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Understanding the ECONOMICS

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To: Interested Parties

From: Michael Oppenheimer, Annie Petsonk, Joseph Goffman, Dan Dudek

Date: November 25, 1997

As you prepare for the upcoming Third Conference to the Parties to the Framework Convention on Climate Change to be held in Kyoto, Japan next week, we hope that you find useful the attached set of issue briefs on major issues to be resolved at Kyoto.

If you have any questions about these or would like to discuss them further, please do not hesitate to contact us at our D.C. office (202) 387-3500 or New York office (212) 505-2100. From 8:00 p.m. Kyoto time on December 1st through December 11th, Annie Petsonk, Joseph Goffman and Dan Dudek can be reached at the Hotel Gimmond, telephone: (81-75) 221-4111. After December 2nd, EDF's Executive Director, Fred Krupp, and Michael Oppenheimer can be reached at the Hearton Hotel, telephone (81-75) 222-1300.

Thank you.

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Building An Effective Kyoto Protocol November, 1997

- 1. Building a Durable Kyoto Protocol: Defining the Goal, Charting The Path**
- 2. Failure at Kyoto: A Narrow Time Window For Reductions, A Steep Price For Delay**
- 3. Building an Effective Kyoto Protocol: Three Gases vs. Six**
- 4. Answering the Competitiveness Conundrum: Market Mechanisms and the Kyoto Protocol**
- 5. Incentives for Early Reductions: Charting The Path To Emissions Targets**
- 6. Building an Effective Kyoto Protocol: Participation By Economies In Transition**
- 7. Building A Durable Kyoto Protocol: Participation of Developing Nations**
- 8. Financing Greenhouse-Friendly Development Under the Kyoto Protocol**
- 9. Building an Effective Kyoto Protocol: Conserving Forests That Take Up Greenhouse Gases**
- 10. Building a Successful Kyoto Protocol: Integrity, Compliance, Enforcement**

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November 25, 1997

Building a Durable Kyoto Protocol: Defining The Goal, Charting The Path

Building a Kyoto Protocol that meets the objective of the Framework Convention on Climate Change to limit warming requires addressing both the total amount of warming and the rate at which that warming occurs. The ultimate amount of future warming will be determined by the level at which atmospheric concentrations (i.e. amounts) of greenhouse gases, such as carbon dioxide, are stabilized. The rate at which the world warms will be determined by the length of time taken to stabilize atmospheric concentrations.

The objective of the UN Framework Convention on Climate Change is to stabilize atmospheric concentrations of greenhouse gases at levels that prevent dangerous interference with the climate system. An acceptable concentration and time frame for stabilization should be determined by the consequences to humans and ecosystems that follow from the climate changes that accompany a particular choice.

Long term global warming of greater than approximately 1 degree Celsius above current levels may not have occurred in the ten thousand year experience of human civilization. Adjustment to rates of warming greater than 1 degree Celsius per century would be increasingly difficult for terrestrial ecosystems. We consider a rate of warming of 1 degree Celsius over the coming century and an ultimate warming of slightly more than one degree as a prudent preliminary long term target for global warming policy. This target can be achieved if stringent limitations are applied to overall emissions of all greenhouse gases, including stabilizing carbon dioxide concentrations at 450ppm within one century. In contrast, current scientific understanding indicates that the long term concentration target of 550 ppm proposed informally by the United States and formally by the European Union entails unacceptable risks to human societies and natural ecosystems.

The Kyoto Protocol should be designed to allow the world to retain the option of achieving the 450ppm objective while scientific understanding of the consequences of climate change advances. Many different choices of emissions limitation objectives in the early years, including the proposals of each of the major Parties, are consistent with achieving the long term objective. However, different choices for a first step determine the required stringency, and therefore the likelihood of attainment, of the subsequent steps that will need to be taken to meet the 450ppm goal.

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Building a Durable Kyoto Protocol: Defining The Goal, Charting The Path, cont'd.

Greater emissions reductions involving more countries and gases, and beginning earlier, create additional room for flexibility in choices later on, and make eventual attainment of the goal more likely than if small reductions involving fewer gases are implemented by fewer countries starting late. Considering the following list of characteristics, it is clear that the proposals of each of the major Parties need to be improved. Strictly from an atmospheric point of view, characteristics of a protocol that leave a wider range of options open in later years, and increase the chances that the long term target will be achieved, include:

1. Stringent emissions limitation obligations leading to reductions below 1990 levels.
2. Early start for emissions reductions, with reductions beginning not later than 2005.
3. Comprehensiveness in gases covered.
4. Inclusiveness in country coverage, i.e. strong incentives for early participation by all nations, including economies in transition and developing countries.
5. Equivalent treatment of protection and enhancement of accountable sinks of gases (e.g., reforestation and forest protection projects).

From an economic and policy point of view, characteristics that enhance the likelihood of success by spurring innovation, reducing costs, and providing Parties with a wider range of options include:

1. Emissions limitation obligations set in terms of legally binding multi-year budgets for carbon-equivalent units (CEUs) for all gases and sources, expressed in comparable terms.
2. Emissions trading and saving of CEUs among nations with budgets.
3. Voluntary joint implementation for credit between budget and non-budget nations.
4. Mechanisms to credit project-based reductions achieved before obligations begin.
5. Availability of a broad menu of compliance options, rather than a centralized or limited range of choices.

Finally, a credible Protocol must invite the participation of sovereign nations, whose participation will be more likely if each nation knows that it will be participating in a regularized system where new obligations are established on a regular and collective basis; and where compliance will be rewarded and non-compliance penalized. The Protocol should therefore include:

1. Rigorous procedures for reporting, accounting, and certification of emissions reductions, and recording of emissions transactions, with all transactions "vintaged," i.e., identified by nation of origin and year of origin.
2. Independent third-party review of reporting, accounting, and emissions limitation performance, with sanctions for fraud in the reviews.
3. Penalties for non-compliance with reporting, accounting, and emissions limitation obligations.
4. Mechanisms by which any Party can raise an issue of non-compliance with reporting, accounting, and emissions limitation obligations.
5. Regular reviews of performance and establishment of successive emissions budgets in light of scientific developments.



November 21, 1997

Failure at Kyoto: A Narrow Time Window For Reductions, And A Steep Price For Delay

Reaching agreement on an effective greenhouse gas Protocol by December 10th seems a daunting prospect. Some have argued that perhaps the nations should simply postpone their efforts. *The costs of delay, however, would be quite steep, in both environmental and economic terms.*

- The world is now in a greenhouse time window. New infrastructure investment is projected to lead to dramatic increases in greenhouse gas (GHG) emissions from many countries. Without action very soon to reduce emissions, it will become vastly more difficult to turn the "supertanker" of emissions from the rocky shores of rapid warming.
- Given the realities of world and national political calendars, failure to reach agreement at Kyoto would likely set negotiations back by 4-5 years - crucial years for the time window.
- Long-lived GHGs are piling up in the atmosphere. Their increasing concentrations are expected to increase the rates of warming. Stabilizing concentrations of GHGs in the atmosphere will require reductions in global GHG emissions.
- Leading ecologists have warned that warming at rates more rapid than one degree Centigrade over the next century could bring about interference with the climate system that is likely to be "dangerous" to ecosystems, including the forests that assure flood control and shelter watersheds critical to much of the world's drinking water supplies.
- A rate of warming of one degree C. over the next century corresponds approximately to an atmospheric concentration at stabilization of 450 parts per million (ppm) of carbon dioxide, accompanied by comparable restrictions on the other five principal trace gases. To prevent dangerous interference with the climate system, it is essential to keep open the option to limit concentrations to 450 ppm while more scientific knowledge develops about the impacts of rates of warming over time.
 - ◆ In this narrow time window, options exist for reducing emissions on paths that keep the 450 ppm option open (see graph below). Soon, however, the window will close, and it will no longer be feasible to reduce emissions on these paths. *When the time window closes, the opportunity to limit warming to one degree will be lost - forever.*
 - ◆ A first emissions budget starting in 2008 is within the time window, *provided that nations adopt strong incentives for early reductions before 2008.*

The following graph shows the narrow greenhouse time window. The graph demonstrates that a five-year delay in the start of legally binding targets will exact a steep price, because it will delay emissions reductions relative to business as usual, and therefore require steeper reductions later in order to keep open the option of stabilizing CO₂ concentrations at 450 ppm. Beginning reductions from business as usual no later than 2005 - which is possible if legally binding targets that begin in 2008 are paired with incentives for early reductions - would require, in the future, global emissions declines as steep as 2.0% per year in order to keep open the option of stabilizing concentrations at 450 ppm. Delaying action five years could require emissions declines as steep as 2.5% per year in order to keep the 450 ppm option - a 20% increase in the rate of reductions needed, and a significantly more daunting prospect in economic terms.

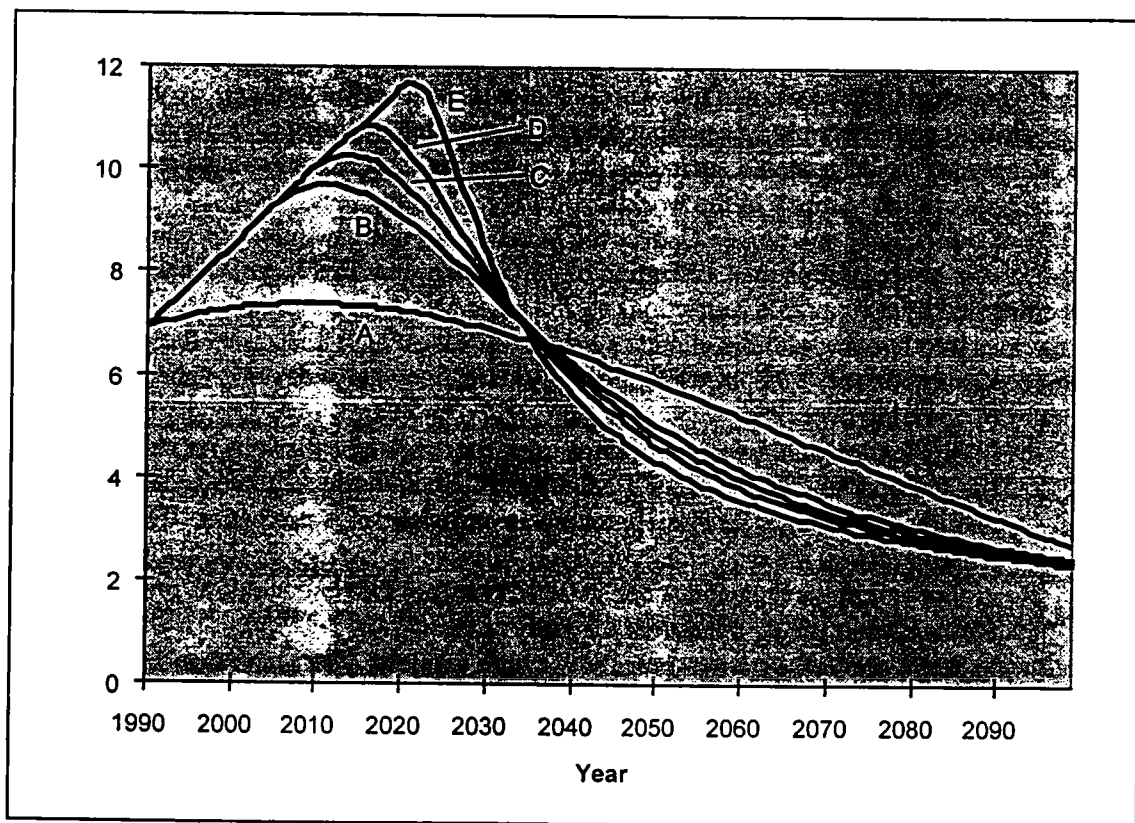
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The Greenhouse Time Window: Global CO₂ Emissions Leading to Stabilization at 450 ppm

The graph below shows five different emissions paths leading to stabilization at 450 ppm in 2100. The graph shows various emissions paths departing from "Business as Usual" ("BaU"):

- The smoothest ("A") curve is the "S" path identified by the IPCC for reaching 450, and implies reductions below BaU beginning in 1990.
- The next ("B") curve is the curve drawn by Wigley, Richels and Edmonds (WRE), and implies that reductions from BaU are delayed until 2005.
- The "C", "D" and "E" curves show emissions paths that delay reductions below BaU until 2010, 2015, and 2020, respectively.

The curves demonstrate the consequences of delay by showing the steepness of the reductions required in subsequent years to meet the desired concentration. Steeper, more accelerated reductions are required, and must be undertaken sooner, precisely because initial action has been delayed. Economically, by creating a more gradual path for emissions reductions over time, early reductions avoid the need for costly, precipitous changes in energy and infrastructure. Failure to achieve early reductions forecloses the gradual paths, leaving only the paths that require unrealizably steep reductions in GHG emissions.



- A - Reductions begin 1990. Gradual reductions, at steepest a 2% annual decline by 2080.
- B - Reductions delayed until 2005. Steepest decline of 2%/year beginning not later than 2035.
- C - Reductions delayed until 2010. Steepest decline of 2.5%/year beginning not later than 2030.
- D - Reductions delayed until 2015 - decline of 3.0%/year beginning not later than 2028.
- E - Reductions delayed until 2020 - decline of nearly 5%/year beginning not later than 2025.

November 25, 1997

Building an Effective Kyoto Protocol: Three Gases vs. Six

Earth's climate benefits from a natural greenhouse effect, in which water vapor, carbon dioxide, and other naturally emitted trace gases trap heat that would otherwise radiate into space. The gases are essential to life on Earth, for without their warming effect, Earth's average temperature would be a frosty zero degrees Fahrenheit. A limited number of human-generated greenhouse gases (GHGs), however, are known to enhance this warming effect. Emissions of these gases are on the increase. Warming from GHGs emitted today will affect Earth's climate for centuries. The different gases come from a range of human activities. Their warming effect has been assessed carefully by the scientists of the Intergovernmental Panel on Climate Change (IPCC).

- CO₂. The principal human contribution to global warming comes from *carbon dioxide* (CO₂), produced from burning coal, oil, and natural gas to produce electricity, drive cars, fly airplanes, and grow food. Industrial activities, including manufacturing, also rely on fossil fuels, and therefore emit CO₂. Each ton of CO₂ emitted to the atmosphere typically survives there for 100 years, continually warming the earth. Growing trees and the undisturbed forest soil they live in take up and store CO₂. Forests are therefore sometimes called greenhouse gas "reservoirs," and the process of CO₂ absorption by growing forests is called a "sink." In contrast, cutting and burning forests, or letting soils degenerate, is a source of CO₂ to the atmosphere. Scientists refer to the warming power of one ton of CO₂ in the atmosphere for 100 years as a "global warming potential" of 1 (one). Despite the larger global warming potential of the other gases listed below, so much CO₂ is emitted that it is expected to cause two-thirds to three-quarters of future warming.
- Methane (CH₄). Methane, or "natural gas," is a fossil fuel. When burned, it releases CO₂, although less than coal or oil do per unit of heat. Methane is a greenhouse gas. While its atmospheric lifetime is shorter than CO₂, overall, it is 24 times more powerful a global warmer per ton emitted. Methane is emitted from leaky gas pipelines, landfills, coal mines, rice paddies, and cattle.
- Nitrous Oxide (N₂O). Nitrous oxide exerts 300 times more powerful a global warming effect than CO₂ per ton emitted. Like methane, nitrous oxide is emitted from a mix of agricultural and other activities - from the application of certain nitrogen-containing fertilizers to farm fields, and from the use of adipic acid, a feedstock chemical in nylon production.
- Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆). These chemicals are used as alternatives to ozone-depleting chlorofluorocarbons, and in the manufacture of semiconductors, and some are released from the production of aluminum. Their power as global warmers is, on a ton-for-ton basis, as much as 20,000 times that of carbon dioxide, and their emissions are growing rapidly.

Failure to include any particular class of greenhouse gases in the controls to be established by the Kyoto Protocol could encourage economic activity to shift to those unregulated areas, exacerbating the global warming problem. For example, natural gas can yield more energy
(over...)

Building an Effective Kyoto Protocol: Three Gases vs. Six, cont'd.

per unit of greenhouse gas emitted than can other fossil fuels like coal and oil. So some electric utilities may choose to reduce greenhouse gas emissions by switching from those fuels to natural gas. Including methane in the greenhouse gas emissions controls would provide those utilities with an incentive also to offset or prevent methane leaks from natural gas pipelines. If methane is not included in greenhouse gas emissions controls, however, the shift from coal to natural gas could mean that increased methane emissions from leaking natural gas pipelines negate some of the benefit of reducing CO₂ from coal. In addition, leaving any or set of gases out of a target means that the target overstates its effectiveness in tackling the greenhouse problem, since the target does not cover gases whose contribution to warming will increase.

- The U.S. proposes stabilizing emissions of all six gases at 1990 levels from 2008-2012. Excluding HFCs, PFCs, and SF₆ from its target would enable the U.S. to characterize its proposal as a 5% reduction in CO₂/methane/N₂O, even though the atmosphere would bear the brunt of the increase in the other three gases.
- Similarly, the proposals of both the European Union and Japan exclude HFCs, PFCs, and SF₆. Analyses indicate that when the warming effect of those gases is taken into account, the EU's proposal to reduce emissions 15% from 1990 levels by 2010 shrinks to around an 8-12% reduction, and Japan's proposal to reduce 5% from 1990 levels by 2008-2012 actually amounts to an increase of about 2%.



November 24, 1997

Answering the Competitiveness Conundrum: Market Mechanisms and the Kyoto Protocol

Building a Kyoto Protocol that will invite sovereign nations to join together to meet the objective of the Framework Convention on Climate Change requires that the Protocol answer those nations' concerns about limiting the costs of mitigation and preserving national competitiveness. Fortunately, market mechanisms are available that provide nations and private sector companies with the flexibility to obtain emissions reductions at lowest cost, while spurring the innovation and competition that will be needed to technologies and processes that reduce both emissions and costs. From an economic and policy point of view, the essential elements that enhance the likelihood of success by spurring innovation, reducing costs, inviting the broad participation of nations, and providing Parties with a wider range of options, are:

1. Emissions limitation obligations set in terms of legally binding multi-year budgets for carbon-equivalent units (CEUs) for all gases and sources, expressed in comparable terms.
2. Emissions trading and saving of CEUs among nations with budgets.
3. Voluntary joint implementation with credit between budget and non-budget nations.
4. Mechanisms to credit project-based reductions achieved before obligations begin.
5. Availability of a broad menu of compliance options, including investments in incentives to protect existing forests, plant trees, and re-forest degraded lands, rather than a centralized or limited range of choices.

Experience with analogous tools in various countries, including the emissions trading program established in the United States to control acid rain, has been that properly designed market-based approaches can reduce emissions ahead of schedule and at far lower cost than conventional command-and-control regulation.

