Annex B and non-Annex B members.[36]

The EB may establish any committees, panels, or working groups it deems necessary, and may draw on outside expertise as required.[37] The board has established a Small Scale Project Activities Panel, an Accreditation Panel, and a Methodologies for Baselines and Monitoring Plans Panel. The Small Scale Panel completed its work in 2002, but the others continue to function. Members are appointed after a public call for experts with "demonstrated and recognized technical expertise." Where the work is particularly technical or time-consuming, panel members are paid fees according to United Nations procedures. Two EB members serve as chair and vice-chair of each panel.[38]

4.3. Designated national authorities

Each party to the Kyoto Protocol must designate a national authority (DNA) that provides written approval of each project in which it is involved. The host party's DNA must provide a letter confirming that the project assists the country in achieving sustainable development before the project can be registered with the EB.

4.4. Designated operational entities

Designated operational entities (DOEs) validate proposed CDM projects by checking to ensure they conform with all of the requirements for a CDM project and verify and certify the emissions reductions achieved by CDM projects.[39] The CDM modalities envisage that the vast majority of validation, verification, and certification decisions taken by DOEs will be final; the EB will examine only "problem" projects. Thus the quality, consistency, and transparency of the work done by DOEs are critical. To ensure the quality and consistency of the work done by DOEs, they must be accredited by the EB before being designated by the COP/MOP.

A DOE is accredited only for specified project types and must be re-accredited every three years. The work of DOEs is subject to spot-checks. The EB may suspend a DOE immediately if information reveals that it no longer meets the accreditation standard. A project validated, verified, or certified by a DOE that is subsequently suspended is not affected unless "significant deficiencies" in the DOE's work relating to the project were found.[40]

To avoid potential conflicts of interest, the DOE that has validated a project may not verify and certify the emissions reductions for that project.[41]

36. The rules also ensure that members cannot delay the work of the board by failing to turn up. If a member is not present the alternate counts toward the quorum and may vote. A member or alternate that misses two consecutive meetings may be terminated. Vacancies can be filled by the chair in consultation with representatives of the relevant country group.
37. The board is required to consider regional balance when appointing members of such a group.
38. The persons serving as chair and vice chair are from an Annex B and a non-Annex B party, respectively.
39. A DOE must ensure that it complies with applicable host country laws when carrying out its functions, demonstrate it has no real or potential conflict of interest in the CDM project, maintain a publicly available list of all CDM projects in which it is involved, submit annual activity reports to the EB, and make non-confidential information from CDM projects publicly available, as required by the EB.
40. In such cases, the EB can decide to appoint a different DOE to review the project. If this review finds that excess CERs have been issued, the original DOE must transfer the equivalent amount of CERs to the CDM Registry within 30 days of the end of the review.
41. The EB may allow exceptions to this rule in the case of small-scale projects.

4.5. Small-scale projects

Parties realized that the cost of validating a project might be so high as to render small projects uneconomic. The EB was asked to develop simplified modalities and procedures for small-scale projects; projects that meet one of the following criteria:

- renewable energy projects with a maximum output capacity of 15 megawatts (MW) or appropriate equivalent;
- energy-efficiency projects that reduce energy consumption on the supply and/or demand side by up to the equivalent of 15 gigawatt-hours (GWh) per year; and
- other projects that both reduce anthropogenic emissions by sources and directly emit less than 15 kilotonnes of CO_2 equivalent annually.

COP 8 in New Delhi in 2002 adopted the simplified modalities and procedures for small-scale projects recommended by the EB. The project boundaries, a baseline methodology, leakage, and monitoring plan have been specified for over a dozen categories of small-scale projects.[42] This should simplify preparation of PDDs and validation of project and hence reduce the costs incurred by small-scale projects.

4.6. Afforestation/reforestation projects

The modalities for afforestation and reforestation projects under the CDM were adopted at COP 9.[43] They are identical to those for emissions reduction projects with a few exceptions.[44] An afforestation/reforestation project must be implemented on land that was not forested on January 1, 1990. Projects may specify which of the carbon pools are to be included in the project.[45] GHG emissions from activities on the land prior to afforestation/reforestation are not included in the baseline, but leakage must be deducted from the increase in carbon stocks.[46] Afforestation/reforestation projects have longer crediting periods and must consider the socioeconomic and environmental impacts of the proposed project in accordance with the procedures required by the host party.[47] For the first commitment period, use of CERs from afforestation/reforestation projects by an Annex B party is capped at 1 percent of its base-year emissions multiplied by five.

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42. The EB indicated that project participants may propose new categories of small-scale projects and amendments to the modalities and procedures for small-scale projects, which will be reviewed at least once a year.
43. Only afforestation and reforestation projects are eligible under the CDM for the first commitment period. The eligibility of other sinks projects will be decided during the negotiations for subsequent periods.
44. Simplified rules for small-scale afforestation and reforestation projects are to be developed for adoption at COP 10 in December 2004. Small-scale afforestation and reforestation projects have expected net removals by sinks of less than 8 kilotonnes of CO_2 per year and are developed or implemented by low-income communities and individuals as determined by the host party.
45. The carbon pools are: above-ground biomass, below-ground biomass, litter, dead wood, and soil organic carbon. A pool may be excluded if the project participants provide transparent and verifiable information that the exclusion will not increase the quantity of reductions claimed. Thus if a pool is a sink, it need not be measured, but if a pool is a net source it must be measured.
46. For example, if the land was used for cattle grazing before being reforested, the emissions associated with the cattle cannot be part of the baseline. Cattle grazing and the associated emissions would no longer occur on the land after it has been reforested. If those emissions were part of the baseline, the project would get credit for eliminating those emissions. In practice it is likely that cattle grazing emissions elsewhere increased. Excluding the emissions from the baseline is equivalent to assuming the emissions increased by an equal amount elsewhere. Leakage is an increase in emissions outside the project boundary.
47. Project particpants can choose a single crediting period of 30 years or a renewable crediting period of 20 years, with up to two renewals for a total of 60 years for sinks projects as compared with a single 10-year period or a 7-year period renewable twice for emissions reduction projects.

Since the carbon stored by the trees and soil can be released again by disease, fire, harvesting, or other events, the project proponents must choose one of the following two options to address non-permanence:

1. The temporary CER approach issues "tCERs" equal to the certified net increase in the carbon stocks since the inception of the project after each verification, but the tCERs can only be used for the period in which they are issued.[48]
2. The long-term CER approach issues "lCERs" equal to the certified net increase in the carbon stocks since the previous verification of the project after each verification, and requires an appropriate share of the outstanding lCERs to be replaced if there has been a net release of carbon.[49]

4.7. Funding issues

Public funding for CDM projects from Annex B parties is not to result in the diversion of official development assistance and is to be separate from and not counted towards the financial obligations of Annex B parties under the UNFCCC and the Kyoto Protocol.

Private investment gravitates primarily toward a handful of the larger developing countries. For this reason the COP/MOP is required to review the regional distribution of CDM projects with a view to identifying barriers to their equitable distribution and take appropriate decisions, including assistance in arranging funding for CDM projects.

Article 12.8 of the protocol states that a "share of the proceeds" of CDM projects is to be used to cover the CDM's administrative costs and to fund the adaptation needs of developing country parties vulnerable to the adverse effects of climate change. The Marrakesh Accords specify the share of the proceeds for adaptation as 2 percent of the CERs issued for a project.[50] The share of proceeds to cover administrative expenses will be established by the COP/MOP based on a recommendation from the EB.[51]

The EB has established fees for accreditation of operational entities and for registration of projects. Organizations applying for accreditation as operational entities must pay a fee of US$15,000.[52] Projects are required to pay a registration fee ranging from $5,000 to $30,000, depending on the size of the project, as a down payment until a share of the proceeds for administrative expenses is determined.

48. No new tCERs can be issued after the end of the project's crediting period.
49. The lCERs must be replaced by AAUs, CERs, ERUs, RMUs, or lCERs from the same project. If a verification report is not received when due, all of the lCERs for that project must be replaced. The lCERs for a project expire and must be replaced at the end of the project's crediting period.
50. CDM projects hosted by least developed countries are exempt from the share of the proceeds related to adaptation. The CERs for adaptation are collected by the EB at the time the CERs are issued and are transferred to the Adaptation Fund established under the Kyoto Protocol. The Adaptation Fund is expected to sell the CERs to generate revenue for adaptation assistance.
51. The EB has stated that it will not make such a recommendation until 2004 when there is more information about CER prices. In the interim, the costs of administering the CDM are funded by voluntary contributions from parties, which they may request to be reimbursed.
52. Applicants from developing countries have the option to pay this fee in two installments.

5. Joint implementation

Annex B parties can jointly implement emissions reduction or sink enhancement projects, and to issue emission reduction units (ERUs) for the emissions reductions achieved.[53] The project helps the host party meet its emissions limitation commitment. To avoid double-crediting for the reductions, the appropriate number of AAUs is converted into ERUs.[54] JI projects starting as of 2000 are eligible, but they cannot earn ERUs for reductions achieved prior to 2008.

The Marrakesh Accords created two "tracks" for JI projects. Track 1 is self-regulation of JI projects by the host Annex B party. Track 2 involves international oversight of the project by the Article 6 Supervisory Committee (A6SC), whose functions are similar to those of the EB. The requirements of the two tracks are summarized in table 2.

Table 2. Requirements of Track1 and Track 2

	JI Track 1	JI Track 2
Participation requirement to be met by the host country	1. Party to the Kyoto Protocol 2. Has submitted a report for determining its initial assigned amounts (AAUs) 3. Has a national system of evaluation of GHG emissions from sources and storage by eligible sinks 4. Has a computerized national registry compliant with international requirements 5. Annually submits a current inventory fully compliant with the Kyoto Protocol requirements	1. Party to the Kyoto Protocol 2. Has submitted a report for determining their initial assigned amounts (AAUs) 3. Has a computerized national registry compliant with international requirements
Validation, registration	Host country validates and accepts proposed projects. An independent entity may be used for validation.	An independent entity validates a proposed project prior to registration by the A6SC.
Verification	Host country verifies the emissions reductions or sink enhancement achieved; may use an independent entity.	An independent entity performs the verification.
Transfer of ERUs	The host country transfers the agreed amount of ERUs.	The host country can transfer ERUs only after verification by an independent entity.

Source: Wollansky and Freidrich 2003.

The Marrakesh Accords say little about Track 1 except listing conditions that the host party must meet to use this option.[55] These eligibility conditions require the host party to be current in terms of its annual

53. Like the CDM, it was originally anticipated that each JI project would involve the entities or governments of two Annex B parties (bilateral model). Projects can be implemented unilaterally or with funding from a group of investors.

54. The host party has an emissions limitation commitment and receives AAUs equal to its commitment. Assume that its actual emissions were just equal to its commitment without the JI project. The reductions achieved by the project would leave the government with surplus AAUs equal to those reductions. If ERUs were also issued for the reductions, they would be credited twice. Converting AAUs into ERUs ensures the integrity of the compliance accounting.

55. A party that meets these conditions may still decide to require JI projects to use Track 2 to provide added credibility, to reduce the risk associated with possible loss of Track 1 eligibility in the future, or simply to reduce the administrative burden for the government.

emissions inventories and have the appropriate national systems in place. Under these conditions the host party should be able to assess the effect a proposed project would have on its national emissions, its holding of Kyoto units, and hence its compliance with its emissions limitation commitment. The host party may then regulate JI projects however it chooses.[56] If it awards ERUs in excess of the reductions achieved, then compliance with its emissions limitation commitment will be more difficult.

If the host Annex B party fails to meet its reporting and review eligibility requirements, it can only participate in JI projects under Track 2.[57] This involves international oversight of JI projects by the A6SC, whose functions, powers, and rules of procedures are very similar to those of the EB. The JI project cycle under Track 2 is also very similar to the CDM project cycle.

The COP/MOP will provide guidance regarding the implementation of Article 6 and exercise authority over the A6SC. The A6SC will be composed of ten members (and ten alternates), including three members from the Annex B economies in transition, three from other Annex B parties, three from non-Annex B parties, and one member from the small island developing states. The functions and rules of procedure of the A6SC will be essentially the same as those of the EB.

Proposed Track 2 projects will be validated by accredited independent entities (IEs) prior to registration by the A6SC.[58] The emissions reductions or sink enhancements achieved by projects will also be verified by IEs, which will be accredited by the A6SC, but they do not require designation by the COP/MOP. The accreditation provisions are essentially identical to those for DOEs and it is expected that many DOEs will also be IEs.[59]

Article 6 does not have a “share of the proceeds” provision to fund administrative costs. The Marrakesh Accords state that administrative costs shall be borne by both the parties included in Annex B and the project participants according to specifications set out in a decision by the COP/MOP at its first session.

6. Emissions trading

International emissions trading (IET) allows an Annex B party to transfer Kyoto units to another Annex B party. Although they may allow legal entities to participate in emissions trading, it is the national governments that have the compliance obligation under the protocol. As with the other mechanisms, the Marrakesh Accords provide that IET must be undertaken in accordance with modalities agreed by the COP that will be endorsed by the COP/MOP.

The eligibility requirements are the same as those for Track 1 of JI, as listed in table 2. These conditions require the host party to be current in terms of its annual emissions inventories and have the appropriate national systems in place. As well, an Annex B party may impose restrictions on trade under

56. Although Article 6 provides that JI projects must generate ERUs additional to any that would otherwise occur, the fact that the host party must convert AAUs to ERUs means additionality is not critical for the environmental integrity of JI if the host party is meeting its reporting and review commitments.

57. Since the host party must convert AAUs to ERUs and transfer them internationally, the eligibility conditions for Track 2 are identical to those for international emissions trading.

58. The IE functions are not spelled out in a specific section as for the CDM but have to be gleaned from the Article 6 guidelines and the requirement of the A6SC to give consideration to relevant work of the EB as appropriate.

59. The provisions for withdrawal of accreditation of an IE are the same as those for DOEs.

Article 17; and a party may refuse to accept certain types of units, refuse units from some countries, or limit the quantity of units accepted to meet its supplementarity objective.[60]

Each Annex B party must maintain a commitment period reserve (CPR), a minimum quantity of Kyoto units, in its national registry. The reserve requirement is the lower of 90 percent of its assigned amount and 100 percent of five times its most recently reviewed inventory.[61] The former provision will generally be lower for countries that are net buyers of Kyoto units, while the latter will generally be lower for net sellers.[62] The CPR limits the scope for calculated or inadvertent over-selling of Kyoto units, potentially rewarding non-compliance if the penalties for failure to meet national emissions limitation commitments are weak or poorly enforced.[63]

The computerized transaction log maintained by the Secretariat will check all proposed transfers of Kyoto units between national registries. The transaction log will verify that a proposed transaction conforms with the CPR and other rules. If a proposed transaction violates any of the rules, the log will notify the national registry concerned, which is legally obliged to stop the transaction. Any units transferred in breach of CPR limits will be deemed invalid for compliance purposes until the CPR is re-established.

Many Annex B parties will establish national emissions trading programs as a domestic policy. Such trading programs will need to address if and how participants can use Kyoto units for compliance with their domestic obligations. The domestic program may use AAUs as the allowances or it may allow the exchange of Kyoto units for domestic allowances, and vice versa, under specified conditions.

7. Activities implemented jointly

COP 1 (in Berlin, 1995) established a pilot phase for activities implemented jointly (AIJ) under the UNFCCC. Parties could agree to implement voluntary projects to reduce emissions or enhance sinks. AIJ projects could not receive credits for the emissions reductions or sink enhancements achieved. At COP 7 it was decided that AIJ projects could qualify as CDM or JI projects and so earn Kyoto units.

An AIJ project that meets the requirements of the CDM may apply for registration as a CDM project before December 31, 2005. If accepted, the crediting period for the project may start any time after January 1, 2000. The project can then earn CERs for the emissions reductions from the start of the crediting period. An AIJ project that meets the requirements for JI projects may apply for registration as a JI project. If accepted, ERUs can be issued for emission reductions or sink enhancements achieved after January 1, 2008.

60. Restraints on transfers of Kyoto units do not violate international trade law, because they represent exchanges of sovereign commitments rather than traditional goods and services. *Supplementarity* is the principle that the use of flexible mechanisms (emissions trading, CDM, joint implementation) is to be supplementary to domestic policies and measures, implemented by industrialized countries to meet their Kyoto targets. This principle was agreed at COP 6, Part 2 (Bonn, July 2001).

61. The CPR does not apply to transfers of ERUs for Track 2 JI projects since these ERUs are issued under international supervision in a host country that may not meet the eligibility requirements for IET.

62. See Missfeldt and Haites (2002).

63. Any party that allows its CPR to fall below required limits without taking prompt corrective measures risks finding itself before the Enforcement Branch and in the meantime not being able to transfer Kyoto units.

8. Overview of the Kyoto mechanisms

The three Kyoto mechanisms enable Annex B parties to the Kyoto Protocol to meet their emissions limitation commitments for 2008 to 2012 at lower cost. Projects under the CDM also contribute to the sustainable development of the non-Annex B host parties. At present only the CDM is operational; joint implementation and international emissions trading will begin operation after the protocol enters into force. Table 3 provides an overview of the Kyoto mechanisms.

Table 3. Overview of the Kyoto mechanisms

	Project mechanisms		Non-project mechanisms
	Joint implementation	Clean Development Mechanism	Emissions trading
Parties (subject to eligibility criteria)	Annex B–Annex B	Non-Annex B–Annex B	Annex B–Annex B
Authorized legal entities (dependent on party eligibility)	Yes	Yes	Yes
Kyoto unit	Emission reduction units (ERUs)	Certified emission reductions (CERs) Temporary CER (tCER) and long-term CER (lCER) from afforestation and reforestation projects	All Kyoto units including (AAUs), (RMUs), ERUs, CERs, tCERs, and lCERs.
Unit fungibility	Yes	Yes	Yes
Unit use restrictions	Refrain from using ERUs from nuclear facilities	CERs from afforestation and reforestation not to exceed 1 percent of Annex B users' assigned amount. Annex B parties are to refrain from using CERs from nuclear facilities	No restrictions
Unit carry over	Yes, up to 2.5 percent of a party's assigned amount	Yes, up to 2.5 percent of a party's assigned amount	Yes, without restriction
Unit availability	From 2008 to 2012	From 2000	From 2008 to 2012
Coverage of activities	All Kyoto eligible sources and LULUCF[a] activities	All Kyoto eligible sources. Sinks limited to afforestation/reforestation	Not applicable
Responsible institutions	COP/MOP, Article 6 Supervisory Committee, accredited independent entities	COP and COP/MOP, CDM Executive Board, designated operational entities	COP/MOP, national registries, transaction log
Administrative support	Climate Change Secretariat	Climate Change Secretariat	Climate Change Secretariat
Administrative costs	Borne by the participants	Borne by the participants	No specific provisions

Source: Adapted from Wollansky and Freidrich 2003.

[a]Land use, land-use change, and forestry in reference to net removal by sinks under Article 3.3 and 3.4 of the Kyoto Protocol.

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Special Feature on the Kyoto Protocol

CDM Incentives in Industrialized Countries—The Long and Winding Road

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Industrialized countries have been astonishingly slow in providing incentives for their private sectors to invest in Clean Development Mechanism (CDM) projects or to buy certified emission reductions (CERs). On the other hand, capacity-building initiatives have been promoted extensively and have used almost 10 percent of the total funds invested in the CDM. With the introduction of the linking directive, the European Union could open a window of opportunity to kick-start private sector participation. This would require stronger national allocation plans than are currently being considered.

Keywords: Clean Development Mechanism (CDM), Incentives, Capacity building, Private sector.

1. Introduction

Seven years have passed since the Clean Development Mechanism (CDM) was agreed on at the Third Session of the Conference of the Parties to the UN Framework Convention on Climate Change (COP 3) in Kyoto and only recently have the first CDM projects been registered. Only now, the first link of the CDM and a mandatory domestic climate policy instrument, the European Union Emissions Trading Scheme (EUETS), has been passed into law. We are halfway between Kyoto and the end of the first commitment period (2012), and only now are the building blocks being put in place. So our activities must be accelerated considerably if the CDM is to fulfill its dual aim of providing cost-efficient emissions reduction and sustainable development. This paper assesses the history of industrialized country initiatives to spur the CDM and looks at governments and companies as major players. The different vehicles being used will be addressed and the overall volume of incentives quantified. While the principle of linking domestic climate policy instruments with the CDM is simple and was suggested even before the Kyoto conference (Michaelowa 1996), its implementation has taken a long time. Like the proverbial ostrich, many people stuck their heads in the sand and thought that the CDM would materialize on its own.

2. The lack of incentives in the AIJ pilot phase

The pilot phase of activities implemented jointly (AIJ) that started in 1995 tried to test the principle of transboundary project cooperation on greenhouse gas reduction, but it lacked a key element—the emissions credit. Therefore neither companies nor countries were interested in investing large amounts

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of money. The only exceptions were the Netherlands, Norway, Sweden, and Switzerland, which to date have spent 36, 6, 28, and 6 million euros (€), respectively, on their AIJ programs.[1] These countries learned important lessons, and the Netherlands laid a decisive cornerstone for the development of the CDM with a number of initiatives (Michaelowa 2002).

3. Capacity building as a prerequisite of sourcing CDM supply

When the CDM was agreed at Kyoto, many people were unsure what it actually signified. It took over a year to generate a preliminary common understanding, but obvious differences persisted until the Marrakesh Accords were agreed at COP 7.[2]

3.1. National Strategy Study Program

In 1997, Switzerland agreed to provide seed funding to the World Bank to set up a program of country studies on the Kyoto mechanisms called the National Strategy Studies (NSS) Program. Australia, Austria, Canada, Finland, and Italy joined later. This program, which formally ended in 2004 and spent almost €6 million (World Bank 2004a), proved to be the catalyst needed for many countries to embark on their own CDM program and thus considerably influenced the current CDM supply structure. Each national strategy study (NSS) was geared to produce an estimate of the CDM potential of the specific country studied with the following elements:

- a description of the CDM
- an estimate of demand and supply on the international greenhouse gas market
- an estimate of costs and scope of greenhouse gas abatement options in the host country
- institutional requirements for the CDM
- a description of a project pipeline, i.e. a list of potential CDM projects

The way the program worked, one Annex B country would completely finance a national strategy study of a particular country;[3] the World Bank played a relatively limited role in financing but asserted an important one when it came to the content of the study. Each NSS had a common structure that started with a general model-based world market assessment, continued with a model-based assessment of supply, described the institutional challenges for the CDM in the country, and ended with a project pipeline, i.e. a list of potential CDM projects. While the modeling chapters were initially useful for generating a rough idea about the overall market, they later degenerated into runs of a model provided by a Swiss consultant named Dr. Jürg M. Grütter that gave little added value but swallowed up a lot of resources.[4]

In the NSS Program, the World Bank also promoted its own agenda, particularly concerning the development of a project pipeline for its Prototype Carbon Fund (PCF). This role sometimes led to

1. All original US dollar values were converted into euros by dividing by 1.2.
2. COP 7 took place in Marrakesh, Morocco, October 29 to November 9, 2001, and resulted in the Marrakesh Accords, a 245-page compilation of rules and procedures that pave the way for ratification and entry into force of the Kyoto Protocol.
3. The Annex B countries are the emissions-capped industrialized countries and economies in transition listed in Annex B of the Kyoto Protocol.
4. The CERT model is available at http://adminsrv.admin.ch/swissaij/home_whatsNew_CERT.htm.

conflict with the financing country and to long delays in the publication of studies. This is why Germany made its financial contributions on condition that it would retain control over the content and could decide unilaterally when a report was fit for publication.

In each NSS, a team of host country consultants would be put in charge of writing the report, while consultants from the Annex B country financing the study would provide support. Often, however, the consultants from the Annex B countries played a major role that, of course, limited the degree of capacity building. They also took the major share of the available funding so that, essentially, the NSS program built the capacity of Annex B country consultants at least as much as the capacity of the host country consultants.

Usually, an NSS took 18 months to be completed, but in some cases they dragged on for as long as three years. The main reasons cited for these delays were insufficient project ownership of the host country, conflicts over the allocation of financial resources, lack of competence, and slow allocation of experts by the Annex B consultancy. An instructive case is Indonesia, which had decided to separate its NSS into an energy and a forestry part. The former was financed by Germany, the latter by Australia. While initially both parts were to be started in early 2000 and published jointly, it became quickly clear that the Australian part would have difficulties. Eventually, the German NSS was published in September 2001 and the Australian one more than two years later.

By the time the NSS Program was wrapped up, seventeen national strategy studies had been completed in 16 CDM host countries (see table 1). Ten were supported by Switzerland, three each by Australia and Germany, and one each by Austria, Canada, and Italy. Interestingly, smaller countries were quicker in negotiating NSS terms with the World Bank, while larger host countries were sometimes skeptical and took a long time in negotiations. A prime example is India, which only started its NSS in 2003.

One particularly useful element of the NSS Program was the series of workshops held in Switzerland in 2000 and 2002, where representatives of different NSS countries met to exchange experiences.

Table 1. Host and financing countries that have completed national strategy studies

Year	Host country (financing country)
1998	Argentina (CAN)
1999	Uzbekistan (CH)
2000	Colombia (CH), Kazakhstan (AT)
2001	Bolivia (CH), Indonesia – Energy (D), South Africa (CH), Zimbabwe (CH)
2002	Egypt (CH), Thailand (AU)
2003	Chile (D), Indonesia – LULUCF (AU), Peru (CH), Uruguay (CH)
2004	China (CH, D, IT), India (CH), Vietnam (AU)

Note: Austria (AT), Australia (AU), Canada (CAN), Switzerland (CH), Germany (D), Italy (IT).

3.2. Country programs

As it became clear that the NSS Program could not cover all capacity-building needs, a number of United Nations (UN) agencies and Annex B countries embarked on specifically targeted programs (table 2).

Table 2. CDM awareness-building programs

Agency	Program name	Budget (millions of euros)[a]	Duration	Host country	Comments
		UN agencies			
United Nations Council for Trade and Development (UNCTAD)	Carbon Market E-Learning Center	n.a.	2001–ongoing	Not specified	Online, fee-based training course on the CDM. Dubious quality and semi-commercial character.
United Nations Development Programme (UNDP)	Climatic Change in Maghreb Region	~ 0.3 for CDM part	1999–2002	Algeria Morocco Tunisia	Workshops, development of project pipeline
United Nations Environmental Programme (UNEP)	Diverse	0.8	2002–2003	Latin America	Workshops
United Nations Industrial Development Organization (UNIDO)	Concept for Developing National Capacity to Implement the Industrial Clean Development Mechanism Project in Africa	~2.0	1998–2001	Congo Ghana Kenya Nigeria Senegal Tanzania Zambia Zimbabwe	Evaluation of CDM potential in industrial sector
UNIDO	Capacity Mobilization to Enable Industrial Projects under the CDM in Nigeria	~0.2	2000–2004	Nigeria	Evaluation of CDM potential in industrial sector
UNIDO	Capacity Mobilization to Enable Industrial Projects under the Clean Development Mechanism	~0.6	2001–2002	Indonesia Malaysia Philippines Thailand Vietnam	Evaluation of CDM potential in industrial sector
UNDP, UNCTAD, UNIDO, UN Framework Convention on Climate Change, World Business Council for Sustainable Development	Engaging the Private Sector in the Clean Development Mechanism	1.3	2000–2002	Brazil South Africa	CDM investment guides

Table 2—*Continued*

Agency	Program name	Budget (millions of euros)[a]	Duration	Host country	Comments
Multinational agencies					
Asian Development Bank	Opportunities for the Clean Development Mechanism in the Energy Sector	0.6	2002–2003	China	CDM guide, project identification note (PIN)
Compania Andina de Fomento	Diverse	0.5	2000–2003	Latin America	Workshops
EC ASEAN Energy Facility	CDM-ASEAN	0.4	2003–2005	ASEAN	Two regional workshops, background papers
EU Commission	Start-up CDM in ACP Countries (SUSAC)	1.2	2000–2002	South Africa Senegal Zambia	Workshops, small strategy studies, development of sustainability criteria
EU Commission	Methodologies for the Implementation of the Kyoto Flexible Mechanisms - CDM	0.3	2003	Latin America	Not specified
EU Synergy Program	Planning and Strategies for the Implementation of Clean Development Mechanism of the Kyoto Protocol in Latin America (PLANER)	1.1	2001–2003	Belize Costa Rica Guatemala Honduras Nicaragua Panama Ecuador Peru Colombia	Workshops, guidebook, eligibility criteria
EU Synergy Program	Analysis of Viability of the Clean Development Mechanism in the Mediterranean Area (AVINMAR)	0.6	2001–2002	Lebanon Morocco Palestine Tunisia Turkey	Workshops, project design document (PDD) support
EU Synergy Program	Clean Development Mechanism Capacity Building amongst the Private Sector in Africa (CAPSSA)	0.9	2002–2003	South Africa Senegal Zambia	Workshops, small strategy studies, development of sustainability criteria
EU Synergy Program	EU–China Partnership in CDM Implementation	0.5	2003–2004	China	Workshops
EU Synergy Program	Business Opportunities for CDM Project Development in the Mediterranean	0.5	2003–2005	Mediterranean	Workshops, PDD development

Table 2—*Continued*

Agency	Program name	Budget (millions of euros)[a]	Duration	Host country	Comments
EU Synergy Program	Innovative Risk Coverage and Financing of Projects Related to the Implementation of CDM Projects Focusing on India and Morocco (IRIS)	0.4	2003–2004	India Morocco	Workshops
EU 5th Framework Program	Scenarios and Strategies for the Implementation of the CDM of the Kyoto Protocol in the Mediterranean Region (CDMED)	0.4	2000–2001	Mediterranean	Scenarios, pre-feasibility study for wind project in Egypt, user guide
EU 5th Framework Program	Promoting and Financing CDM Renewable Energy Projects in the Mediterranean Region (CDMEDI)	0.1	2002–2003	Mediterranean	User guide, workshops
European Bank for Reconstruction and Development	Bankable CDM Projects in the Caucasus/Central Asia	n.a.	2004–2006	Caucasus Central Asia	PDD support
World Bank	PCF Plus	0.7	2000–2003	Latin America	Workshops, PINs
National agencies					
Canadian International Development Agency (CIDA)	Diverse	n.a. but substantial	2000–2004	Argentina China India	Workshops, manuals, preparation of PINs and PDDs
Danish Development Co-operation (DANIDA)	CDM Programme	~0.8	2003–2004	Thailand South Africa	PDD support
German Development Co-operation (GTZ)	Climate Protection Program (CAPP)	1.5	2003–2006	India	Training courses, designated national authority (DNA) staff support, support of PDDs
Institute for Global Environmental Strategies (Japan)	Integrated Capacity Strengthening (ICS)	~4.0	2003–2006	Cambodia India Indonesia Philippines	Well-funded program aimed at expanding to other countries. Workshops outside the capital organized by different organizations. Focus on waste management, renewable energy, and small-scale projects.
UK		~0.5	2003–2004	India	Workshops

Table 2—*Continued*

Agency	Program name	Budget (millions of euros)[a]	Duration	Host country	Comments
UK	CDM Centres of Excellence	0.1	2004	India, South Africa	
USAID		~1.0	1998–2000	India	Workshops and US study tour with industry leaders
USAID	Diverse	0.8	2000–2003	Latin America	Workshops and baseline methodologies
Total budgeted by all programs		~23.0			

Sources: Project documentation, government sources, personal communications from project participants, and own estimates

[a]€1 = US$1.2

In early 2004, Canada started a novel type of collaboration with broker Natsource to support project design document (PDD) development in India. It made a budget of 0.3 million Canadian dollars (0.2 million euros) available in the form of interest-free loans to be forgiven if the certified emissions reduction (CERs) credits generated by the projects are sold to Canadian buyers. The Energy and Resources Institute (TERI), a renowned Indian research institute, is supporting the developers in answering PDD-related questions.

A common feature of all these programs was the writing of studies and holding general CDM workshops. The most effective of these programs was the United States' (US) effort in India. It involved the secondment of two US experts to TERI who focused on India's industry associations, with which they did several CDM workshops. The apex of that program was the sending of a delegation of some 50 chief executive officers from Indian companies to Washington, DC, which was received by Vice President Al Gore at the White House. Afterwards, awareness of the CDM among Indian businesspeople was extremely high and it was instrumental in changing the negative attitude of the Indian bureaucracy towards the CDM. The only flaw was that the US program had spread the impression that CDM revenues would amount to billions of dollars that could be easily reaped. For the donors arriving in India after the signing of the Marrakesh Accords, this impression did not facilitate their work.

At the other end of the effectiveness scale were the efforts of the United Nations Industrial Development Organization (UNIDO). A lot of money was spent on studying CDM potential in the industrial sector in Africa and in countries belonging to the Association of Southeast Asian Nations (ASEAN) but without any follow-up. In Indonesia, the study was written by a notoriously unreliable consultant from the local coal industry.