For example, the acid rain control program established under the U.S. Clean Air Act imposes a nation-wide cap on sulfur dioxide (SO₂) emissions from electric utilities. Under the Act, utilities that do better than their cap can earn emissions credits by over-complying. They can save the credits, "spend" them to meet future compliance requirements, or sell them to others who find it more difficult to comply. The SO₂ trading program is currently 30% *ahead* of schedule in reducing emissions, and emissions allowances are available for purchase on the national market at *one-fifth the cost* initially expected. A lively, transparent market in SO₂ allowances, unencumbered by mechanisms that interfere with the ability of the emissions marketplace to spur innovation and grind down cost, has encouraged broad participation, and has demonstrated the power of these tools to answer the competitiveness and cost questions that nations face at Kyoto.

The Protocol should also penalize those who fail to comply with their emissions budget obligations, including the transparent accounting, reporting, and monitoring requirements. These penalties not only ensure the system's integrity, but also ensure that those who comply with their obligations will not be placed at a competitive disadvantage relative to those who do not.



November 15, 1997

Incentives for Early Reductions: Charting The Path To Emissions Targets

The early reduction of greenhouse gas emissions is critical from both an environmental and an economic perspective. Environmentally, as IPCC Chairman Emeritus Bert Bolin reported to SBSTA on October 24, 1997, early reductions are "of major importance" in the long term because they are what begins to turn the "supertanker" of emissions away from the rocky shores of rapid warming. They are also critical, as the attached graphs demonstrate, in keeping open the option for limiting atmospheric concentrations and consequent warming while more scientific knowledge develops about the impacts of rates of warming over time.

Economically, by creating a more gradual path for emissions reductions over time, early reductions avoid the need for costly, precipitous changes in energy and infrastructure. The challenge is to create incentives for early reductions prior to the start of the first legally binding target/budget period. One way of creating powerful incentives for early reductions is to provide national, and, where appropriate, international, assurance that early reductions will be awarded the same treatment as reductions that occur during a legally binding budget period. This applies to: (1) early reductions through actions at home; (2) early reductions through international cooperation among nations with legally binding emissions budget commitments; and (3) early reductions through international cooperation between nations with and without legally binding emissions budget commitments.

The next two pages identify the accounting rules that can enable nations to establish credible, environmentally and economically effective early reduction crediting programs, including programs that provide incentives for investments at home, abroad, in technologies and processes, and in forest protection and planting.

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Incentives for Early Reductions, cont'd.

1. Early Reductions Through Action At Home. As a matter of sovereign domestic policy, nations may recognize and award credit for emissions reductions at home prior to the start of a legally binding budget. To provide assurance to the international community that the reductions, which otherwise will not be subject to international scrutiny, are credible, any nation awarding such credits would subtract the credits from its first budget. Nations do not need international approval - they can start this early reduction incentive program right away.

- This early reductions program can achieve significant environmental and economic benefits. For example, if, prior to the start of a legally binding budget period, a company in a nation with a binding emissions budget commitment reduces its GHG emissions by 50,000 tons of carbon-equivalent from an agreed baseline, the nation could, as a matter of its sovereign domestic policy, award that company a 50,000-ton credit that the company could save and use during the budget period. To provide international assurance that the nation will not exceed its future emissions budget if the company emits the entire 50,000 tons, the nation would subtract the 50,000 tons from its first budget.
- Overall, the environment is better off because the 50,000 tons of early reductions are eliminated from the atmosphere. In addition, the availability of these early reduction credits provides a powerful economic incentive for early action, because it rewards those who act early, and negates any advantage of delay. Early reducers gain flexibility by earning credits that they can save or sell in the future.

2. Early Reductions Earned Through International Cooperation Between Nations With Legally Binding Budgets. There are strong environmental and economic benefits for providing early reduction credit for emissions reductions earned through pre-budget projects undertaken cooperatively by budget nations. (By definition, all such reductions must be determined on a project basis, since no budget exists.) These benefits obtain regardless whether a nation's actual emissions are projected to be above or below its future budget level. While this early crediting does not affect cumulative atmospheric loading, it does provide strong incentives to lessen emissions early, when large concentrations of greenhouse gases mean faster warming. It also provides incentives for industrialized nations to invest sooner in revitalizing technology, capital stock and infrastructure in other budget nations, particularly economies in transition.

(a) Early Projects. If an investor in a budget nation undertakes an emissions reduction project in a host budget nation prior to the start of the first budget, the project reduces emissions from a project baseline, and is reported and verified to the international community, then, with the prior voluntary agreement of the two nations, all or part of the project's emissions reductions earned prior to the start of legally binding budgets could be held by the investor and later added to the investor nation's budget. Any remainder could be added to the host nation's budget.

(b) Reduction "Stream" From Early Projects. Some early reduction projects might continue to yield reductions during the legally binding budget period. In that case, after the budget period starts, the host country would simply track and report the emissions reductions that flow from the project. If by mutual agreement the host country wished to transfer some or all of those reductions to the investor, then, as an accounting matter, the host country would simply subtract from its budget any reductions that the investor country, through the transfer, wished to

Incentives for Early Reductions, cont'd.

add to its budget. This accounting convention follows the accounting procedures that would be used for projects that start during a budget period. (The same "budget-add, budget-subtract" procedure would apply to transactions of budget tons, including forward and during-budget sales, regardless whether the selling nation's actual emissions were above or below budgeted levels.)

3. Early Reductions Earned Through International Cooperation Between Budget and Non-Budget Nations. With the prior agreement of the two nations, an investor in a budget nation might invest in an emissions reduction activity in a non-budget nation prior to the start of a legally binding budget. In that case, provided the activity yielded emissions savings, as measured against a project baseline, additional to what otherwise would have occurred, then, with the prior agreement of the two nations, the emissions reductions earned could be held by the investor and added to the investor nation's legally binding budget. Alternatively, the two nations could share in the early credit. The host nation could sell its share of the early credits, or save them for its own use in the event that it someday adopted a legally binding budget. Such early crediting would provide a powerful incentive for investments in greenhouse-friendly technologies and services during the infrastructure boom in rapidly developing nations.

Forests. Properly verified forest protection or afforestation projects, whether early or during a budget, and whether at home or abroad, should be creditable, provided the projects' success is reliably quantifiable on an annualized basis, and includes accounting for exogenous factors such as leakage. Domestic projects in budget nations that add to the forest baseline would be added to the national budget; where there is no forest baseline, any sale or use of such credits by a budget nation/investor would require a debit from the national budget. Credits earned through cooperative early forest projects in countries without budgets and awarded to budget nations/investors should be recognized as additions to the budget of the investor nation.

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November 21, 1997

Building an Effective Kyoto Protocol: Participation By Economies In Transition

To be effective in global terms, it is essential that the Kyoto Protocol engage all industrialized nations, including economies in transition, in the adoption and implementation of credible, environmentally adequate legally binding targets to limit and reduce greenhouse gas emissions. As part of that engagement, it is essential that the economic revitalization that is beginning in Russia, Poland, and other economies in transition proceed with vitality, and proceed in the context of an international system that provides incentives for new investment in the greenhouse-friendliest technologies possible.

At the same time, to a great extent, the effectiveness of a Kyoto Protocol will depend on its environmental credibility. Therefore, the approach to emissions reduction crediting for all nations, including the economies in transition, not only must provide credible accounting for emissions transactions at both national and international levels, but also must preserve incentives for greenhouse-friendly investment in all industrialized nations. Given that a Kyoto Protocol likely will require industrialized nations to limit their emissions to 1990 emissions or below, and given that the emissions of economies in transition have fallen below 1990 levels, some nations have challenged the terms under which economies in transition should be permitted to engage in emissions transactions. Nations with economies in transition, by contrast, believe that they should not be discriminated against relative to other nations, particularly when any so-called emissions "windfall" has been the result of painful economic restructuring.

A simple set of rules can bridge the gap in the dispute, delivering environmental performance, environmental credibility, and fairness. These rules all follow from the premise that the credibility of emissions transactions depends solely, vitally, on the existence of a baseline from which emissions reductions can be measured. In the case of countries with emissions budgets, their legally binding budget target provides the baseline. In the case of transactions with nations that have not adopted budgets, or whose budget periods have not yet begun, transactions must demonstrate that they flow from projects that have reduced emissions below the baseline of what would have otherwise occurred. The resulting rules are:

- Transactions in early reductions from a baseline. In all cases, prior to the beginning of the first budget, crediting should be available for cooperative early reduction projects that demonstrably reduce emissions below the baseline of what otherwise would have occurred.
- Sales of budget tons, during or before the start of the budget period. All nations with emissions budgets should be allowed, without discrimination, to transact carbon-equivalent units (CEUs) from their national emissions budgets during and prior to the start of the budget period. All such sales of CEUs must be reported internationally as deductions from the sellers' national budgets. Of course, failure to meet budget levels will subject, without discrimination, non-performing nations to the Protocol-specified consequences, including suspension of sales of CEUs.
- Pre-budget "windfall." No nation should be allowed to transact any pre-budget difference between actual emissions and 1990 levels.

Inclusion of these simple rules in the Protocol will ensure that strong incentives for greenhouse-friendly investment will foster revitalization in economies in transition while maintaining the Protocol's environmental integrity and credibility.

November 21, 1997

Building a Durable Climate Change Protocol: Participation of Developing Nations

Participation of all nations in greenhouse gas emissions reduction will be essential if nations are to achieve the Framework Convention objective of preventing dangerous anthropogenic interference with the climate system. Developing nations, however, face many competing demands as they search for the resources to enable their sustainable development. From the perspective of atmospheric science, while developing nations do not need to begin participating at precisely the same time as industrialized nations, it will be impossible to meet the Convention's objective if either group waits indefinitely; and the longer either group waits, the more difficult it will be to meet the Convention's objective. From an economics and policy perspective, the longer that either group waits, the more expensive it will be for all.

The greatest challenge nations will face at Kyoto, and the greatest opportunity they can seize, is to develop a structure that invites the earliest possible participation of developing nations. An agreement that leads with a strong commitment by industrialized nations, and incorporates the following elements, can meet the challenge and the opportunity of Kyoto:

1. Joint implementation for credit, starting as soon as possible. Joint implementation, undertaking voluntarily, can provide developing countries with improved technologies and enhanced protection of forest resources, reduce emissions at lower cost, and enable developing countries to begin to build carbon-equivalent unit (CEU) reserves for their future use.

- The earlier that for-credit joint implementation begins, the sooner developing nations can, on a voluntary basis, participate in the technology and resource transfers that it can provide.
- Credible accounting systems for technology and forest-based projects, as well as a mechanism by which any Party can challenge the accounting and reporting of such projects, provide the integrity backstop for effective joint implementation.

2. "Growth" budgets for nations that voluntarily adopt emissions budgets early. Nations undertaking project-based joint implementation will face relatively high transactions costs. They can reduce those costs, and therefore encourage more investment in their emissions reduction opportunities, if they voluntarily adopt emissions budgets.

- Developing nations that adopt budgets early should receive growth budgets - initial budgets above historic emissions levels.
- Growth budgets should be set in terms of an overall cap, as with budgets for industrialized nations. Fluctuating budgets, such as those based on per capita emissions, should be avoided, since, because the CEU totals for such budgets would not be readily calculable, they would hamper nations' participation in an international emissions trading market.

3. Participation of all major emitting nations in emissions budgets within a definite time window. It is vital that all major emitting nations begin to participate in emissions budgets during the narrow time window that exists for keeping open the long-term concentration options of preventing dangerous interference with the climate system.



November 21, 1997

Financing Greenhouse-Friendly Development Under the Kyoto Protocol

To be effective in global terms, it is essential that the Kyoto Protocol provide mechanisms, over time, that engage the participation of developing nations in activities that foster economic growth and sustainable development while limiting and reducing greenhouse gas emissions. While industrialized nations should take the lead in reducing emissions, since they have contributed most to the global warming problem to date, emissions from developing nations are projected to overtake those from industrialized nations in the relatively near future, and after that, it will be impossible to limit warming and stabilize atmospheric concentrations of greenhouse gases without the participation of the developing world.

At Kyoto, what will industrialized nations offer developing nations in the way of incentives to invite the participation of the latter group in emissions reduction activities? Can the Kyoto Protocol be designed so as to foster clean development? Several proposals have been offered that link industrialized country compliance with investment in cleaner growth in developing countries. Together, many of these options provide an important menu of credible, effective options and incentives. Limiting the options to only one of these proposals, however, risks sacrificing the advantages that group of proposals together can provide.

Options currently on the table include joint implementation for credit, and a range of proposals for carbon investment funds. These potentially are useful if structured so as to preserve the integrity of the compliance mechanisms in the Kyoto Protocol. In fact, if the Protocol is properly designed, it will spur the creative development of more such options. *What is essential, however, is that the Kyoto Protocol recognize only those options that have at their core the common elements that ensure integrity in the context of compliance with the Kyoto Protocol.* Therefore, the Protocol should accept only those linked compliance-funding mechanisms that:

- Proceed from the core Kyoto Protocol structure of emissions budgets, expressed in carbon-equivalent units (CEUs), with comprehensive coverage of all greenhouse gases, and equivalent treatment of protection and enhancement of accountable sinks (e.g., reforestation and forest protection projects).
- Utilize common reporting stated in carbon-equivalent units (CEUs).
- Identify CEUs by country and year of origin ("vintaging").
- Only engage in CEU transactions that are processed through the double-entry book-keeping system upon which the integrity of the Protocol will be premised.
 - Under that system, every emissions transaction must be recorded by deducting the CEUs sold from the seller nation's budget and adding the CEUs purchased to the buyer nation's budget, and the balance in every nation's budget account must be calculated ("true-up") at the end of each year.
 - Where the trade reflects an emissions reduction investment in a project, reporting must include the year in which the CEUs were earned.

November 21, 1997

Building an Effective Kyoto Protocol: Conserving Forests That Take Up Greenhouse Gases

The principal human contribution to global warming comes from carbon dioxide (CO₂), produced from burning fossil fuels. Cutting forests, burning wood, and letting soils degenerate, all release CO₂ to the atmosphere. Each ton of CO₂ released to the atmosphere, whether from burning fossil fuels or cutting down forests, typically survives in the atmosphere for 100 years.

But forest ecosystems take up carbon dioxide during photosynthesis, and the undisturbed forest soils they live in store large amounts of CO₂. (Forests are therefore called greenhouse gas (GHG) "reservoirs," and the process of CO₂ absorption by growing forests is called a "sink.") Because forests and forest soils possess a tremendous capacity to absorb atmospheric CO₂ and provide a natural, long-term carbon reservoir, it is critical that a Kyoto Protocol provide powerful incentives to protect existing forests, plant trees, and re-forest degraded lands. In constructing these incentives, three questions arise:

1. Forest baselines. How can national greenhouse budgets be developed that take account of the entire baseline forest conditions in a nation, as well as changes to that baseline over time?

- When sufficient scientific data are available, GHG emissions budgeting will be most effective if national budgets are adopted for net greenhouse gas emissions, i.e., the national budget is set in terms of gross emissions minus removals by sinks.
- However, in many nations, there are significant uncertainties about the amount of land that is covered in forest and the amount of carbon that this forest takes up.
- The Intergovernmental Panel on Climate Change (IPCC) should be asked to prepare a report that would provide the foundation for the adoption, by the end of the present decade, of consistent, transparent, and comparable methodologies for measuring and reporting emissions and removals from land-use change and forests.
- Future budgets should be established in terms of net emissions.

2. Forest project crediting. In an emissions budget and trading system, should nations be eligible to receive credit for particular forest projects? If so, how should credit be awarded?

- Properly verified forest conservation or afforestation projects, whether undertaken during a budget period or commenced prior to a budget period, and whether at home or abroad, provide a significant potential for carbon storage, and should be creditable, even in the absence of national forest baselines, provided the projects' success is reliably and regularly quantified, and includes credible accounting.
- Domestic projects in budget nations that add to the forest baseline would be added to the national budget.
- Where there is no forest baseline, any sale or use of such credits by a budget nation/investor would require a debit from the national budget.
- Credits from cooperative early forest projects in countries without budgets and awarded to budget nations should be recognized as additions to the latter countries' budgets.

3. Crediting for conserving existing forests. How can an agreement be designed that provides incentives for protecting existing mature forests, whose soils store vast amounts of carbon?

- Projects that demonstrate that they will take up more carbon than would otherwise have occurred, should be eligible for crediting. When such projects conserve existing forests, they will need to take care that the pressure to displace the project's potential wood supplies is not simply shifted to another supply source.

November 21, 1997

Building a Successful Kyoto Protocol: Integrity, Compliance, Enforcement

Enforcing compliance among sovereign nations is the fundamental challenge of any international treaty. Essential to the success of a Kyoto Protocol will be mechanisms that invite - and enforce - compliance with emissions accounting and performance obligations. Fortunately, the use of market-based approaches can add incentives to the Kyoto Protocol compliance tool-kit.

Monitoring, Reporting and Accounting. Regular, transparent reporting and accounting for emissions of all gases, from all sources, and uptake by all sinks, is the heart of any successful international agreement to reduce greenhouse gas emissions (GHG).

- To ensure compliance accountability, the reporting needs to be stated by GHG emissions/uptake as well as carbon-equivalent units (CEUs).
- To ensure accurate accounting, the Kyoto Protocol should provide that any Annex I Party not in compliance with its reporting obligations is assumed to have emissions a specified level (e.g., 20%) over budget and must buy its way back into compliance; any other Party not in compliance with its reporting obligations is prohibited from engaging in emissions transactions, including joint implementation.
- A Kyoto agreement that allows emissions reductions to be traded will need to require reporting/accounting of all transactions, identified by country and year of origin.
- *The heart of the Kyoto Protocol's accounting system is rigorous reporting. Every emissions transaction must be recorded by deducting the CEUs sold from the seller nation's budget and adding the CEUs purchased to the buyer nation's budget. This double-entry book-keeping ensures that there are no off-budget transactions. Every transaction, whether joint implementation or emissions trading, must be entered in each nation's budget account books*
 - Where a trade reflects the transfer of an increment of a nation's emissions budget, the nation and budget year from which the CEUs were sold must be entered on the budget books of both the seller and the purchaser.
 - Where the trade reflects a specific emissions reduction investment and not just the transfer of an increment of a nation's emissions budget, reporting should include the year in which the CEUs were earned.
 - In either case, this identification, often called "vintaging," allows the Protocol to reduce, by rule, the credit value of CEUs transferred by nations that have exceeded their budgets. This rule enables the market to provide feedback to each nation, delivering a powerful incentive for nations to improve their environmental performance. With such a rule, CEUs from high-performing nations will be able to command higher market prices, and will also earn better ratings from the private, non-governmental carbon quality "rating" services that are likely to develop.
- Equally critical is a required annual "true-up" or balancing of the emissions budget books. True-up reveals a nation's compliance or non-compliance with emissions budget obligations.
- Only by requiring vintaged reporting of all emissions, uptake, and transactions by all nations, with annual "true-up" of emissions budget accounts, can the Kyoto agreement deliver credible environmental results.

(over...)

Strong Compliance And Enforcement Mechanisms. Market-based approaches provide opportunities for, and demand, compliance mechanisms that use the “stuff” of emissions transactions to generate powerful incentives for nations to meet their emissions obligations. Five simple rules provide the compliance structure that can make the Protocol a success.

1. *End-of-budget penalty for emissions over-budget.* Any emissions over-budget should be deducted automatically from the next budget, with a penalty. For example, if a nation exceeds its budget by 1 million tons of carbon-equivalent, and a penalty of 20% were included in the Kyoto Protocol, then 1,200,000 million tons would be deducted from its next budget. Failure to include this mechanism will simply invite unlimited “borrowing” from future.
2. *In-budget automatic credit reduction for emissions over-budget.* To deliver a similar compliance incentive that begins to “bite” during a budget period, the Protocol should automatically reduce the credit value of CEUs from nations whose emissions are in excess of their budget amounts during a budget period.
3. *Ban on export of credits from non-reporting nations.* The primary backstop for these compliance mechanisms is a rule ban the export of emissions reductions from any nation whose compliance with reporting requirements has been called into question. This export ban, however, is not sufficient by itself to enforce in-budget compliance - it needs to be supplemented with the automatic credit reduction (Rule #2 above).
4. *Third-party auditing, with consequences for fraud.* The secondary backstop is that the Protocol should require all Protocol Parties to adopt legislation for certifying independent emissions auditors; for conditioning emissions transactions upon the completion of independent audits; and for criminalizing fraud in the reporting, accounting, auditing, and transacting of CEUs as well as in the conduct of expert reviews under Article 9 of the Kyoto Protocol. Without this provision, there is no guarantee of the independence of auditors and expert reviewers.
5. *Menu of compliance alternatives.* The Protocol should invite the development of a range of mechanisms by which nations can bring themselves back into compliance with their environmental obligations. For example, nations should have the choice of stepping up their emissions activities at home, increasing their investment in emissions-reducing technology transfer and related projects abroad, or procuring offsetting credits from the international market, including from funds that pool investments in offset projects that produce verified emissions reductions. The Protocol should prohibit mechanisms that would undermine the obligations (e.g., the Protocol should not allow nations to print and sell new paper CEUs.)

Including these compliance tools in the Kyoto Protocol, and ensuring that any Party may raise a challenge and obtain review of another Party’s implementation under these rules, will help assure those who reduce emissions to realize the value of their investments, while punishing those who fail to comply.



ENVIRONMENTAL
DEFENSE FUND

1967 **30** 1997
YEARS

September 29, 1997

Dr. Jeffrey Frankel
Member
Council of Economic Advisers
The White House
Washington, DC 20502

Via Facsimile 202-395-6958

Dear Dr. Frankel:

Following up on your question Tuesday with regard to the possibility of delaying action to curb greenhouse gas emissions, in particular the hypothesis of a so-called "delay dividend" in carbon terms, I thought you might find the context of the Wigley-Richels trajectories of interest. Specifically, in their *Nature* paper, Wigley and Richels estimate the carbon benefit of a delay strategy, calculating the cumulative carbon saving on two different trajectories for each stabilization level up to the year of stabilization. For example, the Wigley-Richels cumulative carbon saving for the 10-year delay 450 ppm trajectory vs. no delay 450 ppm (1990 vs. 2000) is 20 GtC. However, the difference between the delay and non-delay trajectories over the years 1990 to 2040 is approximately 60 GtC. In other words, the net price of a ten-year delay from 1990 to 2000 on the Wigley-Richels trajectories is 40 GtC - a steep price to pay, and one that must be made up in the out-years in order to achieve stabilization at the same concentration level and time frame (i.e., 2100) as the non-delay trajectory.

EDF's scenarios, like the Wigley-Richels scenarios, are based on a full carbon cycle model, and therefore include the so-called delay dividend. Our scenarios are a little different, among other reasons, because they start later (reflecting the reality that it is already 1997, so seven years of delay have already occurred.) Like Wigley-Richels, we also find that the so-called delay dividend is completely swamped by the increase in overall emissions that would occur under a delay strategy. The net result is that even taking into account the "dividend", a near-term delay would require much more aggressive emissions reductions in the out-years in order to stabilize at the chosen concentration level.

EDF's analyses show that it is possible to meet a 450 ppm stabilization concentration with realistic out-year annual emissions declines, provided that meaningful efforts begin in the near term. Our analyses indicate that a delay strategy would require significantly more ambitious technology innovation, technology penetration and diffusion, and capital stock turnover in order to achieve the markedly steeper annual emissions declines that would be needed in the out-years. The bottom line is the delay dividend can't get us out of the trouble that the delay itself causes. A delayed start would not only inflict the environmental penalty of subjecting human and natural ecosystems to more rapid warming. It would also force our generation and our

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Dr. Jeffrey Frankel
September 29, 1997
Page Two

children's generation to shoulder the much heavier economic burden of extremely rapid capital stock turnover. The same type of delay consequence is observed for a 550 ppm target.

I was surprised by another point you made in our conversation. You raised the traveler analogy, i.e., adjusting to climate change for people is like "moving from Boston to New York (or further south more likely)". Surely this example doesn't do justice to the scope of the problem of slowing the rate of climate change in order to leave time for human systems to adjust. The issue is the cost of replacing or altering long-lived infrastructure involved in managing water resources, supporting coastal habitation, and controlling floodwaters, among others. In addition, there is actually a significant issue of allowing people longer periods for adaptation to hotter conditions in order to minimize increases in heat-related deaths, a well-quantified phenomenon during heat waves. Of course, the rate of warming and sea level rise is a critical issue for ecosystems as well. Finally, the faster the change, the greater the likelihood of a surprise response from the geophysical system.

One additional point. Recent press reports indicate a view among some economics agencies that emissions trading and joint implementation effectively constitute a transfer of funds from the United States to, say, China. But joint implementation and emissions trading with other nations will only occur where the marginal cost of greenhouse gas emissions control is lower abroad than it is at home; to the extent that those investments occur in sectors where the United States has a technology edge, they will result in an increase in U.S. technology exports with direct job benefits here at home.

I would be happy to discuss these issues further at any time. In case you saw the New York Times article in Tuesday's Science Times on solar variations, I am enclosing a copy of my response.

Sincerely,

Michael Oppenheimer
Dr. Michael Oppenheimer / *CAF*

Chief Scientist



September 25, 1997

Industry, Not Sun, Is Culprit in Global Warming

° Letters Index

To the Editor:

Your Sept. 23 Science Times article on the Sun's contribution to global warming omits critical data and obscures the most important fact about the trend -- a potentially disruptive warming of Earth is inevitable unless industrial emissions are curtailed.

It is odd that the chart of temperatures accompanying the article is cut off at 1975 and refers only to the Northern Hemisphere. Had global data for the past 20 years been included, the assertion by some that "the majority of the century's warming occurred before 1940" would be seen to be incorrect.

Observed warming of 1 degree Fahrenheit is the net result of many atmospheric changes, some of human origin and some natural. One reason most scientists are confident that greenhouse gases have contributed to this warming is that the atmospheric buildup of most of these gases is known to high accuracy. Consequently, their heat-trapping effect can be calculated precisely. An analogous calculation cannot yet be done for the solar effect because there are insufficient data to directly determine the Sun's variation over the past century.

Unless greenhouse emissions are curtailed soon, the human influence on climate is likely to overwhelm natural variations over the coming century.

MICHAEL OPPENHEIMER

New York, Sept. 23, 1997

The writer is chief scientist with the Environmental Defense Fund.

**United States Department of State*****Under Secretary of State
for Global Affairs******Washington, D.C. 20520-7250*****September 24, 1997****PLEASE DELIVER TO: Interagency Climate Change Deputies Group**

Mike Armstrong, FEMA	Melinda Kimble, State
Brian Atwood, USAID	Jeff Lang, USTR
Jim Baker, Commerce, NOAA	Al Larson, State
Rosina Bierbaum, White House	David Lipton, Int'l Affairs
Joseph Bordogna, NSF	Mark Mazur, NEC
Stuart Eizenstat, State	Katie McGinty, CEQ
Dirk Forrister, CEQ	Jerry Melillo, White House
Jeffrey Frankel, CEA	Betsy Moler, Energy
John Garamendi, Interior	Peter Orzag, NEC
Jack Gibbons, White House	Dan Reicher, Energy
T.J. Glauthier, OMB	Richard Rominger, USDA
John Goodman, Defense	David Sandalow, CEQ
Sherri Goodman, Defense	Lois Schiffer, Justice
Joshua Gotbaum, OMB	James Steinberg, White House
Jon Gruber, Treasury	Todd Stern, White House
Fred Hansen, EPA	Lawrence Summers, Treasury
Kitty Higgins, Labor	Dan Tarullo, NEC
Elgie Holstein, Energy	William Townsend, NASA
Jeffrey Hunker, Commerce	Janet Yellen, CEA

FROM: Timothy E. Wirth, Under Secretary for Global Affairs
SUBJECT: Climate Change Information of Interest

Attached you will find two items of interest to the Interagency Climate Change Deputies Group: A letter from Ken Lay CEO of ENRON to Mr Soichiro Okamatsu of the Japanese Ministry of International Trade and Industry, and an article from USA Today that illustrates the progress of global warming.

Additionally, we have one upcoming luncheon on October 23. Please respond to Ms Barbara Peterson at (202) 647-6205. Thank you.

Harry Pearce
Vice President General Motors
Thursday, October 23, 1997
12:00-1:30 p.m.
Henry Clay Room, Main State



E. Joseph Hillings

*Vice President and General Manager
Federal Government Affairs*

Enron Corp.

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VIA COURIER

September 10, 1997

The Honorable Tim Wirth
Undersecretary of Global Affairs
Department of State
2201 C Street, NW
Room 7250
Washington, DC 20520

Dear Secretary Wirth:

Enclosed is a letter from Dr. Ken Lay, Chairman and CEO of Enron to Mr. Soichiro Okamatsu, Advisor to MITI which I thought would be of interest to you.

Sincerely,

Encl.

Sep. 9. 1997 2:54PM

CHAIRMAN'S OFFICE

No. 1292 P. 1/3



Kenneth L. Lay
*Chairman and
Chief Executive Officer*

September 5, 1997

Enron Corp.
P. O. Box 1188
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Mr. Soichiro Okamatsu
Advisor to the Ministry of International
Trade and & Industry (MITI)
Ministry of International Trade and Industry
Environment & Policy Division
131 Kasumigaseki
Chiyoda-ku
TOKYO, JAPAN 100

Dear Mr. Okamatsu:

Our Washington office communicated your kind invitation to meet with you in Washington the week of September 8 which I have regrettably had to decline since I have commitments out of the United States. I do hope that we can meet some time in the future to discuss our respective views on the challenge that the global climate issue presents to all people.

I recently participated with other corporate leaders in a meeting at the White House with President Clinton at which he presented his concerns and recommendations on how this issue might be addressed at the Kyoto Conference. Enron has spent considerable time and effort to understand the issue and participate in this debate. In this effort, Mr. Terry Thorn, Enron's Senior Vice President for Environmental and International Affairs has been active in the many official meetings of the United Nations and will be among the business participants at the Kyoto Conference. It is an issue of significant interest to Enron and to me.

Enron is one of the most active companies advocating near-term and relatively aggressive actions to mitigate excess carbon emissions. We recognize this is a complex issue. Here is a brief outline of our position.

First, we do not challenge the scientific analysis supported by the United Nations and the United States government.

The science behind climate change is complex. Conclusions reached by international scientists are based on research by climatologists, meteorologists, chemists, physicists, geologists, biologists, simulation modelers, systems analysts, mathematicians, and economists. It is difficult for any single specialist, let alone a knowledgeable lay person, to contradict the findings of hundreds of international experts who have spent years studying the intricate details of complex physical and economic systems. Clearly

Natural gas. Electricity. Endless possibilities.

Sep. 9, 1997 2:54PM CHAIRMAN'S OFFICE

No. 1292 P. 2/3

Mr. Soichiro Okamatsu
September 5, 1997
Page 2

something is happening throughout the world that is causing ice-shelves to melt, glaciers to melt, and changes in marine life.

Secondly, Enron supports a control program for climate change mitigation. There are at least two reasons why action might be taken to first slow down the growth in greenhouse gases and then reduce emissions levels: (1) the science is compelling and (2) the insurance value of starting a program is great. Starting a regulatory CO₂ mitigation program does not mean rigidly continuing such a program if and when better science dictates halting or escalating further reductions in greenhouse gases. Starting a regulatory program means setting into motion public and private-sector initiatives that capture the cheap reductions as soon as possible while validating the science.

Third, we think the cost to control greenhouse gases will be less than some people have predicted. Before the US EPA developed regulations dealing with acid deposition, power companies and industry experts and consultants predicted that the cost of SOx control would be very high. In reality though, the cost of control has been less than one tenth of the cost that people had predicted. These lower costs were achieved for a variety of reasons. One reason for this low cost is that Congress mandated a market-based solution for solving the acid deposition control problem instead of employing command-and-control approaches. Enron applauds the US government's advocacy of market-based solutions for mitigating CO₂ and other carbon emissions. In fact, studies by public sector and private sector economists illustrate that CO₂ control costs can be reduced by around 70% when international carbon credit trading is employed.

Fourth, we think a start date for a regulatory program should be sooner instead of later. While some countries see the need to begin a carbon control program sooner rather than later, other countries are proposing programs that would not start until between 2005 and 2010 or even not until 2020. If the carbon mitigation program is delayed until 2010 or 2020, then the environmentally sound technologies that promise to be part of the long-term solution to a variety of environmental problems will be delayed and the improvements market forces always bring to existing technologies – especially in efficiency, will be postponed. Consequently the long-term cost of carbon control will be high.

Finally, Enron fully supports market-based approaches to achieving carbon reductions. Enron supports JI among countries that have commitments to reduce carbon emissions -- Annex-1 countries. We also endorse the idea of an opt-in provision for those countries that have yet to take on complete commitments but want to participate in JI. However, any opt-in country must be held to a high standard of environmental and energy-sector standards to make sure that the integrity of the JI program is not eroded.

With respect to emissions allowance trading, we also endorse this type of system but only where the economic, regulatory, and legal systems can support it. Clearly, the US is one country where carbon emissions trading systems can be developed. We have the infrastructure and experience with SOx trading that creates a foundation for CO₂

Sep. 9. 1997 2:54PM CHAIRMAN'S OFFICE

No. 1292 P. 3/3

Mr. Soichiro Okamatsu
September 5, 1997
Page 3

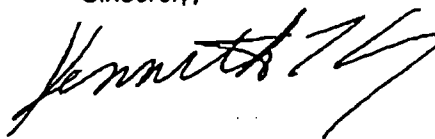
trading. Many other countries lack our resources and regulatory sophistication to adopt an emissions trading program. Thus, for these countries, JI-based trading makes sense.

I hope these thoughts give you a good picture of our position. Enron has a reputation as an innovative company. We believe reasonable carbon control targets and timetables, and enlightened regulatory programs based on carbon credit trading will yield incentives for environmentally friendly energy technologies and reduce the threat of global climate change.

Hopefully these are comments that are of interest to you as you refine the position of the Government of Japan which as I understand agrees with the United States' position in several key areas.

I thank you for your kind invitation to meet and while my schedule has precluded our meeting on your upcoming visit to Washington both Terry Thorn and I would be pleased to have a future exchange of views with you either in person or by telephone. Please accept my best wishes for the success of your visit.

Sincerely,



Polar regions show signs of heating up



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Polar regions show signs of heating up

While scientists debate the complexities of global cooling and warming and humankind's contributions to those changes, a clear phenomenon is occurring at the Earth's polar regions: They are warming up.

In last week's journal *Nature*, scientists reported that the area covered by Antarctic sea ice diminished by 25% between the mid 1950s and the early 1970s.

In the north, the figurative canary of the coal mine is the tree line that bounds the arctic in Canada and in Siberia.

Harvey Nichols, professor of biology at the department of Environmental Population and Organismic Biology, University of Colorado, Boulder, has discovered that the tree lines of both regions are advancing farther north and that the changes have occurred since the 1970s.

The barren dwarf spruces and larches that once edged the tundra are now thriving trees flush with cones, and new seedlings are just beginning to appear in the tundra.

"The expectations about global warming based on atmospheric models all point to a predicted warming of the polar regions," Nichols says. "The arctic tree line has been known for a long time to be limited by climate. The trees fail to go farther north because it's too cold. Theoretically, they should respond to climate warming and show us whether or not such events are taking place."

Nichols also studies fossil pollen along a 900-mile stretch of the tree line in northern Canada. Like the ebbing and flowing of an ocean tide, the tree line has advanced and retreated many times over the centuries. It advanced as much as 240 miles farther north during the height of natural global warming 5,000 to 6,000 years ago.

Nichols, whose work is supported by the National Geographic Society and the National Science Foundation, also has learned that a 2-degree or so rise in temperature causes the tree line to advance about 60 miles. Over the last 2,000 years, the tree line has receded due to cooler temperatures. The new advance is noteworthy, Nichols says, but must be kept in perspective.

"We have to be properly humble about this, and we can't say whether this is global warming produced by industry or whether it is a natural process or some combination," he says. "But the fact that we've been able to show it over a large section of wilderness suggests that it is possibly one of the earliest signs of a major vegetational boundary responding to climate warming."

Robert Stewart, global change science adviser for the Canadian Forest Service, Natural Resources Canada, says changes have been occurring along the northernmost vegetation boundary for about 100 years.

He says Nichols' work supports the studies by Steve Zoltay, Northern Forestry Center, Edmonton, Alberta, and Dale Vit, University of Calgary, who study the permafrost. Their work shows that the permafrost has moved 86 miles northward in the last century, Stewart says.

"Now the tree line has become biologically active," he says.

"We don't know what is causing this but have clear evidence that the tree line and the permafrost are responding to warmer temperatures."

By Tim Friend, USA TODAY

- [Go to Science digest](#)
- [Go to Life front page](#)

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**Groundbreaking *Energy Innovations* Study Shows
Prosperous Path to Global Climate Protection**

Less Costly, Cleaner Energy Benefits the Environment and Economy

Washington, DC, June 17 — By 2010, U.S. emissions of carbon dioxide, the chief global warming pollutant, could be cut to 10 percent below 1990 levels while national energy costs are reduced by \$530 per household annually and nearly 800,000 additional jobs are created, according to a groundbreaking new report released today. These benefits can be attained through smart policies that stimulate the introduction of innovative technologies to use energy much more efficiently and to tap domestic renewable resources.

The study's findings are critical for consideration at this month's summit meetings in Denver and New York, where global warming will be a major topic as climate talks enter their pivotal final stage prior to the Kyoto climate summit December deadline.

The study, *Energy Innovations: A Prosperous Path to a Clean Environment*, paints a picture of a healthier and more secure energy future for the United States. Backed by in-depth engineering and economic analysis, the study demonstrates the benefits of choosing an *Innovation Path*, rather than remaining on the *Present Path* of inefficient, fossil-fuel dependent energy production and consumption.