After the Marrakesh Accords had been agreed and it became clear that many countries had problems in setting up their own designated national authorities (DNAs), the focus of donor activities shifted. From 2002 onwards, several focused on DNA building (see table 3).

The institution-building programs show that host country ministries often feel that the CDM could bring them new possibilities for collecting rents from the private sector. Therefore, inter-ministerial conflicts often arise over who will be in charge of the DNA and from whose desk(s) project proposals will be approved (Varming 2003). In this context, it is key that the local consultants helping in these processes understand the political games and manage things to minimize the possibilities for rent seeking. The German program in Indonesia benefited from just such a well-connected consultant; still it took more than a year to get the formal decision made about the setup of the DNA.

Table 3. CDM institution-building programs

Agency	Program name	Budget (millions of euros)[a]	Duration	Host country	Comments
UN agencies					
UNDP (UN Foundation, Italy, Norway)	Capacity Building for the Clean Development Mechanism in China	1.2	2003–2006	China	Institutions, development of three projects
UNDP/UNEP	RAB	~0.8	2003–2004	Morocco	Follow-up of earlier program, now centered on making approved DNA fully operational.
UNEP	CD4CDM	8.0	2002–2005	• North Africa and Middle East (Egypt, Jordan, Morocco) • Sub-Saharan Africa (Côte d'Ivoire, Mozambique, Uganda) • Asia (Cambodia, Philippines, Vietnam) • Latin America (Bolivia, Ecuador, Guatemala)	Largest CDM institution-building program to date. Intense preparation of stakeholders on national and regional levels.
Multinational agencies					
EU Commission	Establishing the Institutional Capacity to Enable Small Scale CDM Projects in India	0.3	2003	India	
EU Commission	Building-up the Structures for Commercializing Renewable Energy in China through Policy Advice, Capacity Building and Identification of CDM Funds Availability for such Projects	0.3	2003	China	Linking different stakeholders
World Bank	CF Assist	n.a.	2003–	Not specified	Training modules for establishing DNAs, book on legal issues.

Table 3—*Continued*

Agency	Program name	Budget (millions of euros)[a]	Duration	Host country	Comments
National agencies					
DANIDA	n.a.	~0.5	2003	Malaysia	Support for the Energy Secretariat of the DNA
GTZ	CAPP	~0.6	2002–2006	Indonesia Mongolia Tunisia	Local consultant works with ministries and other stakeholders until a DNA is agreed.
Total budgeted by all programs		~12.0			

Source: Project documentation, government documentation, personal communications from project participants, and estimates.

[a]€1 = US$1.2

Many host countries do not understand the long-term institutional commitment necessary to develop a consistent CDM strategy. They hope that donor funds will pay for the operational costs of the DNA. Only rarely do they try to assess the level of costs involved. In Indonesia, the German program stressed the need for a calculation of the DNA budget, which came to US$180,000 per year, and suggested a fee of 0.5 percent of expected CERs be levied from project proponents.

4. Funds

Engaging in the CDM is a risky business, as not only conventional project risks exist but also novel, emission reduction-related ones. Therefore, right from the start of the CDM, attempts were made to diversify project risks, and a number of funds have been created (see table 4).

4.1. The Prototype Carbon Fund and its successors at the World Bank

The World Bank planned to set up a fund for governments and private companies right after the adoption of the Kyoto Protocol. The Prototype Carbon Fund (PCF) was announced in 1998, formally set up in 1999, and closed for subscription by investors in 2000. So far, six governments and 17 companies have subscribed. The initial PCF volume of $145 million was raised to $180 million by increasing the shares of some of its participants (World Bank 2004b). By developing a procedure that builds on the sequence of Project Identification Note (PIN) → Project Concept Note (PCN) → Project Design Document (PDD) → Term Sheet → Emission Reduction Purchase Agreement (ERPA), the PCF became the model for most other CDM programs. It was instrumental in developing baseline methodologies and became a model for its transparency.

While the World Bank had initially stated that it would leave the carbon market once the private sector had really embraced it, the bank has entrenched itself with the creation of several new instruments. To promote small-scale projects with development benefits, it set up the Community Development Carbon Fund (CDCF), currently subscribed with $50 million and having four government and ten private sector subscribers (World Bank 2004b).[5] One initiative that has raised eyebrows in the community of non-governmental organizations (NGOs) is the BioCarbon Fund ($30–50 million) that concentrates on carbon sink projects, including project types that are not eligible for the CDM under the current rules. On behalf of governments, the bank administers the Netherlands CDM Facility ($120–160 million), which is to buy 21 million CERs. An option on 11 million CERs has also been concluded. The Italian Carbon Fund shall contain $15 million to $80 million, and rumors persist that a Spanish Carbon Fund will see the light soon.

Table 4. List of CDM funds

Agency	Name	Target fund volume (millions of euros)[a]	Fund volume firmly committed as of early 2004	Funds committed to ERPAs as of early 2004
World Bank	PCF	150	150	140
World Bank	CDCF	100	30	—
World Bank	BioCF	40	25	—
World Bank	Netherlands CF	130	100	n.a.
World Bank	Italian CF	80	15	—
DBJ/JBIC		45	0	—
Govt. of Denmark	Danish CF	n.a.	7	—
KfW		50	8	—
Total		580	335	140

Source: World Bank 2004b, Sinha 2004, KfW 2003.
[a] €1 = US$1.2

4.2. Funds administered by government banks for public and private clients

Two CDM funds were planned in Japan for the 2003 fiscal year, but by spring 2004 it was announced that they would be merged into one. The Japanese Bank of Industrial Cooperation (JBIC) fund, under the Ministry of Foreign Affairs' supervision, aimed to get €24 million from the private sector and €4 million in government money. The Development Bank of Japan (DBJ) aimed for €21 million (PointCarbon 2003).

Denmark has recently asked Ecosecurities and Standard Bank London to administer a Danish Carbon Fund financed initially with €7 million. The fund does not finance carbon sink projects. The German bank for reconstruction and development, Kreditanstalt für Wiederaufbau (KfW), opened a fund for subscription in June 2003 with a target volume of €50 million (KfW 2003).

4.3. Private funds: Teething troubles

In parallel with the World Bank, the Union Bank of Switzerland (UBS) was developing a fund. Senior management, however, stopped the preparations when they were already at a fairly advanced stage. Only now are private banks looking again into this possibility. Many vehicles are in the preparation stage—some with high-flying announcements—but it remains to be seen which ones will actually fly. In

5. All values taken from Sinha (2004).

the United Kingdom in early 2004, ICECAP, a London-based company, was launched under the sponsorship of Cumbria Energy, Investec Bank, and Less Carbon. It is a vehicle intending to purchase CERs for large industrial emitters and governments with a target level of 40 to 50 million CERs.

5. Government procurement

While the CDM was initially seen as a private sector instrument, it has increasingly become a means for governments to cover expected shortfalls in their Kyoto emissions budgets. Natsource (2003) sees government demand for the CDM and joint implementation (JI) at 84 to 762 million tonnes of carbon dioxide equivalent in 2010, which would be from 45 to 73 percent of all purchases in greenhouse gas (GHG) markets. PointCarbon (2003) calculated committed government demand at 100 million CERs. The use of procurement programs could lead to higher prices for a number of reasons (Natsource 2003, 46). They offer sellers the advantage of knowing that the prospective buyer is committed to purchasing reductions (i.e., that the government is a “captive buyer”). They may set criteria for emissions reduction projects that are supplemental to the criteria established under the CDM (e.g., achievement of additional goals such as technology transfer, location of activity types, and specific sustainable development objectives, etc.). Finally, they create additional paperwork requirements for prospective sellers. These factors are likely to lead to higher-priced offers in procurement programs than in the market, all else being equal.

5.1. The Dutch program: Path diversification

Already in 1998, the Dutch government announced in its national climate policy plan that it would use the Kyoto mechanisms to cover 50 percent of the gap between business-as-usual emissions and the Kyoto target. It started to act quickly by allocating a budget of €680 million for buying 67 million CERs (Asuka 2003). The Dutch strategy was initially built on two pillars but was diversified later. The first pillar was the PCF; the second one was a tender program, the Certified Emission Reduction Unit Procurement Tender (CERUPT), which announced its first round of proposals in 2000. The selection procedure, however, proved so cumbersome that CERUPT, which was originally estimated to deliver 17 million CERs, was stopped after the first round. The government now chooses intermediaries to source CERs. Besides asking the World Bank to develop the Netherlands CDM facility at the International Finance Corporation (IFC), it contracted the Compania Andina de Fomento (CAF) and the Rabobank to develop a project pipeline. Each of these pipelines has a target volume of 10 million CERs (Sinha 2004). Moreover, bilateral carbon purchase agreements (BCPAs) are being negotiated; the Indonesian one is aiming for 5 million CERs. Existing non-binding memoranda of understanding (MOUs) between the Netherlands and CDM host countries include Colombia (25 million CERs), Costa Rica (30 million), El Salvador (5 million), Panama (20 million), Uruguay (5 million), Bolivia (10 million), Nicaragua (5 million), Guatemala, and Honduras (no target value for the last two countries).

5.2. The followers

The CDM procurement program, under the Swedish International Climate Investment Program (SICLIP-CDM), aims to assemble a portfolio of four to six CDM projects that are geographically spread out. The call for CDM projects was issued in May 2002, and five projects with a total CER estimate of two million have been selected.

Finland launched a CDM/JI tender in 2003. CDM projects were selected from 23 eligible project proposals, of which 12 came from India. Three projects originated from “open tendering” before the CDM tender (Hämekoski and Fagerholm 2004). Austria opened its tender in 2004. In the context of the National Allocation Plans, several European Union (EU) member state governments have quantified their current needs estimates for CER and emission reduction units (ERU), and more are likely to follow (Betz et al. forthcoming).

Current budgets are clearly insufficient to cover the gaps (see table 5), and it remains to be seen whether this runs counter to the European Union Commission’s allocation guidance (Lefevere 2004). Overall, the tendency to leniently allocate allowances to industrial emitters shifts demand from the private sector to government. Government demand, however, is likely to come in large installments and relatively late, and thus will have a chilling effect on the market.

Table 5. Government CDM procurement programs

Country	Administering agency	Committed budget (millions of euros)	CER and ERU need in NAP (in millions, 2008–2012)	Gap at current prices of €4/CER (millions of CERs)
Austria	Kommunalkredit	73[a]	35	16.75
Belgium	n.a.	—	22	22
Denmark	DANIDA	130	18.5	—
Finland	Finnish Environment Institute	10	15	12.5
Ireland	n.a.	—	18.5	18.5
Italy	n.a.	—	57	57
Luxembourg	n.a.	—	15	15
Netherlands	VROM, diverse intermediaries	680	100	—
Portugal	n.a.	—	32.5	32.5
Spain	n.a.	—	100	100
Sweden	STEM	~8	0	—
EU totals			413.5	267.25

Source: National programs, Gilbert et al. 2004.
[a]Until 2007.

6. The EU linking directive: Harnessing the private sector

The European Union is a pioneer in the setting up of a domestic GHG trading scheme for its private sector.[6] In 2003, the EU Emissions Trading Directive became law. Initially, the EU Commission was skeptical concerning the integration of the Kyoto mechanisms into the trading scheme. It stated that the priority should be on implementing trading domestically. Due to pressure from emitters, the initial Commission proposal of October 2001 included the wording that the “Commission believes that the eventual inclusion of credits is desirable.” It made very clear, however, that it feared lax international rules on the CDM and JI. A separate directive would need to be developed. The Council’s position in

6. For a detailed, up-to-date history, see Lefevere (2004).

late 2002 became clearer when it stated that “credits will be recognized subject to modalities.” The final text of the emissions trading directive was very positive: “Project-based mechanisms are important to…increasing the cost-effective functioning of the Community scheme” and the “use of the mechanisms should be supplemental to domestic action.” Article 30.3 refers to “provisions adopted by EP and Council which should apply in parallel with the Community scheme from 2005,” thus making the timetable clear. Thereafter, the Commission embarked on drafting the “linking directive” at a speed rarely seen before. Its first unofficial draft, which was leaked in June 2003, contained the following features:

- the import of CERs (and ERUs) would be capped at 6 percent of allocated EU emissions permits (EU allowances)
- no CERs would be accepted before 2008
- no sinks CERs would be allowed
- hydro would be only allowed if consistent with the criteria of the World Commission on Dams

The environment directorate in the Commission thus continued in the spirit of seeing the CDM as a dangerous instrument. This is surely also due to the fact that the person drafting the directive came from an NGO background and had been fighting market mechanisms for many years.

Already within the Commission, however, voices arose that saw the CDM much more positively. Thus the official draft published in July 2003 looked very different. It discussed an import cap of 8 percent once imports surpass 6 percent of allocated EU allowances and said that hydro projects should take account of environmental and social impacts.

The Council position published in January 2004 strengthened the CDM even further. It deleted the reference to entry into force of the Kyoto Protocol, thus making the CDM independent of the fate of the protocol. This was a step of great significance. Moreover, it said that CERs should be accepted from 2005 and converted into EU allowances at 100 percent. As well, import restrictions and acceptance of sinks would be put in the competence of member states.

In an astonishing willingness to adopt the linking directive before the 2004 European Parliament elections, the EU Parliament did not ask for a reconciliation procedure but was willing to compromise on many issues. Thus it was possible to adopt the directive in parliament in late April 2004. The final text says that CERs can be used from January 2005 and that no common CER import limit will be set. Limits will be member state competence and thus are unlikely to be implemented, as no member state wants to jeopardize its competitiveness. Sinks are excluded until 2007; their inclusion for the Kyoto commitment period (2008–2012) will be reconsidered in 2006. Large hydro projects are to follow the rules of the World Commission on Dams.

The survival of the Kyoto mechanisms without the Kyoto Protocol coming into force is thus guaranteed, and the linking directive is the first large-scale incentive for private companies to participate in CDM projects. Unfortunately, the demand for CERs will be rather small, as the initial allocation of allowances under the EU scheme is likely to be generous.

7. Private sector initiatives

Japanese companies are so far the only ones that are actually investing in the CDM. In 2003, Chubu Power invested €4.3 million to acquire a 34 percent equity stake in the Thai AT Biopower project. The utility J-Power aims to both invest in CDM projects as well as to buy CERs on the market (Nakayama 2004). It has invested in the Yala rubber wood bioelectricity project in Thailand and negotiated CER purchases with six South American project developers. The Japanese activities are remarkable inasmuch that there is no domestic incentive for the private sector and that it is unlikely that an emissions trading system or carbon tax will be introduced soon.

8. Conclusion

For several years, incentives for the private sector to invest in CDM projects have been completely lacking. International institutions and governments, however, have been very active in CDM capacity-building activities, having spent over €30 million on them to date. Since 1999, the World Bank has played a catalytic role with its carbon finance program to harness project proposals. Besides the bank, only a limited number of governments have been active in investing in funds and setting up procurement programs. Out in front is the Netherlands, which has opened a series of procurement channels; they are now being followed by several other European countries. In 2002 and 2003, approximately 70 million CERs were sold (Sinha 2004); the EU governments will demand at least 250 million CERs and ERUs, but committed budgets are only likely to procure about 100 million tonnes of emission credits. In contrast to earlier announcements that it would withdraw once the market had matured, the World Bank's program is expanding and is by far the largest actor in the CDM market. Depending on the national allocation plans of the EU member states, the linking directive can harness considerable private demand for CERs.

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Special Feature on the Kyoto Protocol

The Clean Development Mechanism: Issues and Opportunities

Naoki Matsuo[a]

It is widely agreed that the Clean Development Mechanism (CDM) is a useful international instrument that encourages and reinforces the reduction of greenhouse gas emissions (GHGs), and also that it should be further promoted as a way to fill the gap in energy and GHG efficiency between industrialized and developing countries. A number of problematic issues have become apparent, however, during the past two and a half years of experience with the CDM. This paper identifies some of these and provides possible insights into their nature and possible resolution. While some technical aspects such as baseline setting are crucial and are being resolved gradually through accumulated experience, other political aspects such as the utilization of public funding need more discussion (rather than formal negotiations).[1]

Keywords: Clean Development Mechanism (CDM), Kyoto Protocol, United Nations Framework Convention on Climate Change (UNFCCC), greenhouse gase (GHG).

1. Using the Clean Development Mechanism for true collaboration between South and North

The Clean Development Mechanism (CDM) may open the door to global partnerships to mitigate climate change by providing concrete examples of win-win type solutions.

In the negotiations of the Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC), we still observe a wide gap between South and North. This is based on the developing countries' concern about unfairness, historical contributions to global warming, emissions limits on developing countries, and the attitude of developed countries (such as that of the United States' Bush administration).

In addition, there is concern about negotiation tactics. In order to overcome such formal/strategic behavior, we need some "proven" experiences that show, first, that climate change mitigation represents opportunities, not costs; and that collaboration between South and North promotes sustainable development.

In the Kyoto Protocol negotiation process, the countries with economies in transition witnessed that East Germany obtained real benefits by merging with West Germany, and the Latin American countries recognized that a credit-transfer mechanism is beneficial for them based on experience with the US

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1. This paper is based on presentations made at the Asia-Pacific Seminar, at Miyazaki, 2003, and the Asia-Europe Environment Forum at Jeju Island, 2004.

Initiative on Joint Implementation (USIJI)/activities implemented jointly (AIJ).[2] The CDM may play this kind of role, filling the gap between South and North by showing the real benefits through collaboration on climate mitigation measures enhanced by market mechanisms.

The roots of the CDM can be traced to the concept of joint implementation (JI), first outlined in the text of the UNFCCC. A later proposal by the United States to institutionalize JI in the Kyoto Protocol—which was rejected by the developing countries during negotiations (although it would have functioned much the same as the CDM)—surfaced again in the Brazilian proposal of a Clean Development Fund (CDF) just prior to COP 3 (where the protocol was agreed). The end result, the Clean Development Mechanism, may prove to be the instrument that was needed to bridge the gap between South and North—one initiated by the developing world—as well as for satisfying the interests of developed countries (Matsuo 2004).

Selection of a less energy-intensive economic development pattern is the critical element needed by developing countries from the perspective of energy cost-saving, energy security, and protecting their local environment, as well as mitigating the effects of climate change. In most cases, climate change mitigation measures represent not costs but opportunities. The challenge that we currently face is how to maximize this desirable aspect of climate mitigation, especially in developing countries.

In addition, the CDM may open the gate for negotiation of future commitments, not only under the Kyoto Protocol but also under other amendments to the UNFCCC.

2. The history of the CDM

At COP 7 in Marrakesh in 2001, the CDM Executive Board—the supervisory body of the CDM—was established. It subsequently established three panels in the beginning of 2002: the Accreditation Panel, the Small-Scale CDM Panel, and the Methodology Panel.

As of September 2004, four operational entities (third-party bodies to validate projects and verify/certify emission reductions) have been accredited. Simplified procedures and a list of indicative methodologies have been prepared (for small-scale CDM projects). More than ten methodologies have been approved (on baseline setting and monitoring). The methodology approval process has been delayed longer than expected, but the consolidation of methodologies, which was just started by the Methodology Panel, may speed up this process.

No project has been registered yet under the CDM. The first likely ones may be two HFC 23 decomposition projects in India and Korea (photo 1),[3] which are expected to be registered in October and November, and the first certified emissions reduction (CER) credits should be issued as well within 2004 or early 2005.

Around 60 countries have established their designated national authorities (DNAs), as required under the protocol, for preparing/promoting CDM projects as hosts or investors.

2. In the negotiations at COP 1, the Parties could not agree on the criteria of joint implementation, but they did agree on starting on AIJ as the pilot phase of joint implementation. The USIJI is an AIJ project initiative and many projects have been implemented under it, especially in Latin American countries.

3. HFC 23 is a type of hydrofluorocarbon with a very high global warming potential (GWP) of more than 10,000.

The CER market has been growing rapidly (almost doubling each year) prior to their actual issuance (under forward transactions).

Presently, the typical emissions reduction size of proposed CDM projects is on the order of 10,000 tonnes of carbon dioxide (tCO_2) equivalent per annum, far from the anticipated needs of some of the Annex I (industrialized) countries such as Japan, which may need to purchase more than 10 percent of its annual emissions (120 million tCO_2 equivalent per year) from abroad. On the other hand, projects with several million tonnes of reductions or more remain waiting in the wings. Some of them may appear in a couple of years.

Out of all countries of the world, China has the most potential for utilizing the CDM. As it just released its provisional CDM policy on June 24, 2004, it may take several months for it to become clear how this policy and related procedures will be implemented.

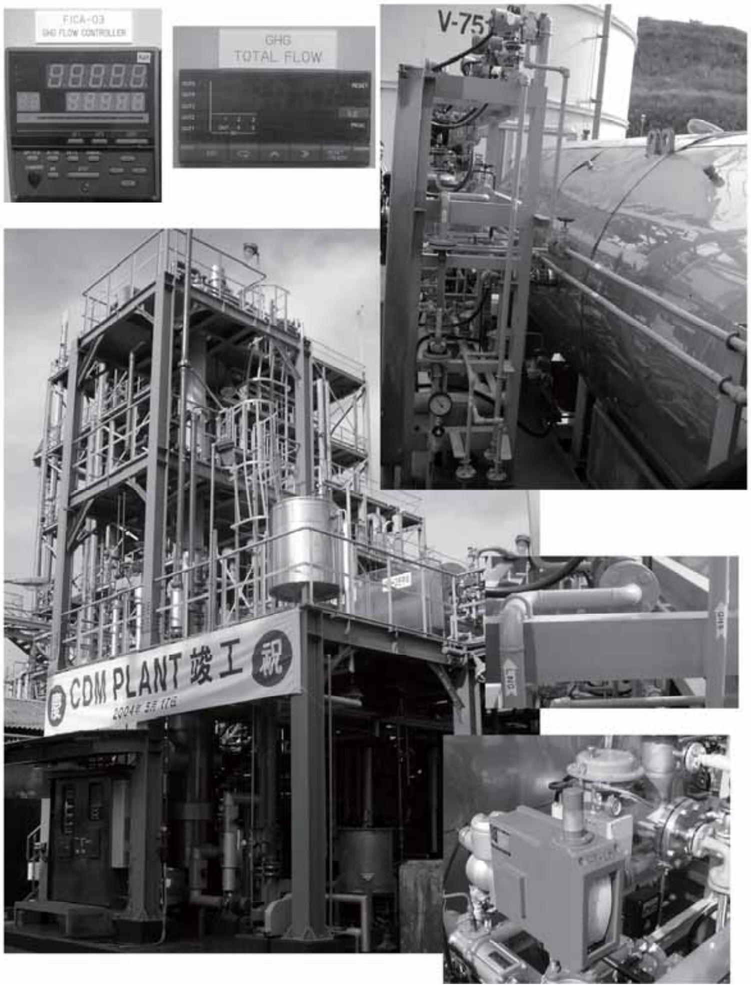

Photo 1. The HFC 23 decomposition project in Ulsan, Korea, likely to be one of the first CDM projects in the world

3. Issue mapping

The CDM framework has been developing steadily and is going into operation, albeit more slowly than initially expected.

Through experience in the processes to date, obstacles have become apparent in some of the following areas. They need to be overcome in order to further develop the CDM framework so it operates more smoothly and effectively (some of these obstacles will be explored in the following sections):

- Project design document development (especially drafting baseline methodology)
- Secondary transfer of CER credits to non-participants
- The market value of CER credits
- Establishing a designated national authority (DNA) in host countries
- Domestic incentives in investing countries
- Project selection
- Project financing (carbon financing)
- Sustainability (especially in utilization of public funding)
- Matching needs and seeds

3.1. PDD methodology, additionality, and baseline setting

The design of a project design document (PDD) is a critical part of the process to have a project recognized as a CDM project, but considerable technical expertise is needed to draft the documentation, especially in setting the emissions baseline (see figure1). The baseline scenario is the one that would have occurred if the project were not registered under the CDM.[4] The emissions reduction (i.e., the CERs claimed) is defined as the difference between the baseline emissions and a project's emissions, but identifying a baseline scenario is difficult because it is counterfactual and will never occur.

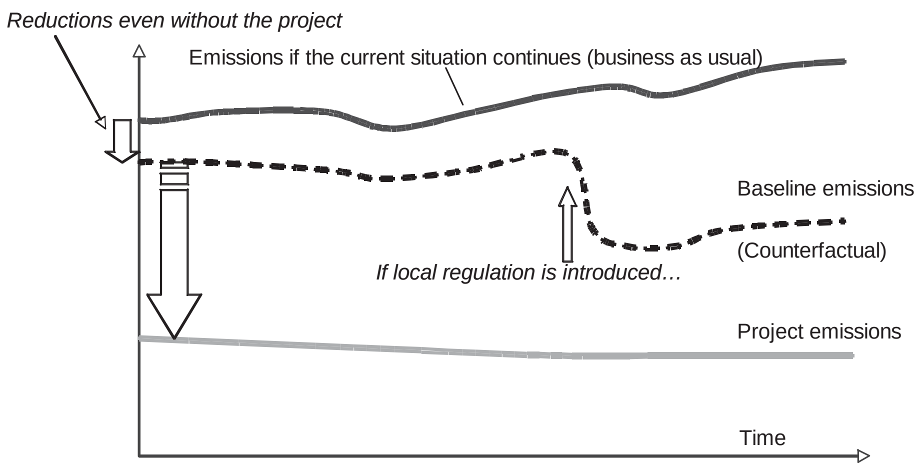

Figure 1. Illustration of the baseline concept

4. In other words, the baseline scenario is what would have occurred if the revenue of CERs is zero for private sector projects.

The process of identifying the baseline scenario involves two steps in the CDM framework: (1) development of a methodology, to be approved by the Methodology Panel/CDM Executive Board (EB), and (2) application of the methodology to the specific project, validated by an operational entity (OE) (figure 2).

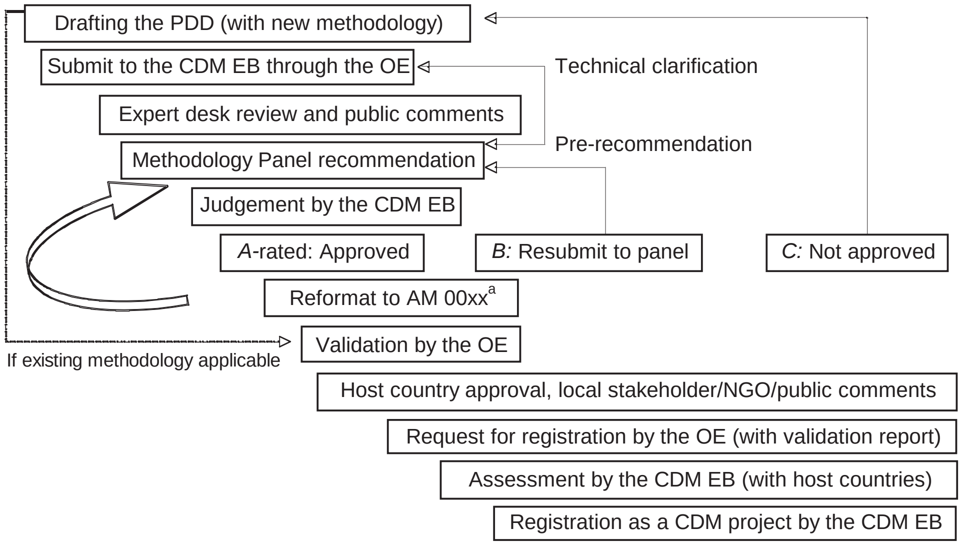

Figure 2. Procedures involved prior to registration of a CDM project

[a]AM 00xx is the serial number attached to the approved methodology.

In many cases, it takes expertise and time to prepare a new methodology for approval.[5] The methodology is the "logic" with "procedures," while its application needs "evidence" specific to the project. The methodology consists of the following:

1. identification of the baseline scenario,
2. representation of the baseline scenario by mathematical formula using measurable parameters, and
3. monitoring the methodology of such measurable parameters (in the project scenario).

The first item (identification of the baseline scenario) is especially difficult. In some cases, the meaning of "additionality" is confused with baseline scenario identification. With the concept of additionality it is assumed that that the project would NOT be implemented if were not registered as a CDM project. But when discussing additionality, there is no mention what kind of scenario would be realized if the project were not a CDM project. The identification of a baseline scenario is a broader concept than additionality.

The amount of credits generated by a project (which equals GHG emission reductions) depends very much not only on whether or how much time it takes to be registered as a CDM project but also how the

5. If an existing approved methodology can be applied to the project, this step can be skipped. For example, in the case where an investor is planning to implement similar projects in several non-Annex I countries, a new methodology may be developed for the first project (and get approved) and then be applied to the rest.

baseline is set. For example, if the baseline is set conservatively (i.e., lower), it may lose a few dozen percentage points worth of CER credits. In other words, if the project developer can develop a more reasonable (more certain) baseline, the project can generate more CERs than less reasonable (conservative) ones.

The approved methodologies for baseline setting are to be consolidated for cases of grid-connected renewables and landfill gas capture. While it is uncertain how this approach will operate, it may speed up the process. On the other hand, some of the approved methodologies are not of good quality, so we hope that consolidation is not the default method but a minimum requirement for the development of better methodologies.

3.2. Can non-Annex I countries sell CERs?

In the Marrakesh Accords, it is not explicitly mentioned whether a non-Annex I (developing) country or a company in that country can sell CERs to non-participants of the project.

Simply speaking, such secondary transfers might be regarded as transfers under emissions trading, but emissions trading under Article 17 of the Kyoto Protocol is only allowed between emissions-capped developed countries.

On the other hand, a non-Annex I country can hold CER credits in its account in the CDM Registry, as specified in the Marrakesh Accords. Therefore, some people have the view that such transfers should be possible. This issue is linked to whether or not so-called unilateral and/or South-South CDM projects should be possible.

At this moment, it is risky for a non-Annex I partner to acquire CER credits directly. It would be safer to obtain the associated funds instead from the perspective of hedging against risks.

This issue will probably have to go to the highest decision-making body, the COP/MOP, as it is beyond the responsibility of the CDM Executive Board.[6] It may take several years, however, to reach consensus in international negotiations.

3.3. Market value of CER credits

Once issued, any CER credit may have the same/common market value (dependent on time only),[7] but this depends (under forward transactions) on many aspects of the project, including, for example, the status of methodology used in the project, its possibility of success (proven), the experience of the participants with technology and CDM processes, etc., and the possibility of unexpected/unforced failure.

Good collaboration between the host country and investors is a must not only at the company level but also at the country level for credible delivery of CER credits to the market (with higher revenue).

6. COP = the Conference of the Parties. MOP = the Meeting of the Parties. The existing COP will serve as the MOP once the Kyoto Protocol enters into force.
7. Under the Kyoto Protocol, CERs as well as other GHG units may have similar market values after 2008, except for those involving reforestation/afforestation CDM projects—called temporary CERs (tCERs) or long-term CERs (lCERs)—which may have much lower value due to their limited lifetime.

From 2005, the European Union is going to launch its Emissions Trading Scheme (EU ETS) among 25 Member States. The so-called Linking Directive ensures the fungibility of CER credits in the EU allowance market. As the EU allowance price will be determined by the demand/supply relations under the EU ETS, CER prices are expected to be linked to the stringency of the GHG emissions reduction targets for European companies until 2008.

From 2008 (if the Kyoto Protocol enters into force), the market will be enlarged to include all Annex I Parties (which will have ratified the protocol and therefore be eligible for participating in the Kyoto mechanisms), including the EU market.

3.4. Project selection and financing

In designing a CDM project, the inclusion of components that reduce non-CO_2 gases is a technique that can be used to make the project more profitable and make it easier to demonstrate its additionality. Recently, for example, projects using biomass-related residue, resulting in the reduction of methane (CH_4) emissions, are recognized as a promising type of CDM project.[8]

Renewable energies are another promising type of project, while the energy-saving type is more difficult; however, the number of projects involving energy-saving and fuel-switching is increasing as experience (to demonstrate additionality) accumulates.

Another approach is to attach the CDM component of a project to an existing, ongoing, or planned ordinary (non-CDM) project. For example, an independent power producer may increase its energy efficiency or switch fuel from coal to natural gas if CER revenues are expected. In this case, the underlying project can be of any type, e.g., a project funded by official development assistance (ODA) and/or a profitable project. In this case, the baseline scenario is straightforward and risks specific to the CDM are relatively limited.

A barrier is found in the fact that carbon-related financing is not well known among those in the financial sector, not only in developing countries but also in developed countries. In order to promote CDM projects, banks or other players in the financial sector are needed that are familiar ways to design the structure of project financing, including approaches to take the new carbon value into account, in addition to the usual monetary value.

3.5. Utilizing public funding

It was decided in the Marrakesh Accords that public funding of CDM projects should not result in the diversion of ODA funding.[9] This decision does not prohibit the use of ODA, but rather, was meant to emphasize the importance of discussion on how to utilize public funds within the CDM framework between countries concerned.