—more—

Energy Innovations was researched and written jointly by the Alliance to Save Energy, the American Council for an Energy-Efficient Economy, the Natural Resources Defense Council, the Tellus Institute and the Union of Concerned Scientists. Working together for nearly two years, independent energy policy experts from these organizations gathered data and used government analytic models to assess the effects of different policy options on the economy and environment.

The study documents our ***Present Path*** predicament in which energy supply and use is a burden on the economy and harmful to the environment. Alternatively, an ***Innovation Path*** is presented, which offers strategies that would guide the economy toward more secure, lower cost, less polluting ways of producing and using energy. New incentives, better standards and market mechanisms would be employed to promote greater energy efficiency and cleaner energy resources in cars, homes and business. These measures would generate cost savings and channel investments toward ever cleaner and more efficient technologies.

“This report serves as a roadmap on how to address the threat of global warming, while creating new jobs and lowering energy costs,” said Alden Meyer, Director of Government Relations for the Union of Concerned Scientists. “Now the question is whether the Administration will have the political courage to take on the polluting special interests and protect our children’s future.”

Fossil fuel consumption is the primary cause of the 30 percent increase in the concentrations of carbon dioxide measured by scientists in the earth’s atmosphere. This pollution buildup is causing global climate change that, left unchecked would spread the frequency and severity of heat waves, floods, droughts and storms; disrupt crops, forests and ecosystems; spread disease and undermine economies and communities.

—more—



"President Clinton has recognized that a greenhouse world is no place to nurture our children," said Dan Lashof, Natural Resources Defense Council Senior Scientist. "Now he must lead the United States and the world onto an innovation path that will cut greenhouse pollution even as it grows the economy."

Once incorporated into the country's energy policies, the benefits of the *Innovation Path* are significant. Analyzed against the continuation of current U.S. energy trends, the dividends in 2010 include:

- Reduction in fossil fuel dependence
- Renewable energy delivering 14 percent of energy needs
- Carbon dioxide pollution reduced by 10 percent below 1990 levels
- National energy costs reduced by \$530 per household annually
- Creation of 770,000 new jobs

"Three concerns — our environment, our economy and our security — compel us to rethink the current U.S. energy strategy," said John DeCicco, Senior Associate, Governmental Relations for the American Council for an Energy-Efficient Economy.

"With oil imports rising, America is at risk from economic disruption or military conflicts due to our dependence on imported oil," he said. "The *Energy Innovations* study points the way to a more secure economy while protecting the environment."

The key energy technologies that would become the cornerstones of the *Innovation Path* include fuel cells, advanced gas turbines, integrated green building designs, membrane technology, biomass fuels, advanced wind turbines, and thin film photovoltaic modules. The final mix of technologies will ultimately yield more usable energy and less pollution from each ton of coal, barrel of oil or cubic foot of natural gas. The shift from the dependence on fossil fuels will be orderly as the country moves to an increasing percentage of renewables.

—more—



The study takes special note of the opportunities presented by the emerging regulatory changes taking place in the electricity industry. The treatment of environmental and energy efficiency policies in the context of utility restructuring is critical to the nation's chances of curtailing global warming and spurring economic growth.

"In the race to greater competition in the electric utility industry, it is crucial that restructuring be handled so that environmental gains are not lost," said David M. Nemtzw, President of the Alliance to Save Energy. "If restructuring of this industry is not handled right, environmental, economic, national security, and other benefits of clean energy would be at peril. Energy efficiency and renewable energy must play a leading role in restructuring legislation and upcoming climate change talks."

"The policies analyzed here, will provide impetus for the kinds of technological innovation, learning and diffusion, needed to ensure sustainable development of our economy and society in a sustainable world," says Steve Bernow, Director of the Energy and Environment Program at Tellus Institute. "This will reflect both continuity, in our traditions of creativity, inventiveness and practical ingenuity, and change in our transition to a more modern and cleaner technological basis for our economy."

###





United States Department of State

*Bureau of Oceans and International
Environmental and Scientific Affairs*

Washington, D.C. 20520

CC: JAF
JSDATE: July 31, 1997 TIME: 3:00 p.m.NUMBER OF PAGES TO FOLLOW: 5FAX TO: Attached List of RecipientsTELEPHONE: ----- FAX: -----OFFICE: -----

FAX FROM: Ambassador Mark G. HambleyTELEPHONE: (202) 647-1555 FAX: (202) 647-0217OFFICE: OES

MESSAGE:

Attached is the latest issue of the environmentalist rag published at Bonn by a large group of NGOs. Partially (if not wholly) subsidized by the environment ministries of Denmark, The Netherlands, and Germany, this issue is particularly interesting for: (a) its front page article describing the enviro's take on the Byrd resolution and (b) for its positive read on the discussions within the AG-13 working group which is dealing with the multilateral consultative mechanism.

As our daily report (Update No. 4 for July 30/31) indicates, the cooperation suggested by ECO is for appearances only. We believe that this group is still groping for the functions it will eventually undertake -- if any -- a point made by USDEL on repeated occasions during the discussions. (MGHambley)

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Bonn, Germany
July 28 to August 8, 1997

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Eco has been published by Non-Governmental Environmental Groups at major international conferences since the Stockholm Environment Conference in 1972. This issue is produced co-operatively by CAN groups attending the Climate Negotiations in Bonn, July-August 1997.

The Plot Thickens...

On July 25, 1997 the United States passed a non-binding Senate Resolution, otherwise known as the Byrd Resolution, unanimously, by a vote of 95-0. Although all Senators voted for the Byrd Resolution, there is by no means consensus in the Senate as to what the Byrd Resolution actually means. In essence, there are three main blocks of Senators' views reflected in this one non-binding resolution. One group does not believe that climate change is even a problem, claims that the science is inconclusive and contradictory, and is worried about "any treaty that would bind our Nation's economy to control by some U.N. multi-lateral entity," to quote one Senator. This group questions the classification of India, Mexico, Indonesia and Brazil as developing countries and calls for them to take on binding, specific emissions reduction commitments now. The second group, which includes Senator Byrd, the main sponsor of the resolution, recognizes that "climate change is a looming threat to the global environment" and believe that each country must "make unique and binding contributions of a pace and kind consistent with their industrialization." The third group is actively worried about global climate change and believes the United States and

other industrialized countries "have a responsibility to take the first steps to clean up the problem which we have created" by adopting a protocol in Kyoto that includes a binding reduction target. While recognizing the Convention's "common but differentiated" principle, these Senators believe that to solve this problem in the long-term, all countries must act to reduce GHG emissions.

How did this Resolution come into being and how does it impact the US position?

In recent months, industry opponents of action on global warming have seized on a new argument in their efforts to undermine US support for binding emissions reduction commitments by industrialized countries. Because such commitments will not initially apply to major developing nations like China and India, they charge, US competitiveness in the global marketplace will suffer as energy-intensive industries move production – and jobs – overseas, and the environment won't benefit because cuts in emissions by the US and other industrialized countries will be more than offset by growth in developing country emissions. This argument has proven very effective on Capitol Hill where industry have aligned

continued on back page, col. 1

South Cuts Faster than North?

by Kilaparti Ramakrishna and Linda Jacobsen, Woods Hole Research Center

One dominant theme as we move towards Kyoto is that action by industrialized nations alone will not put us on the road to safe concentrations of greenhouse gases; that we need action by the developing countries as well. While a number of Annex I countries have joined this bandwagon, none is more strident in its advocacy than the United States. Under Secretary of State Timothy Wirth in his testimony on July 15 to the US Congress said that the list of developed country Parties established by the Convention's Annex I in 1992 no longer reflects current realities. He called for a new Annex to enable developing countries, on a voluntary basis, to take on binding greenhouse gas emissions obligations. Put simply in Wirth's words, "no one should be exempt; we emit the most, so we have to act first; but others have to phase in over time". Also called the policy of "evolution", the suggestion implicit in this demand is that the developing countries are proceeding with rank impunity to add greenhouse gas emissions to the atmosphere since they are not currently under an obligation to reduce or do anything to effect reductions of their ghg emissions. But this is a myth.

While the emissions from the developing countries are increasing, as must acknowledge they should, the increases are not as steep as projected not so long ago. Several studies make this

continued on back page, col. 3



"How much? for a glass of water?" ...Delegates inspect the Maritim's menu

CONTENTS

Editorial	2
Conference Reports	2 & 3
Ludwig	4

4

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Don't Take the Bait!

Since COP1 in Berlin, US "brown" industry have pursued a cynical strategy aimed at polarizing these negotiations along North-South lines. They have attempted to persuade developing countries that their economies will suffer as a result of industrialized country actions to reduce emissions. Meanwhile, they are spending millions of dollars to persuade industrialized country citizens and policymakers that binding emissions limits will shift hundreds of thousands of manufacturing jobs to – you guessed it – developing countries.

The centerpiece of the industry strategy is an effort to force the United States to take positions that will alienate the developing world, and thus prevent any agreement in Kyoto. Industry lobbying persuaded the U.S. Senate to pass a non-binding resolution last week calling on the Clinton Administration not to sign any agreement that doesn't involve developing country commitments. While developing countries will have to eventually join in a global emissions limitation framework if the treaty's ultimate objective is to be achieved, the industry campaign is not intended to further effective developing country participation, but to block any action to reduce industrialized country emissions.

It remains to be seen whether the U.S. delegation will respond to this resolution by stepping up its push for near-term "evolution" mechanisms in the Kyoto proposal, or even worse, by trying to reopen the Berlin Mandate. It also remains to be seen whether major developing countries like China and Brazil will toughen their stance on the range of issues involved in advancing developing country commitments under the current climate treaty.

Either move would feed the destructive cycle of action and reaction that remains the fossil fuel industry's best hope for a stalemate in Kyoto. Both the United States and developing countries should resist falling into this trap.

CONFERENCE REPORTS

SBI Tuesday

The sixth session of SBI turned out to be highly strung with the recent brawl over the "consideration process" of non-Annex I national communications. As of date, only 2 countries-Jordan and Argentina- have completed their communications. Tanzania, on behalf of G77 and China expressed concern over the GEF's 'not-so-speedy' approval of proposals for national communications citing it as one of the main reasons for the limited work done so far in this area. It highlighted the principle of differentiation (referring to Annex I and non-Annex I commitments), as a premise in meeting reporting requirements, which was later on corrupted by Australia hailing 'differentiation as the cornerstone of this convention' (obviously referring only to Annex I commitments!) The US, Canada and Australia all called for the 'timely submission' of communications and formulation of guidelines for a review process of non-Annex I communications ('not as detailed and extensive' says the US). To our surprise this spurred strong, emotional reactions from developing countries, particularly from China, India and the Philippines. China was strongly against any uniform assessment of Annex I and non-Annex I national communications; against any pressure for deadlines; and more importantly against any form of in-depth-review (IDR). It pointed out that the discussion should center around the "consideration process" aimed at "merely assessing the aggregated effect of steps taken by all parties through the consideration of information included in the communications". There should be no value judgement or any kind of evaluation. In short, they said the consideration process should not be confused with the review process.

Malaysia and India rightly pointed out that the reason for the delay in preparations of national communications is basically the lack of financial and technical assistance. They called for a stop to 'finger-pointing' over who has and hasn't done what and rather create an "enabling activities environment". (rightly so!)

We view this burst of emotions from developing countries as directly related to recent developments in the US calling for new commitments from developing countries. The concerns of developing countries over the lack of financial and technical assistance for enabling activities is very much valid and links up with our call for Annex I and II parties to fulfill their obligations on technology transfer and support for the funding mechanism.

Discussion on the GEF was linked to the earlier discussion on process and preparation of national communications. The US and EU are already calling for an early decision to designate GEF as the permanent financial mechanism by

COP-3. (with EU saying 'subject to a review process'). Developing countries aren't united on this issue but it was stressed that the GEF's 'performance' is critical to the decision of availing a permanent status. The litany of woes around the 'slow project approval and processing'; GEF operating on its own without 'guidance'; stringent criteria for projects etc... attest to this concern. GEF replenishment (a substantial increase!) was also stressed. An open-ended contact group to discuss issues concerning the review of the financial mechanism has been set up. Canada's proposal on MDBs consistency is worth noting in the context of mainstreaming climate in overall financial flows, including private sector investments.

Finally while we are very much aware of the GEF's 'prompt start' in preparing its 'high-level' delegation to the Kyoto field trip, we first want to see a comprehensive evaluation of the GEF pilot phase taking into account developing countries' concerns and actual experiences before jumping into any decision appointing it as the permanent financial mechanism.

SBSTA Wednesday Morning

The meeting began with the consideration of interim reports of the two informal groups on division of work between SBSTA and SBI. On methodological issues the group reported on the priorities of the tasks: greenhouse gas inventories, projections of GHG emissions and sinks, methods for evaluating and monitoring effectiveness and effects of specific policies and measures and for assessing adaptation strategies and technologies.

Saudi Arabia's began discussion by proposing the group discontinue its work, which should be done instead by the yet-to-be-established ITAPs (not very soon, in other words!).

Next came cooperation with relevant international organizations. First four intergovernmental organizations reported on their activities including their link with the PCCC. The IOC pointed out that the skeptics arguments need to be answered. UNEP, later supported by Zimbabwe and China regretted that their proposal for a climate awareness program had not been accepted by the GEF. The IPCC gave a detailed outline on their future work. The Third Assessment Report (TAR) will be finished late 2000/early 2001. The IPCC structure will be modified slightly – WG 1 remains largely unchanged, WG 2 will deal with impacts and adaptation (including human health) and will bring together for the first time natural, social and economic sciences and will have more regional and cross-sectoral aspects. WG 3 will mainly be on mitigation, this time analyzed through technological, social and economic sciences.

A highly policy-relevant synthesis report will be edited in addition to the normal report and the policy makers' summary. For the TAR, the chair-

5

CONFERENCE REPORTS

man-elect of IPCC. Dr. Watson, wanted an increase of participation of experts from developing countries as well as including much more technical work which appeared in languages other than English. Bob Watson strongly emphasized a much greater need for work on impacts, which has nearly disappeared. Switzerland asked for SBSTA to translate the IPCC results into policymakers' language. The US and the EU wanted a focus on the synthesis report and wanted a list of questions the synthesis report should answer to be elaborated by Parties by the end of the year. China seemed to want the lowest common scientific denominator by urging IPCC to synthesize different opinions. On the other hand it desired more clarity by wanting the technical reports to reflect the fulfilment of Articles 4.2 (a) and (b) of Annex I countries. The Marshall Islands and Samoa laudably reminded Parties of the need for the IPCC to stay independent and urged the investigation of socio-economic aspects of inaction. Zambia wanted the links between environment and trade to be studied and the role of GATT/WTO explored. Australia would be grateful if ICAO and IMO made comments – a point which later was reflected in the draft conclusions.

A short discussion began on ITAPs (intergovernmental technical advisory panels) and a roster of experts. While the US felt that ITAPs may not be necessary, the EU wanted to postpone conclusions on ITAPs until the roster of experts experiences were clear. Several developing countries highlighted the need for the ITAPs to be established ASAP to help with the issue of technology transfer.

SBSTA Wednesday Afternoon

Discussions on technology transfer resumed at SBSTA late in the afternoon with Mr. Chairman warning the US not to take more than 30 minutes in its intervention. The US of course managed to outline its proposals in moving financial institutions towards pro-climate activities within this budget period. After several other interventions on MDB's consistency, technology information centres and the private sector role, this agenda item was closed with the recommendation that secretariat continue its informational work (are we sure it was not prepared by the World Bank?) on technology transfer issues.

Chairman then moved towards the adoption of the skeletal report of the work of SBSTA. The contact groups on methodologies and on division of labour, despite a long afternoon lag, failed to come to an agreement. But significantly, they have agreed to negotiate so they could come to some form of an agreement. The contact group on division of labour between SBSTA and SBI, now popularly known as the "Ping-Pong Committee", pledged to arrive at a consensus by Thursday as long as its team members don't get invited to

other tournaments (i.e. a contact group). The other informal group on AJ methodologies likewise failed to come to an agreement. (Chairman elect is getting more and more worried that agenda items are being shelved to the last meeting day on Tuesday.)

There was a long, unnecessary exchange of text on a non-paper on cooperation with international organizations. The US and Canada were keen on including strong language on the TAR's synthesis report and key policy issues. But Saudi Arabia of course had to object to the use of the word 'policy' and to avoid being too specific (gearing up for AGBM eh? c'mon guys this is a non-paper!)

Perhaps the most interesting part of the session is a surprise brawl over the draft report of the contact group on methodologies. As we expected, it outlined the priorities for work on methodologies focusing on inventories, projection, mitigation, impacts and adaptation. After a not so discreet shoving of papers by my corporate friends around the almost empty Maritim Hall, our friendly OPEC friends asked for more time to study the draft text which came through 4 informal sessions of the said group. G77 and China also wanted more time to deliberate on the draft text which clearly irked the EU, in particular Germany as it noted that there were a lot of non-Annex I countries who participated in the meetings. Chairman elect then said, "well Germany, once you join the group of 77 and China, you will understand why these things happen!" Bear in mind colleagues that stalling on this issue again is costing the developing world a lot.

SBI Wednesday Afternoon

NGOs received a round of support yesterday in SBI during the discussion on the NGO Consultative Mechanism. After listening to the interventions from 4 NGO groupings (yes we supposedly only have 3 constituencies, but once again NARUC showed up 5 minutes before showtime and asked to make a statement on behalf of 'local authorities'. Who is NARUC? Good question.) Parties explained their views on this crucial issue. It is fair to say that the Secretariat's proposal for a Business Consultative Mechanism fell flat on its face, with the only supporter being, well, business. Surprise, surprise. Many delegates, including Malaysia and Benin, stated their strong belief that accreditation to the Convention should be linked with support for the objective of the Convention. Many also strongly endorsed allowing NGOs to make interventions in all of the Conventions' bodies, including the COP. And certainly not to go unnoticed is the impassioned intervention from Senegal calling on all delegates to take this issue seriously and involve NGOs as much as possible. What's next? Well, a contact group, of course – in October – to continue the discussion... We look forward to it.

Good News: Help may be coming!

Reporting is the core of the Convention, and any modifications or additions to it. Without accurate and timely reports from Parties the entire regime is going nowhere. Any commitments, new or old will be meaningless without the means of assessing whether they are implemented.

This is probably the sole topic upon which almost all Parties agree and yet almost all Parties are late in reporting and when they do submit communications they are almost invariably incomplete. In the case of developing country Parties this is currently due largely to inadequate technical and financial resources that the established Convention mechanisms are poor at providing, certainly in a timely manner.

Help, however, may be at hand. In its half forgotten (often wholly forgotten) corner of the Convention process, AG13 has been quietly building an assistance mechanism, instead of the expected non-compliance mechanism. At the last meeting in Bad Godesberg, China took up the EU on its insistence it wanted an assistance mechanism and proposed that the multilateral consultative process assist the Parties, and especially the developing ones, in compiling and communicating information on implementation (Article 12.7 code for reporting).

At this week's meeting the Chinese and EU positions converged rapidly and, given a little more time, a really useful process looks like being agreed. If nothing else, it has been good to see Saudi Arabia, Kuwait, Indonesia, Zimbabwe, the EU, China, Iran, Russia and many others all heading in the same direction and genuinely helping each other on a matter of central importance to the Convention. A bit more of the same spirit applied elsewhere might work wonders.

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CLIMATE NEGOTIATIONS BONN JULY-AUGUST '97 NGO NEWSLETTER

—The Plot Thickens— from front page
 themselves with Senators from states with large fossil fuel interests in an effort to use the Senate to push the Administration to press developing countries further than ever before in the negotiations. One need only hear US Undersecretary of State Tim Wirth's support for "the thrust of the Byrd resolution"... and his statement that it indeed "strengthens our hand" in the negotiations, to see the industry strategy in action. Put this together with the conversation between Don Perleman and a Nigerian delegate earlier this week in which Perleman was overheard gleefully chuckling that if developing countries just dig in and react to the Senate Resolution and the Clinton Administration's rhetoric by insisting on no new commitments, "We can kill this thing" — meaning the Kyoto Protocol — and the circle is complete.

Industry-stoked fears that a Kyoto Protocol will cause a "giant sucking sound" as millions of jobs flee the US to developing countries that have no emissions limits are without merit. First of all, two-thirds of US emissions of carbon dioxide are from energy used in residential and commercial buildings and the transportation sector (this includes both direct fuel use and the power plant emissions associated with electricity used in these sectors). Obviously, building and transportation services can't be exported. The remaining one-third of US CO₂ emissions comes from industry. However, detailed analysis has shown that the competitiveness risk is limited to a handful of energy-intensive industries representing about 3 percent of manufacturing shipments and jobs, and

even this risk can be avoided through appropriate design of domestic policies.

It should be noted that this relatively limited competitiveness issue is independent of whether developing countries take on binding emissions limits or not, as these industries face greater competition from Japan and Europe, rather than China and India. Most importantly, the industry campaign is not designed to persuade China and India to take on binding commitments, but to block any meaningful action to reduce emissions here at home.

This is, however, only part of the recent story in the US.

On the other end of Pennsylvania Avenue in Washington, President Clinton stated last week: "I believe the science demands that we face this challenge now. I'm positive that we owe it to our children. And I hope that we can find the wisdom and the skill to do democracy's work in the next few months, to build the consensus necessary to actually make action, as opposed to rhetoric, possible." The administration is gearing up an intensive public outreach effort to educate Americans about the risks of global warming — and the clean energy and transportation technology solutions to the problem. This will include public appearances by the President, Vice President Gore, and appropriate Cabinet officials, as well as a major White House Conference on climate change this fall. This effort will have to continue well beyond Kyoto if it is to succeed in ultimately persuading the Senate to ratify a meaningful climate treaty, but at last, the administration is directly countering the fossil fuel lobby's aggressive disinformation campaign.



Australopithecus

Ludwig

Isn't it sporting of Australia? ...emphasising how much they value having NGOs on their delegation... when Aussie NGOs have very publicly boycotted such representation in disgust at their government's policies... Or perhaps the delegate just didn't notice they weren't there...

More seriously, Ludwig understands that his account of "The" Don Perleman's conversation earlier this week is being denied, and is naturally hurt by such a suggestion of lack of sincerity. Ludwig is prepared to offer an affidavit... or would Don perhaps like to take a lie detector test? Come to think of it, there are one or two other questions we might like to ask him at the same time...

THANKS

The Climate Action Network would like to thank the Environment Ministries of Germany, Denmark and the Netherlands, who have provided funding for Eco. With resources contributed by: APC Networks and EuroFax.

—South Cuts Faster than North? from front page
 point eloquently. A study prepared by the Environmental Defense Fund and the Woods Hole Research Center in mid-1996 identified several measures that the developing countries have voluntarily undertaken in the field of energy conservation, promoting energy efficiency through various incentive structures and elimination or reduction of subsidies with direct consequences on ghg reductions. The Japanese Environmental Agency in collaboration with the Woods Hole Research Center and the World Resources Institute organized an international conference on opportunities and problems of early actions for climate protection in Kyoto during March 30-31 this year. It concluded that enough developing countries are taking measures to reduce their ghg emissions to warrant rewards to the countries and companies participating in this exercise so that more countries and companies could be persuaded to join. A recent analysis by Walter Reid of the World Resources Institute and Jose Goldemberg of Brazil (former Brazilian Environment Minister) documents how, since 1990, several large developing

countries have aggressively pursued a variety of emissions limitation strategies including price reform and promotion of efficiency and renewable energy. They concluded that "developing countries may be achieving equivalent or greater CO₂ emissions savings than OECD countries in absolute terms and, since they are starting from a lower baseline, significantly greater savings as a percentage of their emissions".

Furthermore, the guidelines adopted for the preparation of national communications from developing countries also seek information on such actions by these countries. If the industrialized countries had come through with financial support as they agreed to in article 12 of the Convention in helping developing countries prepare their national communications, we will have a verifiable source of such data from developing countries. As we have seen in the previous three days and as evidenced in the submission of only two national communications from developing countries, the rich countries are once again remiss in fulfilling their obligations under the convention. All this begs the question, who are the leaders and who are the laggards?

cc: JATF
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February 19, 1997

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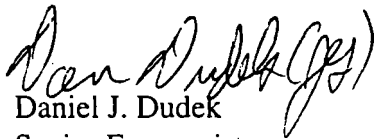
Dear Dr. Munell:

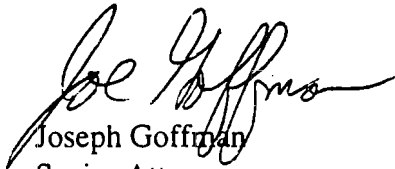
The Clinton Administration's January 17, 1997 proposal for the structure of an international protocol or other legal instrument for addressing climate change marks a significant and positive step in the effort to tackle the global warming problem. In the context of the January 17 proposal, we thought you might find of interest the enclosed recent paper, "Emissions Budgets: Building an Effective International Greenhouse Gas Control System".

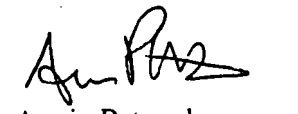
As the evolving policy debate on an international agreement to reduce greenhouse gas emissions moves forward, we hope you will find this paper useful in considering the development of credible compliance and enforcement mechanisms, which we believe to be fundamental to the environmental effectiveness of the agreement. At the same time, we hope that the paper may be of assistance in the effort to elaborate further a number of the key elements of the U.S. January 17th proposal.

If you or your staff have any questions or would like to discuss this paper, please do not hesitate to contact us.

Sincerely,


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EMISSIONS BUDGETS



Building An Effective International Greenhouse Gas Control System



ENVIRONMENTAL
DEFENSE FUND

February 1997

TABLE OF CONTENTS

EXECUTIVE SUMMARY	-1-
INTRODUCTION	-3-
REVIEW OF THE EMISSIONS BUDGET POLICY FRAMEWORK	-7-
INTERNATIONAL GREENHOUSE GAS TRADING: COST-SAVING AND SOVEREIGN COMPLIANCE	-9-
Reporting	-11-
Debt-Carryover and Discount	-12-
The Discount	-13-
THE IMMUTABLE IDENTITY BETWEEN TRADING AND COMPLIANCE	-16-
Setting the Budgets	-17-
Mechanics of Reporting, Accounting and Trading	-18-
Trading	-20-
Compliance	-22-
JOINT IMPLEMENTATION AND PARTICIPATION	-22-
CONCLUSION	-27-

EXECUTIVE SUMMARY

For over a decade, the Environmental Defense Fund (EDF) has been engaged in the design, development, and implementation of markets for environmental protection. These activities have ranged from the creation of markets for water savings from conservation investments to reduce irrigation to the acid rain allowance trading system of the Clean Air Act Amendments of 1990. Since 1985, EDF has been concerned about the problem of global climate change and has been working to develop both a scientific understanding of the problem as well as practical solutions. This paper represents our current thinking concerning a framework for an international protocol that could deliver both the environmental and economic benefits desired.

The concept of emissions budgets were first introduced by EDF at the meeting of the Ad Hoc Group on the Berlin Mandate (AGBM) in February of 1996 in Geneva at the request of the Netherlands. The fundamental strategy of emissions budgets is to establish a dynamic framework of review and learning over time by harnessing in tandem a continual process of scientific and technical review to a process of emissions control within a legally binding framework which allows parties to trade extra emissions reductions. Of course, such a system must ultimately be gauged against the goals it aims to achieve. EDF believes that credible environmental goals would include:

- ◆ a first period of emissions reductions that begins by 2005 and ends not later than 2014
- ◆ an ultimate concentration objective of 450 ppmv (CO₂ equivalent), inclusive of all greenhouse gases (GHG)
- ◆ a transient constraint to limit the warming rate not to exceed 1° C per century.

The foundation of emissions budgets are legally binding obligations for OECD nations and economies in transition established on the basis of historic emissions baselines and set as a cumulative emissions budget for 10 years. For other nations, comprehensive GHG inventories and reporting would be required. Also critical to the foundation are the transparent and verifiable annual national reports covering all gases, sources and sinks by sector and including all transacted international GHG reductions by country and vintage. The plan for this construction is given by the continuing review and evaluation process to set new budget levels which on a 10 year cycle would:

- ◆ assess the science
- ◆ review the progress of the Parties
- ◆ review the development and adoption of technologies.

The bricks resting upon this foundation are the emissions reductions produced by Parties and their transaction through international greenhouse gas emissions reduction trading. Parties' performance in meeting their emissions obligations would be durable with savings for early reductions and automatic debt carryover for any shortfalls. Performance

would be evaluated for all GHG emissions by sources, uptake by sinks, and transactions in terms of 100-year global warming potentials (GWPs). Joint Implementation, for credit, is an essential element for addressing both graduation and economic competitiveness concerns. For nations that have not taken a budget, project-by-project crediting of reduction investments with the possibility of international review would be the primary trading path. For nations with a budget, full international trading of reductions is available. In addition, for those non-Annex I Parties that opt to take an emissions budget, an explicit growth allowance should be provided. Such growth allowances would be made available under a formula by which they would decline over time so as to reward early participation.

The mortar holding the system together is the incentives for sovereigns to meet their underlying emissions commitments. These include:

- ◆ All GHG reduction obligations remain until discharged
- ◆ For Parties with cumulative net emissions greater than the budget but less than 110%:
 - ❖ all emissions greater than budget automatically deducted from next budget
 - ❖ dispremium charged on emissions over budget (e.g., 1.2 to 1.0)
- ◆ For Parties with cumulative net emissions greater than 110% but less than 120%:
 - ❖ Above **Plus** automatic discounting of the non-complier's sold GHG reductions that have not yet been used by other countries for compliance beginning in the year of first occurrence (discounting to be in proportion to amount of non-compliance)
- ◆ For Parties with cumulative net emissions greater than 120%:
 - ❖ Above **Plus** mandatory COP review of Party's noncompliance
 - ❖ Prohibition on further sales of reductions as of the date of noncompliance

Under the emissions budget approach, each nation would be free to meet its budget and earn savings in any way, consistent with its own sovereign priorities, that it chooses. Each Party would determine whether it would participate in international emissions trading and who would be empowered to do so. The approach is designed to capitalize on our greatest asset in addressing the global threat of climate change – human ingenuity. Emissions budgets reward early adopters, innovators, savers, and cost reducers. EDF believes that emissions budgets provide a straightforward, uncomplicated policy framework with clear environmental goals and easy to measure performance that is sufficiently flexible to consistently capture these assets over time.

INTRODUCTION ⁻¹⁻

Under the "Berlin Mandate" adopted at the first Conference of the Parties (COP), signatories to the United Nations Framework Convention on Climate Change (FCCC) have committed to develop a protocol to control greenhouse gas (GHG) emissions by their third Conference, to be held in Kyoto, Japan in late 1997. In the atmosphere, these pollutants, the byproducts of fundamental economic activities like energy production, transportation and agriculture, can lead to accelerated warming resulting in dangerous changes to the earth's climate system. Analyses produced by the Intergovernmental Panel on Climate Change (IPCC) indicate that failure to limit the emissions of these gases are expected to be damaging to natural ecosystems and costly to the many human societies that have developed during the 10,000-year period of relative climate stability leading up to the present.⁻²⁻

At the same time, because of the link between GHGs and activities fundamental to both industrialized and developing economies, many anticipate, or at least fear, that the costs of limiting their emissions will be high. For the same reason, others question the capacity of any international agreement to establish a truly durable and efficacious regime for limiting these emissions. This doubt is intensified by the fact that an international GHG regime could exist only as the artifact of a voluntary agreement between and among sovereigns, often in competition with each other, and representing the widest possible diversity of economic needs and resources and political and cultural aspirations. As a result, the tools that can be used to induce or enforce compliance by sovereigns with their GHG emissions obligations may be limited – and downright meager when contrasted with those that domestic authorities can bring to bear to ensure that private firms comply with domestic emissions limitation requirements.

In view of these circumstances, an international program must meet a set of exacting tests of equity, economic efficiency and responsiveness, durability in terms of legally binding commitments, flexibility and, above all, environmental efficacy – if it is to be credible. In addition, the international regime should function as a framework that can encompass the inevitable variety of domestic policies and measures – ranging from emissions taxes and technology standards to emissions cap-and-trade systems – that

¹ *This paper was written by Dr. Daniel J. Dudek, senior economist, and Joseph Goffman, senior attorney, of the Environmental Defense Fund's New York and Washington offices respectively. EDF is a not-for-profit, non-governmental organization that combines science, law and economics to solve environmental problems. The authors can be reached at 257 Park Avenue South, New York 10010, telephone (212) 505-2100 or 1875 Connecticut Avenue, NW, Washington, D.C. 20009, telephone (202) 387-3500. In addition, EDF's international counsel, Annie Petsonk, can be contacted at the Washington office.*

² *See Intergovernmental Panel on Climate Change, Science of Climate Change: Impacts, Adaptation and Mitigation of Climate Change: Scientific-Technical Analyses, Cambridge University Press, 1996.*

each nation will adopt in the exercise of its sovereign decision-making for the purpose of meeting its international obligations. Equally important, the protocol must be designed to create a reliable mechanism of accountability for nations' performance of their GHG emissions obligations.

Finally, the FCCC itself introduced and codified a distinction between nations characterized by advanced industrial economies (denominated as "Annex I Countries" in the parlance of the FCCC) and those at all other stages of economic development. It is all but certain that this distinction, or some form of it, will inform at least the initial structure of the commitments and obligations propounded in Kyoto, with few, if any, emissions limitations imposed on the developing countries. Nevertheless, because of rapid economic growth and other conditions, the latter category of countries are expected to contribute an ever increasing proportion of global anthropogenic emissions of GHGs. Consequently, the international regime must be sufficiently dynamic to induce those nations ultimately to participate in a worldwide effort to limit GHG emissions. This inducement is key both to an environmentally effective agreement and to limiting economic advantage from non-participation.

In response to these challenges, EDF first introduced the concept of emissions budgets at the February 1996, meeting of the Advisory Group on the Berlin Mandate (AGBM) in Geneva at the invitation of the Netherlands. Emissions budgets are the building blocks both of a verifiable and legally binding protocol and an effective international emissions trading regime. This paper builds on that earlier work to elaborate particularly on the critical reporting and compliance elements of this policy approach.³

In July, 1996, at a meeting of the second COP in Geneva, U.S. Undersecretary of State Tim Wirth announced U.S. support for negotiations that would lead to legally binding GHG emissions limitation and reduction obligations. Because it marked a watershed shift in U.S. position, Undersecretary Wirth's statement transformed the international debate on climate change by making the prospect of success for the Berlin Mandate plausible, perhaps for the first time. At the same time, Undersecretary Wirth's statement linked acceptance of such obligations to the availability of flexible, cost-reducing mechanisms of international emissions trading and joint implementation for credit.

During the December, 1996 meeting of the AGBM the U.S. government offered a document containing a preliminary description of a system of national emissions limits and international GHG emissions trading including the option of emission budgets. The U.S. followed its December submission with proposed draft protocol language on January 17, 1997 embodying the concepts included in the earlier document, but now focusing on emissions budgets. The proposed draft language provided further detail, but contains, as

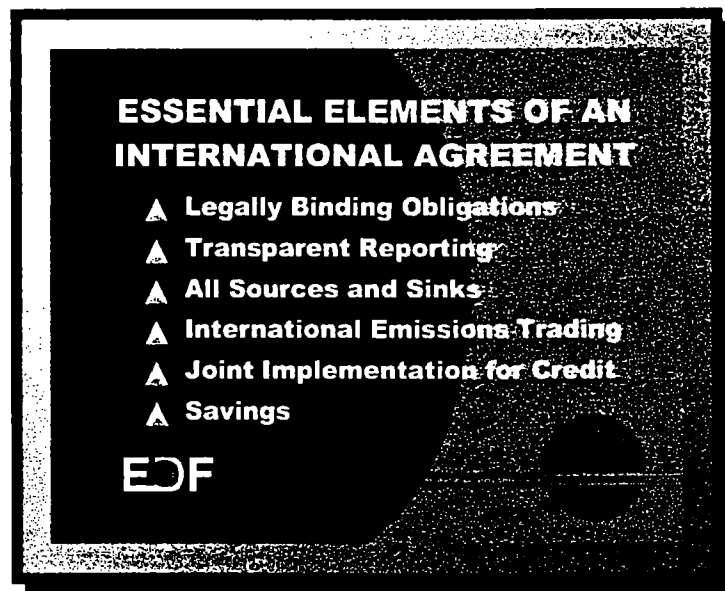
³ See *Dudek, Daniel J.*, "Emission Budgets: Creating Rewards, Lowering Costs and Ensuring Results", Proceedings Climate Change Analysis Workshop, Springfield, Virginia, June 6-7, 1996, 18 pp.

the U.S. itself has indicated, a number of gaps that remain to be developed in order to fully develop the mechanics of a comprehensive global GHG budget and trading system.

For the COP to succeed in negotiating a viable GHG emissions protocol and for such protocol to succeed, in turn, in curbing GHG emissions such a vision is necessary. If designed in a way that included and integrated the necessary elements of accountability and flexibility, a GHG emissions budget and trading system would open the best – perhaps, the only – path to a global GHG regime that could meet the challenging array of tests confronting such a regime. However clear and well-aimed the U.S. documents have been in presenting a general outline, they also highlighted the crucial task of identifying the critical elements of such a system and of integrating those elements that must be accomplished by participants in the process leading up to and through the upcoming Kyoto Conference.