8. Under anaerobic conditions, biomass (e.g., municipal waste, cattle manure, wastewater from a biomass-related factory) is degraded to methane, which has GWP of 21. For biomass and other types of CDM projects, utilization of “waste” (and demonstration of why it is regarded as waste) is crucial.

9. The Marrakesh Accords do not explicitly specify who is to decide the eligibility criteria for using ODA for a project. The investor side is responsible for demonstrating this in the PDD (Annex 2), while only the host country of the project may make this judgement at the approval level.

As the Parties to be regulated under the Kyoto Protocol are the Annex I countries themselves, it is not out of place to utilize public funds to acquire CERs in order to comply with the quantified commitments.

Moreover, the use of public funds is a good way to support sustainable development aspects in the developing countries so as to correct regional imbalances, because the privately funded projects will be located based on economic efficiency.

Utilizing public funding, including ODA and other official flows, (OOF) is a challenging task. Hopefully, considering its political nature, the developing countries will initiate the discussion on how to utilize such public funding. Some new business models may be needed to help disseminate methods of utilizing public funds in the CDM arena.

4. Conclusion: Collaboration is the key

As discussed here, the CDM is still in its developing stages and some issues remain to be addressed, but one can see that almost all countries recognize the CDM as a useful tool. This means that even if the Russian Federation does not ratify the Kyoto Protocol,[10] the CDM will not be discarded and will continue to be used, and it is sure to be used in the next framework agreement following Kyoto.

At least in Europe, CER credits may retain their economic value as a fungible commodity in the EU allowance market, as the European Union decided to stay with the EU Emissions Trading Scheme regardless of whether or not the protocol enters into force.

As for technical aspects such as baseline setting, considerable experience has been accumulated so far, while some political aspects still need to be resolved, through collaboration between South and North (e.g., in the host country approval process of projects and/or discussions, rather than negotiations, on utilizing public funds).

The CDM is a market-based mechanism, and it offers participants the potential for win-win activities. Having said this, negotiations on profit sharing (both financial and in terms of credits) are still needed between project participants. Views may differ on how, or whether, government should have a say on this profit sharing. If the host government sets a high barrier for investors in its approval process (e.g., on the profit sharing issue), it may lose many opportunities because of the competitive nature of the CDM. Over time, experience will reveal the best approaches.

As South and North share two common goals—mitigating climate change and promoting sustainable development—there is a strong incentive on both sides to find solutions, and accumulate more experience through collaborative efforts.

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10. On September 30, 2004, the Russian Government (Cabinet) agreed to submit the Kyoto Protocol to the lower house of parliament (the Duma) for ratification.

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Special Feature on the Kyoto Protocol

The UK Emissions Trading Scheme: Paying the Polluter—A Policy Experiment

Peter J. G. Pearson[a]

This paper examines the existing voluntary UK Emissions Trading Scheme (UKETS), which represents effectively a rather unusual "policy experiment"—the establishment of a voluntary greenhouse gas emissions trading scheme (with a significant subsidy element that effectively pays the polluter) designed to secure emissions reductions in line with Kyoto Protocol commitment, in order to gain experience in emissions trading and verification and to influence the development of European Union policy and policy instruments. Included in this paper is a discussion of the background and aims of the UKETS, a review of its early performance, and an examination of the working of the scheme and the relationship between the UKETS and the European Union Emission Trading Scheme (EUETS), due to start in January 2005, drawing on the 2004 review of the UKETS carried out by the UK's National Audit Office.[1]

Keywords: Economic instrument, Emissions trading, Greenhouse gas, United Kingdom (UK).

1. Introduction

There has been growing interest in the use of economic instruments for the control of environmental pollution, especially air pollution (Hasselknippe 2003; Royal Society 2002; Stavins 2003). Much attention has focused on emissions trading schemes for local, regional, and global pollutants (Ellerman et al. 2003). In their report, *Emissions Trading in the U.S.: Experience, Lessons, and Considerations for Greenhouse Gases*, Ellerman et al. outline the economic case for emissions trading, in terms of its potential to meet emissions reduction goals at minimum cost through equalizing the marginal costs of abatement: "Emission sources with low-cost compliance options have an incentive to reduce emissions more than they would under command-and-control regulation. By trading emission credits and allowances to high-cost compliance sources, which can then reduce emissions less, cost-effective emission reductions are achieved by both parties. When inter-temporal trading is allowed, sources can also reduce emissions early, accumulating credits or allowances that can be used for compliance in future periods if this reduces cumulative compliance costs."[2] It follows that emission trading schemes should yield the largest cost savings when abatement costs vary widely across sources and/or over time.

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1. The paper draws on a research project, *Policy Drivers and Barriers for Sustainable Innovation*, supported by the United Kingdom Economic and Social Research Council (ESRC), under its Sustainable Technologies Programme. For more see www.sustainabletechnologies.ac.uk/home.htm.
2. In addition to static abatement cost minimization, permit trading is potentially dynamically efficient in reducing abatement costs over time, since it offers incentives to innovate to reduce abatement costs and so reap the gains from future trading. In principle, further welfare gains may be available if the permits are auctioned and the revenues can be used successfully to reduce distortionary policy instruments, such as taxes on employment (see Parry 2003).

And, on the basis of a review of schemes in the United States for a variety of pollutants, Ellerman et al. also argue that, "In practice, well-designed emissions trading programs also have achieved environmental goals more quickly and with greater confidence than more costly command-and-control alternatives."

There are, of course, many steps between theory and practice. The history of policy instruments for the control of environmental pollution illustrates the kinds of compromises often associated with the introduction of new instruments—permit trading schemes are no exception, as the reviews suggest (Ellerman 2003; Ellerman et al. 2000, 2003; Joskow and Schmalensee 1998; Stavins 2003; Sterner 2003). The UK Emissions Trading Scheme (UKETS) represents a rather unusual "policy experiment" in establishing a voluntary pilot greenhouse gas emissions trading scheme (with a significant subsidy element that in effect pays the polluter), which is designed to not only secure emissions reductions but also to gain emissions trading and verification experience, and to influence the development of European Union policy and policy instruments.

2. The UKETS: Background, aims, and early performance

2.1. Background and aims

The UK Government aims to exceed the reductions in greenhouse gases that it accepted under the 1997 Kyoto Protocol, through a suite of policy instruments called the UK Climate Change Programme,[3] announced in November 2000 (see also table 2). The government's positive stance toward the Kyoto Protocol is partly explained by the relative ease with which carbon dioxide (CO_2) emissions in the United Kingdom were reduced below their 1990 levels by the year 2000. This was largely an unintended by-product of electricity liberalization in 1990 and the resulting fuel-switching from coal towards gas and nuclear power (Pearson 2000). As Sorrel (2003a) emphasizes, however, the task is likely to become more challenging in future, partly because of the retirement of nuclear power stations. The UK Climate Change Programme includes the voluntary UKETS, claimed to be the world's first economy-wide greenhouse gas emissions trading scheme.[4] The UKETS began in March 2002 with an auction in which the participating organizations bid on emission reductions over the five years between 2002 to 2006, in return for a share of the 215 million British pounds (£) in incentive funding from the Department for Environment, Food and Rural Affairs (DEFRA), which manages the Climate Change Programme.[5] The program should be seen in the context of the 2003 UK Energy White Paper, titled *Our Energy Future—Creating a Low Carbon Economy*, in which one of the four UK energy policy goals was to put the nation "on a path to cut the UK's carbon dioxide emissions…by some 60% by about 2050 with real

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3. The program set out how the UK planned to deliver its Kyoto target to cut its greenhouse gas emissions by 12.5 percent by 2008 to 2012, and move towards its domestic goal to cut carbon dioxide emissions by 20 percent below 1990 levels by 2010. See www.defra.gov.uk/environment/climatechange/02.htm#uk (accessed July 26, 2004).

4. See www.defra.gov.uk/environment/climatechange/trading/uk/index.htm. There was a pilot greenhouse gas trading scheme in Denmark that operated from 2001 to 2003, but it was only open to eight electricity generators.

5. For key government documents on the UKETS, see DEFRA (2001) and www.defra.gov.uk/environment/climatechange/trading/uk/documents.htm (accessed July 26, 2004). For a brief early guide, see www.defra.gov.uk/environment/climatechange/trading/uk/pdf/trading-summary.pdf (accessed July 26, 2004).

progress by 2020."[6] From January 2005, the UK will also take part in the EU Emissions Trading Scheme (EUETS); for some years the two schemes, which are not identical, will co-exist.

The NAO (2004, s. 1.4) notes that the UKETS was established with four main aims: (1) to obtain a significant quantity of emissions reductions at a reasonable cost; (2) to give UK organizations early experience in taking part in emissions trading, in anticipation of European and international trading systems; (3) to establish the City of London and the UK as an international center for emissions trading (and encouraging emissions brokers and other ancillary service providers to develop business in the UK); and (4) to influence the development of the EUETS.[7]

The history of the UKETS goes back at least to a government-commissioned report by Lord Marshall, titled *Economic Instruments and the Business Use of Energy* (Marshall 1998), which recommended that both an energy tax and a pilot emissions trading scheme should be developed as instruments of UK climate change policy. Significantly, Marshall (1998, para. 77) actually suggested that "a 'virtual' pilot with interested players would be an opportunity to experiment with the detail of a trading system and allow firms to practise using it, without the dangers of legislating ourselves straight into a particular regime." The UK government adopted the energy tax recommendation by developing the Climate Change Levy (CCL), implemented in April 2001. The CCL is a broadly revenue-neutral tax on the use of some forms of energy in industry, commerce, and the public sector, with offsetting cuts in employers' National Insurance Contributions and additional support for energy efficiency schemes and renewable sources of energy.[8]

The government also followed up on the emissions trading recommendation; various government branches sought advice on international experience and worked with business groups, including the UK Emissions Trading Group (ETG), before developing the UKETS.[9] The Confederation of British Industries and the Advisory Committee on Business and the Environment set up the ETG in June 1999 to represent business interests in emissions trading and to design a voluntary trading scheme as an alternative to taxation, "'[s]omewhat to the surprise of government' who welcomed and encouraged the idea" (Smith 2002, 18).

When the UKETS was launched in 2001, it built on the outline proposals from the ETG and included the financial incentive which they had recommended for participants who took on binding emissions caps.[10] The NAO review comments that, while some members of its advisory panel had suggested that this relationship between the ETG and government could be viewed "by outsiders as a case of government working too closely with big business," DEFRA and the ETG had told the NAO that

6. For a review of the White Paper's aims and achievements, see Department of Trade and Industry (2004a).

7. DEFRA suggests that there are three reasons for companies to enter the scheme: (1) the financial incentive (and the efficiency improvements that might flow from achieving reductions), (2) "learning by doing" emissions trading, and (3) enhancements in company reputation. See www.defra.gov.uk/environment/climatechange/trading/uk/faq.htm#Q15 (accessed July 26, 2004).

8. Rates of levy are 0.15 pence per kilowatt-hour (p/kWh) for gas, 1.17 pence per kilogram (p/kg) (equivalent to 0.15p/kWh) for coal, 0.96p/kg (equivalent to 0.07p/kWh) for liquefied petroleum gas, and 0.43p/kWh for electricity. The government expects the CCL package to lead to reductions in carbon dioxide emissions of at least 2.5 million tonnes of carbon a year by 2010. For more details, see http://www.defra.gov.uk/environment/ccl/index.htm (accessed July 26, 2004). For discussion of the negotiated agreements, see Boemare et al. (2003).

9. Some details of the consultation process may be found in the *Emissions Trading Consultation Paper*, at www.defra.gov.uk/environment/consult/ggetrade/index.htm (accessed July 26, 2004).

10. For more on the ETG and the history of its role (including its current approach to the EUETS), see www.uketg.com/ (accessed July 26, 2004).

"members felt that this was a new way of developing innovative policy which had been very effective" (NAO 2004, s. 1.11).

Smith (2002, 18) argues that this liaison ensured the ETG's awareness of government policy priorities:

> One key constraint was the firewall around the household sector. This effectively excluded the electricity sector—an obvious participant in emissions trading—because participation would affect household energy prices. Many other obvious participants had Climate Change Levy Agreements (CCLAs). An incentive was needed to get them to join the voluntary trading scheme in order to ensure the critical mass of participants needed to make the scheme a success. Thus links were proposed that would allow CCLA holders to buy carbon permits from the pilot scheme as a means to comply with their CCLA target. Or, if they over-complied with the CCLA target, then they could generate carbon permits which they could sell into the voluntary scheme.…This need to fit a voluntary trading scheme around the government's new CCL package complicated its design. Some features follow neither theoretical principles of good design nor pay heed to experience abroad. Instead, the design process muddled-through and fitted around the recently forged climate policy landscape.

Smith also notes that about three-quarters of the respondents to a survey of business financial directors criticized this complexity.

2.2. Participating in the UKETS

The UKETS started with the March 2002 auction, in which Direct Participants[11] volunteered to take on an absolute target in return for a financial incentive (worth a maximum of £30 million per annum after tax, over five years) for 2002 to 2006. As long as they meet their annual target, each Direct Participant gets annual incentive payments of 20 percent of their total payment.

From April 2002 the Direct Participants were allowed to trade their emissions "allowances"—the emissions allowed after the promised reductions. Each year, Direct Participants are allocated allowances that amount to their target emissions for the year, and at the year-end each has to possess allowances sufficient to cover its actual emissions for that year. A Direct Participant can either (a) reduce its actual emissions below its target (thereby yielding emissions allowances that it can sell to others or bank to use in future years), or (b) meet its target, or (c) buy allowances to cover any emissions in excess of its target.

In the second way of taking part in the UKETS, as indicated, it is open to the approximately 6,000 companies in 46 "energy-intensive" industrial sectors that have Climate Change Levy Agreements. The UK government accepted arguments that energy-intensive sectors exposed to international competition needed "special consideration."[12] These agreements, now negotiated between almost all of the eligible sector trade associations (on behalf of their members) and the government, cover the period 2001to 2013 and set "relative" (e.g., per unit of output) or "absolute" energy efficiency or carbon saving targets, in exchange for an 80 percent discount on CCL payments that would otherwise be made by facilities

11. Companies and other organizations including, for example, the Natural History Museum.
12. See http://archive.treasury.gov.uk/budget/1999/nr/hmt6.txt (accessed July 26, 2004).

identified in the agreements.[13] Companies with Climate Change Agreements can use the UKETS either to buy allowances to meet their emissions targets or to sell any over-achievement of these targets, and they are known as UKETS “Agreement Participants.” Boemare et al. (2003, s. 110) argue that trading “offers CCA facilities a highly cost effective route to avoiding non-compliance penalties, since the cost of purchasing allowances to cover marginal exceedances of the CCA target is much less than the cost of CCL payments on all fuel and electricity use over a two-year period.…Overall the trading arrangements have both increased the incentive for individual facilities to comply with their targets, and provided a cheap mechanism with which to do so.”[14]

As well as the involvement of the Direct Participants and Agreement Participants, there are two other ways to participate in the UKETS. Firms can generate credits from approved UK-based emissions reduction projects to sell into the scheme. Projects will be allowed in any sector except, normally, the domestic sector, but cannot cover emissions that already concern targets under the scheme.[15] The first three routes are primarily designed for companies and other institutions; however, the fourth way to take part is that anyone can open an account on the Emissions Trading Registry[16] to buy and sell allowances.[17]

3. The UKETS: The working of the scheme and the National Audit Office’s review

In April 2004 the UK National Audit Office (NAO) reported to Parliament on its review of the UKETS (NAO 2004).[18] The review process included consultation with UKETS participants and a wide range of other stakeholders, analysis of case studies focusing on four of the largest Direct Participants (who accounted for more than half of the incentive funding), and the use of specialist consultants and an expert advisory panel.[19] In this section, we draw on some of the key findings of that review and other recent reviews.

3.1. Early experience

The eventual outcome of the March 2002 auction was that 34 Direct Participants promised to deliver total emission reductions of 4.03 million tonnes of CO_2 equivalent (tCO_2e) in 2006, representing 13 percent of their baseline (mostly an average of 1998–2000 emissions) of 30.5 million tonnes, through

13. Details of the Umbrella Agreements with trade bodies can be found at http://www.defra.gov.uk/environment/ccl/agreements.htm (accessed July 26, 2004).

14. Smith (2002, 18) also argues that the two-fold flexibility that flows from the ability to use the UKETS as a compliance strategy on top of the ability to trade energy reductions with each other as part of CCLA compliance “makes the original CCLA targets even less onerous.” See also Boemare at al. (2003, s. 110), who discuss arguments about both the weakness of the agreement targets, on the one hand, and the “hidden costs” associated with meeting them, on the other; they suggest, however, that “the ease with which most CCA facilities have met their first milestone targets suggests that the criticisms have some validity.”

15. All projects will require prior approval from government. The precise rules for projects are still under discussion. See http://www.defra.gov.uk/environment/climatechange/trading/uk/faq.htm#Q15 (accessed July 26, 2004). For more on projects, see Begg et al. (2002) and http://www.dti.gov.uk/ccpo/ (accessed July 26, 2004).

16. See http://etr.defra.gov.uk/Web_TsAndCs.asp (accessed July 26, 2004).

17. Source: http://www.defra.gov.uk/environment/climatechange/trading/uk/index.htm (accessed July 26, 2004).

18. The NAO scrutinizes UK public spending on behalf of Parliament through its statutory authority to report on the economy, efficiency, and effectiveness with which government departments and other bodies use their resources. See http://www.nao.gov.uk/ (accessed July 26, 2004).

19. The author was a member of this advisory panel.

yearly reductions from 2002 to 2006, that would grow by 20 percent per year. Later, after three Participants had left the scheme, the reductions promised by 2006 fell to 3.96 million tonnes (i.e., about 6 percent of the total reductions expected under the Climate Change Programme), implying a target for 2002 of one-fifth of this, i.e., 0.79 tonnes (NAO 2004, s. 2.2). Allowing for the meeting of annual targets for 2002 to 2005, as well as the 2006 target, over the five years the Direct Participants have contracted to supply a total of 11.88 million tonnes of reductions over the baseline, at a price of £17.79 per tonne.[20]

In 2002, the first operational year of the UKETS, the 31 Direct Participants reduced emissions by 4.64 million tonnes CO_2e (against their target of 0.79 for 2002 and 3.96 for 2006), with three-quarters (23) of them meeting or exceeding their targets, and the remaining quarter covering their deficit by buying allowances in the market. Consequently, all Participants met their first year targets—and received total incentive payments of almost £43 million for the year (NAO 2004, s. 2.4).[21] In the second year, 2003, the Direct Participants reduced emissions by nearly 5.2 million tonnes CO_2e (against their raised second-year target of 1.58 million tonnes);[22] all were in compliance and two-thirds (21) met or exceeded their targets.[23] Thus in 2002, the Direct Participants exceeded their annual targets by 3.85 million tonnes, i.e., by almost 490 percent, and in 2003 by 3.62 million tonnes, i.e., almost 230 percent. And in both years they greatly exceeded the 2006 target (although, as the NAO notes, the ability to sell or bank allowances means that the eventual impact of the reductions in the early years is likely to be less than the reductions reported in those years, although it is difficult to estimate by how much).

3.2. Emission baselines, the auction, and targets

The NAO reviewed the emission baselines set under the UKETS; the rule was that they were normally to be set as the average of the Participant's relevant emissions over the baseline period (1998–2000). The NAO's consultants examined the four Direct Participants that achieved the largest reductions in 2002; these participants, while not a representative sample, accounted for more than 50 percent of the promised 2006 reductions. All four had reduced their emissions before and during the baseline period as a result of environmental regulation and/or corporate policy. DEFRA had decided that Direct Participants should not profit from reductions that arose from compliance with regulatory obligations. Nevertheless, adjustments that DEFRA made for various reasons to the four Direct Participants' baselines meant that, in order to meet their targets, if their operations were to continue at the same level as in 2000 and 2001, only one of them would need to lower its emissions from the average of the 2000 and 2001 levels. Research by the NAO's consultants suggested, however, that "the companies have in practice made significant additional efforts to cut emissions and they report that incentive payments are helping to pay for emissions reductions"; the research also suggested that about two-thirds of the reductions they achieved in 2002 by these four participants were attributable to the UKETS.

20. See http://www.defra.gov.uk/environment/climatechange/trading/uk/index.htm (accessed July 26, 2004).
21. See also http://www.defra.gov.uk/environment/climatechange/trading/uk/pdf/ets-commentary-yr1.pdf (accessed July 26, 2004).
22. Source: http://www.defra.gov.uk/environment/climatechange/trading/uk/index.htm (accessed July 26, 2004).
23. Source: http://www.defra.gov.uk/environment/climatechange/trading/uk/pdf/2003results.pdf (accessed July 26, 2004).

The NAO notes that DEFRA "felt unable to set more demanding baselines as the Scheme needed to be based on even-handed application of general principles, and to allow some 'credit for early action' for participants who had reduced significantly their emissions before the scheme's launch" (NAO 2004, 5). In its recommendations for the UKETS, the NAO (2004, 6) suggests that, while "some Direct Participants have gained unduly from the way in which baselines were set," DEFRA should continue to explore ways of enhancing the value obtained from incentive payments. They might do this through negotiating extra emissions reductions or voluntary limits on selling surplus allowances.

The NAO (2004, s. 2.28–2.46) also suggests that the auction offers lessons for the future. They report that DEFRA had to put in significant effort—including mailing 5,000 companies, launching a public relations campaign, the appointment of an "emissions trading champion," and two postponements of the auction—to attract enough Direct Participants, and that these difficulties may have been influenced by the tight timescales that DEFRA felt were needed in order for the UK to obtain the benefits of early emissions trading experience. DEFRA used a *descending clock* auction method,[24] in which bids were invited at descending prices until the volume of bids and their price were equal to the incentive funds available. It also applied a binding 20 percent constraint on any single participant's share in the total budget. The price eventually achieved—£55.37 per tonne in 2006, equivalent to £17.79 per tonne over the life of the UKETS[25]—exceeded DEFRA's consultants' prior estimate of £11 per tonne, although that estimate had been said to be highly uncertain.[26]

The NAO's consultants suggested that the descending clock method was a reasonable approach to getting from the auction participants the maximum reduction for the available funds. The NAO notes that the evidence of the April 2004 price of around £2.50 per tonne suggests that DEFRA could have bought significant quantities at less than £17.79 per tonne. The NAO's consultants suggested, however, that the use of a different auction scheme, such as a sealed bid system, might have enabled DEFRA to obtain slightly smaller reductions at a significantly lower price if it had withheld some funds, with the option of using them later to buy extra reductions. Some of the NAO's advisory panel, on the other hand, thought that a sealed bid auction could have been unacceptable to business and would have caused delays.

Summing up in this area, the NAO took the view that "[m]any of the issues identified above (the difficulty in attracting participants, the limitations of the auction design and undemanding targets) stem from the voluntary nature of the UKETS and the consequent need for an incentive payment. In a mandatory trading scheme, these issues either would not occur or, in the case of target-setting, would not give rise to an incentive payment" (2004, 14).

Since the March 2002 auction closing price of £17.79 per annual tonne, prices and quantities of traded emissions have ranged widely. In the first year of the scheme, prices fell to around £4 to £6 per tonne after the auction and then tripled to the peak level so far experienced, around £12.50, by October 2002,

24. See NAO (2004, appendix 3).

25. Because annual targets have to be met by each participant, as well as the final 2006 reduction, each tonne reduced in 2006 is equivalent to a total reduction over five years of three tonnes (0.2 tonnes in 2002, rising by 20% per year to 1.0 tonne in 2006).

26. As the US sulphur trading scheme also showed, advance modeling of emissions prices tends to be subject to wide error margins (Ellerman et al. 2000, 2003).

as growing demand by Agreement Participants for allowances to meet their own target coincided with supply uncertainties associated with verification delays for many Direct Participants. Subsequent falling demand from Agreement Participants and rising supply from over-achievement of 2002 reduction targets by Direct Participants led to declining prices to levels of £3 and below in the first months of 2003 (NAO 2004, s. 2.45–46). Since then prices have remained relatively low, at around £1.50 to £3 per tonne.

3.3. Learning by doing

The NAO (2004, part 3) suggests that Direct Participants in the UKETS generally held positive views of the "learning-by-doing" benefits of taking part, confirming that they now understood better how they could benefit from emissions trading, how to collect and measure data on energy use and emissions, and how to verify reductions (although some complained about costly and complex verification procedures, a view which was also suggested by sector associations, who administer Climate Change Agreements for each industry sector, particularly in relation to small companies' participation in the market). Moreover, those that had needed to use the emissions market now had gained practical experience of it. Some Direct Participants also said that the UKETS had helped to secure corporate commitments to projects to reduce emissions. Only a minority, 866 (i.e., 17 percent) of the nearly 6,000 Agreement Participants used the market (more than four-fifths as buyers); about half of these traded only once, suggesting limited learning benefits.

The NAO (2004, s. 3.23–3.29) also found that there is now a small core of emissions trading expertise in the City of London. While current trades are relatively simple transactions, more complex financial products are expected to grow as international trading develops. Companies that supply emissions trading services, including brokerage and verification, are now established in the UK market and well placed to develop their market positions in the long term, as European and international emissions trading becomes established, although none of the brokers claimed to be currently making a profit from the UKETS. The brokers also expressed disappointment because (1) they felt that Agreement Participants were not always well informed about the scheme; (2) trading mechanisms (such as a "screen" showing prices offered and taken, as in other markets) were not fully developed; and (3) transactions prices, volumes (typically 500–1,000 tonnes), and hence commissions have been relatively low.

4. The UKETS and integration with the EUETS: Compatibility and timing

The European Union Emission Trading Scheme is due to be launched in January 2005. The NAO (2004, s. 3.10–3.22) confirms that the significant differences between the UKETS and the EUETS (see table 1) and the co-existence of the schemes from 2005 have raised complex issues for both industry and government in the UK.

Because the EUETS was developed at a time when individual Member States had already introduced a range of national climate policy instruments, Sorrell (2003b, 678) argues that "[t]he result is a very crowded 'policy space' in which complex interactions between the EU ETS and existing instruments appear unavoidable." He suggests that the problem of policy interaction is especially acute for the UK, because it has recently set up a complex, elaborate, and interdependent mix of climate policies.

Table 1. Differences between the UK and European emission trading schemes

Source of difference	UKETS	EUETS
Basis of participation	Voluntary, with incentive payments	Mandatory for those operations falling within the scope of the scheme
Gases included	All six greenhouse gases	Carbon dioxide only (potential to include other gases at a later date)
Electricity generators	Excluded	Included
Other industry sectors covered	Any company or public body can join (manufacturing or service)	Specific sectors only: • All combustion installations over a certain size (20 megawatt thermal input) • Oil refineries • Coke ovens • Iron and steel works • Pulp and paper industry • Minerals processes (e.g., cement, glass, and brick production)

Source: NAO 2004, 29.

Sorrel (2003a) prepared table 2 to illustrate the potential interactions between the EUETS and various climate policy instruments.[27] He shows how the implementation of the EUETS in the UK raises some difficult questions in relation to double regulation, double counting, equivalence of effort, and the linking and fungibility of trading commodities.

In a related paper, Boemare et al. (2003, s. 115–121) explain the following:

1. *Double regulation* occurs where a group is directly or indirectly affected (beneficially or harmfully) by two instruments with similar objectives, as in the case of the EUETS and electricity in the UK.
2. *Double counting* issues occur when compliance obligations for specific emission sources are disputed between two trading schemes,[28] which arises in the UK's case for emissions from electricity generation and for the emission reduction project scheme.
3. *Equivalence of effort* issues arise where the economic impact of environmental regulation appears different between competing firms or inequitable because of differential treatment of non-competing firms (such treatment can be challenged on legal, political, or environmental grounds). Demonstration of equivalence of effort may be needed to show that differential treatment will not

27. These interactions are discussed in Sorrell (2003b) and in further detail in the other reports of the Interact Project. See http://www.sussex.ac.uk/spru/environment/research/interact.html.

28. This can lead to double coverage when carbon allowances or credits are surrendered for emissions increases or double crediting when allowances or credits are created from emission reductions.

arise when an actor (from source to member state) is exempted from a specific policy instrument, an issue that relates to some UK Climate Change Agreement facilities.

4. Issues of *linking and fungibility* arise when a trading scheme links to a third-party scheme, which is relevant here because of the need to interface successfully between the EUETS and the already linked UK Climate Change Agreements and the UKETS (both via Direct Participants and the project scheme).

Table 2. The nature of the potential interactions between selected UK policy instruments and the EUETS

Category	Instrument	Acronym	Direct	Indirect	Trading
Carbon/energy taxes	Climate Change Levy	CCL	√	√	–
Negotiated agreements	Climate Change Agreements	CCAs	√	√	√
Emissions trading	UK Emissions Trading Scheme, cap-and-trade scheme	UKETS (DPs)[a]	√	√	√
Emissions trading	UK Emissions Trading Scheme, project scheme	UKETS (projects)	√	√	√
Industrial pollution control	Integrated Pollution Prevention and Control Directive	IPCC	√	√	–
Support for renewables	Renewables Obligation[b]	RO	–	√	√
Promotion of energy efficiency	Energy Efficiency Commitment	EEC	–	√	√

Source: Sorrell 2003a, table 1

[a] Direct Participants

[b] The Renewables Obligation (RO) is a tradable green credit scheme for renewable electricity, involving obligations for electricity suppliers to supply specified percentages of electricity from renewable sources. The Energy Efficiency Commitment (EEC) obliges electricity suppliers to invest in energy efficiency in the household sector. For a discussion of the interactions between the EUETS and the UK RO and EEC, see Sorrell (2003b), who shows that the attainment of targets under the RO and EEC affects the attainment of targets under the EUETS, and vice versa. This creates the potential for double crediting and double counting of emission reductions. The EEC and the RO will benefit if electricity prices increase due to the EUETS (Mullins and Karas 2003, 61).

Boemare et al. (2003, s. 122) show how the interactions between the EUETS and existing instruments, including the UKETS, carry varying implications for economic efficiency, environmental integrity, political acceptability, and wider policy objectives like supply security, depending on how the issues are addressed. They suggest that the problems of double regulation and equivalence of effort provide particular challenges.

The significance of these problems will be influenced, inter alia, by the EUETS allowance price. Boemare et al. (2003, s. 122) say that “[i]n the UK, a combination of low electricity prices, generous allocation criteria and the strong desire of all parties to minimize the obstacles to implementing the EUETS may allow these problems to be circumvented in the short term with relatively minor changes to existing policies. But there is a risk that such expediency will add complexity to an already overcrowded policy mix."

The compatibility problems between the UKETS and EUETS have arisen partly because of the multiple objectives that the UK has sought to achieve through its policy instruments. Boemare et al. (2003, s. 113) point out that the EUETS conflicts with several of the objectives which underlay the design of the CCL and wider UK climate policy. These explicit and implicit objectives, whose importance has shifted over time, included "the desire to protect domestic consumers, energy intensive industry, and UK coal producers, together with promoting energy efficiency and avoiding a 'windfall' to nuclear generators" (Sorrell 2002).

In relation to electricity generation, for example, the EUETS gives responsibility "directly" to generators, while both the UKETS and the Climate Change Agreements assign the responsibility "indirectly," i.e., on electricity consumers. And if emissions allowances were to be created for both consumers and producers, double-counting might arise. Sorrel (2003b) explains that "[t]hese problems only result from increases above or reductions below the CCA targets and from changes in the emissions intensity of electricity use, which means that some emissions increases/reductions will be double counted and some not. Overall, this will not threaten the environmental integrity of either the EU ETS or the CCAs, but will introduce complexity into the policy mix as a result of a conflict over the compliance obligations for electricity emissions."[29] The NAO (2004, s. 3.15) says that DEFRA aims to address the double-counting issue by adjusting the calculation of emission allowances to be allocated to the generators under the EUETS—but has admitted that this will be hard to achieve with precision.

The NAO (2004, s. 3.14) also says that, following the publication of the proposal for the EUETS in September 2001, the UK's unsuccessful attempt to persuade the European Commission to follow the UK's existing indirect treatment of electricity-related emissions in the Climate Change Agreements and in the designed UKETS happened too late to allow the UKETS to be amended in line with the direct treatment that the Commission judged appropriate, because of the complexities flowing from the volume of cross-border electricity trade in Europe.[30]

The intersecting timetables of the UKETS and the EUETS (the UKETS will still have two years left when the EUETS starts in 2005, and the Climate Change Agreements run until 2013) will cause complications in bringing the two schemes together (NAO 2004, s. 3.10–3.22). In particular, issues arise for UK companies, depending on whether they are Direct or Agreement Participants or neither (and some companies belong to more than one category and might also be covered by both trading schemes). The NAO points out that decisions by companies about whether to seek permission to opt out from the first 2005 to 2007 period of EUETS (see below) could affect the relative sizes of the two emissions markets and, in particular, the liquidity and value of the UK market, since allowances will not be tradable across the two schemes.