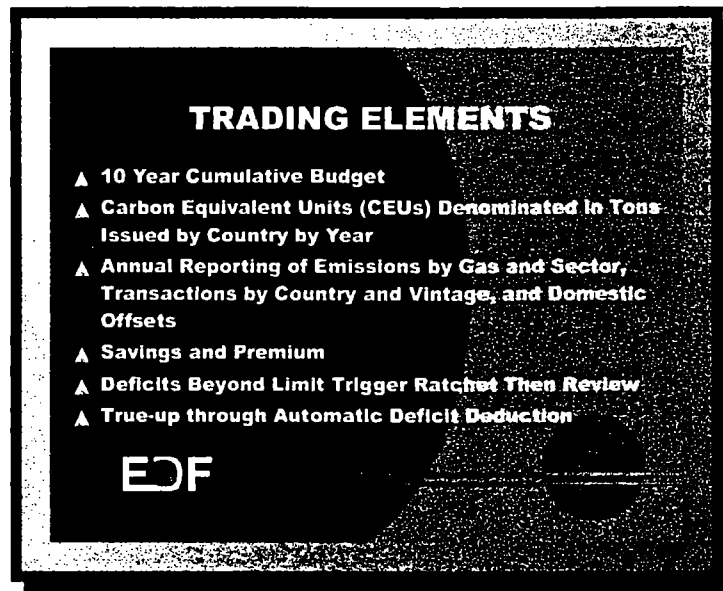
This report seeks to lay out EDF's current thinking on these critical elements and their integration. Specifically, it proposes an emissions budget and trading system for greenhouse gases that includes the following:

- ★ **national budgets**
- ★ **covering all sources and sinks**
- ★ **expressed as total GHG emissions over a decade-long period**
- ★ **and in terms of carbon equivalent units (CEUs).**



Nations could meet their decadal budget obligations by trading CEUs with each other and by "saving" CEUs whenever their decadal GHG emissions total was less than their total budget. Such CEUs could be used to offset GHG emissions in subsequent decadal periods and even earn "premiums" in the form of increases in their emissions

value.

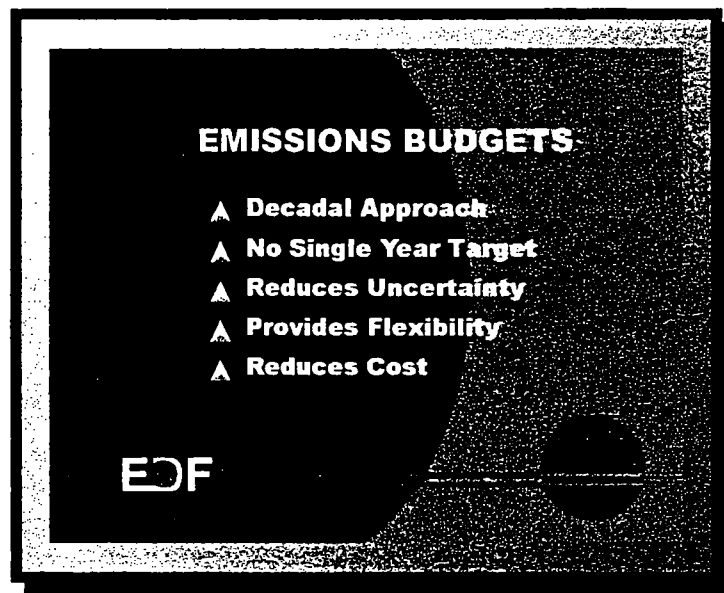


To ensure compliance, countries would be obligated to furnish detailed annual reports of their current and cumulative emissions and of the acquisition and/or sale of their CEUs. Countries exceeding their budgets would be subject to a two-pronged automatic sanction. The emissions value of any CEUs such countries had exported would be discounted upon their use by those holding such CEUs. In addition, cumulative GHG emissions in excess of a country's decadal budget -- adjusted to reflect CEUs acquired or exported by the country -- would be deducted --again, automatically -- from the country's budget for the decadal period immediately following.

Finally, each decade's emissions budget for affected nations would be established during the course of an ongoing review process undertaken by the Secretariat. Emissions budgets for upcoming decades would be announced at the 5-year point of the current decadal period after assessments of the atmospheric and climate science and of technology developments as well as of the performance to date of the overall regime.

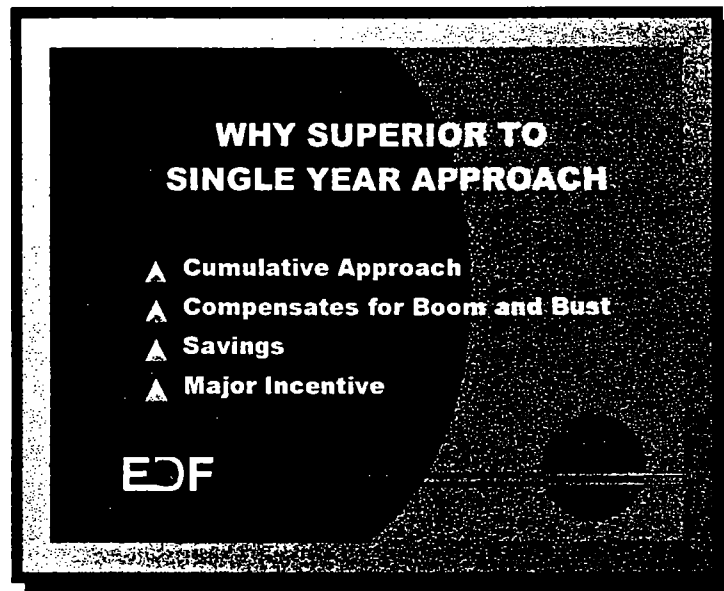
A simple exposition of these elements by itself does not reveal the underlying logic that dictates their necessary integration. Consequently, in addition to reviewing the importance of using an emissions budget and trading approach as the bulwark of an international GHG regime, one of the aims of this report is to distill the inextricable linkage between accountability and flexibility that these specific elements embody and that is indispensable to the success of a global GHG control strategy.

REVIEW OF THE EMISSIONS BUDGET POLICY FRAMEWORK

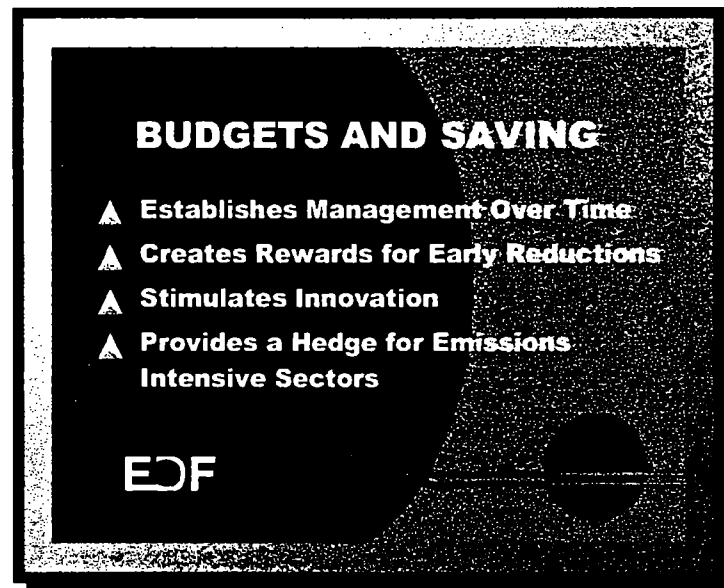


The fundamental definition of compliance — i.e., in the form of an explicit quantity of emissions for which each nation is accountable — parallels the experience of the U.S. under the Clean Air Act. Historically, Clean Air Act programs have imposed a variety of requirements on pollution sources, but only rarely have these made the sources directly or expressly accountable for their total emissions. As a result, these programs have tended to achieve fewer emissions reductions than intended or desired. In contrast, to combat acid rain, Congress amended the Clean Air Act to reduce emissions of sulfur dioxide from power plants. Here, each plant was held legally accountable for meeting a specific total emissions limit. This feature, together with the inclusion of emissions trading, has made this program one of the most successful of U.S. environmental policy initiatives.

Equally critical to the ultimate success of an international GHG regime is the integration of flexibility elements with express accountability on the part of each nation for meeting an explicit emissions limit. First, structuring each nation's budget as a 10-year cumulative obligation not only reflects the cumulative aspect of the effect of greenhouse gases on climate warming, but it also offers economic actors and nations' economies the temporal framework in which they can rationalize their response to the simultaneous demands of meeting their GHG emissions obligation and of inevitably dynamic economic conditions. As a result, sources and nations will be able to minimize the costs associated with budget compliance. At the same time, the 10-year budget period still creates a time horizon short enough to signal meaningful accountability so that nations and firms will feel compelled to manage their GHG emissions to meet the budget.



Second, the inherent opportunity for year-to-year “saving” of unused increments of each nation’s GHG emissions budget within each decadal budget period creates an explicit incentive for early reductions. Since it is the cumulative effect of GHGs in dangerously accelerating the *rate* of warming and of resulting climatic and ecological change that represents a critical aspect of the threat posed by global climate change, honing incentives for early reductions is essential. For this reason, an effective regime should permit “savings” of unused increments of a nation’s emissions budget to be carried forward for use in later periods.



To augment the value of such “savings” and thus intensify the incentives for early reductions, nations or firms that create and save unused budget increments or

CEUs should be able to earn a small premium that would increase the GHG emissions value of CEUs carried forward over time. Again, ecosystems – and human society – are critically sensitive not only to the extent of climate warming but also to the rate at which climatic change occurs. Offering an emissions-value-increasing premium for emissions savings parallels the environmental protection value that early reductions create by slowing the rate of climatic warming and avoiding ecological damage.

In addition to direct environmental considerations, among the effects created by both the opportunity for nations and sources to manage emissions over time and the resulting incentives for early reductions is the stimulation of innovation in reducing or avoiding GHG emissions. Successful innovation not only lowers cost but it is further rewarded through the economic value garnered by traded or “saved” CEUs. Increasing investment in environmental innovation opens an ongoing flow or supply of the technologies and innovations necessary to sustain, and ensure the economic affordability and environmental efficacy, of a long-term global commitment to curb GHG emissions.

Finally, the importance of temporal flexibility embodied in both cumulative budgets and the availability of “saving” is vividly illustrated by examining their significance for the emissions-intensive sectors and activities that dominate, at least in part, most industrialized and developing country economies. Since nations will accept to make the transition to low-emissions economies only if they can do so while maintaining robust economies, the predominance of these sectors dictates that nations have the flexibility needed to manage this transition over time. Similarly, the ineradicable economic self-interest of the firms that operate in these sectors demand that they, too, be afforded the tools needed to meet their emissions obligations while remaining viable. The ability to trade and save CEUs for future use provides precisely the mechanism for accommodating continued activity by these firms and sectors while allowing nations to meet the obligations of GHG emissions budgets.

INTERNATIONAL GREENHOUSE GAS TRADING: COST-SAVING AND SOVEREIGN COMPLIANCE

Intra- and inter-budget-period savings is but one of two iterations of emissions trading. In addition to the “trading” of emissions between years and budget periods that savings allows, the budget system also permits trading between and among sovereign nations and firms in different countries. The set of benefits provided by inter-temporal trading through saving also emerges from international emissions trading. Since such trading confers an affirmative economic value upon actions that produce surplus reductions, the emissions trading market rewards environmental innovators and any firm or sovereign that overcomplies with its emissions reduction responsibility. In addition, emissions trades, almost by definition, allow the trading firms or nations to achieve the same net emissions reduction at a cost lower than that which they would

have incurred in making their reductions in the absence of the trade. That firms – and sovereigns – can resort to trading in addition to whatever other emissions reduction strategies might be available guarantees that they will enjoy increased flexibility in integrating their economic needs and their GHG compliance requirements.

At the same time, it is the economic dynamics of the emissions trading market that can provide the key to unlock the riddle of sovereign compliance with an international GHG emissions reduction protocol. Regardless of whether a protocol imposed quantitative emissions limitations or required specified technologies or taxes, the challenge of ensuring *sovereign nations'* compliance with a GHG protocol is one of the central environmental challenges in designing such a protocol.

To illustrate why this challenge is so daunting, the enforcement tools afforded the U.S. Environmental Protection Agency under the federal Clean Air Act make a revealing contrast with the remedies practically available in an international context in which the accountable party is a sovereign. For example, Title IV of the Clean Air Act, which established the emissions trading program for sulfur dioxide (SO₂) reductions requires firms to pay an *automatic* penalty of \$2,000 for each ton of excess SO₂ emitted and to suffer an *automatic* deduction in their future allowable emissions. In addition, they are subject to a full panoply of civil and criminal sanctions. The availability of these remedies and the ability of enforcement officials to bring them to bear against firms reflects a widespread and highly durable consensus that permeates virtually every sector of U.S. society, a consensus, in turn, that, together with the threat of these sanctions, elicits compliance from the vast majority of regulated firms.

Similar tools are not nearly so readily available in an international context, nor is there likely to be a comparable consensus amongst sovereigns in the foreseeable future. Consequently, even with the third COP in Kyoto less than a year away, many governments and interested parties appear to be stumped by this question: if, at the end of each budget or compliance period, there are nations whose GHG emissions exceed their budgets, what happens? Environmentally, the atmosphere will continue to be subject to unacceptable levels of GHG emissions. By the same token, from the point of view of the integrity of a protocol purporting to embody “legally binding commitments”, the credibility of such an agreement would be destroyed if, instead of having an ongoing obligation, those nations simply are permitted to start with a “clean account” in the next budget cycle.

At the other extreme, remedies and sanctions that excluded such nations from the GHG emissions budget and trading system or imposed general trade sanctions would, if imposed without any intermediate compliance/enforcement measures, also render any agreement non-credible on environmental grounds. Simply banishing non-compliers from the trading system would be self-defeating as a first-order sanction, since those countries would continue to emit GHGs at excessive levels. In fact, one of the key functions that the protocol's compliance strategy must serve is ensuring that countries facing difficulties in complying are provided a mechanism or path that eases

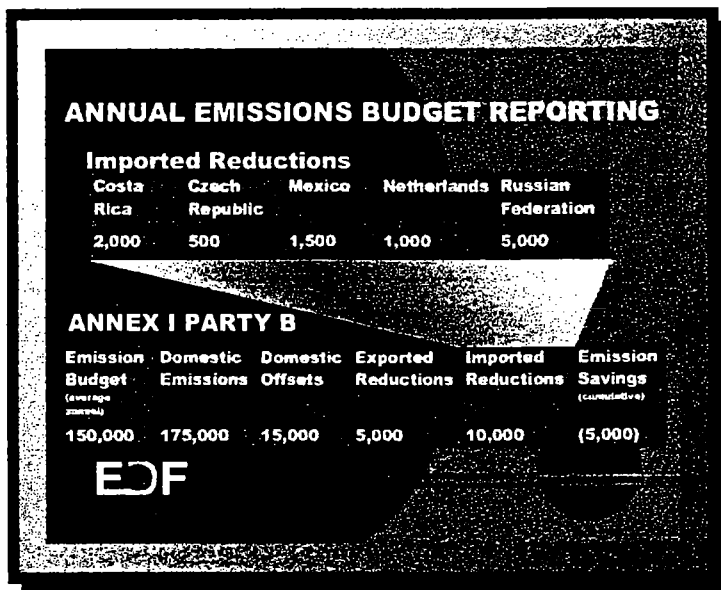
their achievement of compliance. A first-resort exclusion of these countries from the trading system would be environmentally counterproductive.

As for an approach that relied on general trade sanctions, the recent history of trade sanctions demonstrates that nations are extremely reluctant to administer such sanctions. Their imposition as a first-order measure requires a degree of political will that is unlikely to exist in the GHG context in the near term. Moreover, the environmental objectives of a protocol –not to mention the economic competitiveness concerns of nations with GHG emissions budget obligations – strongly suggest that the protocol should seek to engender a dynamic that will encourage those nations in the developing world, which initially may not be subject to legally binding GHG reductions obligations, to assume such obligations eventually. General trade sanctions, however, may discourage, rather than encourage, other parties from taking on budget obligations. It is hard to imagine that nations considering accepting legally binding GHG obligations would choose to do so if the result were to expose them, as a first-order sanction, to the economic losses created by trade sanctions.

Ultimately, such sanctions will have to be included as sanctions in a protocol, but it is hard to see them serving any role other than that of last resort. On the contrary, the effectiveness of any GHG emissions limitation regime will depend on structured, automatic and readily usable first- and second-order measures. To accomplish this, the Kyoto protocol must build a “compliance tripod” of measures, fashioned as an extension of the emissions trading and banking system itself, which would both ensure inter-temporal environmental compensation for excess emissions and create an inherent disciplinary feedback against nations’ noncompliance. The three legs of the tripod are: 1) annual reporting, 2) automatic GHG emissions debiting with interest for those countries exceeding their GHG emissions budgets and 3) automatic discounting of GHG emissions reductions exported by nations that are significant violators.

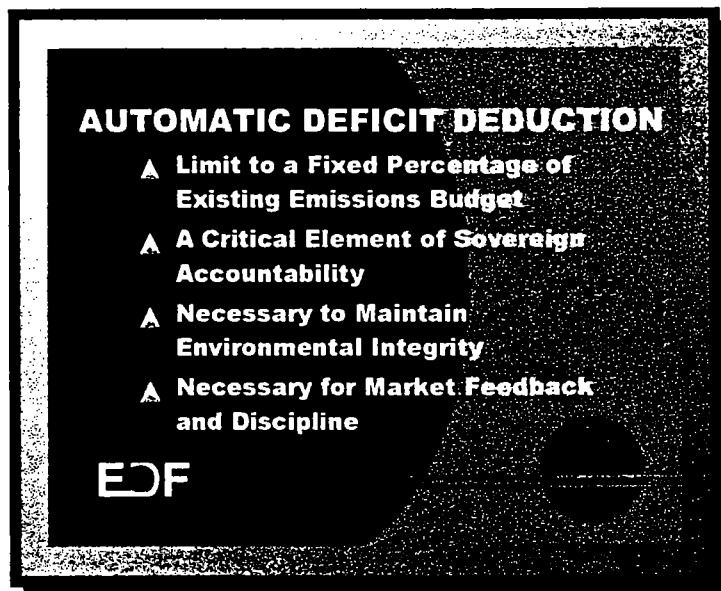
Reporting

The annual reporting of each nation’s GHG emissions, internal offsets and international GHG emissions trading activity is an obvious, as well as indispensable, instrument of accounting for each nation’s compliance performance. By the same token, the reporting system should also serve as the formal instrument for tracking, and therefore formally effecting, the exchange of emissions between sovereigns and each sovereign’s “savings” and carrying forward of increments of its emissions budget through the achievement of early reductions. These mechanics will be discussed in more detail, in the section on “Mechanics”, below.



Debt-Carryover and Discount

The concept of inter-temporal flexibility underlying banking -- which produces the benefit of early reductions -- must be applied to the likely event that some nations, including those not generally regarded as "bad actors", may simply miss their budgets. By imposing an automatic but limited debt-carryover with interest, the protocol would be able to harness that behavior by ensuring that it is environmentally compensated for -- rather than being either "forgiven" or subject to sanctions so draconian as to be unimplementable in the international context.



The debt-carryover would be implemented by automatically deducting from the ensuing period's budget the full amount of the nation's excess emissions at the conclusion of the current budget period. This automatic deduction would be augmented in size by an additional percentage of sufficient size to ensure that the mechanism itself – which, in effect, is a form of “borrowing” an increment of a future budget and “repaying” the increment with “interest” – would not be used as a routine compliance option. Rather, as a remedy for what would be treated as an initial instance of noncompliance, this debt-carryover would be a first-tier response, which could be followed by more stringent sanctions in the event the nation exceeded its net budget in the following period.

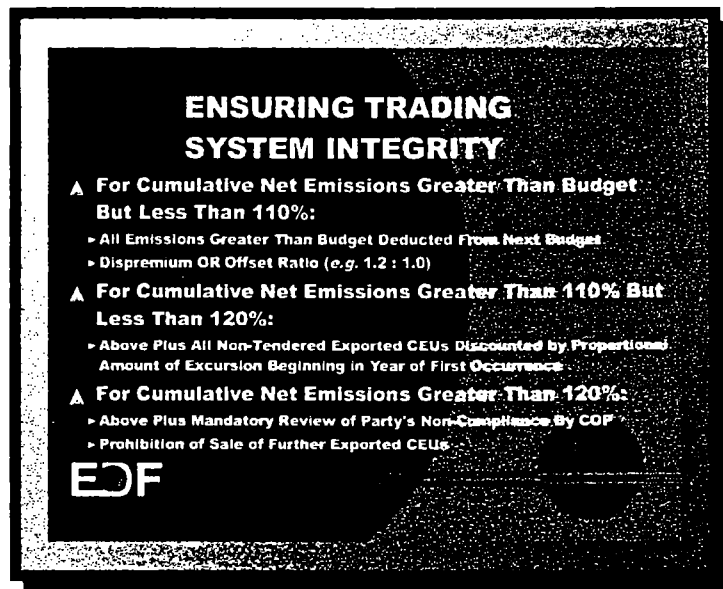
In addition to ensuring that each nation's accountability was truly continuous from budget period to budget period, the automatic debiting of nations' consecutive budgets for excess emissions would serve two other functions intrinsic to the integrity of the global GHG emissions budget and trading system. First, these debits would ensure that the environment was compensated both for the GHG emissions reductions initially lost and, through the additional “interest”, for the delay in achieving those initially lost reductions. Second, in the absence of an automatic deduction for excess emissions, CEUs transferred by non-complying nations could be used to offset emissions generated by the firms or nations acquiring the CEUs notwithstanding the fact that such CEUs did not represent surplus emissions reductions. By offsetting the non-complying nation's excess emissions, however, the automatic debit would ensure that GHG emissions reductions transferred by the non-complying nation were surplus or ultimately became surplus. The automatic debt-carryover is an essential element of both the protocol's system of accountability and to its environmental integrity.

The Discount

Though indispensable, mandatory debt-carryover alone is not sufficient to reward compliers and sanction non-compliers in a credible, effective and reliable way. In fact, the debt-carryover offers a partial answer at best to the question of what it is that the protocol can use or create to compel or induce a sovereign to achieve compliance with its GHG emissions budget. Certainly the prospect of an automatic deduction, augmented by “interest”, in the immediately following budget period signals nations that an “emit now, pay later” strategy for managing their GHG emissions over time would be inevitably expensive and potentially risky.

For nations whose commitment to, or capacity for, compliance is only marginal, however, the budget deduction can prove to be little more than a mere restatement of the nation's future obligation, an obligation that in itself has little credibility unless backed by something more than attenuated threats of eventual sanctions. Since, as discussed above, a compliance strategy that relies primarily on the imposition of sanctions is simply not credible in this context – and could even be self-defeating, the protocol needs to incorporate a mechanism that will lead sovereigns to *prefer*

compliance over noncompliance even if they are not persuaded by the possibility of sanctions.



It is from the inherent economic dynamics of the GHG emissions trading market that such a preference must come. In fact, the protocol should seek to rely directly and explicitly on the emissions trading market as the mechanism for delivering that preference. To do so, the protocol should include an automatic and immediate imposition of discounts on GHG reductions exported by nations whose annual reports show that the combination of their emissions and their exported reductions is putting them over their GHG budgets. In those cases, the protocol should require that, beginning in the year – within any budget period – in which this first occurs, governments applying those reductions to their own budgets automatically discount, by the proportion of the exporting country's excess GHG emissions, the exported reductions' tonnage value for emissions offset purposes.

This automatic discount is necessary because without it, exported GHG reductions from non-complying nations would be available to offset in full other nations' actual emissions notwithstanding the fact that the exported reductions or CEUs did not represent actual surplus reductions. Although the automatic debt-carryover addresses this issue as well, the remediation it provides does not occur until the subsequent budget period.

Equally important, this automatic discounting would force the market to value various countries' exported reductions differently based on their compliance. Reductions from compliers would earn more than those from non-compliers at least in proportion to the tonnage-value discount imposed on the latter. At the same time, firms and nations buying exported reductions would exercise preference for reductions from

complying nations, and invest effort in ensuring that reductions they acquired were from countries in compliance or on a course for compliance. Thus, by sending a market signal back to nations that fail to manage their emissions reduction obligations, this discount provision fulfills the capacity of the "compliance triangle" to impose a discipline both on these sovereigns and their firms and on their emissions trading partners.

Because one critical attribute of the automatic discount is its shifting of some risk – and, therefore, incentive – to buyers, the discount enhances the integrity of the emissions trading system in another way. Buyers' preference will be for reliable trading partners who can deliver CEUs that will retain their full value in offsetting emissions in the context of buyers' own compliance obligations. As a result, a preponderance of the CEUs transacted in the global emissions trading market may be those that *in the first instance* are highly likely to represent truly surplus reductions.

At the same time, in contrast to a regime in which non-compliers were excluded from the emissions trading market de jure, the fact that it would be the market, in exercising its preferences, that produced the effective exclusion of non-compliers from emissions trading comports with an overall strategy of using the market to elicit compliance. In this instance, the loss of economic opportunity resulting from this exclusion could act as a spur to drive non-compliers to take the actions necessary to achieve compliance. In fact, firms and other entities seeking to generate surplus GHG emissions reductions and sell them in the global market would become constituents for compliance within their own countries. In the face of the limitations that characterize an international enforcement regime, the protocol must rely on using the incentives inherent in a global GHG emissions trading market to mobilize constituents in favor of compliance.

From a superficial perspective, an approach, such as an automatic discount, which exposes buyers to uncertainty as to the use-value – in this case, the emissions-tonnage value -- of their acquisition would seem to be incompatible with an active exchange market. However, a simple comparison to currency markets, or, for that matter, to any transaction involving currencies that are "foreign" to one of the parties, and which regularly fluctuate in value in comparison to the party's "domestic" currency, demonstrates that this uncertainty is a routine part of international commerce. Moreover, it is easy to imagine that transaction partners and intermediaries would find a variety of hedging or insurance instruments readily available to manage such uncertainty. Only if it resulted in the full confiscation of a CEU's offset value would a discount system fatally inhibit the development of an international emissions trading market.

In this case, no such confiscation would be necessary. The concurrent presence of the debt-carryover mechanism would render surplus, at least eventually, exported reductions, even from initially non-complying countries. Consequently, the emissions-offset value of such reductions would not have to be discounted to zero. By the same token, the discounting would be applied only for those CEUs presented for

use in meeting the buyer's compliance obligations after the selling nation's budget exceedance emerged in annual reporting. CEUs that had been used prior to that time would not be discounted, thus avoiding the imposition of retroactive liability for purchasers of a sort that could inhibit emissions trading activity.

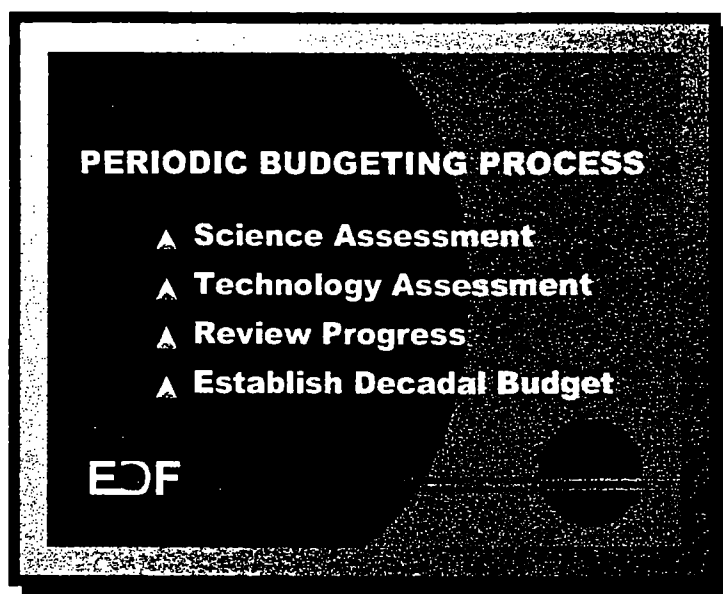
Without *both* an automatic debt-carryover to subsequent budget periods *and* an automatic discount applied within each budget period for CEUs exported by nations demonstrably exceeding their budgets, an international GHG protocol would lack adequate mechanisms for ensuring both nations' accountability for compliance and its own credibility. Without the ability to rely, in any but the most extreme circumstances, on the kinds of remedies, sanctions or other coercive measures typical of domestic pollution control laws such as the U.S. Clean Air Act or, in some instances, the general system of international commercial trade, a GHG protocol must develop a fully integrated set of incentives to motivate compliance.

That is why implementing nations' GHG emissions obligations through a system of emissions trading is so indispensable to the success of a GHG protocol. An emissions trading market is virtually the only mechanism that can provide such incentives. At the same time, the emissions trading and compliance regime must be carefully designed to hone these incentives. Just as the opportunity to create early reductions and "save" them for future use intensifies incentives for early action and for the development of environmental innovations, features like a discount applied to the GHG emissions reduction exports of non-compliers are essential to perfecting those incentives that can effect nations' -- and their firms' -- preference for compliance. Moreover, such a discount does more than provide a tangible instrument for delivering such incentives. Without a discount, the emissions budget and trading regime will lack important mechanisms that can be readily usable in the first instance to perform the function -- traditionally served by penalties and similar remedies in domestic legal programs -- of disciplining sovereigns that stray from the path of compliance.

THE IMMUTABLE IDENTITY BETWEEN TRADING AND COMPLIANCE

In a GHG emissions budget and trading system, the mechanics of accountability must be carefully designed. Fortunately, it is possible to create a unified system through which sovereigns can effectuate emissions trading and, at the same time, to design it so as to establish their accountability for meeting their GHG emissions budgets.

Setting the Budgets

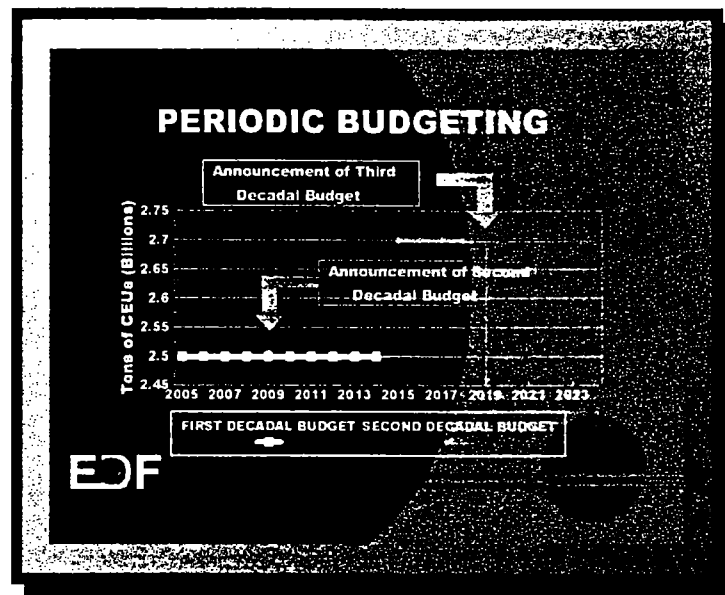


The key specification for each budget period is setting the numerical value of each nation's decadal budget. Presumably, since the initial commitments of the industrialized nations under the FCCC were expressed in terms of 1990 emissions levels, the protocol will establish each nation's initial budget as a function of its 1990 emissions. For purposes of setting the initial budget as well as each subsequent budget, the Parties should rely on the resources of international institutions such as the Intergovernmental Panel on Climate Change, under the direction of the Secretariat, to focus on three major components.

First, as the IPCC has done continuously since before the signing of the FCCC in 1992, the IPCC should provide an ongoing assessment of all scientific developments relevant to climate change. Inevitably, this will include a dual focus on tolerable concentrations of GHGs in the atmosphere and tolerable rates of climatic change. Second, technological advances and innovations are likely to progress at an accelerated pace in the wake of the establishment of a GHG protocol and in response to the incentives it engenders. These, as well as technological costs and limitations, should also be carefully assessed. Finally, nations' performance under the protocol as that performance develops needs to be assessed as well.

These assessments should inform the setting of the budget for the immediate subsequent period as well as projected reduction trajectories over a multi-budget-period horizon. An equally critical element of the budget-setting process is timing. Specifically, each budget should be established and announced no later than the end of the fifth year of the current budget period. By following this schedule, the protocol's budget-setting process will afford nations and firms the time necessary to

anticipate their upcoming compliance obligations and to integrate them with their overall economic responses.



This budget-setting schedule also contributes to the protocol's ability to establish a credible system of accountability. A five-year separation between the establishment of the ensuing period's budget and the application of remedies such as an automatic debt-carryover can help ensure that the budget-setting process will not be compromised by efforts to ease non-complying nations' obligations under the debt-carryover provision. As a result, the carryover will represent a true net deduction from a budget that is not inflated to defeat the effect of the carryover.

Mechanics of Reporting, Accounting and Trading

One of the innovations introduced by the SO₂ emissions trading program under the U.S. Clean Air Act was that the SO₂ emissions "allowance" served – all at the same time – as i) the currency of trading, ii) the instrument of compliance for affected sources and iii) the regulatory mechanism applied by the U.S. EPA for ensuring sources' accountability and for "tracking" emissions trades. Similarly, the protocol can establish a single, simple sovereign accounting system that performs the same multiplicity of functions for an international GHG emissions budget and trading regime. At the same time, this system would be able to succeed without relying on the allocation of emissions "allowances" or marketable permits.

This is critical, since in the context of a GHG protocol a compliance accountability infrastructure must be designed to meet several constraints as well as

the demand that it work. First, the protocol, and its compliance and trading accounting method, must be able to accommodate every possible policy approach -- e.g., pollution taxes, technology standards, research and development subsidies, marketable permits -- available to sovereigns in adopting their respective domestic strategies to meet their GHG emissions budget obligations. A system that presupposed the adoption of certain measures and the exclusion of others would be untenable to the extent that it would necessitate the forfeiting by sovereigns of at least a portion of their own policy-making prerogatives.

By the same token, reliance on the creation of elaborate or powerful new international institutions for the purpose of implementing a protocol could doom such a protocol, for, here, too, demanding that sovereigns surrender significant elements of their authority may be a prospect even more daunting than inducing them to agree to curb their GHG emissions. Finally, an international system for accounting for, and tracking trades in, each nation's GHG emissions must be simple, reliable and durable.

Fortunately, the FCCC itself already has laid the foundation for such a system in its existing requirements that countries file annual reports of their GHG emissions. To implement each nation's GHG emissions budget requirements and effectuate the application of GHG emissions trading they may have engaged in in meeting their respective emissions budgets, the protocol should require each nation to file an *annual* report with the following information:

EMISSIONS, REDUCTIONS, AND TRADING REPORTING					
Annex I Party B					
Emission Budget (average annual tons)	Domestic Emissions (by sector)	Domestic Offsets (by sector)	Exported Reductions (by nation and vintage)	Imported Reductions (by nation and vintage)	Emission Savings (cumulative tons)
150,000	173,000	15,000	5,000	10,000	(5,000)
150,000	185,000	17,500	2,500	15,000	(10,000)
150,000	190,000	20,000	1,000	15,000	(16,000)
150,000	200,000	25,000	10,000	10,000	(41,000)
150,000	185,000	25,000	15,000	5,000	(61,000)
150,000	180,000	20,000	15,000	5,000	(81,000)
150,000	175,000	20,000	15,000	2,500	(98,500)
150,000	145,000	20,000	30,000	0	(103,500)
150,000	130,000	20,000	40,000	0	(103,500)
150,000	140,000	20,000	35,000	0	(106,500)

1. **Emissions Budget**, expressed in annualized terms by multiplying its decadal GHG emissions budget by 0.1.

2. **Actual Domestic Emissions Reported in Total and By Sector.**

3. Domestic Offsets. In this category, a nation could report *surplus* GHG emissions reductions generated as a result of actions in GHG emissions sectors not regulated under its domestic programs and not used by its sources in meeting compliance under those programs.

4. Exported Reductions. These would be reported expressly in terms of the year of their vintage, as well as being identified by their country of origin. In the case of the vintage year, this information is necessary for the purpose of calculating the emissions-value “premium” that could be earned for reductions that were “saved” and held unused over time. Since reductions, or CEUs, exported by nations whose annual reports revealed that they were exceeding their budgets would be discounted, in terms of their emissions value, before they could be applied to the importer’s domestic compliance program, the identity of the country exporting the CEUs would have to be maintained.

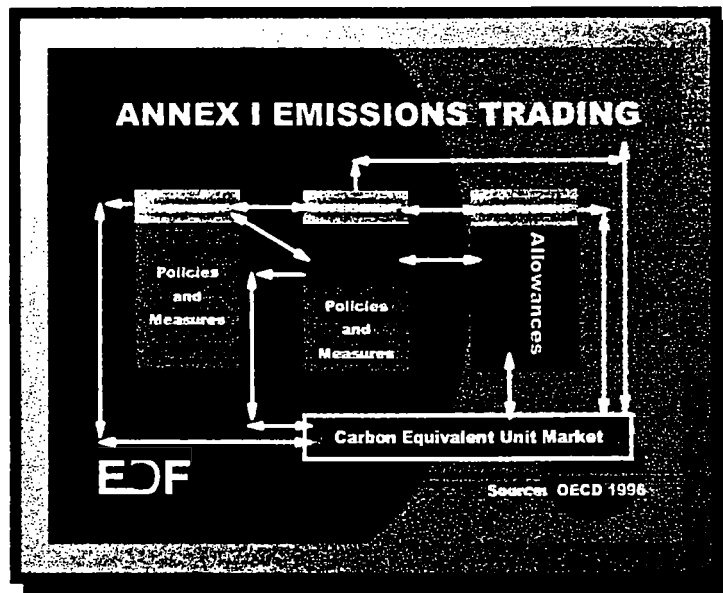
5. Imported Reductions, also reported expressly in terms of vintage year and country of origin for the same reasons.