29. He also notes that the "use of relative targets in the CCAs means that trading links with the EUETS could inflate the number of EUETS allowances and violate the EUETS cap. Such problems could be avoided through the use of a 'Gateway' arrangement to prevent net sales from the CCA sector."

30. For an analysis of the potential impact of the EUETS on the electricity generation industry in the UK, see ILEX Energy Consulting (2003). Among the conclusions was that the EUETS could lead to large CO_2 reductions in the UK generation sector and that, overall, the introduction of the EUETS is largely positive for the generators, with the potential for large windfall gains.

In this context, one of the NAO report's recommendations in relation to possible future trading schemes is that DEFRA should enhance its risk management procedures, because the risk evaluation of the UKETS addressed mostly operational risks and "did not include more fundamental and problematic issues, such as the major differences between the Scheme and the European Scheme that became apparent as the latter developed" (NAO 2004, 7).

5. The National Allocation Plan

The European Commission required each Member State to submit a National Allocation Plan (NAP) by March 31, 2004,[31] which is consistent with the targets set through the burden sharing mechanism under the Kyoto Protocol that limits CO_2 emissions from the energy and industrial sectors. In its first NAP, each Member State had to decide beforehand how many tradable allowances to allocate in total for the period 2005 to 2007 and how many each plant covered by the EUETS would receive. The NAO (2004, s. 3.22) noted that, while many organizations thought the timetable too tight, "the UK has at least some trading experience and the Department [DEFRA] feels that it is in an advantageous position compared to other member states."[32] After some debate and modeling (Department of Trade and Industry 2004b), the UK government "decided that the first phase of the EUETS (2005–7) would be used to deliver additional CO_2 savings which it was envisaged in the Climate Change Programme would be delivered by emissions trading but for which there are no firm policies yet in place. These additional savings would equate to 1.5 MtC."[33]

In January 2004, as part of the consultation process, DEFRA published its Draft UK National Allocation Plan and its initial Regulatory Impact Assessment, which discussed the risks, benefits, and costs for the UK of implementing the EUETS. The assessment concluded confidently that "the benefits of the scheme outweigh the costs of the scheme, as compared to the option of doing nothing to address climate change and not implementing an EU directive.…It will enable emission reductions to take place in the economy where they are most economically viable and through the trading mechanism the cost of those reductions will be shared across other participants in the scheme."[34]

In May 2004, its subsequently published *Regulatory Impact Assessment* concluded the following in relation to competitiveness:[35]

> We believe that it is important that we review other Member States' NAPs closely and that other EU Member States show a similar level of ambition.…We have stressed to the European Commission the importance of the scrutiny process in order to ensure that the EUETS does not distort competitiveness and that Member States' NAPs move them clearly towards their Kyoto goals.…Only the UK, Sweden and Germany look likely to be on track at present.…[The] UK NAP seeks to give all sectors (with the sole exception of the electricity generation sector) as many allowances as they are likely to require for

31. May 1, 2004 for the ten acceding countries.
32. For a review of the challenges faced in preparing the UK NAP, see Mullins and Karas (2003, s. 1.6).
33. See http://www.defra.gov.uk/corporate/consult/eu-etsnap/enote2.pdf (accessed July 26, 2004).
34. Regulatory Impact Assessment, published January 19, 2004. See http://www.defra.gov.uk/corporate/consult/eu-etsnap/ria.pdf (accessed July 26, 2004).
35. Regulatory Impact Assessment, published May 6, 2004, and available at http://www.defra.gov.uk/corporate/consult/euetsnap-stagethree/ria.pdf (accessed July 26, 2004).

> their business needs in the first phase.…The electricity generators will be expected to deliver the reduction of 1.5 million tonnes of Carbon we are seeking in this first phase—equivalent to a 1.2% reduction on projected emissions across the traded sector. Any impact on the UK's competitiveness will be tempered by the fact that our EU competitors are also likely to face higher energy costs."[36]

In June 2004, in a firmly worded joint public statement, UK Environment Secretary Margaret Beckett and Confederation of British Industry Director General Digby Jones reinforced their support for emissions trading and voiced their concerns about European "fair play," in terms of Member States meeting their Kyoto targets and the need for a level playing field, in regard to the competitiveness of British businesses:[37]

> We are united in our support for emissions trading, which gives firms the flexibility to meet CO_2 reduction targets by trading emissions permits. But…it is critical that our neighbours in Europe show similar commitment.…The UK emissions trading scheme has, for instance, been instrumental in shaping the way the EU is attempting to reduce CO_2 output.…But strategically it is essential for key departments in the European Commission—not just environment, but others such as enterprise and internal market—to ensure that the combination of all national plans across the EU adds up to a coherent whole.…British business sees it as vital that they are operating on level ground.

The UK National Allocation Plan was submitted to the European Commission on April 30, 2004, and published for public consultation on May 6.[38] In June 2004, in recognition of the transition problems between the UKETS and the EUETS, the UK applied for some installations to opt out: "The UK seeks approval for temporary exclusion for the installations of Direct Participants in the UK Emissions Trading Scheme who are also covered by the EU Emissions Trading Scheme, for the first two years of the EU Emissions Trading Scheme, whilst their agreements in the UK Scheme are still in force."[39] On July 7, 2004, the European Commission concluded its assessments of the UK NAP (and several others) for compatibility with the NAP criteria[40] in Annex III to the Directive (2003/87/EC).[41] It decided that, provided that the UK implements certain technical changes by September 30, including the provision of sufficient information on the manner in which new entrants would be able to begin participating in the scheme, then all companies will qualify automatically for trading.[42]

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36. For a note on the industries and regions of the UK likely to be affected by the EUETS, see *Competitiveness, Trade and Regional Implications of the EUETS,* available at http://www.dti.gov.uk/energy/sepn/euetsimplications.pdf (accessed July 26, 2004). The UK Department of Trade and Industry sponsored the Royal Institute of International Affairs to provide a report and workshop on the international implications of implementing the EUETS (Mullins and Karas 2003). See also http://www.dti.gov.uk/energy/sepn/euetsreport.shtml (accessed July 26, 2004), and Kruger and Pizer (2004).
37. Web page published June 9, 2004. See http://www.defra.gov.uk/news/statements/040609.htm (accessed July 26, 2004).
38. For the 2004 UK National Allocation Plan, see http://www.defra.gov.uk/corporate/consult/euetsnap-stagethree/nap.pdf (accessed July 26, 2004). For other related documents, see http://www.defra.gov.uk/corporate/consult/euetsnap-stagethree/index.htm (accessed July 26, 2004). See also Department of Trade and Industry (2004b) for details of the underlying energy projections, published in May 2004. For other details, see http://www.dti.gov.uk/energy/sepn/euets.shtml#research (accessed July 26, 2004).
39. See www.defra.gov.uk/environment/climatechange/trading/eu/nap/pdf/optout.pdf (accessed July 26, 2004).
40. Including consistency with Kyoto Protocol obligations, national climate change programs, other EU legislative and policy instruments, and with competitiveness issues between sectors and between countries.
41. For the Directive text, see http://europa.eu.int/eur-lex/pri/en/oj/dat/2003/l_275/l_27520031025en00320046.pdf (accessed July 26, 2004).
42. For the text of the EC decision on the UK NAP, see http://europa.eu.int/comm/environment/climat/pdf/uk_en.pdf (accessed July 26, 2004). For information on other Member States' plans, see http://europa.eu.int/comm/environment/climat/emission_plans.htm (accessed July 26, 2004).

Boemare et al. (2003, s. 122) warn, however, that "[w]hile the opt-out provisions of the EUETS allow some policy changes to be postponed, these provisions are only available up to 2008 and do not resolve core issues such as the double regulation of UK electricity emissions. Furthermore, such provisions create potential distortions to competition and undermine the environmental effectiveness of the EU scheme."

6. Influence of the UKETS on the EUETS

We have seen that the UK did not manage to convert the EUETS to an indirect treatment of electricity-related emissions. Nevertheless, the NAO report argues that, on the positive side, the UKETS encouraged the development of the EUETS and influenced its design in relation to the banking of allowances and penalties for missing targets (NAO 2004, s. 3.10–3.22). The experience gained in establishing the UKETS is also thought to be assisting DEFRA and industry to get ready for the EUETS start-up in 2005. DEFRA is adapting the UKETS registry allowance recording system for use in the EUETS and other trading schemes, and is cooperating with some EU Member States who may wish to follow the UK system in their own registries. The NAO also concludes, however, that the overlapping timetables and differences between the UKETS and EUETS will lead to complexities, and that "wider benefits to the UK and participants in the UK Scheme may be less than hoped for" (NAO 2004, 2).

The NAO report recommended that in "implementing the EUETS, DEFRA should continue to press for UK companies to retain as much benefit as possible from their experience in the UK Scheme and for elements of the UK Scheme to be adopted by other member states. One of the aims of the UKETS was to benefit the UK economy by enabling UK-based service providers such as brokers, verifiers and consultants to win business at home and abroad. DEFRA should use its influence to ensure that barriers to these companies' expansion into the European Scheme are removed….DEFRA should continue to collaborate with other member states to help them establish emissions trading registries based on the UK system" (NAO 2004, 6).

In relation to UK policy decision-making, Sorrell (2003b) argues that the EUETS challenges UK climate policy, bringing up issues that are fundamental to the climate debate: "These include the status of the 20 percent target, the appropriate treatment of electricity and the priority to be given to tackling fuel poverty. Both government and stakeholders have been slow in recognising this, but a vigorous debate is now underway. In the long term, it is clear that the EUETS will trigger major changes in UK climate policy. If the transition is handled well, the final result should be a rationalised policy mix which offers advantages in terms of both efficiency and equity. If it is not handled well, the final result could be a policy mess."

7. Conclusion

We have seen that the UKETS was an unusual policy experiment, a pilot voluntary greenhouse gas emissions trading scheme with a significant subsidy element and some apparently rather costly emissions reductions from the Direct Participants, secured through the auction process. It was also intended to gain emissions trading/verification experience and to influence the development of European

Union policy and policy instruments. It has possibly been more successful in the former than in the latter. The NAO (2004, 5) suggests, however, that a pioneering scheme like the UKETS is inherently risky, that the scheme succeeded in establishing a well-functioning trading system, and that the "learning by doing" should include DEFRA, which should make the best of its opportunity to learn from this experience, "in further developing this scheme, in continuing to influence the European emissions trading scheme and in designing other trading schemes planned in the environmental area."

A key challenge which has emerged from the experience of the UKETS, and has been highlighted by the problems of interaction and harmonization with other UK policy instruments and with the EUETS, is that of securing a mix of climate change policy instruments that work synergistically rather than antagonistically towards a long-term goal—and that have sufficient flexibility to evolve as national and international circumstances change.[43] The UK's experience shows that this is particularly difficult where there are multiple objectives and constraints that surround the ongoing development of the policy package; and compromises struck with one instrument, such as the Climate Change Levy, can easily lead to further complexities and compromises with the instruments that follow.

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43. See, for example, Foxon et al. (2003).

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Special Feature on the Kyoto Protocol

The Clean Development Mechanism and India: Firm Responses, Baselines, and Development Dynamics

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This paper provides an assessment of the Clean Development Mechanism (CDM) from a developing country's perspective with specific reference to activities in India. The CDM has elicited considerable interest from various Indian industries. We analyze here the nature of initial CDM projects in India, sector preferences, scales, and possible contributions to India's development priorities. The issues of technology transfer, transaction costs, baselines, and additionality are discussed with reference to the Indian context. The scope and limitations of the CDM are critically reviewed. Observations and recommendations are made for mainstreaming the climate actions with development dynamics in developing countries in the post-Kyoto architecture.

Keywords: Clean Development Mechanism (CDM), Technology transfer, Transaction costs, Baselines, Development, and Climate.

1. Introduction

Climate change is among the most vital global concerns of the century. A significant step to address the problem was taken in 1992 with the adoption of the United Nations Framework Convention on Climate Change (UNFCCC). India acceded to the convention in November 1994, thus becoming one of the Parties to it. The Kyoto Protocol to the UNFCCC was agreed in December 1997, and India ratified it in August 2002. Article 12 of the protocol envisages the participation of developing countries in emissions reduction of greenhouse gases (GHGs) through the Clean Development Mechanism (CDM), which has the dual objectives of promoting sustainable development in developing countries and assisting the Annex I (developed) countries in meeting their emissions limitation targets agreed under the protocol. Whereas concerns have been raised by studies that the CDM market could be very thin and without depth and breadth (Halsnaes 2002), considerable activities for promoting a carbon market have been witnessed lately with specific interest in emissions credits from CDM projects. Studies such as the assessment of six major developing countries—namely, Brazil, China, India, South Africa, Mexico, and Turkey (Chandler et al. 2002)—have shown that sizable potential for CDM projects exists during the Kyoto Protocol's first commitment period (2008–2012). Some estimates put the total volume of CDM projects to be a third of the emission reductions required by the Annex I countries (Jotzo and

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Michaelowa 2002). India, having a diversified and fast-growing economy, has good potential for CDM projects in the energy, transport, forestry, agriculture, waste, and industrial sectors (ADB 1998). It is generally felt that the majority of the projects in India would be in the energy sector, and though agriculture and forestry have potential they are unlikely to attract substantial CDM activities because of factors like disaggregated and marginal ownership of cattle and land, high transaction costs, uncertainty about the status of carbon sinks in the Kyoto Protocol, and low awareness in these sectors. Table 1 gives the carbon mitigation potential for India.

Table 1. Carbon mitigation potential in India (2002–2012)

Mitigation option	Mitigation potential (in teragrammes of carbon)	Long-term marginal cost (US$/tC)[a]
Demand-side energy efficiency	45	0–15
Supply-side energy efficiency	32	0–12
Electricity transmission and distribution	12	5–30
Renewable electricity technologies	23	3–15
Fuel switching (from coal to gas)	8	5–20

Source: Shukla et al. 2004c.

[a]US dollars per tonne of carbon.

India has been an active participant in the UNFCCC process. It has undertaken an extensive scientific exercise to prepare its initial national communication, which is at an advanced stage of completion, and it has formed a designated national authority (DNA) for administering CDM activities.[1] The national communication project has developed a comprehensive inventory of GHG emissions in India, conforming to the reporting standards and obligations under the UNFCCC. The DNA, which is the apex body in each host country for CDM project administration, is constituted of an expert panel for initiating wide-ranging consultations on CDM activities in the country.

2. Firm responses

Here we analyze the CDM projects submitted to the government of India before March 2004 in the host country approval process. The proposals show significant awareness and enthusiasm among the project proponents, many of whom had prior experience in proposing mitigation projects, such as under the Certified Emission Reduction Unit Procurement Tender (CERUPT) process for the Netherlands and Finland. There were 15 projects that participated in the CERUPT bid, and after the completion of bidding, five were selected. Of the selected projects, three were wind energy projects and two were biomass-based power generation projects. Though one would have expected CERUPT to be something of a forerunner for estimation of costs of mitigation from CDM projects, costs were not the sole criteria on which the CERUPT projects were selected. Despite prior experience, the project idea note (PIN) and

1. The national communication and DNA are part of the package of requirements that countries which are Parties to the UNFCCC must satisfy.

project design document (PDD) for most CDM projects that we analyzed needed significant improvement in content and form. The selection of project type and technologies was driven more by the preferences of buyers rather than sound criteria like least-cost mitigation and contribution to national development priorities. An examination of the project reports revealed that while many projects had potential for positive contribution to sustainable development, these aspects were not articulated well. Besides, there were few projects that were at best “development neutral” and could have been better structured to contribute to national development priorities. For instance, one project that involved the thermal oxidation (burning) of HFC-23 (a byproduct in the production of HCFC-22) had very high mitigation potential because of its simplicity and low cost, but it contributed little to sustainable development or to knowledge and technology enhancement.[2] A conclusion we draw from these initial projects is that there is a need for capacity building among the project proponents in terms of crafting the project architecture that can best contribute to the dual aims of the CDM exhorted in Article 12 of the Kyoto Protocol.

2.1. Geographical spread of CDM projects

There are 28 states in India’s federal structure, and CDM project proposals originated from a number of them (see figure 1). The majority of initial proposals, though, originated from a few particular states, including Karnataka, Andhra Pradesh, Uttar Pradesh, Maharashtra, Gujarat, and Tamil Nadu. The three most significant factors that prompted projects from these states are the existence of a coastline (suitable for wind power projects), a sugar industry (for bagasse-based cogeneration),[3] and energy-intensive industries (offering efficiency or fuel-switching prospects).

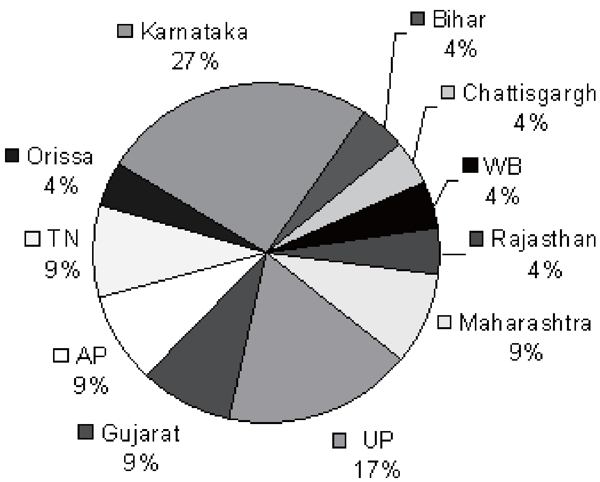

Figure 1. Geographical distribution of proposed CDM projects, by state, as of February 2004

Note: Total number of projects is 23. AP = Andhra Pradesh; UP = Uttar Pradesh; TN = Tamil Nadu.

2. HFC stands for hydrofluorocarbons; HCFC stands for hydrochlorofluorocarbons.
3. Bagasse is a by-product of sugar cane production.

The northeastern part of the country, which consists of many small states in hilly terrain, does not have any representation in these initial CDM proposals, although they have potential for mitigation through forestry and small hydro projects. One apparent reason for inaction in these states could be low awareness of the CDM in these regions. Well-crafted CDM projects in these areas would contribute significantly to sustainable development. Although the sample of initial project proposals is small, it still suggests the need for a more balanced regional spread of projects.

2.2. CDM project types

India, being a socio-economically diverse country, offers a wide range of potential CDM project types. Of the 23 proposed CDM projects, 12 are based on biomass use (including bagasse for cogeneration) (see figure 2). This predominance of biomass is because of the strong presence of the sugar industry in India. Sugar factories need steam and electricity for sugar processing, and the abundant sugarcane waste has good fuel properties. These are suitable conditions for stand-alone co-generation facilities. In the past decade such projects were initiated with support from the government of India through subsidies as well as official development assistance (ODA) grants. The combination of a decade of learning from the execution of these projects and the high growth in the sugar industry has created favorable conditions for the creation of new projects via the CDM route at a time when the former ODA and subsidy regimes have already been terminated. The portfolio of proposed CDM projects is diverse, and this shows the considerable awareness of Indian industry of the Kyoto Protocol and its flexibility mechanisms. There are number of energy efficiency projects in the cement and steel industries focusing on process improvements and waste gas heat recovery. All the projects except two are in the electricity sector, and they all involve using renewable energy or fuel switching. There are no projects proposed in transport, agriculture, or forestry, though some projects from these sectors could be part of the least-cost options for GHG mitigation in the country.

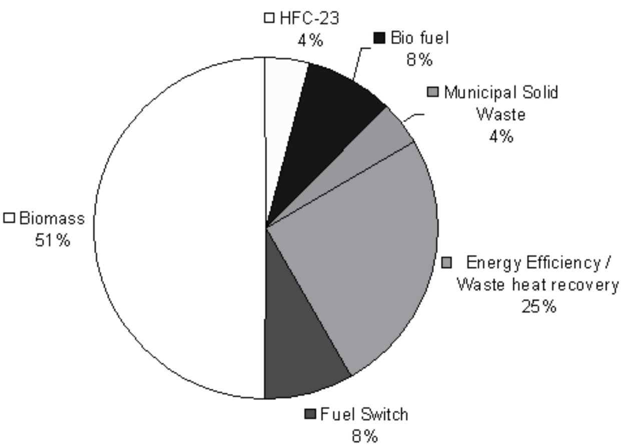

Figure 2. Types of CDM projects proposed, as of February 2004 (total projects = 23)

2.3. Beliefs, expectations, and reality

Indian academia, research institutions, industry, industry associations, non-governmental organizations (NGOs), international consultants, and the policy making apparatus of the government have long been aware of climate change as a problem and have actively followed the UNFCCC processes and Kyoto Protocol issues (World Bank 2004). Moreover, India has had strong policies of promoting renewable energy and has extensive environmental regulations. While, on one hand, there has been quite a bit of enthusiasm, bordering on "irrational exuberance," over expectations of CDM projects,[4] there has also been pessimism arising out of lower CER prices and uncertainty on protocol issues for the period beyond 2012. But there are serious caveats to having high expectations of CDM projects. Such high expectations could lead to non-additional projects being groomed for the CDM route and promotion of additional projects with very low CER potential. This could lead to a high incidence of costs without the expected benefits and, finally, this could give a bad first experience of CDM projects, leading to a lowering of enthusiasm for taking up projects in the future. Hence, a tempering of expectations regarding the CDM is needed in order to have a realistic orientation towards it.

2.4. Unilateral projects

Many of the projects were proposed in collaboration with foreign partners who might also be the buyers of certified emissions reduction (CER) credits, as in the case of the CERUPT. The projects having foreign collaboration are often preferred by CER buyers, and this creates a bias in favor of bilateral projects. But there has been a conspicuous presence of unilateral CDM projects promoted by Indian firms. The unilateral initiatives are prompted by the advance of technological capabilities within the country, an untapped market potential for intra-national technology transfers, and lower transaction costs and risks of unilateral projects vis-à-vis international collaborations. While the unilateral projects have the merit of retaining the economic rents of CERs within the country, they could drain the funds away from other investment opportunities, and expose developing country project developers to higher risks; they also lack the technological learning advantages associated with international projects. The policy vis-à-vis unilateral projects needs to balance these contrasting factors. Simultaneously, it should address retention of a reasonable part of value addition from CERs within the country from the projects involving international partners. There are also possibilities of CDM projects under South-South or inter-developing country cooperation. The feasibility and advisability of conducting such projects in the South Asia region is due to the diverse endowment of energy resources among different countries in the region (Shukla et al. 2004c). Despite the significant potential for such projects, there is hardly any activity in these kinds of projects due to political and financial barriers.

2.5. Contribution to sustainable development

The architecture of firms in relation to CDM projects is such that they aim to maximize their own direct benefits. The contribution of projects to sustainable development, an important goal of the CDM as per Article 12 of the Kyoto Protocol, however, is external to most firms' interests. Policies are thus

4. India is one of the very few countries in the world which has a ministry dedicated to the promotion of renewable energy, the Ministry of Non-Conventional Energy (MNES).

needed to further the contribution of CDM projects to sustainable development. India's government and industry associations can work closely to identify CDM projects that have high potential to contribute to national development goals, and they can identify together a positive portfolio of CDM projects. This can reduce the risks and transaction costs for firms and would simultaneously align the CDM projects to national development priorities. In the absence of such an internal mechanism and policies, the CDM projects are likely to be driven by the narrow interests of firms and the needs of the world market for CERs, leading solely to low-cost mitigation projects with little contribution to national priorities.

3. CDM issues in India

Even in the event of the ratification of Kyoto Protocol by Russia,[5] the price of CERs will remain low due to the absence of the biggest potential buyer, the United States, and the inclusion of "hot air" from Russia and some other countries with transition economies. Hence, CDM project proponents cannot expect CERs to provide substantial coverage of project risks. In the initial learning phase, this is making project developers look for smaller-sized projects in order to minimize overall risk exposure. In fact, risk exposure would be higher for the host country developers in the case of unilateral projects that do not have a confirmed buyer of CERs. The scarcity of capital in developing countries is another factor that leads to selecting small projects. This is also prompted by the simplification of procedures for small-scale projects under the Marrakesh Accords,[6] which would reduce the transaction costs and approval time for small projects. Of the proposed CDM and CERUPT projects in India, many that were approved were small-scale projects that fall under the Marrakesh Accord's definition. This predilection for small projects could lead to large-scale projects, which are part of the least-cost options for mitigation, not being undertaken—at least in the initial stages of the CDM process.

The large projects in the areas of fuel-switching in the electricity, industry, and transport sectors and the use of renewable energy are usually within the least-cost option portfolio for mitigation (ADB 1998). These projects have high mitigation potential and could also contribute to sustainable development in a more significant way. How the bias for small projects, which is prompted by the present CDM architecture, could be avoided is an issue that should be dealt with at the host country level or through suitable modifications in signals from the multilateral process. At the host country level there can be a centralized policy for identifying and promoting large projects having high mitigation and sustainable development potential. These projects may receive special attention and support in approvals through the DNA and the CDM Executive Board approval processes.

With the first commitment period of the Kyoto Protocol taking many of the low-cost mitigation projects ("low-hanging fruits"), the apprehension persists in developing countries that they will be left with high-cost mitigation options if and when they eventually join an emissions limitation commitment regime in the future. Moreover, with high transaction costs and low CER prices for CDM projects

5. This is likely to follow, judging from the recent EU–Russian deal on joining the World Trade Organization (WTO) and rartifying the Kyoto Protocol. See http://www.pointcarbon.com/article.php?articleID=3807&categoryID=147&PHPSESSID=cf2a15cbbf9fab41cd40e9faab915c5c.
6. Decision 17/CP.7 of the Marrakesh Accords aims at simplifying procedures for renewable energy projects below 15 megawatts capacity, energy efficiency projects below 15 gigawatts/hour/year, and other activities mitigating less than 15 kilotonnes of CO_2 equivalent annually.

during the first commitment period, developing countries might not get compensated enough for forfeiting low-cost mitigation options upfront.

3.1. The Indian context

India being a large and diverse country raises many special issues for implementation of the CDM. In India's federal democratic framework, the rights and obligations of framing and implementing policies are shared between the central and state governments. Key sectors such as electricity and forestry belong to the concurrent list. The federal setup presents various complications for CDM projects because of the multiplicity of agencies that could be involved at the state and central levels. For instance, electricity sector policies such as subsidies are decided by each state, though these have serious implications for additionality and baselines for CDM projects.[7] The markets in India are also fragmented in the sense that, while the urban centers function predominantly in the market domain, the formation of markets in rural India is incomplete. Almost all modern technologies can be found in the industrial sectors in India, with the technology stock varying from World War vintages to the most modern ones. In rural India, traditional agricultural practices continue to use technological stocks and practices from the pre-modern era. Hence, fixing additionality for CDM projects in such a diverse socio-economic milieu is far from easy.

3.2. Institutions and capacity

The Government of India has constituted a DNA and placed it within the Ministry of Environment and Forests at the center. This is an expedient arrangement, with little commitment of resources or long-term institutional strategy in terms of the independence and professionalism that would be the key to the DNA's effective functioning. The continuance of the DNA within the ministry would be fraught by hazards such as "red tape," professional incompetence, and even regulatory capture when large public-owned companies start proposing CDM projects. There is, therefore, a case to build a DNA that could ultimately become an autonomous institution vested with adequate expert support and financial independence. The success of the DNA and the overall CDM process will also hinge on the support it gets from industry associations, which, by being close to their industry, can bridge the information gap and provide for informed decision-making with respect to CDM projects. This would also facilitate increasing awareness of the CDM in industry and ensure expectations are realistic. Though awareness of the CDM among industries is high in India, this has unfortunately not translated into good documentation in CDM proposals. The lacuna needs to be overcome through capacity building for prospecting, documenting, and implementing CDM projects. Consulting firms can play a role here, although their capacities are far from adequate given the size of the task. As well, the involvement of financial institutions in developing CDM projects is vital. Up to now only a few financial institutions in India have committed limited resources for developing capacity to develop and support CDM projects, though their capacity is too limited to tap the full market potential. A strategy is needed to integrate the consulting and financing needs of project proponents to lower the transaction costs. Some Annex I

7. For joint implementation and Clean Development Mechanism projects, emissions reductions must be additional to those that would otherwise occur. *Additionality* is a positive difference between the emissions that occur in the baseline scenario and the emissions associated with a proposed project.

countries, such as Canada, have started to institute mechanisms to fund identification and development of CDM projects in India, but a more concerted way of building capacity would be to develop nodal institutions in India which would oversee and coordinate such activities.

3.3. Baselines

Though there are aggregate baseline studies on business-as-usual (BAU) scenarios in India and others, largely based on the Intergovernmental Panel on Climate Change's (IPCC) Special Report on Emissions Scenarios (SRES) typology (Shukla 2004c), these still fall far short of addressing the short-term and project-level issues that need to be sorted out for the accounting of CERs from CDM projects. There can be no standardization with respect to methodology for baseline determination, since studies have shown that slight variation of the parameter for baseline fixation could lead to significant differences in baseline emission rates and mitigation potential for projects (Sathaye et al. 2001). The issue of fixing baselines is going to be a thorny one in the absence of cooperative rule-making that balances the need for high environmental integrity by the system vis-à-vis the demand for low transaction costs and risks from project proponents. A detailed study of the bagasse-based cogeneration plants in India's sugar industry (USAID 2000) shows the complexities involved in deciding on the baselines. The sugar industry here is variegated with different vintages of technology and sugar cultivation practices, resulting in wide variation in economics and technology. Moreover, varying state-level policies for purchasing electricity from sugar industry cogeneration plants add to the difficulty in having high commonality in baseline methodology. While a project-specific baseline would give very high environmental integrity, it also has relatively high transaction costs. A multi-project baseline methodology like the ones based on technology or geography, or a baseline at the sugar industry level, might reduce transaction costs but will not give as high a level of environmental integrity as a project-specific baseline. Moreover, with the kind of diversity in India's sugar industry it is difficult to have multi-project baselines. It is also going to be difficult to balance the trade-off between having a robust baseline and keeping the transaction costs of CDM projects low. Hence, it would be prudent for India's government to propose a task force or committee to look into the aspects of baseline fixation and recommend methodologies for implementation.

Recent studies of India's power sector (Shukla et al. 2004a, 2004b) have shown that the marginal baselines for power plants are more appropriate than ones based on average emission rates of generation. The average baseline approach is based on the weighted average emissions of all the generation in the system, while the marginal baseline approach considers only the marginal plants. A marginal baseline takes the power plant built at the margins, hence it could be a viewed as a good reflection of what kind of generation a new plant would displace for ascertaining additionality and fixing baselines (see figures 3 and 4).

For developing a baseline, power generation was projected econometrically using the past data of generation based on fuel type and technology. As can be seen from figures 3 and 4, the baselines for states differ considerably. While the baseline for the state of Gujarat shows a declining emissions trend, the baseline for Andhra Pradesh shows an increasing one. This divergence in baseline trends between states is due to the increased use of natural gas in Gujarat, which has resulted in declining emission intensity as the use of gas has penetrated a predominantly coal system; whereas in Andhra Pradesh a change in rainfall patterns and unsustainable water use upstream of hydro dams have led to a fall in electricity generation from hydropower sources, leading to an increase in emissions intensity. The diversity of baselines across states would make it politically impossible to agree on a common approach. Besides, employing such an approach would be imprudent from the perspective of environmental integrity. Practical approaches are therefore needed to reconcile the relevant project-level baselines, state-level baseline trends, and their national-level aggregation. In the fast-changing dynamics of developing countries, it would be impossible to find theoretical solutions that give accurate baseline estimates under counterfactual assumptions. What is needed is to generate practical signals that are agreed under a cooperative regime. A common signal could be what the firms would need to consider in their project assessments, rather than each committing resources to articulate its own signal—an approach that would remain disputable and therefore pose higher risks.

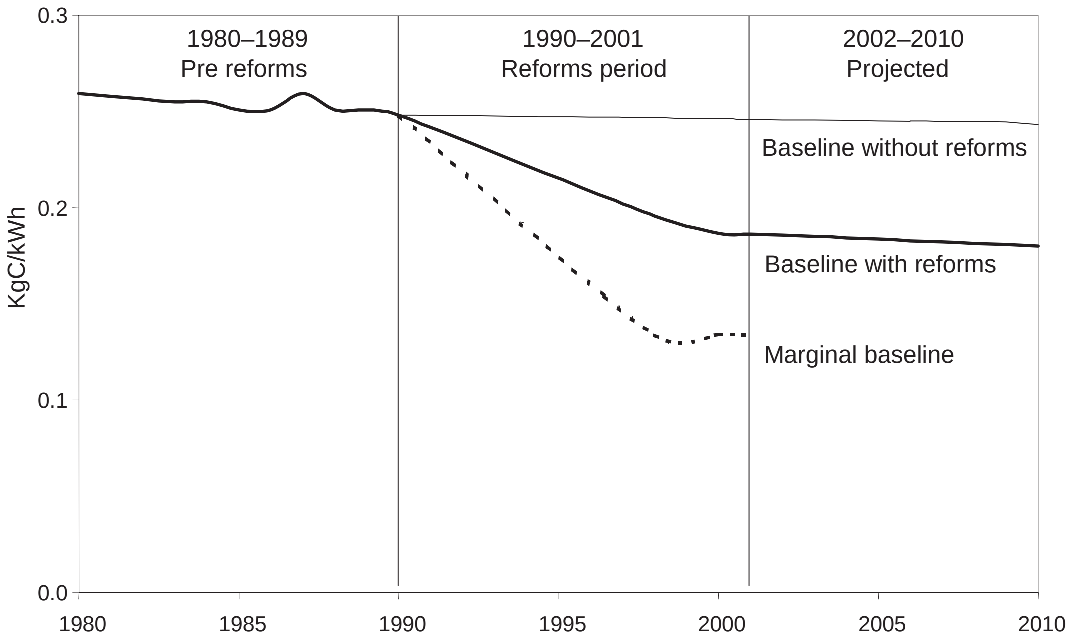

Figure 3. Electricity sector baselines for the state of Gujarat in India, in kilograms of carbon per kilowatt-hour

Source: Adapted from Shukla et al. 2004a.

The practical approach is also mandated by the complexities of real life and the diversity of systems. For instance, the generation and consumption of electricity is dependent on the extant dispatch practices in the electricity market. Hence, in the absence of a dispatch-based baseline, it is difficult to ascertain whether a CDM project displaces a base load or a peak load plant, and so the actual mitigation potential is also uncertain. This is particularly significant in a situation such as in India, where the electricity market is making the transition from monolithic, vertically-integrated utilities with centralized dispatch to being more disaggregated and market-driven. Some future policies such as integrated resource planning (IRP), if implemented, could also change the electricity market dynamics and hence affect the choice of what could be a good baseline methodology (R. M. Shrestha and R. Shrestha 2004). Moreover, most electricity and energy markets in developing countries are being reformed (Heller and Victor 2004), and hence are in a very fluid situation, making it difficult to develop baseline scenarios. To create a baseline scenario based on actual dispatch, we would need data on dispatch, which might not be available uniformly for all states in India, and the dispatch-based baseline can be arrived at only by using a complex simulation based on generator and grid characteristics. Moreover, in the evolving liberalization of the electricity market, any pooling arrangement or trading scheme where confidentiality of price is assured, there will be an impediment in getting the data required for developing the baseline based on actual dispatch.

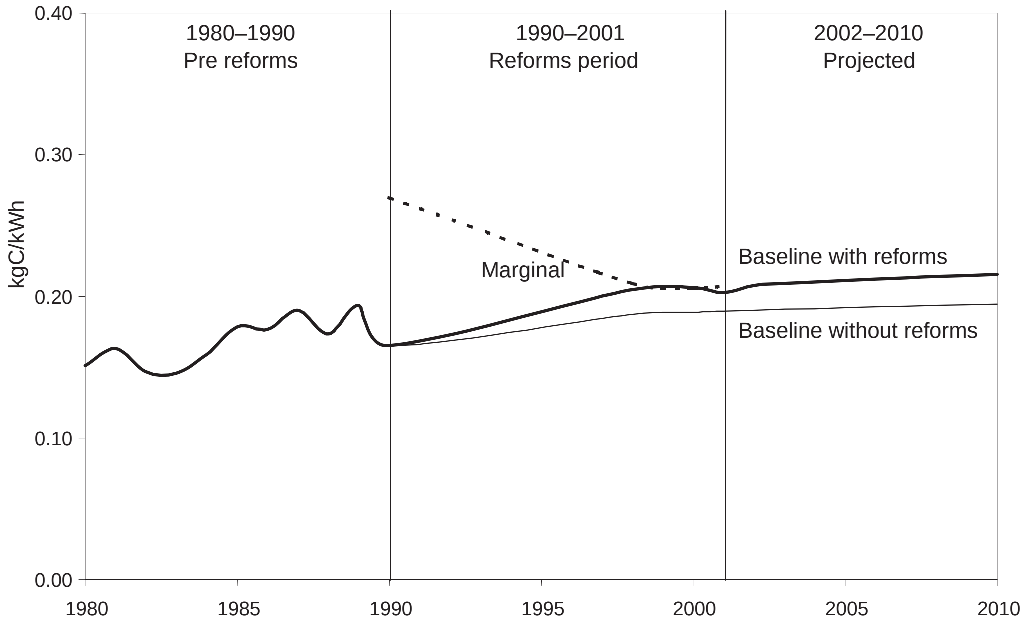

Figure 4. Electricity sector baseline for the state of Andhra Pradesh, in kilograms of carbon per kilowatt-hour (kgC/kWh)

Source: India adapted from Shukla et al. 2004b.

The CDM projects with high mitigation potential and that support sustainable development significantly, such as the fuel-switching projects in the transportation and energy sectors, seem to be mired in issues of additionality and baselines. These projects, therefore, may get side-lined, while projects with little contribution to sustainable development but that provide clear mitigation baselines are very likely to be promoted. Baseline identification is the basis of the CDM—and also its curse. The success of the CDM hinges on how baseline complexities are demystified through cooperative and practical approaches that accommodate the dynamics of the real world, or at the minimum, reward "good conduct" such as is done by the "off-set" method, rather than conducting a futile chase for pristine estimates in a stylized, counterfactual world that is far removed from the rapidly changing realities of developing countries.

3.4. Technology transfer

Article 11 of the Kyoto Protocol envisages the transfer of technology from developed countries to developing countries. In the CDM and CERUPT projects so far proposed in India, however, there is little technology transfer potential, and even in the very few projects where new technology is being introduced, the acquisition of technology is through the conventional route of open-market procurement rather than technology transfer being an inherent part of the project initiative. Moreover, in large developing countries like India, the best technology available globally can be found in some advanced firms servicing export markets. The question thus is not whether an advanced technology exists in the country somewhere, but to what extent it could penetrate the market. Hence, technology penetration rather than singular technology transfer is of greater significance.

In the case of the least developed countries (LDCs), however, technology transfer would be a significant issue, and CDM projects could be important harbingers of technology transfer from developed countries. There is also significant scope in developing countries like India for transferring technology to LDCs at lower cost, and this might be more effective, since technology adaptation could be made easier due to similarity of institutional and infrastructure environments. But these South-to-South technology transfers and the consequent CDM projects have not been given serious consideration. What the South-to-South technology transfers often lack is not the technological capacities but the meager investment resources needed and the funds, similar to the case of ODA that has been used extensively to transfer new technology from developed to developing countries. But with the Marrakesh Accords, by agreeing to not divert or disguise ODA funding for CDM purposes, there is an added complexity in determining the additionality of projects funded by overseas funds.[8] Though the funding country can account for the ODA and the CDM funds in a separate manner to help identify additional projects or some proof that ODA funds are not being diverted, these are not foolproof ways of ascertaining ODA additionality, and all of them suffer from one shortcoming or another. Rather than proposing a new procedure or mechanisms for deciding ODA additionality, an implicit understanding should be developed in the comity of nations not to divert ODA funds for CDM purposes. This would be a more amenable and implementable proposition, rather than beginning with mistrust and then finding violations when precisely codifying each transaction, and ending up with misunderstandings, inflexibilities, and conflicts.

3.5. Transaction costs

Though policy for small CDM projects has been liberal, their transaction costs can be a real threat to their viability, because transaction costs for small projects can be a significant part of the overall project costs. Irrespective of project size, transaction costs can act as a barrier for many good projects. Hence,

8. Decision 17/CP.7 *emphasizes* that "public funding for Clean Development Mechanism projects from Parties in Annex I is not to result in the diversion of official development assistance and is to be separate from and not counted towards the financial obligations of Parties included in Annex I."

dual strategies are needed: one aimed at reducing transaction costs and a second to bundle the small projects together for CDM assessment. In India, we find that international consulting firms charge upwards of US$10,000 for preparing a report for host country approval. Such reports usually include neither the robust assessment of baselines nor address the risks of expected future CER streams. On host country approval, the subsequent reports would cost much more. There is a great need to standardize the host country report format, develop standard methodologies, provide guidance to small project proponents, and register local consultants who can provide standardized services at competitive rates and build their capacity. For pooling of projects there should be some institutional support for identifying similar small projects and preparing independent but generally identical reports at little incremental cost.

A host of market intermediaries, such as international consultants and NGOs, are becoming active in India in developing PINs and PDDs for project proponents. While these intermediaries bring experience and knowledge from other markets, it is questionable whether the additional value they bring justifies the substantially higher transaction costs being observed at this stage. Moving towards a revenue-sharing mode of arrangement between project proponents and consultants could lead to a more balanced contract, which will alleviate moral hazard issues that arise when project consultants are paid upfront.

3.6. Project risks

The diversity of India and its unique political economy pose unique risks to projects involving international transactions. Under the federal framework, there are overlapping regulations designed separately by the central and the state governments. The legal risks to a CDM project would thus vary depending on its location. Moreover, there are considerable political risks due to opposing views held by different political entities on matters concerning the environment. The sweeping powers of judicial review of administrative actions and the oft-used practice of public interest litigation for challenging the administration’s actions in court pose additional risks to projects. The enormous delays in the processing of judicial matters accentuates the risks from legal actions. Since the CERs are a new “commodity” that does not have precedence in India’s legal system, the early projects may have to face risks from delays and problems in the process of systemic learning. Every new technology brings its own risks. In CDM projects, there are the added risks of satisfying sustainability criteria and dealing with rapidly shifting baselines and operating environments.

CDM projects will need bilateral or multilateral contracts relating to generation and sharing of CERs. Central to the sharing of risks are the contracts made between the CER generators in India and CER buyers. The weakness of contract enforcement in the developing country environment is another source of risk. With the legal status of CERs not being clear, CDM contracts would be inherently more risky. As well, the official CER market remains uncertain without ratification of the Kyoto Protocol by Russia. Without an official CER market, the price signals that are very necessary for the evolving CDM market will be missing. Under these circumstances, the present market dynamics are governed primarily by the policies of the European Union (EU) and EU trading arrangements. The price signals from EU initiatives have been the singular largest contributing factor for the early start of the CDM, and EU policies have been central to the creation of a CDM market because they have reduced the market risks.

4. Development and climate

As noted earlier, an essential objective of the CDM is to contribute to sustainable development in the host countries. CDM projects aligned with the host nation's development priorities would have greater acceptability and, therefore, lower transaction costs and risks arising from social resistance. Thus, host countries should delineate the policies and measures needed to encourage projects that would make a large contribution to mitigation as well as to development priorities. Aligning development and climate actions is vital to the effective operation of the CDM.

4.1. Development dynamics

Most developing countries are at best partly market-driven and can be called "hybrid states," where a part of the economy functions in the realm of markets and the rest functions outside. Moreover, many sectors such as electricity are undergoing drastic changes that are not readily predictable. Hence, rather than orienting actions under the protocol that are hinged on assumptions about a counterfactual future and market mechanisms, efforts should go into finding a more cooperative and effective way of ensuring mitigation. Output-oriented and market-driven policies often falter in the developing countries where the markets are incomplete, and they may not align outputs with national priorities. Alternatively, it is feasible and pertinent to craft policies and measures that provide the inputs that support "good conduct" aligned to the achievement of national goals (Heller and Shukla 2003). Note that key to the success of the CDM is its alignment with the development dynamics of these countries.

4.2. Beyond Kyoto

Studies across major developing countries have shown that economic development need not be climate unfriendly (Chandler et al. 2002). In fact, economic development may provide the necessary technologies and capital for overcoming unsustainable practices. As can be seen from figure 5, the energy intensity of gross domestic product (GDP) for India shows a declining trend during the past decade—without the nation being part of any emissions reduction commitment agreement. The economic reforms in this period allowed technological and fuel transitions by providing access to global markets. The reforms not only prompted higher economic growth but also facilitated the transfer of cleaner technologies and fuels that reduced the carbon intensity of India's economy. A key question before Indian policy makers, therefore, is how to further decouple economic growth and carbon emissions. The Kyoto mechanisms can be used as instruments for such decoupling. The present architecture of the CDM, however, is biased to promoting smaller, isolated CDM projects rather than wider development-oriented activities that are inherently climate friendly. The CDM Executive Board's reluctance to give consent on methodological issues for larger projects (Heller et al. 2003) makes it very unlikely for CDM processes to support sustainable development in developing countries in a significant way. The present regime architecture is based on ideal market assumptions and is not very pragmatic in eliciting the sustained interest of developing countries. The incentives for developing country participation are jeopardized by not explicitly aligning the actions and interests of the private project players to the national developmental goals in host countries.

The architecture of the Kyoto regime has made projects to address climate change peripheral to mainstream development activities in developing countries. Climate policies and actions have thus acquired an image of being unfriendly to development, leading to apprehension and rigidities in developing countries' proactive participation in the post-Kyoto regime. Thus, instead of continuing with a regime that is focused on outputs (i.e., reducing GHG emission levels), which has made many governments shy towards proactive participation, the new regime should concentrate on giving adequate incentives and the wherewithal to align the economies of developing countries along rapidly declining emission intensity pathways. This could be done by retargeting ODA to assist the least developed countries in adaptation, supporting other developing countries or regions in major mitigation activities, and through supporting development of national and regional markets that would enlarge energy and technology choices for sustainable development (Heller and Shukla 2003).

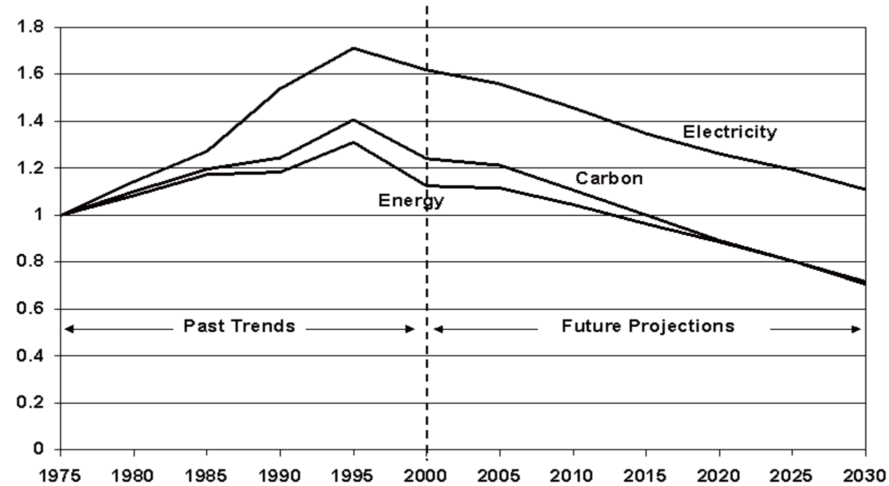

Figure 5. Energy, electricity, and carbon intensities for India

Source: Shukla 2004c.

5. Conclusion

India has a classic "dual economy," where a growing modern sector and persistent traditional sector co-exist. For a decade its economic policies have been driven by market-oriented reforms aimed at integrating the national economy with global markets. We note that the country's development policies, aimed at reducing widespread poverty, regional imbalances, and enhancing the quality of people's lives, remain the key focus of India's policy agenda. The country's policies vis-à-vis global environmental issues are sewn within this overall context. As India is among the countries with lowest per capita GHG emissions, the emissions pathways that compromise development are, therefore, neither feasible nor sellable as stand-alone propositions. Development along sustainable pathways remains the national priority. This is the key anchor and platform for devising activities that are both development- and climate-friendly. The dual objectives of the CDM offer the possibility of developing projects that are synergistic with climate and development goals. As a mechanism resting on a counterfactual future, however, the CDM regime could get lost in great uncertainties that shroud the future pathways of developing countries.

As the CDM enters the practical phase, the initial euphoria among project proponents is slowly giving way to realism because of the complexities revealed in delineating additionality along with baselines and the risks associated with CER prices and the post-Kyoto regime. Price expectations in the CDM market now hinge on the EU greenhouse gas emissions trading scheme (EU ETS), and speculations on Russia's ratification of the Kyoto Protocol add to the near-term uncertainties. Whereas Russia's ratification can increase the credibility, authenticity, and confidence in the Kyoto mechanisms, CER prices may be adversely affected by the "hot air" entering the market with Russia's participation. These uncertainties, compounded by low price expectations due to the non-participation of the United States in the protocol, provide very little cushion for covering the risks for projects that have to be non-additional to begin with. The CDM projects that are currently proposed in India are therefore all small in size. Hopefully, larger projects may be prompted after the initial learning process nears completion.

The CDM has the potential to give a good start to cooperative efforts between developed and developing countries in addressing climate change. A main threat to the CDM, however, is the complexities that can mystify and lock-in the operation of the mechanism. The clauses relating to issues such as additionality and baselines, unless implemented with a sense of realism and practical acumen, can become the cause of costly and unresolvable disputes. One of the key challenges that needs addressing is to demystify the inherent complexities of the mechanism resting on a counterfactual foundation. What should be aimed at is to employ the practical methodologies that approximate the dynamics of the real world and to implement these cooperatively, rather than committing resources to finding pristine estimates in a stylized, counterfactual world that is far from the rapidly changing realities of developing countries.

The uncertainties and low price expectations for CERs in the near term make it mandatory to have very low transaction costs and risks if the mitigation potential in developing countries is to be tapped via the CDM. The transaction costs originate from the protocol processes, intermediaries, and the configuration of national systems. Establishing robust methodologies, building capacity in developing countries, and institutionalizing national responses would all contribute to keeping transaction costs and risks low—measures that are so essential for maximizing the mitigation contribution of the CDM.

The CDM was plugged into the Kyoto Protocol without it having gone through extensive prior discussions. The grey areas that could not be addressed at the strategic stage of negotiations thus need to be addressed during the post-protocol operational stage. In any case, one must keep in mind that the CDM is but an initial step in a long process. The mechanism was not designed from a long-term perspective. The architecture of the CDM, as it is now, keeps it at the margins and not within the mainstream of the development dynamics of developing countries. A key challenge for negotiators for the period beyond Kyoto is how to align climate actions in developing countries with their development priorities. This alignment shall not only help to tap the enormous mitigation potential in developing countries but shall also mainstream climate actions within development policies. Until the next stage of political bargaining finds the instruments to mainstream climate in the development dynamics of developing countries, the CDM will remain the principle vehicle for cooperative actions between developed and developing countries for technology transfer, capacity building, and institution building, as well as for harvesting the low-hanging fruits of mitigation opportunities in developing countries so as to reduce the burden of developed countries in meeting their emissions limitation commitments agreed under the Kyoto Protocol.

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Special Feature on the Kyoto Protocol

Technological Implications of the Clean Development Mechanism for the Power Sector in Three Asian Countries

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This paper analyzes the role of some key technological options (i.e., fuel-switching and renewable energy technologies) available under the Clean Development Mechanism (CDM) for reducing greenhouse gas (GHG) emissions in the power sector of three Asian countries—Sri Lanka, Thailand, and Vietnam. A long-term electricity planning model is used with the aim of minimizing the total net cost of certified emission reduction (CER) benefits from these countries' power sector during 2006 to 2025. The results show that cleaner thermal power generation technologies involving fuel-switching from coal to gas or oil would be the main source of carbon dioxide (CO_2) reduction not only at the presently prevailing CER prices but also at significantly higher prices. The CDM potential of most renewable energy technologies is found to be weak during the study period at prevailing CER prices.

Keywords: Clean Development Mechanism, Renewable energy technologies, Fuel-switching, certified emission reduction (CER) price.

1. Introduction

The Kyoto Protocol has opened up an avenue for mutually beneficial cooperation between developing and industrialized countries through the Clean Development Mechanism (CDM). The prospects of implementing climate-friendly projects under the CDM and getting assistance for sustainable development in that process have raised expectations among policy makers and planners in developing countries. The CDM is expected to be used as an instrument to transfer environmentally sound technologies (ESTs) from industrialized countries (ICs) to developing countries (DCs) for three main reasons. First, the mitigation of greenhouse gases (GHGs) from a CDM project should be additional to that which would occur in the absence of the project. This would require deployment of ESTs instead of conventional technologies. Second, the CDM projects, by definition, have to be implemented in DCs. Third, the CDM is a market-based mechanism and it extends the market for ESTs, whose demand is traditionally limited mainly to ICs, to developing countries. The certified emission reduction (CER) benefits under the CDM improve the financial viability of the ESTs and serve as an incentive for their deployment in DCs. As the viability of ESTs and their adoption in DCs would greatly depend upon their cost and the CER price, questions arise as to what type of ESTs are likely to be adopted at different CER prices and whether the CDM would necessarily result in transfer of new technologies or know-how to DCs.

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As the CDM is a market-based mechanism, a necessary condition is that CDM projects will have to be financially viable at the prevailing CER price. Financial viability alone, however, does not ensure effective implementation of the projects in the presence of legal, institutional/regulatory and other barriers that normally exist in many DCs. Thus, actual potential for adoption of ESTs under the CDM may not be as large as that indicated by the economic potential (i.e., based purely on CER benefits and costs).

Due to the dominant role of the power sector in GHG emissions, this paper first examines the CDM potential and types of cost-effective ESTs involved in the power sectors of three selected Asian countries—Sri Lanka, Thailand, and Vietnam—based on a long-term power generation capacity planning model considering the CER benefits. It also discusses the capital implications of the cost-effective, climate-friendly technological options in the power sectors in the selected countries. Furthermore, some potential barriers to the power sector CDM projects in DCs and measures to overcome them are discussed.

2. The approach

For the purpose of finding out CDM potential, a long-term electricity generation planning optimization model is used. The model determines the optimal technology and fuel options for power generation to meet the projected demand and associated carbon dioxide (CO_2) emissions during the planning horizon (2006–2025). The model is, however, different from a typical electricity planning model in that it determines power generation capacity additions by technology type and fuel requirements that minimize the total discounted cost of electricity production (including costs of capital, fuel, operation, and maintenance) net of total discounted CER revenue that could be earned during the planning horizon. The model also determines the optimal level of CO_2 emissions reduction and corresponding CER revenue at a given CER price (Shrestha and Abeygunawardhana 2004). A number of renewable energy technologies and cleaner fossil fuel-based technology options for power generation are considered in our analysis, while energy efficiency improvement options on the demand side have not been included. Technology options and country-specific maximum available quantities of renewable energy resources considered in the study are presented in table 1, while the unit capital costs of power generation options are shown in table 2. Note that in this paper, the term *renewable energy technologies* (RETs) does not include medium- or large-size hydropower plants, which are treated as a separate option. Transaction costs of different ESTs as CDM projects have not been included in the present analysis. The likely implications of transaction cost are, however, discussed qualitatively in a later section.

Table 1. Renewable and cleaner thermal technology options considered in the study

Country	Renewable options: Option	Renewable options: Maximum limit on new capacity, in megawatts (MW)	Cleaner fossil fuel technology options
Sri Lanka	Biomass	5,000	For all three countries, supercritical (coal), integrated gasification combined cycle, pressurized fluidized bed combustion, and combined cycle plants were considered.
	Small/mini hydro	300	
	Large/medium hydro	—	
	Wind	5,100	
Thailand	Biomass	4,819	
	Large/medium hydro	—	
	Small/mini hydro	—	
	Solar	300	
	Wind	300	
Vietnam	Biomass	4,746	
	Geothermal	400	
	Solar	6,000	
	Small and mini hydro	1,800	
	Wind	9,000	

Source: SLEMA (2004) for Sri Lanka data, SIIT (2004) for Thailand data, and IE (2004) for Vietnam data.

Table 2. Capital cost of candidate power plants considered in the study, in US $/kW at 2000 prices

Plant type	Country: Sri Lanka	Country: Thailand	Country: Vietnam
Pulverized coal	1,205	1,000	1,000
Supercritical coal	1,329	1,329	1,329
Integrated gasification combined cycle	1,420	1,420	1,420
Pressurized fluidized bed combustion	1,440	1,440	1,440
Combined cycle	686	557	600
Gas turbine	409	395	—
Oil steam	585	—	580
Biomass	1,510	1,510	1,510
Biomass integrated gasification combined cycle	1,626	1,626	1,626
Wind	1,200	1,960	1,000
Solar photovoltaic	5,500	5,500	5,500
Geothermal	—	—	2,140
Mini hydro	3,000	—	900
Small hydro	—	—	6,500

3. CO_2 reduction potential under the Clean Development Mechanism

Total CO_2 emissions reduction at different CER prices during the periods of 2006 to 2012 and 2006 to 2025 are presented in table 3 along with values of total CO_2 emissions in the base case (i.e., without the CDM). In Thailand, total CO_2 reduction potential during 2006 to 2025 would vary from 1,065 million tonnes at the CER price of US$5 per tonne of CO_2 (tCO_2) to 1,609 million tonnes at the CER price of $20/$tCO_2$, while in the case of Sri Lanka the corresponding figures would be 44 million and 113 million tonnes, respectively. The CDM potential in Vietnam would vary from 196,000 to 500,000 tonnes in the above CER price range. Thus, at the CER price of $5 (which is close to the average prevailing price), it would be cost-effective to reduce about 21 percent of the base case CO_2 emissions in Thailand, about 15 percent in Vietnam, and 24 percent in Sri Lanka. The total CO_2 reduction potential during 2006 to 2012 in Sri Lanka, Thailand, and Vietnam is much smaller at the CER price of $5, i.e., 3 million, 125 million, and 28 million tonnes, respectively.

Table 3. Total emissions in the base case and CO_2 emissions reduction at various CER prices, in million tonnes

Country	Period	CO_2 emission reductions at each CER price, US$/t$CO_2$							Total emissions in base case
		$2	$5	$8	$10	$12	$15	$20	
Sri Lanka	2006–2012	2	3	6	7	7	7	7	14
	2006–2025	11	44	101	101	102	103	113	185
Thailand	2006–2012	35	125	170	177	180	194	199	984
	2006–2025	252	1,065	1,325	1,415	1,441	1,528	1,609	5,111
Vietnam	2006–2012	12	28	48	58	63	69	79	304
	2006–2025	100	196	284	348	391	469	501	1,308

4. The role of fuel-switching versus renewable energy technologies (RETs) under the CDM

CO_2 emissions reduction from the power sector could be achieved through several options, which include fuel-switching in power generation and the use of more efficient power plants and renewable energy resources/technologies. It is of interest to examine the roles of different technological options for CO_2 reduction. We turn to this issue next by discussing the electricity generation shares of different technology options in the years 2012 and 2025 in the selected countries.

As can be seen in figure 1a, the main source of CO_2 reductions in Sri Lanka in 2012 (the final year of the first commitment period) at CER prices of up to $20 would be fuel-switching (from coal to oil).

Similar observations can be made on factors behind CO_2 reduction in 2025, except that the RETs option would now be optimally selected at the CER price of $15 and above (figure 2a).

In Thailand, fuel-switching (from coal to natural gas-based power generation) would be the main source of CO_2 emissions reduction in 2012 at CER prices of up to $20. RETs-based generation would also contribute to CO_2 emission reductions from $5 to $20 (figure 1b). Similar observation holds true for the year 2025 (figure 2b). Besides, oil-based generation would increase to a CER price of $20 by 2025.

In Vietnam, CO_2 emissions reduction would take place through fuel-switching (from coal to gas) at CER prices of $2 and above. In addition, the use of RETs (i.e., geothermal and small hydro) is found attractive even at the CER price of $5 (figure 1c). By 2025, fuel-switching (coal to gas), use of RETs, and more large hydro would all contribute to reducing CO_2 emissions even at a CER price of $5 (figure 2c).

Figure 1a.
Sri Lanka

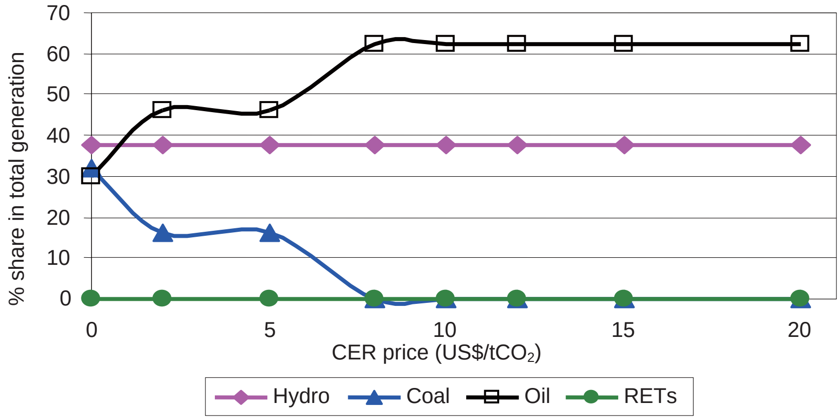

Figure 1b.
Thailand

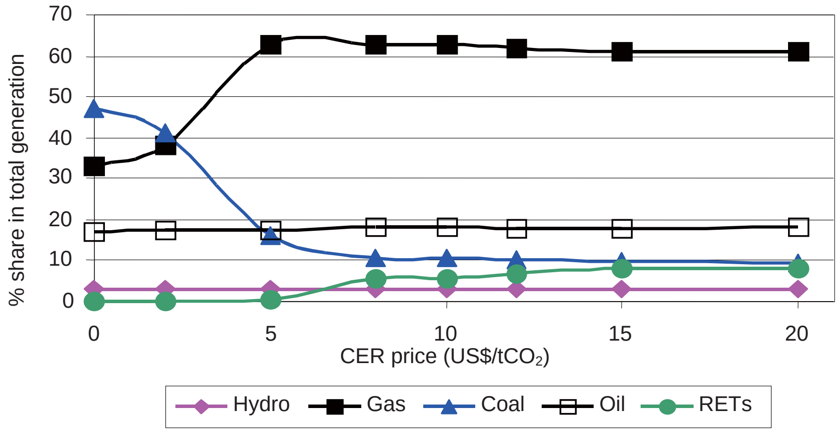

Figure 1c.
Vietnam

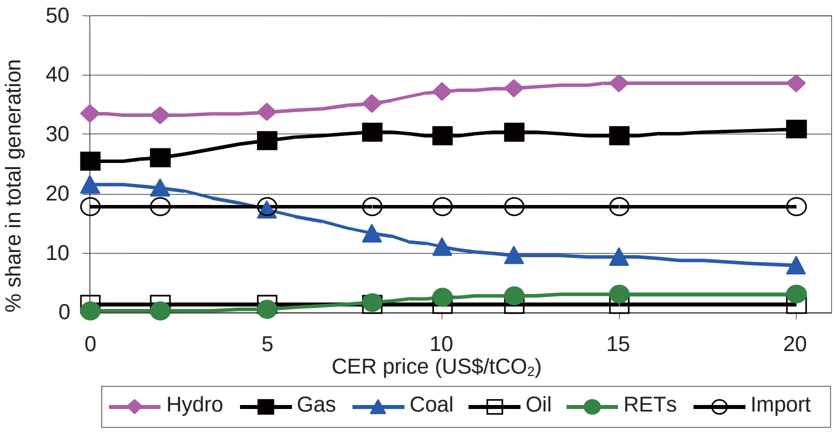

Figure 1. Shares in total power generation by fuel type in 2012

Figure 2a.
Sri Lanka

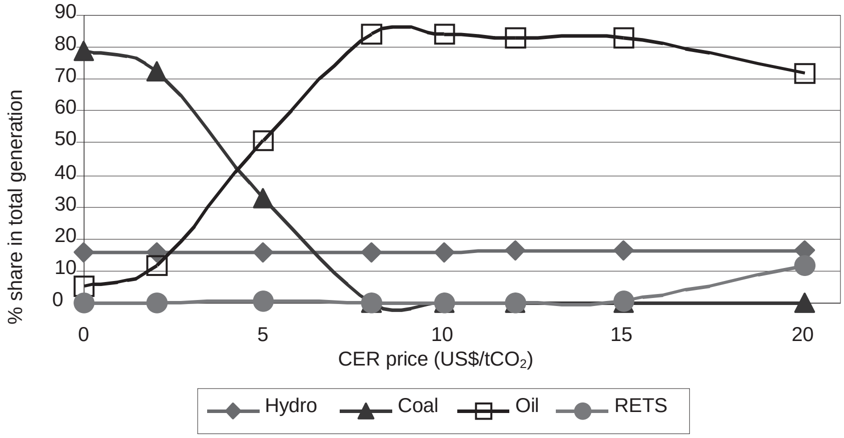

Figure 2b.
Thailand

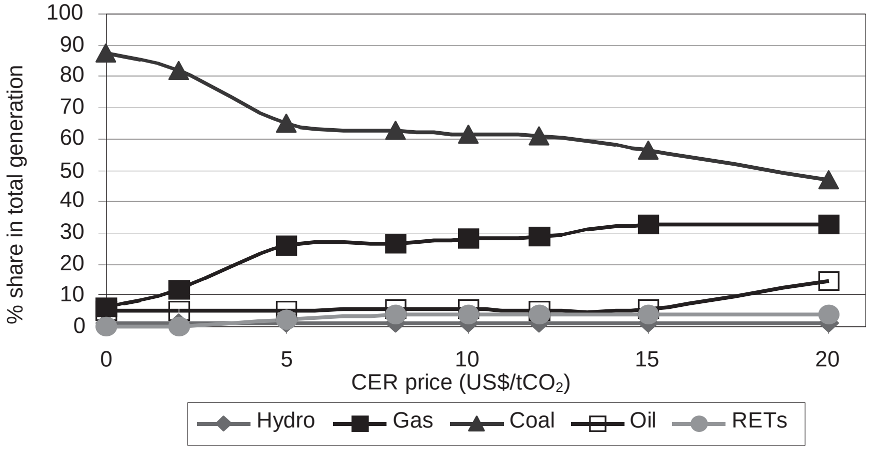

Figure 2c.
Vietnam

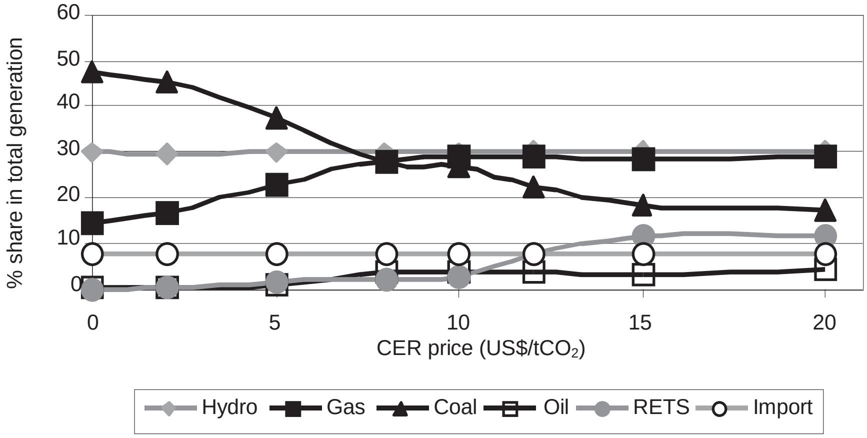

Figure 2. Shares in total generation by fuel type in 2025

Figure 3a.
Sri Lanka

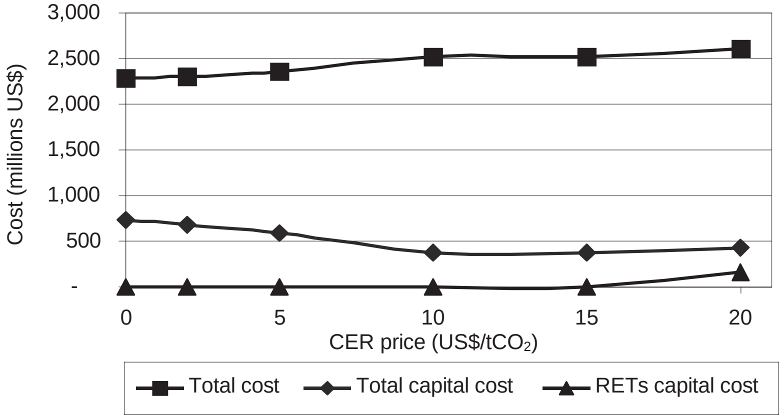

Figure 3b.
Thailand

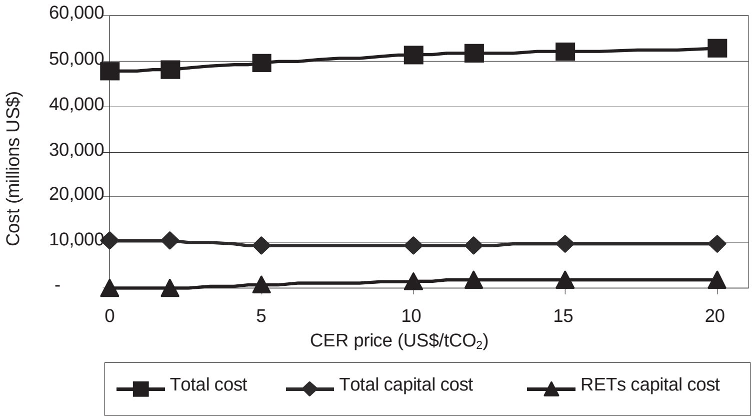

Figure 3c.
Vietnam

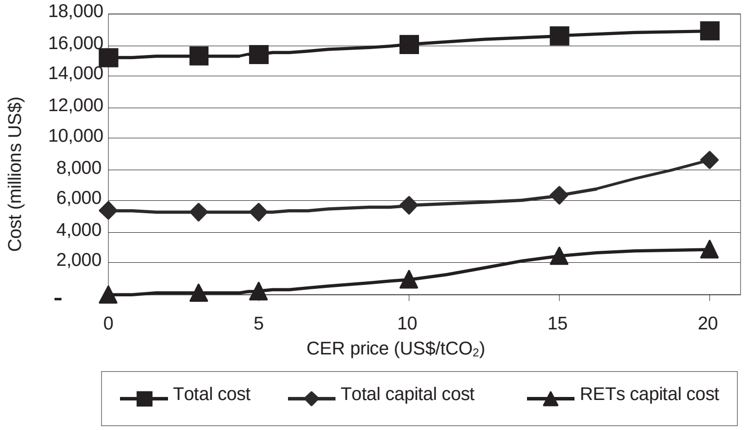

Figure 3. Capital- and total- costs during 2006–2025 at selected CER prices

A major finding of the foregoing analysis is that fuel-switching (from coal to gas in Thailand and Vietnam and from coal to oil in Sri Lanka) would be the most cost-efficient and predominant option for reducing CO_2 emissions from the grid-connected power system, not only at the prevailing CER prices of \$3 to \$6 (Lee 2003) but also at significantly higher prices of up to \$20. The dominant role of fuel-switching continues not only until 2012 but also during the entire planning horizon of 2006 to 2025. It would be the only cost-efficient source of CO_2 reduction in Sri Lanka at prices of up to \$15 until 2025, while it would be the only cost-effective option for CO_2 reduction in Thailand at CER prices up to \$5.

The use of RETs would not be optimal in Sri Lanka even at a CER price of \$15 by 2012, and this is so also by 2025. Power generation based on biomass would become optimal even at a relatively low CER price of \$5 in Thailand. Similarly, geothermal-based electricity generation would become cost-efficient even at the CER price of \$5 in Vietnam. Besides, the hydropower share would also increase at CER prices of \$5 and above in the case of Vietnam. This is because, unlike Sri Lanka and Thailand, Vietnam has significant potential for additional hydropower generation.

As fuel-switching would be the efficient and dominant mode for CO_2 reduction at low CER prices, a question can be raised as to whether fuel-switching would result in the introduction of technologies that are different from the existing ones in these countries. To answer this question, the structure of capacity additions by type of power plants needs to be analyzed. Additions to generation capacity during 2006 to 2012 at different CER prices are presented in table 4, while table 5 presents the capacity additions during the entire planning horizon.

Table 4. Power generation capacity additions by plant type during 2006–2012, in megawatts (MW)

Country	Plant type	Fuel type	CER Price, US\$/tCO_2 \$0	\$5	\$10	\$15	\$20
Sri Lanka	Pulverized coal	Coal	600	300	0	0	0
	Combined cycle	Oil	0	0	300	300	300
	RETs	RE[a]	0	0	3	3	0
	Total addition (MW)		600	300	303	303	300
Thailand	Pulverized/supercritical coal	Coal	11,000	1,200	0	0	0
	Gas turbine	Gas	2,200	2,200	2,200	2,200	2,200
	Combined cycle	Gas	2,400	11,400	11,400	11,400	11,400
	RETs	RE	0	160	1,960	2,910	2,910
	Total addition (MW)		15,600	14,960	15,560	16,510	16,510
Vietnam	Pulverized/supercritical coal	Coal	1,300	700	0	0	0
	Combined cycle	Gas	1,440	1,440	1,440	1,440	1,440
	Import	Hydro	3,000	3,000	3,000	3,000	3,000
	Large hydro	Hydro	3,373	4,060	5,287	5,520	5,690
	RETs	RE	0	215	1,083	1,201	1,205
	Total addition (MW)		9,113	9,415	10,810	11,161	11,335

[a]Renewable energy.

Table 5. Power generation capacity additions by plant type during 2006–2025, in megawatts (MW)

Country	Plant type	Fuel type	CER price, US$/$tCO_2$				
			$0	$5	$10	$15	$20
Sri Lanka	Pulverized coal	Coal	3,600	1,500	0	0	0
	Combined cycle	Oil	0	1,800	3,300	3,600	3,300
	Gas turbine	Oil	735	875	840	455	210
	Large hydro	Hydro	40	40	40	89	89
	RETs	RE[a]	0	52	30	29	729
	Total addition (MW)		4,375	4,267	4,210	4,173	4,328
Thailand	Pulverized, IGCC,[b] and supercritical coal	Coal	65,000	46,000	45,500	45,500	35,500
	Gas turbine	Gas	2,200	2,200	2,200	2,200	2,200
	Combined cycle	Gas	6,000	22,800	22,800	22,800	33,000
	RETs	RE	0	1,960	2,910	3,085	2,985
	Total addition (MW)		73,200	72,960	73,410	73,585	73,685
Vietnam	Pulverized / supercritical coal	Coal	19,400	13,100	8,300	6,400	6,000
	Combined cycle	Gas	5,670	8,850	8,850	8,850	8,850
	Import	Hydro	3,000	3,000	3,000	3,000	3,000
	Large hydro	Hydro	12,722	14,014	14,714	13,514	13,514
	Diesel conventional	Diesel	0	580	1,450	1,450	1,450
	Oil steam	Oil	0	600	2,400	1,800	2,400
	RETs	RE	20	650	2,528	10,801	10,800
	Total addition (MW)		40,812	40,794	41,242	45,815	46,014

[a]Renewable energy.

[b]Integrated gasification combined cycle.

As can be seen from table 4, there would be an addition of 11,400 megawatts (MW) of combined cycle capacity at CER prices of $5 to $20 in Thailand. Combined cycle power plants are not new to Thailand; there already exists over 5,000 MW of such capacity in the country (EGAT 2003). A further 2,400 MW of such capacity would be added by 2012 in the base case (i.e., the zero CER price case). Thus, CDM projects based on fuel-switching (from coal- to gas-fired generation) cannot be expected to result in a significant transfer of technology to Thailand.

In Vietnam, additional coal-fired capacity requirement would decline from 1,300 MW in the base case to 700 MW during 2006 to 2012 at the CER price of $5; no such capacity would be added at a CER price of $10 and higher during the period. The reduction in coal-based generation capacity at the CER price of $5 would be compensated for by an addition of large hydro capacity. Altogether, 1,440 MW of combined cycle capacity would be added during the period in the base case as well as at CER price cases, while large hydro capacity of 4,060 MW and 5,690 MW would be added at CER prices of $5 and $20, respectively, as compared to the 3,000 MW that would be added in the base case. More additions of combined cycle and large hydro capacity would take place over a longer period of 2006 to 2025 (table

5). Like Thailand, however, Vietnam already possesses over 2,700 MW of combined cycle plants and more than 4,600 MW of hydropower capacity (IE 2004). Thus, the additions of the combined cycle and hydro plants under the CDM (i.e., at positive CER prices) may bring only marginal gains to Vietnam in terms of technology transfer.

In Sri Lanka coal-fired generation capacity would decline from 600 MW in the base case to 300 MW at the CER price of $5 from 2006 to 2012 (table 4), while it would decline from 3,600 MW in the base case to 1,500 MW at the CER price of $5 over the whole planning horizon; no coal-fired capacity would be added at a CER price of $10 and above (table 5). New requirements for increased coal capacity would be avoided by a significant addition of combined cycle oil-fired plants at CER prices of $5 to $20. The existing capacity of combined cycle plants in Sri Lanka is relatively small (328 MW), and an addition of new, large-scale, combined cycle capacity would provide an opportunity to build significant capacity in installation, operation, and maintenance of such plants. Thus, technology transfer in the form of human resource development for installation, operation, and maintenance of such plants is expected to take place in the country through the CDM.

5. The potential of renewable energy technologies under the CDM

Table 6 shows the cost-effective levels of adding power generation capacity by type of RET in Sri Lanka, Thailand, and Vietnam at selected CER prices during the period of 2006 to 2012 (i.e., the end of the first commitment period of the Kyoto Protocol), while table 7 presents the corresponding figures during the entire planning horizon (2006–2025).

Table 6. RET-based generation capacity additions at selected CER prices during 2006–2012, in megawatts (MW)

Country	Technology	CER price, US$/t$CO_2$				
		$0	$5	$10	$15	$20
Sri Lanka	Biomass	0	0	0	0	0
	Small hydro	0	0	0	0	0
	Solar	0	0	0	0	0
	Wind	0	0	3	3	0
	Total RETs (MW)	0	0	3	3	0
Thailand	Biomass	0	160	1,960	2,910	2,910
	Solar	0	0	0	0	0
	Wind	0	0	0	0	0
	Total RETs (MW)	0	160	1,960	2,910	2,910
Vietnam	Biomass	0	0	0	0	0
	Geothermal	0	20	40	120	120
	Small hydro	0	195	315	281	285
	Solar	0	0	0	0	0
	Wind	0	0	728	800	800
	Total RETs (MW)	0	215	1,083	1,201	1,205

As can be seen from table 6, adding new grid-connected solar power generation would not be cost-effective in the three countries during the first commitment period, even at the CER price of $20. In addition, biomass-based power generation would not be an optimal technology for 2006 to 2012 in Sri Lanka and Vietnam, while the wind power option would not be attractive in Thailand, even at the CER price up to $20. In Sri Lanka, the addition of new grid-connected small hydro capacity would not be attractive during the period for the entire CER price range considered in the study (i.e., up to $20). Furthermore, only an insignificant addition of wind-generating capacity would take place in the country at CER prices of $10 and $15. In the case of Thailand, it would be optimal to add only biomass-based power plant capacity to the power grid at the CER price of $5 and above during the period. In Vietnam, some small hydro and geothermal would be cost-effective at $5 and above, while wind would be attractive at $10 and above. Overall, the non-hydro RET options do not play a major role at CER prices below $10 during the period.

Table 7. RET-based generation capacity additions at selected CER prices during 2006–2025, in megawatts (MW)

Country	Technology	CER price, US$/t$CO_2$				
		$0	$5	$10	$15	$20
Sri Lanka	Biomass	0	10	0	20	480
	Small hydro	0	0	0	0	0
	Solar	0	0	0	0	0
	Wind	0	42	30	9	249
	Total RETs (MW)	0	52	30	29	729
Thailand	Biomass	0	1,960	2,910	3,085	2,985
	Solar	0	0	0	0	0
	Wind	0	0	0	0	0
	Total RETs (MW)	0	1,960	2,910	3,085	2,985
Vietnam	Biomass	0	0	0	0	0
	Geothermal	20	400	400	400	400
	Small hydro	0	245	1,400	1,401	1,400
	Solar	0	0	0	0	0
	Wind	0	5	728	9,000	9,000
	Total RETs (MW)	20	650	2,528	10,801	10,800

Would the result be different over a longer period of time, i.e., after the first commitment period? As can be seen in table 7, grid-connected solar and wind capacity would continue to not be cost effective in Thailand until 2025 (i.e., the end of the planning horizon of this study) even up to the CER price of $20. Biomass power generation would be a cost-effective option in Thailand at CER prices of $5 and higher, and in Sri Lanka at prices of $15 and higher. The case of Vietnam differs again from Thailand and Sri Lanka in that geothermal, small hydro, and wind would be cost-effective in Vietnam, even at a relatively low CER price of $5. In summary, non-hydro RETs would not contribute significantly in the power sector at the prevailing market price of CERs in the three countries (i.e., $3 to $6). This would also be the case at higher prices of up to $15 in Sri Lanka and Thailand and up to $10 in Vietnam. At the CER price of $10, the share of all non-hydro capacity in total power generation capacity addition during 2006 to 2025 would be 0.7 percent in Sri Lanka, 3.9 percent in Thailand, and 2.7 percent in Vietnam.

6. Capital implications of the CDM in the power sector

Many developing countries are faced with a shortage of capital for financing their energy and power sector projects. In this context, it is natural to ask whether the CDM would necessarily help alleviate the problem of capital shortage in their energy and power sectors. In other words, would the CDM reduce the total capital requirements? The answer to this question depends largely on the type of CDM projects implemented. If they are of the fuel-switching type in the power sector, e.g., using combined cycle gas-fired plants, instead of the more capital-intensive, coal-fired steam turbine and super-critical plants, then total capital requirements would indeed be reduced, although the total cost of electricity production may increase due to increase in fuel cost (i.e., higher gas or oil cost). On the other hand, if the CDM mainly involves RETs-based power generation projects such as wind or solar power plants, then it is possible for the total capital requirement of the power sector to increase. This could happen for two main reasons. First, most RETs are normally more capital-intensive than the thermal alternatives. Second, the addition of RETs-based plant capacity like wind and solar may not reduce the capacity requirement of other types by the same amount, due to the intermittent nature of energy availability from such resources; as a result, total additional capacity requirement of the power sector may be increased. This can be seen in the case of Vietnam (see table 5). At the CER price of $15, not only was there a significant level of RETs capacity added but the total additional capacity required in the power sector was also increased by 12 percent in comparison to that in the base case.

Figures 3a to 3c show the discounted capital and total costs during 2006 to 2025 in the power sectors of Sri Lanka, Thailand, and Vietnam at different CER prices along with the capital cost of RETs-based power plants. Compared to the base case, the total capital cost in the power sector of Sri Lanka would be reduced by 19.7 percent and about 48.9 percent at CER prices of $5 and $10, respectively. Similarly, in Thailand, the total capital cost would be reduced by about 9.7 percent and 10.5 percent at CER prices of $5 and $10, respectively. This is mainly because, at these CER prices, CO_2 emissions reduction would take place mainly through fuel-switching, i.e., using less capital-intensive, oil-fired combined cycle plants instead of coal-fired thermal plants in Sri Lanka and gas-based combined cycle plants in Thailand. Unlike in Sri Lanka and Thailand, at CER prices of $10 and $15, the total investment required in Vietnam's power sector would increase by about 7 percent and 18 percent, respectively, as compared to that in the base case.

The upshot of this discussion is that the CDM may help alleviate the capital shortage problem in the power sector of a developing country when it involves the implementation of projects like fuel-switching. On the other hand, implementation of RETs-based CDM projects (especially wind and solar) may result in a higher investment requirement at the sectoral level than in the base case. One implication of this is that low-income countries with a serious shortage of capital may be particularly handicapped in exploiting CDM opportunities to any significant level.

It should be noted that the foregoing analysis presents an optimistic assessment of CDM potential at the selected CER prices because no transaction cost was considered in determining the optimal electricity generation options and associated level of CO_2 emissions reduction. CDM potential could be smaller and the choice of cost-effective technology options could differ if transaction costs associated with different activities in the CDM project cycle are considered. In particular, the inclusion of transaction costs would further reduce the viability of most RETs, as their transaction costs per unit of emissions reduction are high due to their relatively small scale. According to Michaelowa et al. (2003), transaction costs per tonne of CO_2 equivalent can vary widely with project size, i.e., from 0.1 euros (€) per tonne of carbon dioxide (tCO_2), in the case of very large hydro projects, to €1,000/tCO_2 for micro projects (like solar photovoltaics). Furthermore, they report that under current estimates of world market prices for greenhouse gas emission permits, projects with annual emissions reductions of less than a 50,000 tCO_2 equivalent are unlikely to be viable. Thus, renewable power projects based on solar photovoltaics, wind, and biomass may not be viable if their size (i.e., capacity) is below 37 MW, 22 MW, and 8 MW, respectively.[1] In the context of many low-income developing countries, however, RETs-based projects are normally not as big.

7. Barriers to environmentally sound technologies and the CDM

As the CDM is a market-based mechanism, a necessary condition for implementation of a CDM project is its economic viability. The CER benefit under the CDM could improve the economics of a project, but implementation of a project under the CDM could still be difficult due to a number of barriers. Many of the barriers that are typical to the adoption of environmentally sound technologies (ESTs) would therefore also be applicable to CDM projects. In the power sector, the key barriers in many developing countries (DCs) include (1) regulatory/institutional barriers, (2) barriers related to foreign investment, (3) lack of access to financing, (4) technical barriers, and (5) CDM process-specific risk and uncertainty. The discussion in this section is made in the broader context of DCs rather than being specific to the three selected countries.

Institutional and regulatory barriers. Traditionally in many developing countries, a single, vertically-integrated public utility is involved in electricity generation, transmission, and distribution. An absence of laws and policies that allow private firms to produce electricity and that mandate the public electric utilities to purchase electricity produced by private firms or independent power producers (IPPs) prevent investment by private parties in cleaner and climate-friendly power generation technologies. In addition, a lack of policies on determining utilities' buyback rates for electricity produced by IPPs can be a barrier to the implementation of power projects by private parties; the same applies to projects under the CDM.

Barriers to foreign investment. Lack of clear policies and regulation on foreign investments serves as a barrier to CDM projects to be implemented through such investments. In many countries an absence of clearly defined laws and policies governing foreign investment—including policies on the transfer of income earned by foreign investments, as well as foreign exchange regulations—acts as the main barrier

1. These estimates were obtained by assuming a baseline emission factor of 900 g/kWh for a coal-burning power plant and capacity factors of 0.17, 0.30, and 0.79 for solar photovoltaic, wind, and biomass power plants, respectively. Capacity factor is defined as the ratio of average power supplied by a power plant to total capacity of the plant.

to foreign capital inflows. Clearly, a lack of policies supportive of foreign investment will reduce the level of implementation of projects under the CDM.

Many developing countries, especially those in the low-income group, also face high financing costs due to higher risks attached to investments in these countries. Unless the higher-risk premium in the cost of financing can be more than compensated for by savings in project costs, CDM investments may not be profitable. This implies that CDM activities in low-income countries will be mostly limited to relatively high financial return projects.

Lack of access to financing facilities. Potential developers of RETs and energy-efficiency improvement (EEI) projects often lack access to credit facilities for financing the projects in many DCs. In many cases financial institutions are either unprepared (as a matter of policy) or lack expertise in dealing with investments related to RETs and EEI projects.

Technical barriers. In the context of the demand-side EEI projects in many DCs, these include lack of technical services (repair and maintenance), poor quality of EEI equipment ("substandard products"), and inadequate knowledge on operating EEI projects. In the case of electrical equipment, power quality could also be a major barrier. For example, compact fluorescent lamps (CFLs), which use 75 to 80 percent less electricity compared to incandescent lamps, may not operate properly below certain voltages (i.e., 160 to 170 volts), yet it is not uncommon to occasionally find supply voltages below such levels in many developing countries, especially in rural areas of low-income countries.

CDM process-specific risk and uncertainty. Most of the barriers typically faced by investors in EST-based projects also apply to projects under the CDM. In addition, the proponents of CDM projects have to satisfy at least two additional requirements: the sustainable development criteria and the additionality criterion.[2] Sustainable development criteria can be country-specific, and comprehensive tests for them in the context of the CDM are still under development in most countries. Until the sustainable development criteria are formulated in operational terms (which yet remains to be accomplished in most developing countries), CDM projects face uncertainties as to their approval by the host countries. Similarly, CDM projects also face uncertainties related to approval of proposed methodologies by the CDM Executive Board for determining their additionality. It should, however, be noted that these uncertainties may be reduced over time with the rise in the number of CDM projects implemented, as the formulations of sustainable development and additionality criteria would become more transparent in the process.

In the absence of an agreement beyond the first commitment period, CDM projects are also subject to uncertainties as to the validity of CERs after the first commitment period is over. Large-scale investment in capital-intensive projects with a long life can be especially sensitive to such uncertainty.

8. Conclusion

This paper has analyzed the CDM potential of major technology options (fuel-switching and renewable energy-based power generation) in the power sector of Sri Lanka, Thailand, and Vietnam. The analysis shows that fuel-switching (i.e., from coal to gas or oil) would be the more cost-efficient

2. For joint implementation and CDM projects, emissions reductions must be additional to those that would otherwise occur.

and predominant option for CO_2 reduction at low CER prices (in all three countries at CER prices up to $20). Most renewable energy (biomass, solar, and wind) power generation projects would not be cost-effective under the CDM, not only at the prevailing CER market price (i.e., 3 to 6 dollars) but also at significantly higher prices. It is found that from 2006 to 2025 the combined share of non-hydro RETs in total capacity addition in the power sector would be 0.7 percent in Sri Lanka, 2.75 percent in Vietnam, and 3.9 percent in Thailand at the CER price of $10.

The analysis also shows that the total capital requirement of the power sector would be lower than that at the base case (i.e., without the CDM) at low CER prices due to the predominant role of fuel-switching in CO_2 emissions reduction through replacement of coal-fired power plants with less capital-intensive combined cycle plants. On the other hand, the use of a significant level of RETs-based power plants under the CDM could cause the opposite effect, i.e., capital needs could be higher than in the base case (as was found in the Vietnam case at the $20 CER price).

The economic potential of the CDM in developing countries may not be fully attainable due to the existence of institutional, regulatory, and other barriers, which either increase the CDM project cost or make the implementation of CDM projects practically infeasible.

It should be noted that the quantitative analysis of the CDM potential and choice of technological options in this paper was carried out by ignoring transaction costs. Incorporation of transaction costs is expected to further reduce the economic viability of the power generation options based on RETs, which are mostly decentralized and normally smaller in size than the thermal and large hydro options. It should also be noted that the present analysis has not considered the role of demand-side energy-efficiency improvement options for CO_2 emissions reduction at different CER prices. We intend to deal with these issues in subsequent studies.

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Special Feature on the Kyoto Protocol

Mitigating Climate Change through the CDM —The Case of China

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Continued economic growth in China, which is spurring on demand for and consumption of large amounts of energy, poses a significant challenge to implementing a sustainable development strategy in this country. Whereas the climate change issue may not be given a high priority on the nation's political agenda, greenhouse gas emission reduction measures, such as projects under the Clean Development Mechanism (CDM) of the Kyoto Protocol, may provide an opportunity to transfer highly-efficient, low greenhouse gas-producing energy supply and energy use technologies to China and thus stabilize the environmental impact of its economic growth at a relatively low level. In recent years, China has played a constructive role in promoting the effectiveness of the Kyoto Protocol and implementing the CDM. Over roughly the same period, a number of research and capacity-building projects have been conducted to strengthen China's capabilities in methodological research, economic assessment, institutional arrangement, project development and operation, etc. The construction of a domestic CDM administration system is underway, and priority areas for CDM operation have been identified. However, the barriers that have arisen on the domestic and international stage at the institutional, information, pricing, procedural, and capacity and awareness levels need to be overcome in order to advance implementation of the CDM in China.

Keywords: Clean Development Mechanism (CDM), China.

1. The role of the CDM in China's social and economic development

In the dynamic rise of the East Asia region, China has seen impressive economic growth in the last two decades. Between 1978 and 2000 its economy grew at an average 9.52 percent per year, and at the turn of the twenty-first century, China became the seventh largest economy in the world.

In order to construct an overall prosperous and healthy society in the first two decades of the new century, China's economy must grow at an average of 7 percent annually. The resultant large demand for energy will pose serious challenges to both energy supply and security. Increasing energy consumption will also lead to a massive increase in local environmental pollution and emissions of greenhouse gases (GHG).

In this context, sustainable development, including securing a sustainable energy supply, is one of the key elements needed to safeguard people's well-being in the country. In the long run, social and economic development in China should pursue the following objectives: sustain rapid economic growth; transform the economic growth pattern by reducing energy consumption; save energy and increase economic efficiency; improve and further open up foreign capital utilization; introduce talent and

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technology; strengthen energy and transportation infrastructure; enhance environmental protection and ecological construction; and accelerate economic development in rural and remote areas, especially the western regions.

Whereas the climate change issue may not be given a high priority on the political agenda in China, GHG emission reduction measures such as projects under the Clean Development Mechanism (CDM) of the Kyoto Protocol can be consistent with national development goals and relevant policies.

The low efficiency of Chinese energy consumption is significant. Updating old and polluting technology is essential to achieving more sustainable development and is likely to improve the general quality of life. Some studies have demonstrated that carbon dioxide (CO_2) reductions may be accompanied by substantial reductions in damage to human health, e.g., premature mortality and respiratory diseases. Therefore, CDM projects can provide an opportunity to transfer highly-efficient, low-GHG energy supply and energy use technologies to China, and thus stabilize the environmental impact of its economic growth at a relatively low level.

Other studies suggest that under the current form of CDM operation, China’s participation can only result in the acquisition of mitigation equipment and maintenance and operation technology rather than manufacturing technology. Mitigation equipment transferred through the CDM is only a technology carrier; therefore it is not part of China’s technology development process and will not promote the development of innovative technological capabilities in China. This implies that the CDM may not perform its purposes because it may only deliver temporary but not sustained development.

If, through the CDM, only mitigation equipment and maintenance and operation technologies are transferred, then the benefits will be short term, and adverse impacts on future mitigation ability will be exposed when China takes on an emission reduction commitment. If China not only acquires the necessary hardware and technologies but is also able to disseminate engineering services, management services, product design, and innovation know-how, then the CDM may assist China in fostering its own ability to produce mitigation technology and therefore achieve real sustainable development.

2. CDM implementation in China

2.1. Institutional framework

China has been dutifully implementing the 1992 United Nations Framework Convention on Climate Change (UNFCCC) and in 1998 established an inter-ministerial committee to coordinate national activities related to climate change. This committee, called the National Climate Change Coordination Committee (NCCCC), has 15 members and is in charge of overseeing all activities related to climate change in China (see figure 1). The National Development and Reform Commission (NDRC), which chairs the committee and acts as the secretariat to the committee, houses the NCCCC office.

China’s ratification of the Kyoto Protocol in August 2002 enabled it to establish an institutional framework to implement the CDM in the country. The NCCCC provides the institutional and personnel bases for a domestic CDM management system (see figure 2). At present, a regulation on domestic CDM administration is going through the process of approval by national authorities. The proposed regulation states that the NCCCC will be responsible for reviewing national CDM policies, regulations, and standards, and approving national CDM board members, etc.

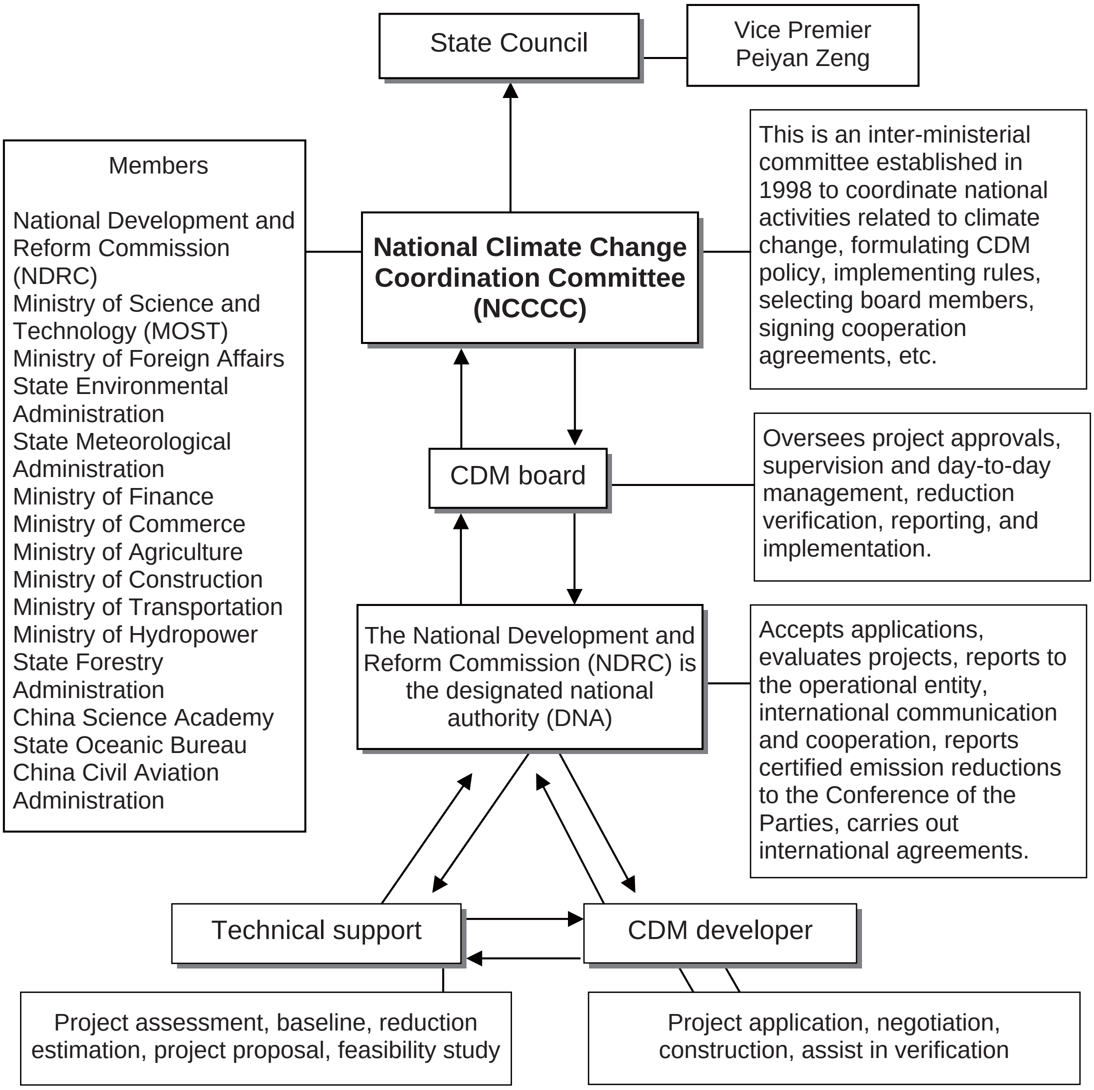

Figure 1. Organizational structure of the National Climate Change Coordination Committee and functions of related organizations

The new national CDM board will be composed of the NDRC, the Ministry of Science and Technology (MOST), Ministry of Foreign Affairs (MOFA), State Environmental Protection Administration, State Meteorological Administration, Ministry of Finance, and the Ministry of Agriculture. The responsibilities of the board include the following: approve CDM projects; report to the NCCCC on CDM implementation, issues, and suggestions; propose the modification of operational rules and procedures of national CDM activities; examine qualifications, project design documents, baseline methodology, and GHG emission reductions; the price of certified emission reductions (CERs); and approval of the terms of capital and technology transfer and monitoring plans, etc.

The NDRC is China's designated national authority (DNA) to the Conference of the Parties (COP). Its responsibilities include the following: accept project applications; grant final approval of projects together with MOST and MOFA, based on the results of national CDM board assessment; issue project approval documents on behalf of the national government; monitor and administrate CDM project implementation; foreign communications; etc.

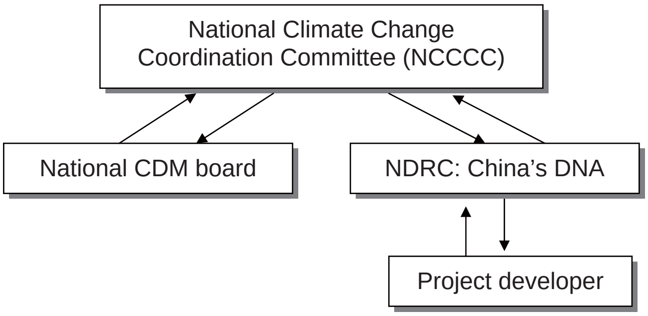

Figure 2. Organizational structure under the National Climate Change Coordination Committee

CDM project developers in China must be Chinese enterprises or entities or Chinese holding joint ventures (NDRC 2004). They are required to submit relevant project documents to the NDRC for approval (see figure 2).

2.2. Procedure for approving domestic CDM projects

The nature of CDM projects is investment in new or renovation projects and, therefore, they should follow the relevant national and local approval procedures for such investments. The NDRC is responsible for approving domestic projects (new investment and renovation projects) with a total investment over 200 million RMB and foreign investment projects with a total investment above 100 million US dollars (China Internet Information Center 2002).

The specific CDM project approval procedure is not intended to interfere with the existing normal project management procedure but, rather, is an added component to the existing one. The two can proceed in parallel, but the projects normally first go through the procedures for new or renovation investment approval and then apply for CDM approval. Figure 3 lays out a possible domestic CDM project approval process.

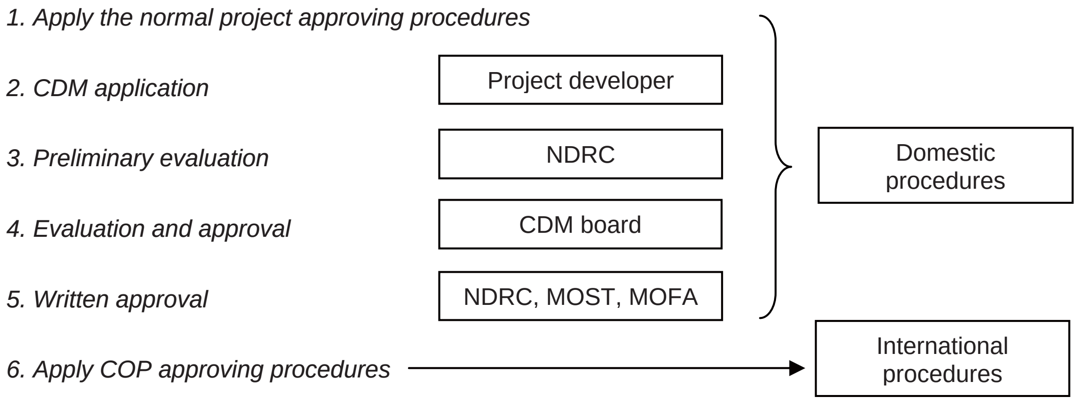

Figure 3. A possible domestic CDM project approval process

2.3. Capacity building and research

The CDM is a cooperation mechanism that is attracting significant attention from both developed and developing countries, and many national and international organizations have conducted relevant research. Given the political and economic importance of China, as well as its key role in either exacerbating or mitigating global climate change, the international community has paid close attention to CDM development in China. The country is ideal for large-scale GHG reduction projects, and thus industrial countries have been eager to start projects and have already provided CDM capacity building support.

Since 2000, a number of CDM-related projects funded by international organizations or foreign governments have been carried out to strengthen China's capability in methodological research, economic assessment, institutional arrangement, project development, and operation, etc. Table 1, contains information about CDM cooperation studies between China and foreign partners.

Table 1. Summary information on CDM capacity building and research projects in China

Project name	Project partners	Objectives	Content	Time frame
1. Country Study on CDM Methodology and its Application	World Bank supports the project. MOST, GTZ, the Swiss government, and Qinghua University are involved in project implementation.	The project aims to understand, master, and apply CDM methodology and technology, and find out the CDM mitigation potential in China and the country's position and role in the international carbon market. Capacity building in China shall also be enhanced.	1. CDM methodology and technical issues, including baseline determination, project boundaries, and additionally and methodology on incremental mitigation cost. 2. CDM case study identification and selection of potential CDM projects in priority sectors.	2000–2003

Table 1—*Continued*

Project name	Project partners	Objectives	Content	Time frame
			3. Economic analysis on China's potential to supply CERs to the world carbon market.	
2. China–Canada Co-operation Project on Climate Change	This is a cooperation project between the Canadian International Development Agency and the NDRC. Qinghua University carries out the CDM component.	The objective is to increase the capacity of Chinese researchers and policy makers with respect to the CDM and climate change.	The research covers CDM capacity building; an operational model for CDM projects; case studies in transportation, renewable energy, and carbon sinks.	2001–2004
3. Feasibility Study of the CDM in China's Electricity Sector	Japan's National Institute for Research Advancement (NIRA) supports the Energy Research Institute (ERI) in cooperating with Japanese institutes.	Feasibility of various power generation technologies for CDM projects.	1. Concept, feature, and nature of the CDM 2. CDM rules and conditions 3. Baseline determination of the CDM 4. CDM case studies in the power sector 5. Main barriers to CDM implementation; policy recommendations	2002–2003
4. UNF CDM Capacity Building Project	Supported by the United Nations Foundation (UNF). The NDRC and ERI are the main actors in this project.	The project will develop CDM operational procedures and offer policy recommendations to the government to strengthen its management capacity for CDM operation.	1. CDM projects information collection and dissemination. 2. Training of policy makers, sector experts, and the business community. 3. Three areas in the energy sector are selected for conducting feasibility studies: renewable energy, energy efficiency, and coal bed methane.	2002–2006
5. Opportunities for the CDM in the Energy Sector of China	The Asian Development Bank (ADB) and MOST, with financial support from the Canadian government. Tsinghua University carries out the research work.	The project will examine opportunities for the CDM in China's energy sector and develop a strategy to promote these opportunities. Other objectives are to review the CDM process and its potential to be a source of project financing, and develop CDM projects as good practice examples.	The study will compile a project brochure, identify project options, and design a regime for small-scale projects. Four cases will be selected in Gansu and Guangxi provinces, and a project development procedure will be formulated.	2002–2003

Table 1—*Continued*

Project name	Project partners	Objectives	Content	Time frame
6. EU–China Partnership in CDM Implementation	The project is sponsored by the European Union (EU) and carried out by ERI, Guangzhou ERI, Berlin Energy Agency, InWEnt Capacity Building International, Italian Agency for New Technology, Energy and Environment, NOVEM, and LDK Consultants.	Contribute to the knowledge and practical implementation of the CDM in China. Identify renewable energy project opportunities to be included in the CDM scheme. Enhance the transfer of renewable energy technology and know-how between the EU and China. Improve the regulatory, normative, and administrative framework conditions for renewable energy use through transfer of experience on energy policy issues and creating awareness among European investors about CDM opportunities in China.	The project includes the following activities: 1. EU–China dialogue on renewable energy policy 2. Best practice renewable energy technologies in the EU and technology needs in China 3. Identification of renewable energy projects suitable for CDM financing 4. Promotion of CDM projects in the field of renewable energy among EU investors	2003–2005

2.4. CDM priority areas

China ranks second in energy consumption in the world. In 2001 its total energy consumption was 1.35 billion tonnes of coal equivalent (tce), accounting for about 13 percent of the world's total. Although substantial progress has been made over the last twenty years in controlling its growth in energy consumption, which has risen at about half the rate of economic growth, demand for energy will continue to grow in order to power economic growth in the twenty-first century. Increased GHG emissions associated with fossil fuel production and use are expected. It is estimated that in a well-off society scenario, China's CO_2 emissions related to fossil fuel combustion will reach about 1,700 to 1,800 million tonnes of carbon (MtC) in 2020 (see table 2).

Table 2. Carbon dioxide (CO_2) emissions from fossil fuel combustion in China from 1990 to 2001 and projected to 2020 (in million tonnes of carbon)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2020
ERI	550.00	631.27	663.25	701.85	739.32	786.90	838.50	821.41	783.08	769.98	767.21	777.30	1940 1716 1437
IEA	616.89	645.78	667.90	711.86	768.01	787.72	803.15	824.28	805.20	790.95	780.37	831.74	1574 1801

Source: Estimates from Energy Research Institute (ERI) experts; International Energy Agency (IEA). http://www.eia.doe.gov/emeu/international/total.html#Carbon.

Improving the low level of energy efficiency and the irrational energy structure in China represents great potential for GHG emission reduction. The low efficiency of Chinese energy use is especially significant. The average energy intensity per unit of gross domestic product lies eight times above the Japanese average, representing significant reduction opportunities in the industrial, residential, and transportation sectors. In China, common industrial equipment, such as boilers, motors, water pumps, and fans, are designed and produced at low efficiency levels and poorly operated. The average efficiency of industrial boilers in China is more than 10 percent lower than that at the international advanced level, as is also the case for water pumps and fans. These equipment are also the major energy consumers: the coal consumption of industrial boilers accounts for one-third of total coal use. Industrial motors use more than 60 percent of total industrial electricity. Replacing outdated equipment will lead to increased energy efficiency, consumption reduction, and GHG mitigation.

The average per capita energy consumption in China is much lower than that of developed countries. In the long run, however, domestic energy use and GHG emissions will inevitably increase. In this growth, if advanced technologies are adopted—such as energy-efficient lighting, high-efficiency refrigerators and air conditioners—and direct coal burning is replaced with gas, then the energy consumption growth rate will be slowed and therefore GHG emissions will be reduced.

In China, coal accounts for about 70 percent of primary energy production and consumption. If the use of low carbon fuels such as coal bed methane, renewable energy, and natural gas is increased, then GHG emissions will be reduced and environmental, economic, and social benefits will be increased.

Coal bed methane is an untraditional natural gas of high-heat value stored in coal reserves and released in mining activities. It is an energy source that can be comprehensively utilized in order to increase clean energy supply, improve mine safety, and protect the global environment.

In China, renewable energy—especially biomass, small hydropower, and solar heating—is already in significant use, providing nearly 300 Mtce of energy supply annually. Development and rapid commercialization of renewable energy technology is the most important measure to employ in order to realize emissions reductions.

Table 3 shows the priority area and technology for CDM implementation in China advocated by research communities.

Energy efficiency improvement and optimization of energy structure, including developing renewable energy and utilizing coal bed methane, are measures that will not only contribute to reducing global GHG emissions but they are also consistent with China's national interests. The CDM has the potential to attract additional private and government funding from developed countries, attract domestic investment in the energy and environment fields, introduce highly-efficient technology, and reduce environmental pollution from fossil fuel combustion.

Table 3. CDM priority areas and mitigation technologies

CDM priority area • sector	Mitigation technology
Energy efficiency improvement	
• Electricity	High efficiency and clean coal-fired power generation and combined heat and power (CHP); high-efficiency and low-loss transmission system; domestic garbage power generation; demand-side management
• Iron and steel	Coke dry quenching (CDQ); blast furnace spent pressure recovery using topping power generation, rotary gas recovery, and OG; high-temperature air combustion technology
• Cement	New dry technique; combustible waste as fuel and clinker component
• Residential	Residential boiler renovation; energy-saving lighting products
• Common equipment	Technical renovation of coal-fired industrial boilers; varied frequency speed adjustment motors; high-efficiency fans and water pumps
Energy structure improvement	
• Renewable energy	High-efficiency biomass conversion systems: district heating, gas and power supply demonstration projects, methane project, and biomass gasification. Wind power, solar photovoltaics, grid-connected wind power, decentralized wind power, floor heating, geothermal power generation and heat supply
• Coal bed methane	Coal mine methane extraction and utilization; ground development and utilization

Source: Research reports from ERI, China Climate Change Country Study (Tsinghua University 2000), etc.

3. Challenges to progress

3.1. Institutional

The CDM is a new cooperation mechanism requiring government commitment and participation; therefore, an administration system needs to be set up to implement it, requiring coordination among various departments. At present, there is no formal official procedure in place for approving CDM projects and related policies in China. The lack of clear guidance from the government to industry on the CDM and related issues is hampering the development of industry interest. This lack of clearly defined approval procedures leads to poor transparency, thereby increasing the transaction costs for industry. A sound management system, transparent procedure and rules, and efficient administration will reduce transaction costs and attract private investment.

This situation is progressively improving, however, through government commitment and foreign support. The task now is to establish the organizational structure, streamline the approval process, and strengthen management capability.

3.2. Capacity and awareness

Implementing the CDM in China is a challenging and complicated process involving many interest groups, who have very little knowledge and understanding of the institutional, financial, technical, and legislative aspects of the CDM. Local enterprises have no understanding of the potential benefits of the

CDM and limited experience in project development, monitoring, and implementation. Very few people in industry have even heard of the CDM. In addition, those organizations that have heard of it, often do not know how to go about developing a CDM project, or at best perceive it as a complex and high-risk opportunity.

There is also a lack of skills needed to develop CDM projects. Companies themselves do not have the skills needed to submit a "Project Idea Note," undertake pre-feasibility studies, and write proposals for CDM projects. There are no Chinese consultancy companies offering industry CDM services. Without the support of consultancy organizations there will be insufficient support for industry to develop CDM projects, other than turning to expensive foreign consultants.

The financial and insurance sectors are key actors in CDM implementation, but GHG credits are not yet considered an asset by insurance underwriters. A continued lack of understanding and awareness of the CDM in the financial sector is likely to lead to higher costs for developers.

3.3. Information

There is lack of capability to collect, analyze, and disseminate information on the CDM. Information needs to be widely disseminated in order to mobilize the participation of potential CDM players and promote public awareness of the CDM.

3.4. Buyer's market

Carbon sink projects and the withdrawal of the United States from the Kyoto Protocol have resulted in an over-supply of reduction credits and lower prices. Low demand for CERs leads to a CDM buyer's market, which puts the host countries in a disadvantaged position. The low CER price discourages project developers who have to bear the high transaction costs and most risks in developing CDM projects.

3.5. Cumbersome COP procedures and methodologies

The COP CDM procedure is a new level of international bureaucracy which, at present, entails a very complicated and time-consuming process, and Chinese stakeholders have little knowledge of the game rules. Moreover, complicated methodology, unclear definition of additionality criteria, vague project boundaries, and uncertainty have greatly increased transaction costs and discouraged potential developers.

Acknowledgements

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Special Feature on the Kyoto Protocol

The Clean Development Mechanism: Current Activities of Japan

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According to Japan's official Climate Change Policy Programme, the government aims to reduce its greenhouse gas emissions by 6 percent compared with its 1990 base year emissions, mainly through domestic actions, and then address a projected 1.6 percent shortfall of emission reductions by utilizing the Kyoto Mechanisms. It is pointed out, however, that the shortfall might be larger than estimated. Among the Kyoto Mechanisms, Japan's priority is the Clean Development Mechanism (CDM) and joint implementation (JI), at least for now. The Government of Japan has been actively promoting CDM and JI projects with this in mind and providing various kinds of promotion schemes to private firms and host countries, especially in the Asia-Pacific region. So far, these have been process-based promotion schemes, in which, regardless of whether or not firms can acquire credits, they are able to receive support from the government. In contrast, as the level of understanding of the CDM and JI in Japan and host countries increases and the first commitment period of the Kyoto Protocol (2008–2012) quickly approaches, results-based promotion schemes are required that reward only those who actually succeed in acquiring credits. It should be noted also that some Japanese firms are moving towards purchasing emission reduction credits or investing in CDM and JI projects. The subjective motive for buying credits is partly to offset their future emissions, but mainly it is to gain know-how in credits procurement through experience. The next two or three years might be the last opportunity for Japan to start preparations for the CDM and JI, in which it is anticipated that both the government and Japanese firms will become active players.

Keywords: Clean Development Mechanism (CDM), Kyoto Mechanisms.

1. Introduction

It has been seven years since the Kyoto Protocol was adopted at the Third Session of the Conference of the Parties (COP 3) to the United Nations Framework Convention on Climate Change (UNFCCC) held in Kyoto, Japan, in December 1997, and many twists and turns have appeared during the ensuing years. The Bush administration announced the withdrawal of the United States from the protocol in March 2001, Japan ratified it in June 2002, and the Russian government (Cabinet) submitted it to the State Duma (Russian parliament) for ratification in September 2004. Today, it is anticipated that the Kyoto Protocol will enter into force in the first half of 2005.

In terms of climate policy, Japan has maintained that, regardless of Russia's ratification, it will make its best efforts to achieve its greenhouse gas (GHG) emission reduction commitment under the protocol and this policy has been proven to be right, when looking at movement in the Russian Federation. It is often pointed out, however, that the target for Japan under the protocol is onerous, and that the cost of

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GHG emission reduction in Japan is relatively high (e.g., IPCC 2001). Therefore, Japan will be able to gain a huge cost-benefit by using the Kyoto Mechanisms after first deploying domestic measures.

This paper will examine Japan's policy regarding the Kyoto Mechanisms and interpret the country's present attitude towards the Clean Development Mechanism (CDM) and joint implementation (JI). Furthermore, it will describe both current public and private activities relating to the CDM and JI in Japan.

2. Japan's policy regarding the Kyoto Mechanisms

According to Japan's Climate Change Policy Programme, which was originally created in 1998 and then revised in 2002, just before Japan's ratification of the Kyoto Protocol, it will reduce its GHG emissions by 6 percent compared with its 1990 base year emissions, mainly through domestic actions, and then address its offset of 1.6 percent by utilizing the Kyoto Mechanisms, which include international emissions trading (IET), JI, and the CDM (Government of Japan 2002). The figure of 1.6 percent of Japan's base year emissions corresponds to roughly 20 million tonnes of carbon dioxide (CO_2) equivalent per year, or 100 million tonnes during the first commitment period (2008–2012), but the 1.6 percent figure is not clearly listed in the Climate Change Policy Programme. Officially, 1.6 percent is the estimated shortfall of the target after all the policies and measures to reduce domestic GHG emissions described in the program are enacted. In case Japan is able to achieve its target solely through domestic actions, it will not be necessary to utilize the Kyoto Mechanisms. It is often pointed out, however, that the program was created merely on optimistic assumptions and that, in reality, GHG emissions would not decrease as projected.

In April 2004, the subcommittee of Japan's Central Environment Council discussed provisional GHG emission estimates for the year 2010 based on current policies and measures (Central Environment Council 2004). According to meeting handouts, Japan's GHG emissions in 2010 might be 4.1 percent to 4.6 percent higher than its base year emissions. If this is true, it will have to reduce its GHG emissions by an additional 10 percent from its baseline, and the amount of emission reduction will be roughly 80 million tonnes of CO_2 equivalent per year, or 400 million tonnes during the first commitment period, after taking account of its sink credits, which corresponds to 3.9 percent of its base year emissions. The discussion in the subcommittee did not imply that Japan should revise the amount it utilizes the Kyoto Mechanisms, because the shortfall figure might be larger than estimated. Instead, the discussion seemed to persist in focusing on the necessity of strengthening domestic measures. At the same time, however, it recognized that Japan might have to rely more on the Kyoto Mechanisms to cover the shortfall from the target.

Among the Kyoto Mechanisms, Japan's government has apparently set different priorities on each mechanism. For instance, a heavy dependence on international emissions trading is not favored, partly because it will not start until 2008 and mostly because IET credits are not always backed by emission reductions. Sometimes these credits are criticized as "hot air," depending on the origin. Japan's government put priority on joint implementation because credits will be generated as the result of emission reductions. Central and Eastern Europe, however—which are potential countries that may implement JI activities—are geographically and culturally distant from Japan. In addition, the enlargement of the European Union (EU) in 2004 and, as a consequence, the inclusion of the EU Emissions Trading Scheme (EUETS), may cause Japan to restrain its investment in JI projects in Central and Eastern Europe, because emission reductions in the target sector of the EUETS may not be approved as credits under the Kyoto Protocol (Government of Japan 2003). In contrast, CDM credits will be generated on the basis of emission reductions, including those made since 2000, which are strictly verified by third parties along with the official modalities and procedures. CDM projects can be implemented in non-Annex I countries, including Asian countries that are geographically and culturally close to Japan and where there is a lot of potential in terms of the amount of CDM credits.

As Yamaguchi (2002) points out, it might be difficult for Japan to procure the necessary credits by solely using the CDM, even if the amount of credits is equal to 1.6 percent of Japan's base year emissions. Therefore, while the government is unsure of its future policy regarding the Kyoto Mechanisms, especially at the end of the first commitment period, it intends not to focus, for example, on international emissions trading, and will stay with the CDM and JI (more with the CDM), at least for now.

3. Current CDM activities of the Government of Japan

3.1. Approval of CDM and JI projects as a host country

Japan has been actively promoting CDM and JI projects in the last couple of years in line with its above-mentioned policy. In the first instance, Japan is one of ten nations among Annex I countries that have officially set up a designated national authority (DNA) for the CDM.[1] Its DNA is the Liaison Committee for Utilization of the Kyoto Mechanisms, and it has to date approved twelve CDM and JI projects as an investing country (see table 1). Of the twelve, two are in the validation process and they are expected to be Japan's first CDM projects. Both focus on the decomposition of hydrofluorocarbons (HFC) and were rated as the first and second largest projects in terms of the amount of credits among projects during the validation process. The estimated total amount of credits from the two would be about 4.8 million tonnes of CO_2 equivalent per year. It cannot be sure, however, that the estimated amount of credits will be generated from the projects and whether all the credits will be transferred to Japan. As far as the amount of credits is concerned, however, Japan can be rated as the first Annex I country that has approved a CDM project.[2]

1. The UNFCCC divides countries into two main groups: Annex I, which is the industrialized countries, including the relatively wealthy ones that were members of the Organisation for Economic Co-operation and Development (OECD) in 1992, plus countries with economies in transition (EIT), and Annex II, which is the OECD members of Annex I (EITs not included). According to the UNFCCC's Web site, the other Annex I countries which have officially set up a DNA are Austria, Canada, Denmark, the European Community, Finland, Germany, Italy, the Netherlands, and Switzerland.
2. The Netherlands and the World Bank are also recognized as vigorous players in procuring emission reduction credits, but the Netherlands so far has procured credits mainly from JI projects, while the World Bank is not a party to the Kyoto Protocol and thus cannot approve CDM and JI projects as a host country.

Table 1. CDM and JI projects approved by the Government of Japan

Date of approval	CDM/JI	Applicant	Host country	Project name	Expected credits (tonnes of CO_2/year)
12-Dec-02	JI	New Energy and Industrial Technology Development Organization (NEDO)	Kazakhstan	The Model Project for Increasing the Efficient Use of Energy Using a Gas Turbine Cogeneration System	62,000
12-Dec-02	CDM	Toyota Tsusho Corporation	Brazil	V&M Tubes do Brasil Fuel Switch Project	1,130,000
22-May-03	CDM	Electric Power Development Co., Ltd.	Thailand	Rubber Wood Residue Power Plant Project in Yala	60,000
15-Jul-03	CDM	INEOS Fluor Japan Ltd.	South Korea	HFC Decomposition Project in Ulsan	1,400,000
29-Jul-03	CDM	The Kansai Electric Power Co., Inc. (on behalf of e7Fund)	Bhutan	e7 Bhutan Micro Hydro Power CDM Project	500
03-Dec-03	CDM	Japan Vietnam Petroleum Company	Vietnam	Rang Dong Oil Field Associated Gas Recovery and Utilization Project	680,000
19-May-04	CDM	Sumitomo Corporation	India	Project GHG Emission Reduction by Thermal Oxidation of HFC-23 in Gujarat	3,380,000
29-Jun-04	CDM	Chubu Electric Power Co., Inc.	Thailand	A.T. Biopower Rice Husk Power Project	84,000
22-Jul-04	CDM	Electric Power Development Co., Ltd.	Chile	Graneros Plant Fuel Switching Project	14,000
01-Oct-04	CDM	Tokyo Electric Power Co., Inc.	Chile	Methane Capture and Combustion of Swine Manure Treatment for Peralillo	79,000
01-Oct-04	CDM	Tokyo Electric Power Co., Inc.	Chile	Methane Capture and Combustion of Swine Manure Treatment for Corneche and Los Guindos	84,000
01-Oct-04	CDM	Tokyo Electric Power Co., Inc.	Chile	Methane Capture and Combustion of Swine Manure Treatment for Pocillas and La Estrella	249,000

Source: Information taken from METI press releases accessed at http://www.meti.go.jp.

3.2. CDM promotion activities

Japan has been promoting various types of CDM and JI schemes to private firms and host countries in the Asia-Pacific region in recent years (main activities shown in table 2). These promotion schemes range from covering the first stages of the CDM project cycle to addressing the later stages. Private firms interested in the CDM and JI can access an outline as well as details of modalities and procedures in publications from relevant ministries (in Japanese). For those with questions or needing preliminary consultation, the relevant ministries have established help desks or support centers. For those who have further interest in CDM and JI projects and want to examine and explore the possibility of potential projects, the ministries bear the costs, with certain limits, for feasibility studies after competitive selection from among applications. In addition, private firms can receive subsidies to cover part of their investment cost in CDM and JI projects, again after competitive selection from among applications.[3] In preparation for the future, when Japanese firms will acquire CDM credits and they wish to transfer those to the government, a national registry is being developed that will be operational in 2005.

In addition, Japan's relevant governmental ministries are implementing CDM capacity-building programs for other host countries in the Asia-Pacific region. The explicit objectives of the capacity-building activities are neither to support particular CDM projects nor to acquire CDM credits directly but to assist with the general development of institutional and human CDM capacity. It is also possible, however, to say that there is implicit interest in CDM credits in terms of procuring credits and achieving the emission reduction commitment of the Annex I countries.

Table 2. Japan's various schemes for promoting the Clean Development Mechanism and joint implementation

Category	Schemes/activities	Responsible entities
Publications	Illustrative Guide for the Kyoto Mechanisms (in Japanese)	Ministry of the Environment (MOE)
	Kyoto Mechanisms Guidebook (in Japanese)	Ministry of Economy, Trade and Industry (METI)
Providing information and consultation	Domestic Kyoto Mechanism Support Center	MOE, Overseas Environmental Cooperation Center (OECC)
	Help Desk for Kyoto Mechanisms	METI
	Help Desk for CDM Sinks	Forestry Agency
Feasibility studies	CDM/JI Feasibility Studies	MOE, Global Environment Centre Foundation (GEC)
	CDM/JI Feasibility Studies	METI, NEDO
Subsidies	Subsidies for CDM/JI projects	MOE, GEC
	Subsidies for CDM/JI projects	METI, NEDO
Registry	The Japanese National Registry (under development)	MOE, METI
Capacity building for host countries	Integrated Capacity Strengthening for CDM (ICS-CDM) in Asia	MOE, Institute for Global Environmental Strategies (IGES)
	Asia CDM Capacity Building Initiative	METI, NEDO

Source: The author selected information from the following Web sites:
http://www.env.go.jp/earth/ondanka/mechanism/index.html
http://www.mofa.go.jp/mofaj/area/europe/pdfs/ji_seki.pdf
http://www.rinya.maff.go.jp/seisaku/cdm/top.htm
http://www.iges.or.jp/en/from/pdf/cop9/cdm/02_Makiya.pdf
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http://www.iges.or.jp/en/from/pdf/cop9/cdm/08_Ancha.pdf
http://www.johannesburgsummit.org/html/documents/summit_docs/2908_partnershipsummary.pdf

3. To be accurate, it may not be appropriate to call the schemes subsidies. More explanation is provided below in section 3.3.

It should be noted that, although there exists a variety of support schemes from relevant government ministries for Japanese private firms to develop CDM and JI projects and to acquire emission reduction credits, there is a lack of strong incentives for them to do so. More specifically, there is no robust reason for Japanese firms to acquire CDM and JI credits. For instance, there is no concrete plan in Japan at the moment to introduce a cap-and-trade type of domestic emissions trading scheme linked with CDM and JI credits. Such a scheme would create a strong incentive for firms to acquire CDM and JI credits in order to comply with domestic obligations. Furthermore, there is no scheme yet for public procurement of CDM and JI credits, which would also give vigorous incentives to firms interested in gaining profits from credits trading.

In contrast to Japan, the European Union plans to introduce the EUETS in EU member countries in 2005, and CDM and JI credits are expected to be eligible for use by private firms to fulfill domestic obligations under it. Also, there are several other credits procurement schemes in Europe. The most famous are the Dutch Emission Reduction Unit Procurement Tender (ERUPT) and Certified Emission Reduction Unit Procurement Tender (CERUPT), both of which are geared to purchasing JI and CDM credits through competitive tender. In addition to these schemes, some European Union member countries are planning their own credits procurement schemes.[4]

In order to facilitate extensive participation of Japanese firms in CDM and JI projects, it will be necessary to introduce promotion schemes at the final stage of the CDM and JI project cycle, such as Japan's credits purchasing scheme.[5] Such schemes will not only give Japanese firms strong incentives and robust reasons to acquire CDM and JI credits but they will also lead the Government of Japan to cost-effectively utilize the CDM and JI.

The factors that determine what kind of promotion schemes will be most effective in facilitating the CDM and JI are the maturity of understanding of both Japanese firms and stakeholders in host countries and the general social and political situation regarding the Kyoto Protocol. At the premature stage, process-based promotion schemes—which allow firms to receive support from the Government of Japan regardless of whether or not they can acquire credits—would be effective, because it is an inevitable need right now to support firms with risk-free options so that they can take their first steps with fewer constraints. In contrast, as the level of understanding the CDM and JI in Japan and host countries increases, and with the first commitment period quickly approaching, it will be essential to provide firms with results-based promotion schemes with a certain risk attached that reward only those who actually succeed in acquiring credits. Firms that wish to acquire credits at minimum cost and then sell them at maximum price in a competitive market situation will try to seek out the best way to develop CDM and JI projects as cost-effectively as if they were agents of the Government of Japan.

4. According to several news reports, Denmark, Austria, and Belgium are planning to implement a CDM and JI credits procurement scheme at an expenditure level in the millions of euros.

5. Japanese firms may have the option to sell credits that they acquire to the European Union or the World Bank, but several barriers (e.g., linguistic problems) exist that hinder these firms from dealing with foreign governments and international organizations. Furthermore, several Japanese promotion schemes attach conditions, such as the one that dictates that credits from financially supported projects should be transferred to the Government of Japan (see section 3.3).

3.3. Projected impacts of CDM credits procurement schemes

Although both government and private firms have shown great interest for the introduction of results-based promotion schemes (in other words, CDM and JI credits procurement schemes), as mentioned above, they have not yet decided to do so, because there are still some legal and political constraints hindering their introduction. In Japan, the final allocation of governmental expenditure is determined by the Diet (parliament), and there are plenty of higher-priority political, economic, and social matters to address in the country at the moment besides the Kyoto Protocol and climate change. So far, as the protocol has not yet entered into force, there has been no legal obligation to reduce GHG emissions, and CDM and JI credits are not yet recognized officially at the international level. The Climate Change Policy Programme does not explicitly state that Japan will procure CDM and JI credits before the first commitment period. Rather, it implies that Japan will utilize the Kyoto Mechanisms when there is a target shortfall after having implemented domestic actions. Under these circumstances, it has not been so easy to justify direct governmental expenditure for CDM and JI credits, which are merely digital data at this moment. It might seem ironic that Japan is spending money on the "process" of the CDM and JI projects cycle instead of their final "results."

Despite the discipline of Japan's financial system, described above, it is inevitable that the government take action, instead of just observing the activities of EU member countries in buying CDM and JI credits. One noteworthy development is the Japan Carbon Fund (JCF). It is similar to the Prototype Carbon Fund (PCF) developed by the World Bank, and is currently being developed by the Ministry of the Environment (MOE), Ministry of Economy, Trade and Industry (METI), Development Bank of Japan (DBJ), and Japan Bank for International Cooperation (JBIC). The JCF is not supposed to procure emission reduction credits exclusively from Japanese firms but through international competitive tender. For Japanese firms, however, it will be easier to participate in competition for credits than for the World Bank. The JCF could provide one of the incentives for Japanese firms to acquire CDM and JI credits, because they would be able to sell those credits to the JCF and gain profits.

In addition, the relevant ministries have been exerting efforts to procure CDM and JI credits under the existing schemes. As shown in table 2, there are two subsidy schemes for CDM and JI projects listed that are provided by the MOE and METI. In substance, these schemes are not regarded as subsidies because both require CDM or JI credits in return for money that private firms receive from the relevant government ministries. For example, the conditions of the MOE's scheme are that part of the credits acquired in the future must be transferred to the Government of Japan (in proportion to the amount of money the firms received from it, divided by the cost they incurred in acquiring the credits). Under METI's scheme, applicants are requested to transfer the government part of the credits equivalent to the amount of money they received.[6] Under both schemes, in the case where private firms acquire credits, they are required to transfer to the government those credits in return for money they received. This is regarded as an advance receipt instead of a subsidy from the viewpoint of private firms. The Government of Japan has been taking the risk that the Kyoto Protocol will not enter into force and the consequential non-delivery of credits. Basically, private firms are not obliged to acquire credits, but they

6. The amount of credits to be transferred to the government will be determined by dividing the amount of money they receive at the market price of a credit at that time.

do have an obligation to transfer credits when they succeed in getting them. Therefore, both subsidy schemes may be regarded as being quasi-credit procurement schemes.

4. Current CDM activities of private Japanese firms

In general, most Japanese firms are not being overly aggressive in directly investing in the CDM and JI or in purchasing credits, with the exception of some limited industries. For instance, Japanese firms are well known as the largest contributor to the carbon funds managed by the World Bank (see table 3)—the total amount of contributions from Japanese firms amounts to more than US$55 million—but most of it comes from the electric utility companies, which emit a huge volume of GHGs (approximately one-third of Japan's total CO_2 emissions). Thus they face the potential risk of being forced to reduce their GHG emissions; they also have relatively ample cash compared to most Japanese industries. Therefore, justifiable reasons are available to explain why they are trying to procure credits. On the other hand, the main reason they contributed to the World Bank and did not invest in CDM and JI projects directly is that the bank has more expertise in procuring emission reduction credits, while they have less at this point. Although Japan's electric utilities have been closely following the climate change issue and they have considerable knowledge of the Kyoto Protocol, it seems that there are still some obstacles hindering them from implementing CDM and JI projects by themselves.

The other industries in Japan have been less vigorous so far in either disbursing money to the carbon funds or in investing directly in CDM and JI projects, but, in fact, there are some firms that wish to purchase emission reduction credits. For example, large Japanese firms belonging to the Nippon Keidanren (Japan Business Federation) have pledged voluntary commitments to quantitatively reduce their GHG emissions (Nippon Keidanren 1997), and firms that are estimated to emit more GHGs than they pledged to are interested in procuring emission reduction credits in order to offset their excess emissions. Environmental departments within firms, for instance, that are in charge of dealing with environmental management issues, including GHG emissions reduction, are especially keen to procure credits. Nevertheless, as with the governmental financial system, the final allocation of investment is determined not only by the environment department but by top management, and each firm has plenty of other priority matters to address in order to survive in the current competitive business environment. So far, purchasing emission reduction credits has not been such an urgent matter for most firms, again, mostly because the Kyoto Protocol has not yet entered into force.

As described in section 3.2, however, the level of understanding of the CDM and JI has been increasing in Japan, as the first commitment period quickly approaches. The presumed entry into force of the Kyoto Protocol will definitely accelerate this trend. Although not all companies are disclosing their intentions, it is assumed that a number of Japanese firms besides the electric utilities are moving towards purchasing emission reduction credits or investing in CDM and JI projects. Although there have been less robust reasons to buy emission reduction credits so far, they can at least justify this behavior. The subjective purpose for buying credits is partly to offset their future emissions, but it is mainly to acquire know-how on procuring credits through experience at this moment. In other words, the main objective is not to achieve the final "result" of the CDM and JI but to be involved in the "process" of the

CDM and JI project cycle. Learning-by-doing is the most suitable term to describe the present motivation of Japanese firms.

Table 3. Japanese firms participating in the World Bank carbon funds

World Bank carbon fund	Minimum contribution[a]	Participating Japanese firms[b]
Prototype Carbon Fund (PCF)	US$5 million	Chubu Electric Power Co., Inc. Chugoku Electric Power Co., Inc. Kyushu Electric Power Co., Inc. Mitsubishi Corporation Mitsui & Co., Ltd Shikoku Electric Power Co., Inc. Tokyo Electric Power Co., Inc. Tohoku Electric Power Co., Inc
Community Development Carbon Fund (CDCF)	$2.5 million	Daiwa Securities SMBC Principal Investments Co., Ltd. Idemitsu Kosan Co., Ltd. Nippon Oil Corporation Okinawa Electric Power Co., Inc.
BioCarbon Fund (BCF)	$2.5 million	Tokyo Electric Power Co., Inc. Okinawa Electric Power Co., Inc.

Source: Information from http://carbonfinance.org (accessed July 24, 2004).

[a]The minimum contribution is larger for government, although there are some private firms that have paid more than the minimum.

[b]The Japan Bank for International Cooperation (JBIC) is contributing to the PCF as a government participant.

As with the Government of Japan, private Japanese firms, generally speaking, prefer Clean Development Mechanism credits to joint implementation credits for almost the same reasons. In addition, there are two more reasons: (1) joint implementation rules are not very clear at present because they follow the CDM rules and, accordingly, the CDM offers a better way to get involved and gain experience; and (2) the CDM has an element of development assistance for developing countries, which provides a positive image for the firms involved.

5. Conclusion

Japanese firms, and even the Government of Japan, seem to have been waiting in the last one to two years to see whether or not the Russian Federation ratifies the Kyoto Protocol. The prerequisite for Japan to decide on policies and measures, and for Japanese firms to decide on a management strategy with regard to climate change after COP 3, was that the protocol would enter into force. When Russia’s ratification of the protocol became unclear, Japanese firms began to ask, “What if the protocol does not enter into force?” It may be true that this kind of thinking deterred their aggressive involvement in the CDM and JI.

It is presumed, however, that the “prerequisite” may be upheld because of the commencement of ratification process of the Kyoto Protocol in the Russian Federation. The Government of Japan, and also the Diet (parliament), will pay considerable attention to complying with the Kyoto Protocol, which will impose a legal obligation to reduce GHG emissions. This change will also affect the management strategy of Japanese firms. Now they have to prepare for the entry into force of the protocol and the anticipated additional domestic policies and measures introduced by the government. These policies and measures may impose burdens on Japanese firms but also may provide business opportunities. For example, the possibility of credit procurement schemes being introduced is becoming likely. At the time the Kyoto Protocol enters into force, CDM and JI credits will become official assets instead of merely digital data, thus for the Diet it will be possible to determine the expenditure needed for acquiring the potential assets.

Now is the last opportunity for Japan to start preparations for CDM and JI projects, especially those involving the Clean Development Mechanism, with just a few years before the first commitment period of the protocol begins. It is expected that both the Government of Japan and Japanese firms will become active players in the CDM and JI market in the near future, as was initially expected. It is time to prepare for what happens when the protocol does enter into force.

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Special Feature on the Kyoto Protocol

Lessons from the Kyoto Protocol: Implications for the Future

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The strengths and weaknesses of the Kyoto Protocol must be carefully assessed in designing future agreements to tackle climate change. The Kyoto Protocol's main strength may lay in its emissions trading feature—a key for cost-effectiveness, environmental effectiveness, and equity. Its main weakness may lay in the incapacity of Kyoto-type targets to deal with the uncertainties surrounding climate change—especially on the side of abatement costs. A mere extension of the current protocol seems unlikely to effectively tackle climate change. A flat rejection of the structure it provides, however, would probably not offer better prospects. Agreements on policies and measures or "technology protocols" might be useful, but can hardly substitute for more comprehensive agreements that would provide clear price signals to economic agents. Carbon taxes would better deal with uncertain abatement costs, but may be more politically difficult at both domestic and international levels. A modified Kyoto structure might give the international community a better chance to achieve its ultimate objective, laid down in the United Framework Convention on Climate Change, of stabilizing atmospheric concentrations of greenhouse gases. It would keep the emissions trading framework but add to the Kyoto-style fixed and binding targets several options to better deal with uncertain costs, namely, price caps, indexed targets, and non-binding targets for developing countries.

Keywords: Climate change, Mitigation, Long term, Ultimate objective, Uncertainty.

1. Introduction

The likely entry into force of the Kyoto Protocol, at the time of writing this article, should not preclude its supporters from acknowledging its weaknesses, when considering future agreements. Nor should it preclude its supporters from acknowledging its strengths. Even ignoring the difficulties of entry into force, one must admit that the Kyoto Protocol was never intended to provide the definitive set of solutions to achieving the ultimate objective of the United Nations Framework Convention on Climate Change (UNFCCC), namely, stabilizing atmospheric concentrations of greenhouse gases. New steps will be needed. At best, Kyoto is only a beginning.

While some analysts seem to believe that the next steps could simply extend the Kyoto agreement in time and, hopefully, space, others propose entirely different types of agreements. But future steps could also further elaborate the basic structure of the Kyoto Protocol—quantified objectives with emissions trading—while incorporating new features. These features—partial indexation of emission targets on economic growth, price caps, and, for developing countries, non-binding targets, would help countries adopt relatively more ambitious targets than otherwise. They could provide more incentives to

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participate and comply, or at least reduce the disincentives to participate. They could thus help to simultaneously broaden and deepen climate change mitigation action—two moves often suggested as contradictory.

The Kyoto Protocol will likely be considered in the future as an important step towards effective climate change mitigation because it introduced emissions trading into the ballpark. This is leading policy makers to introduce emissions trading at domestic levels as their main policy, and might even lead Kyoto and non Kyoto countries to interlink their respective domestic regimes across borders. However, full success in mitigating climate change will require negotiators—either in bilateral, multilateral, or global negotiations—to fix the current shortcomings through options that could make the framework for action truly global and alleviate the rigid, fixed nature of the quantified targets —two points obviously linked, as will be shown below.

This paper is in four parts. *Assessing Kyoto* discusses the strengths and weaknesses of the Kyoto Protocol. *Keeping Kyoto* discusses if Kyoto could be kept essentially unchanged and could prove successful in the future. *Rejecting Kyoto* considers some of the many radical alternatives that have been suggested as a replacement. *Transforming Kyoto* finally assesses ways and means to change the Kyoto structure into a superior agreement, more economically efficient (taking into account its environmental effectiveness) as well as more likely to attract broader participation.

2. Assessing Kyoto

According to its detractors, the Kyoto Protocol will provide too little environmental benefits at too high costs. This may be difficult to prove right or wrong; uncertainties abound on both the benefit and cost sides. Even the real effects on global emissions of the Kyoto Protocol itself (not to mention the dynamics it may create for the future) are not known with precision, in particular due to the opposite effects of potential leakage and technology spillovers.[1] Assessments of leakage rates range from 5 percent to 20 percent in the case of the Kyoto targets (Hourcade and Shukla 2001)—but could go much higher with large emission reductions. Against this, Grubb et al. (2003) set various sources of positive spillover, especially “the international diffusion of more efficient and lower carbon technologies that are developed in response to emission controls in the industrialized world.” They believe that these positive effects do more than offset the leakage. Therefore, regulation of emissions by industrialized countries would also reduce emissions—in comparison to business-as-usual trends—in non-regulated areas.

Moreover, the direct effects of Kyoto on climate change can only be small, because climate change is a problem of a “stock” nature: what drives climate change is not the emissions, but the slow build-up of atmospheric greenhouse gas concentrations over decades, or even centuries. When Cline (2004) finds that “Kyoto” provides positive net benefits, in fact he assesses a hypothetical “Kyoto forever” scenario with emissions of industrialized countries indefinitely capped at 1990 levels. So, what matters for our analysis here is not the effectiveness of the Kyoto Protocol as such, but rather the promises or shortcomings of the architecture it introduces.

1. Leakage is defined here as an increase of anthropogenic emissions of greenhouse gases from countries where emissions are not regulated as an effect of regulation in Kyoto countries.

2.1. The advantages of emissions trading

The main strength of this architecture is in quantified objectives and emissions trading. Most greenhouse gases have no direct local environmental effects; they rapidly mix in the atmosphere, and where they are emitted does not matter. Emissions trading, therefore, does not modify the environmental effect of the targets; but it lowers the costs of emissions reductions, which, depending on the level of stabilization chosen, may be considerable (IEA 2002). This, in turn, is good for the environment, especially as climate change is a long-term issue. Though usually defined as the capacity to reach a given objective at the lowest possible cost, cost-effectiveness can also offer the greater environmental benefits for a given cost—the cost that our societies are willing to pay to mitigate climate change.

Another advantage is that emissions trading, if implemented at the domestic level as well as at the international level, offers governments the flexibility to fine-tune the balance between free allocation and auctioning. This could improve the acceptability of the new regulations to incumbent emitters on the one hand, and maximize social welfare through revenue recycling, on the other. Finally, emissions trading allows international negotiations to focus on an acceptable distribution of efforts, which need not be cost-effective from the onset. This is a key for equity.

Nevertheless, the Kyoto Protocol as it is now does not represent the most efficient solution—nor even the most cost-effective short-term agreement. This would only be the case if the Kyoto Protocol included all emitting countries, allowing the abatement to take place wherever they cost less around the world and preventing leakage.

2.2. Shortcomings of the Clean Development Mechanism

To some extent, however, the Clean Development Mechanism (CDM) instituted by the Kyoto Protocol may substitute for quantified objectives by developing countries and give access to cheap reduction opportunities. Its overall performance, however, is unlikely to be large (Ellis et al. 2004). The CDM is impeded by substantive transaction costs, resulting from the need to assess each project, prove it is additional to what would have happened otherwise, and to define an appropriate baseline. Relaxing the additionality criteria may augment neither the efficacy of the CDM nor its possible benefits for developing countries (Asuka and Takeuchi, forthcoming). As a result, most analysts believe that the CDM will only play a minor role—though, arguably, this also results from a weaker demand for credits following the withdrawal of the United States from the protocol.

Another difficulty is that the CDM is unlikely to be effective against leakage. An agreement effective against this would need to create an opportunity cost for all emissions wherever they take place. This would be possible with a frictionless project-based mechanism if the baselines against which to credit emission reductions were comparable in both industrialized and developing countries. This is not what was decided in the Marrakesh Accords. An efficient plant could possibly be closed in the industrialized world as a result of a carbon constraint, and its production replaced by a less-efficient plant in a developing country, creating leakage. The CDM would not prevent this happening. It may even give such leakage some additional incentive if a newly-built plant is more efficient than those in the host country serving as reference for the baseline, and could thus earn some credits.

It must be noted that, by contrast, the efficacy of a global emissions trading regime to alleviate or eliminate the risk of leakage does not depend on the initial allocation. Even if some countries were allocated surplus emissions beyond their needs, greenhouse gas emissions would have the same opportunity cost everywhere. Any additional emission in such countries would represent a lost opportunity to sell. This loss entails the same cost as buying the permits to cover this emission in a constrained country.

2.3. Not fully cost-effective, even less efficient

An efficient agreement would not only be cost-effective, it would also ensure that benefits outweigh costs and, moreover, provide maximum net benefits in ensuring that an optimum level of abatement is undertaken—usually defined by the level of abatement where marginal abatement cost equals marginal environmental benefit.

It is the conjunction of the stock nature of the climate problem and of the uncertainties surrounding abatement costs that make any arrangement based on fixed quantitative goals, such as the Kyoto Protocol, less than fully economically efficient. If abatement costs were known with certainty, then a quantified objective would define a price, or a price (say, a carbon tax) would define a global quantity. As abatement costs are uncertain, quantity and price instruments are not equivalent. A price instrument would offer certainty on the marginal cost incurred, but not on the actual level of abatement. A quantity instrument would offer certainty on the level of abatement, but not on the costs incurred.

Which instrument is preferable to mitigate climate change? The stock nature of the problem makes the marginal policy benefits roughly constant—over any credible policy interval. That is, avoided marginal climate damages might be high or low, but the first tonne of carbon dioxide that is not emitted in any given year is likely to bring about the same benefit than the last one. By contrast, the cost of abating the first tonne is minimal, while the cost of abating “the last one” (of course, depending on the depth of the cuts) might be very high—and possibly higher than the marginal benefit it provides. Therefore, price instruments, which spontaneously adjust the emission cuts to the reality of the costs, should be preferred over quantity instruments. In other words, the certainty provided by quantitative targets on emissions in any given year has little value but may cost too much (Newell and Pizer 2003; Pizer 2002; IEA 2002).

In sum, what matters for our analysis is the architecture of Kyoto more than its direct results. This architecture provides some key advantages but also has important shortcomings. Thus, should one reject Kyoto and try and build an entirely different agreement, or, rather, aim at transforming Kyoto? Or, would it be more realistic to simply keep Kyoto, despite its shortcomings?

3. Keeping Kyoto

Some analysts, however, seem to believe that the most effective choice would be to keep Kyoto as it is today. It would progressively become a broader, more global agreement, as developing countries develop and reach some thresholds in per capita income (multistage approach). Or developing countries could be incorporated sooner but with large amounts of surplus emission rights, which may or may not result from the adoption of a global rule for emission allocation, such as convergence towards equal per capita allocation (Meyer 2000; Aslam 2002). Industrialized countries that have resisted participating in the first period of the Kyoto Protocol would possibly be given more lenient targets in subsequent ones.

The problem with "progressive" approaches is that they are hardly compatible with low concentration levels if, ultimately, necessary. This is due to the late entry into the system of most developing countries (Berk and den Elzen 2001), but also to the less stringent targets given to some others.

The problem with the convergence option is that it may first provide a large amount of excess allowances to developing countries. Industrialized countries would need to buy this "tropical hot air" first before financing any real mitigation action in developing countries (IEA 2002). One lesson from the Kyoto Protocol is that providing hot air to some countries to help others accept tough targets may not work; for example, the "blank check" to Russia was one of the reasons invoked by the US administration to reject the Kyoto Protocol.

Later on, allocation based on per capita convergence may bind the emissions of developing countries at much lower per capita levels than those previously enjoyed by citizens of industrialized countries. Arguably, some technology spill-over will reduce the peak of energy intensity reached by new-comers in their industrial development, as happened in the past (Martin 1988). Nevertheless, this constraint on emissions might be perceived by developing countries as an unfair constraint on their economic development itself (Chen and Pan 2003).

In sum, keeping Kyoto unchanged while only playing with the "numbers," i.e., the size of the respective allowances, produces the following dilemma: ensure broad participation with weak targets or undercut the goal of broad participation in setting ambitious targets that not all countries will accept.

4. Rejecting Kyoto

Aldy et al. (2003) list thirteen proposals for a future architecture of climate change mitigation action—and their list is incomplete and may not include some of the most useful options to consider. While some might be considered as building upon the Kyoto structure, others are radical alternatives. The most often quoted radical alternatives seem to be commitments on policies and measures, carbon taxes, and "technology protocols."[2]

4.1. Policies and measures

An existing obligation in the UNFCCC commits all Parties to undertake policies and measures that help mitigate climate change. Identifying specific policy requirements may be a logical extension from existing commitments. One possible approach would be to invite developing and/or developed countries to identify a set of win-win policy reforms, according to their national circumstances. Developing countries, for example, would look for "sustainable development policies and measures" corresponding to their own sustainable development objectives (Winkler et al. 2002), then identify whether they lead to emission reductions below business-as-usual levels, and then seek to have them financed by industrialized countries through the Convention process.

2. Others include Bradford (2002) and McKibbin and Wilcoxen (2002). See IEA (2002, 127, 128) for a short discussion of these proposals.

In the course of the negotiations leading to the Kyoto agreement, however, developing countries have proven very reluctant to make commitments on policies and measures seen as contradictory to their sovereignty. It may be difficult to ensure that a wide set of policies and measures provide cost-effective emission reductions. The international financing of the latter could more easily leverage both public and private financing through emissions trading than through other mechanisms in the Convention.

4.2. Carbon taxes

Carbon taxes offer perhaps the most convincing alternative to the Kyoto framework from a theoretical perspective, especially under the form of harmonized domestic taxes advocated by Nordhaus (2002). Their political economy, however, remains difficult. At the domestic level, taxes are usually unpopular and raise profitability concerns for industry if some competitors in other countries do not face the same additional costs. Taxes offer little flexibility to governments to accommodate these concerns while maintaining their environmental effectiveness.

At the international level, uniform tax rates are required for reasons of cost-effectiveness, but the resulting distribution of costs may be unacceptable, especially by developing countries, likely to ask for side-payments. In sum, carbon taxes can be—and already are—useful as part of domestic policy packages, but making them the centerpiece of any future international strategy is likely to prove extremely difficult.

4.3. Technology protocols

Technology protocols have been suggested as a possible alternative to the Kyoto Protocol, in particular by Barrett (2003), who believes that Kyoto lacks credible incentives for participation and enforcement mechanisms. His proposal would involve collaborative research and development in developing new technologies, follow-up protocols establishing technology standards, a multilateral fund to help spread the new technologies to developing countries, a short-run system of pledge-and-review, and a further protocol for adaptation assistance.

Clearly, although various behavioral changes might help achieve stabilization of concentration, deep technology changes will be required. Policies and measures specifically designed to “push” research and development might bring an invaluable contribution to such technical change. Dissemination of new technologies, however, is unlikely to be rapid enough in the absence of long-term price signals that only economic instruments, such as either taxes or tradable permit schemes, would provide (Philibert 2003). Could technology standards substitute for price signals in providing for rapid dissemination of innovation?

Barrett recognizes that such an approach would not be cost-effective and thus only a second best. But, he argues, the setting of standards “often creates a tipping effect. If enough countries adopt a standard, it may become irresistible for others to follow, whether because of network effects, cost considerations (as determined by scale economies), or lock-in.” Well, it may…or may not. Let us suppose some industrialized countries adopt a standard that would, for example, force energy-intensive industries, the power sector, and refineries to give up fossil fuels or capture and store the carbon dioxide. Is not easy to figure out why this would obligate or incite the rest of the world to follow even if this entails huge costs.

Would new multilateral funds make the difference? Maybe—but it is not obvious that new funds leveraging only scarce public money would do more than mechanisms, such as emissions trading, leveraging potentially both public and private money. Also, if some of these technologies become fully cost-effective thanks to economies of scale and learning curves, then they might be disseminated by their own virtues. The technology spill-over effects might be similar to the Kyoto case. Finally, the Intergovernmental Panel on Climate Change (IPCC) made clear that energy efficiency improvements at the end-user level, likely to provide the bulk of short-term affordable emission reductions, require “hundreds of technologies” (Moomaw and Moreira 2001). Should one then negotiate hundreds of protocols?

In sum, international technology collaboration is useful but already exists, notably through 40 International Energy Agency Implementing Agreements. It could be strengthened, and standards might be one area for improvement (Philibert 2004). Technology collaboration certainly should accompany or be part of future climate agreements. It remains doubtful that it should be the centerpiece.

5. Transforming Kyoto

As already mentioned, transforming Kyoto into a superior agreement would mean finding ways to make the agreement global and more effective in dealing with cost uncertainty. These points are linked; it would probably be easier to get developing countries involved in a global emissions trading regime on the basis of assigned amounts that would be exactly set on their business as usual, unabated emission trends, if these could be known with certainty. Thus, they would have everything to gain and nothing to lose from accepting targets. Similarly, the difficulties for some industrialized countries to accept their Kyoto targets are in part due to the difficulty of estimating the resulting costs with certainty—and without controversy.

5.1. Dynamic targets

One way to get around these difficulties might be to index assigned amounts on actual economic growth. Economic forecast will likely be part of the definition of assigned amounts. Deviation from this forecast could then lead, under “dynamic targets,” to modifying these assigned amounts, so as to maintain roughly constant the “gap” between unabated trends and assigned amounts—and the required level of efforts. Such dynamic targets would not need to be “intensity targets,” which may not be much more efficient than fixed targets in reducing the uncertainty on the required effort (Dudek and Golub 2003). Indexation could in fact take a wide variety of forms and be only partial (Ellerman and Wing 2003). One advantage of partial indexation might be to reduce the risk of “double pain” in case of unexpected economic recession and to drive a greater level of efforts (though allowing greater emission levels than with the original objective) in case of an unexpected economic boom (IEA 2002). One difficulty might be, especially in developing countries, the need to provide accurate measurements of economic variables such as gross domestic product.

While indexing assigned amounts might provide some relief on concerns related to cost uncertainties, they would only address the uncertainty arising from uncertain economic forecasting. Other sources of uncertainty regarding abatement costs arise in particular from the uncertain evolution of availability and costs of various energy sources, and unknown future depth and speed of technical change.

5.2. Price caps

A more comprehensive way to deal with cost uncertainty might be the introduction of price caps into the international trading regime, as suggested by Pizer (2002) following a concept from Roberts and Spence (1976). This could take the form of making supplementary permits available in unlimited quantity at a fixed price—at the country level (for domestic entities) or at the international level (for countries). With a price cap, all emission abatement needed to achieve the quantitative commitments would be undertaken as long as the marginal cost of abatement is lower than some agreed price. If abatement costs reach this price, then economic agents and/or countries would be able to cover excess emissions with supplementary permits at the agreed fixed price. The price cap could be implemented either at international or domestic levels (IEA 2002).

A single international price is necessary for unrestricted global trading. Trading might still be possible, however, albeit with the risk of a loss of cost-effectiveness, if prices vary across countries. One solution to ensuring the integrity of the system is that net sellers do not make "use" of the price cap (i.e., their actual emissions remain below their assigned amounts). Thus, no Party or entity would "resell" supplementary permits. However, an agreement on a single price amongst countries of a relatively similar level of development, despite a varying willingness-to-pay, is not necessarily unattainable, as this price cap does not prevent differentiation in respective levels of effort and assigned amounts (Philibert and Criqui 2003).

5.3. Non-binding targets

A similar option for developing countries would be that of non-binding targets. These targets may provide—though emissions trading—an incentive for emission reductions, where sales could occur if (and only if) actual emissions are less than the targets (Philibert 2000). This option may be particularly attractive for developing countries. The existence of such an incentive, however, requires that other countries are potential buyers bound by firm targets.

There are different ways to ensure that countries with non-binding targets only sell emission allowances that exceed the coverage of their actual emissions. The most effective may be to require countries that have over-sold to purchase enough allowances to cover their actual emissions up to the level of the non-binding target—but not beyond (Philibert and Pershing 2001). A commitment period reserve, similar to that instituted by the Marrakesh Accords, would also limit inadvertent mistakes.

Non-binding targets are progressively gaining support, or at least interest, from various experts from industrialized countries (e.g., Bodansky 2003), newly industrialized ones (e.g., Chan-Woo 2002), or developing countries such as India (e.g., Dasgupta and Kelkar 2003) or China (e.g., Chen 2003), and are discussed, for example, amongst Annex I experts (Philibert et al. 2003).[3] The concept could probably be

3. Annex I of the UNFCCC includes the members of the Organisation for Economic Co-operation and Development (OECD) in 1992, plus countries with economies in transition (EIT). The Annex I Expert Group, whose secretariat is assumed jointly by the OECD and the International Energy Agency, oversees development of analytical papers for the purpose of providing useful and timely input to climate change negotiations.

adjusted so as to accommodate suggestions for defining the "conditional" targets by Pan (2003) or Viguier (2003). Finally, non-binding targets might be fixed or dynamic, country-wide or sector-wide. Dynamic non-binding targets would offer developing countries a greater chance to participate in international emissions trading despite possible economic surprises. Sector-wide non-binding targets would likely resemble the concept of sector-wide CDM suggested by various analysts (Samaniego and Figueres 2002; Chung 2003).

5.4. From cost-effectiveness to efficiency

While introducing the options of dynamic targets and non-binding targets for developing countries might be the key to make Kyoto broader, and thus cost-effective, it may not suffice to make it fully efficient.

Climate change is surrounded by many uncertainties on both benefit and cost sides. In the face of uncertainties, what concerns decision-makers are the expected benefits and costs, that is, the average of possible outcomes weighted by their probabilities of occurrence. Adding a price cap to a given target reduces its expected costs by "shaving" the costlier outcomes. It also reduces, however, its expected benefits: if costs reach the level of the price cap, more emissions, and thus more climate damage, will take place than originally sought with the quantitative target.

However, because marginal climate damage (or policy benefits) are roughly constant (over the policy interval), while abatement costs are not, expected benefits are reduced in a much smaller proportion than expected costs. This allows tightening the objective from the onset. At some point, expected benefits would be the same as originally envisaged—at much lower expected costs. The target might be tightened again, up to the point where expected costs are the same as with the original target—but with greater expected benefits. Between these two points there are an infinite number of quantified objectives that, thanks to the price cap, would produce higher expected benefits at lower expected costs than with the original target but no price cap. As a result, the introduction of price caps could allow any agreement to provide greater net expected benefits (as would, but to a lesser extent, dynamic targets for industrialized countries). Wide uncertainties on the policy benefits side probably prevent us from being much more specific on deciding the most efficient target and price cap levels.

Modeling exercises confirm this analysis. Lecocq and Crassous (2003) use a partial equilibrium model of the international allowance market to quantify the economic consequences of the main post-Kyoto quota allocation rules that have been proposed by various authors, and to assess how robust these consequences are to uncertainty on future population, economic, and emission growth. They show that, regardless of the rule selected, the prices of allowances and the net costs of climate mitigation—for all Parties—are very sensitive to uncertainty and in some scenarios very large. This constitutes "a strong barrier against the adoption of any of these schemes if no additional mechanism is introduced to limit the uncertainty on costs."

The possibility of abrupt climatic changes might modify this analysis, if only we had an idea of the greenhouse gas concentrations most susceptible to trigger off such "non-linear climate events."

Uncertain as they are, these possibilities do not really modify the rate of change of marginal expected benefits (Pizer 2003).

While some have seen the price cap as only a short-term “fix” to the current difficulties of the Kyoto Protocol (Jacoby and Ellerman 2004), it could be seen instead as a necessary long-lasting element for future agreements dealing with climate change. Rather than being “inconsistent” with each other, a quantity objective and a price cap would allow a system to spontaneously adjust in real time to the reality of the costs. It would progressively lead us to an efficient level of stabilization, which, given the many uncertainties on both benefit and cost sides, cannot be decided upon today. Decadal revisions of objectives might incorporate new scientific findings on climate change and new assessments of policy benefits, but the process would be too slow to make periodic commitments efficient given uncertain costs.

6. Conclusion

Criticism of the Kyoto Protocol is progressively focusing on the question of incentives for participation and compliance (Barrett 2003; Aldy et al. 2003). Radical alternatives, however, still have to prove they are negotiable, enforceable, and effective. Alternatives have their merits, and could well accompany future agreements at either domestic or international level or both; expecting these to be a substitute for the Kyoto Protocol would imply restarting all negotiations from the onset. On the other hand, the Kyoto Protocol as it stands today remains unsatisfactory for the long term. Keeping Kyoto unmodified is likely to provide a partial and weak response to the threat of global climate change.

Transforming Kyoto might be an efficient way to preserve the achievements of an already long and painful negotiating process, and keep the advantages of international emissions trading but alleviate the shortcomings of the Kyoto-style fixed and binding targets. A transformation of Kyoto, as illustrated in this paper, would help make it more cost-effective and more efficient. It would provide developing countries with real incentives to participate and comply (finance and technology transfer inflows through emissions trading), as well as reduce the disincentives for industrialized countries to participate and comply.

This transformation, however, cannot pretend to bring a definitive solution to the question of incentives. It results from the prisoner’s dilemma structure of providing a global public good: all “players” (i.e., countries) have an incentive to “defect” from cooperating while only global cooperation can bring a better collective outcome. In the absence of a supra-national authority or a credible threat capable to modify that structure, however, there might be no definitive response. Identifying ways of reducing the disincentives for some and providing incentives to others might be the best that analysts can do. The rest belongs to policy makers, their sense of responsibility, and ultimately to the citizens of the world.

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