6. Emissions Savings and End-of-Period Net. These would be the annual net of the other five entries. Of course, if in any year a nation’s emissions exceeded its annualized budget as adjusted to reflect domestic offsets, exports and imports, then such savings would be expressed as a negative value. In addition, to reveal each nation’s performance relative to its GHG emissions budget obligation, and thus expressed as either a net savings to be carried forward for future use or a net debit to be deducted immediately from the ensuing period’s budget, reports at the end of each budget period would state a net sum of the nation’s savings, either positive or negative.

This reporting approach would provide a unified mechanism for compliance and trading. It would be through each year’s report that the mechanics of compliance would be automatically triggered while at the same time international emissions trading would be effectuated.

Trading

Through this approach, which is, in effect, one of double-entry record-keeping, the international emission trading system can accommodate GHG emissions trading between and among private firms in different nations while ensuring both the integration of private and sovereign trading and the full GHG emissions budget accountability of all nations. In addition, it does not presuppose any particular set of policy approaches that participating nations may use on a domestic level, nor does it rely on developing extensive new institutional authorities internationally.



In fact, under this system, virtually any firm operating under virtually any domestic policy regime can transact the international sale of purportedly surplus GHG emissions reductions. Meanwhile, the integrity of the system of accountability remains assured. This approach achieves this by requiring nations to report annually *all* emissions exports, whether initiated by the sovereign itself or any private firms operating within sovereign borders. Even private firm sales transactions, therefore, of necessity will have to be effectuated through both their being reported to the government of the selling firm and a corresponding *deduction being taken from that sovereign's budget*.

To ensure that this occurs with every such transaction, the sovereigns whose firms are purchasing such reductions – presumably for the purpose of using the reductions to offset their own emissions and thus comply with domestic obligations – would agree not to recognize or accept such reductions for such compliance purposes in the absence of a demonstration that the exporting sovereign had acknowledged the transfer and made the deduction from its own budget. Of course, in accepting such purchases, the importing sovereigns would be able to report either a net increase in their own budgets or a net decrease in their emissions. This approach thus makes all international GHG emissions trading take the form of inter-sovereign trading of increments of the sovereigns' GHG emissions budgets. As a result, this approach guarantees that, *by definition or as a creation of the accounting mechanism itself*, all trades are for *surplus* reductions. In effect, certifying that a traded reduction is surplus, often a prohibitively cumbersome process in other trading approaches, is a seamlessly built-in feature of the accounting mechanism.

Compliance

The reporting mechanism is also a crucial trigger for the protocol's two key compliance mechanisms. Since the tenth annual report in each budget period will include a summing of each nation's "savings", both positive and negative, those reports that indicate a net deficit -- that is, emissions in excess of a nation's net budget as adjusted to reflect trades -- will trigger an automatic deduction from the affected nations' budget for the ensuing period.

Similarly, at any time during the course of a budget period a nation's annual report may reveal that its cumulative emissions exceed 110% of its total decadal budget. In that case, the discount requirement would be automatically triggered for application by every other sovereign whose firms held reductions, or CEUs, exported by that nation. Again, the discount, would be applied to those CEUs that were presented by the firms that had acquired them for use in offsetting their own emissions and thus meeting their domestic emissions obligations or were otherwise used by the sovereigns themselves to augment their budgets or offset their emissions. However, the discount would take effect only beginning in the first year after a nation's "budget deficit" was revealed and would affect only those CEUs or reductions that were submitted subsequently. Nevertheless, the ability of the annual reports to reveal, essentially immediately, the creation of nations' "deficits" before the end of the budget period would allow the protocol to require that the discount be applied automatically by all participating sovereigns.

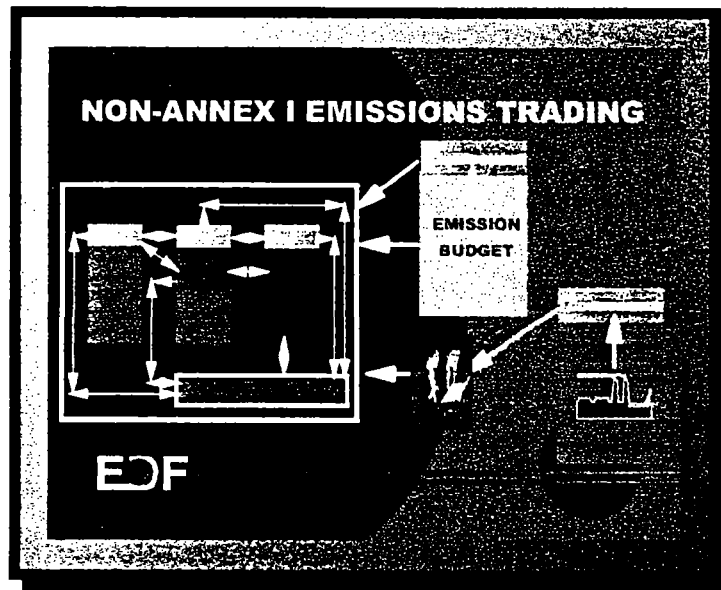
JOINT IMPLEMENTATION AND PARTICIPATION

In its January submission to the international negotiating process, among the items emphasized by the U.S. were the details of a strategy for ensuring the ultimate participation by developing countries in an GHG emissions protocol. The key elements in the U.S. proposal included a proposed requirement that these nations adopt "no regrets" policies to curb GHG emissions and that they prepare annual reports on their emissions and on measures adopted to control such emissions. In addition, the U.S. called for the establishment of a date certain for negotiations which would result in developing countries' accepting GHG emissions obligations and that included mechanisms for the eventual strengthening of those obligations.

The U.S. proposal's focus on these countries and their emissions is especially compelling from both an environmental and economic competitiveness perspective. GHG emissions from the developing world are rapidly reaching or exceeding par with those generated by the industrialized and Eastern bloc nations. Their emissions trajectory corresponds to their economies' increasing importance and activity in the

global marketplace. In fact, unless a GHG protocol creates a robust structure for encompassing these nations and their GHG emissions it will lack environmental – and economic – credibility, a conclusion recognized, much to its credit, by the U.S. proposal.

These ideas will need to be developed further in order to provide a more comprehensive answer to the question of how the developing nations will come to agree to their inclusion in a GHG emissions budget regime. Certainly, as climate science advances the threats posed by climate change will be of concern to those societies whose relative economic disadvantage may render them more vulnerable. At the same time, the traditional tools of diplomacy, which may include outright pressure from the industrial powers will play a role as well. Nevertheless, the same factors that limit the ability of the international community to *compel* routine compliance with a GHG emissions budget regime pose analogous challenges to securing the full-fledged participation of developing countries in such a regime.



Here, too, then, the economic dynamics a global GHG emissions trading market must be enlisted in meeting these challenges. Ostensibly, the most effective way of using the emissions trading market to create incentives for developing countries to participate in an international GHG regime is to condition their ability to engage in transactions in the emissions trading market on their agreement to subject themselves to a GHG emissions budget. Under this approach, "joint implementation", understood as a method by which developing countries without GHG emissions budgets can sell GHG emissions reductions, would not be available as a compliance option for firms and sovereigns subject to a GHG emissions budget.

Erecting such a barrier to developing nations' participation in trading may prove to be too crude and risky a strategy, however, while also denying opportunities for achieving environmental and economic gains. In contrast, permitting international GHG emissions trading for and with nations prior to their accepting GHG emissions budget – that is, joint implementation – may offer a smoother path by which developing countries can “graduate” to full participation in the emissions budget regime. Such an approach, in actuality, may enable the incentives represented by the opportunity to participate in emissions trading to function more effectively. In addition, it may create a stream of economic revenue tied to environmental investments during the current period when many developing economies are stepping up investment in long-term energy and transportation infrastructure. Furthermore, we believe that the incentives for participation can be increased by offering non-annex I Parties that take a budget a growth allowance. With a budget explicitly accomodating growth, Parties opting in would enjoy the full benefits of international greenhouse gas trading without the transactions costs that may dominate joint implementation.⁴

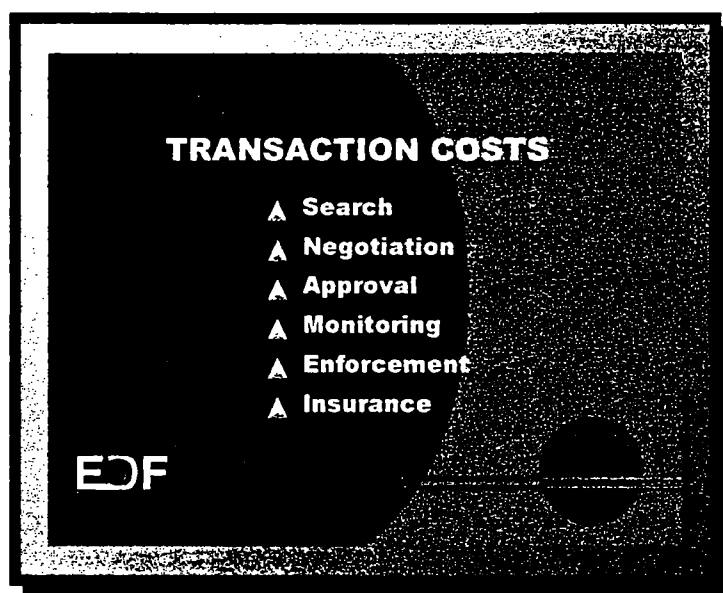
Typically, the kinds of international transactions that would result in the transfer of GHG emissions reduction credits would have the mutual economic benefits to buyer and seller characteristic of trading: sellers would gain a new, additional sources of revenue and buyers would be able to achieve compliance at lower cost. Moreover, these transactions would bring a host of benefits crucial to the credibility, durability and environmental performance of a GHG protocol. First, the very opportunity afforded firms and sovereigns in the industrialized world to meet their GHG emissions budgets at reduced cost and with greater flexibility would enhance the acceptance and credibility of an international GHG regime.

At the same time, those developing economies experiencing the greatest growth in the current economic time horizon are making substantial infrastructure investments whose environmental consequences, including GHG emissions, could have long-lasting effects for good or ill. Investments of the sort that yielded transactable GHG reductions for the host economy or the foreign investor simultaneously would help direct the host countries' economic growth along paths that were less, rather than more, GHG emissions-intensive. In addition to the environmental benefits that would result directly from this outcome, achieving growth in this way would make it that much easier for these countries to accept, eventually, a GHG emissions budget. As a result, the implicit gradualism in this strategy could speed and facilitate these countries' graduation to more rigorous international GHG obligations. In contrast, an approach which barred these countries from participating in international GHG emissions trading or joint

⁴ For a more detailed discussion of this point see Dudek, Daniel J. and Jonathan Wiener, “Joint Implementation and Transaction Costs”, paper prepared for the Environment Directorate, Organization for Economic Cooperation and Development, Paris, 1996, 69 pp.

implementation *until after* they had accepted a GHG emissions budget could actually result in developing countries' finding it more difficult to accept such budgets.

By the same token, allowing developing countries to reap the benefits of engaging in GHG emissions trading even before they agreed to GHG emissions budgets could enhance the effectiveness of the incentive created by the promise of participation in trading following the imposition of a GHG emissions budget. Direct experience in the international GHG emissions trading market and direct enjoyment of the benefits of participation in the market could help persuade developing countries to move into the budget regime and to do so more quickly.

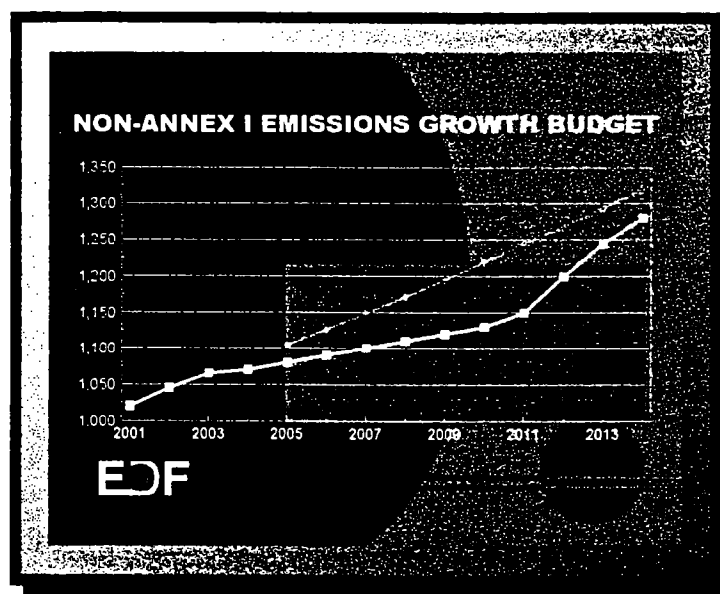


At first blush, this would seem to be a paradoxical result. Presumably, developing countries would be only too happy to reap the rewards of emissions trading without bearing the burden of a GHG emissions budget. In fact, participation in the emissions trading market under these circumstances inevitably will be significantly less advantageous and less lucrative for the exporting country than it would be for those countries that engage in trading while subject to a GHG emissions budget. It is this differential, which inevitably will be substantial, that will create the incentive for developing countries to adopt GHG emissions budget; yet, it is initially allowing countries to participate in emissions trading in the first place that will make the incentive more vivid and compelling.

This differential will arise from the contrast in transactions costs associated with trading where both affected sovereigns are subject to budgets and those associated with trades where the exporting nation is not subject to a budget. In the former case, as discussed at length above, the universal accounting and reporting system, backed by the discount and debt-carryover mechanisms, for countries subject to GHG

emissions budgets will render *all* transacted reductions surplus. As a result, firms and sovereigns engaging in such trades will have to incur few if any costs related to demonstrating that the reduction in question is surplus.

In the case of reductions exported by countries without GHG emissions budgets, however, the trading participants will be forced to incur significant costs in establishing that the reductions in question are truly surplus and can be used to offset emissions subject to GHG emissions budget requirements. This will be the case no matter how liberal the protocol may be or how dominant the constituencies seeking to encourage or facilitate joint implementation may be. In addition to meeting tests that may seek to establish not only “additionality” but “but for” causality as well, joint implementation projects may be required to demonstrate also that their emissions reductions are not merely the result of shifting emissions generation to other firms or activities. Proponents of joint implementation transactions will also incur the costs associated with seeking the approval of as many as three authorities -- that of the host country, that of the country against whose compliance requirements the reductions are being offered and possibly that of an international body that may be created for the purpose by the protocol itself.

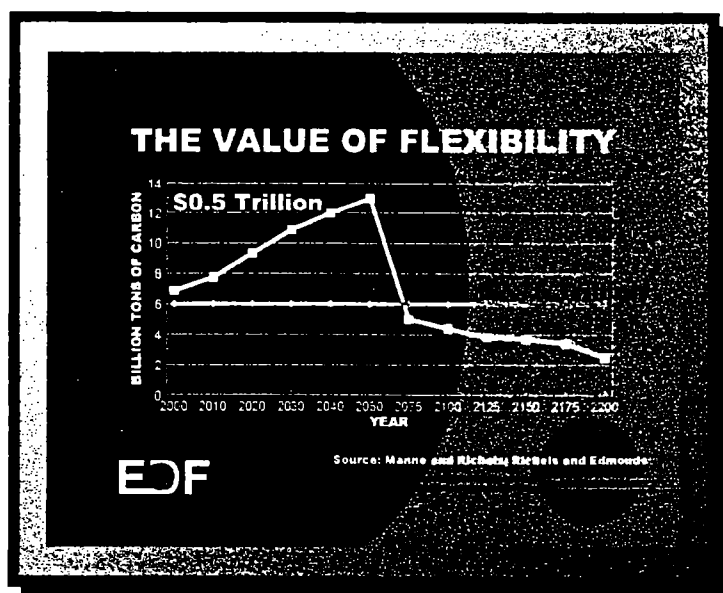


Meanwhile, thanks to the certification that reductions are surplus that is built into the very mechanics of reporting, parties to GHG trading in the emissions budget context will face none of these burdens and costs. As a result, they are likely to seek reductions from countries subject to GHG emissions budgets as a first preference and offer prices commensurate with the reliability and minimization of transactions costs characteristic of that context. In competing against that preference, sovereigns and firms without budgets will suffer smaller demand and lower prices for their reductions.

With experience, these nations will come to identify an economic advantage that the emissions trading market can confer on those that accept budgets.

To facilitate developing countries' response to this incentive, the protocol should specify a fixed formula to be universally applied to developing countries when they elect to adopt a GHG emissions budget. While the formula can include an advantage for those nations that act more quickly, applying a pre-established set of specifications, and thus eliminating case-by-case negotiations, will ensure the integrity of the system of budgets imposed on developing countries. As a result, this approach can be tailored to address the pressing demand of developing countries: that the perceived need for rapid economic growth, comparable to that enjoyed by industrialized nations earlier in their economic history be accommodated. Specifically, for the initial budget period or periods developing countries can be subject to "growth budgets" calculated, for example, as a function of current emissions with a small-percentage margin for increase over a certain time horizon. At the end of the horizon, which can be set at a length that would be greater for those nations that begin their budget commitments earlier, they would be subject to the same reduction path applicable to all nations.

CONCLUSION



This paper has attempted to articulate the framework for an international greenhouse gas trading regime and to elucidate the importance of the elements of that framework for its effective functioning. As the international community rapidly moves toward the adoption of a protocol to limit greenhouse gas emissions, building an international understanding of the practicality and desirability of emissions trading is

essential if agreement is to be reached in Kyoto. Only a system of international emissions trading can effectively span the diversity of national interests, legal systems, norms, implementation strategies, and preferences represented among the community of nations. The very essence of emissions trading is choice – the ability to choose when, where, and how much.

At the same time, only emissions trading has the capacity to modulate both total cost as well as the distribution of costs among nations. Economic analyses of greenhouse gas control are remarkably uniform in ascribing huge cost savings to emissions trading. The key to delivering these cost savings is the creation of a framework for trading which reduces transactions costs, provides environmental and financial credibility, and rewards innovation. This paper has identified the minimum elements necessary.

POLICY INSTRUMENTS FOR GLOBAL CLIMATE CHANGE

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Menu of Instruments and Criteria for Assessment

- Two categories of instruments need to be considered:
 - Domestic policy instruments: to enable individual nations to achieve their specific targets/goals.
 - International policy instruments: to allocate responsibility among nations
- Potential criteria for assessment
 - cost effectiveness
 - dynamic incentives for technology innovation & diffusion (lower costs over time)
 - adaptability to economic & social changes
 - distributional equity
 - institutional (political and administrative) feasibility

Direct Regulations and Voluntary Agreements

- **“Command-and-control”**
 - Technology-based (or design) standards; GCC example — requirements for energy efficient motors, combustion processes
 - Performance-based standards; GCC examples — maximum allowable levels of CO₂ emissions
 - Typically not cost effective (in static sense)
 - Do not provide dynamic incentives for development, adoption, and diffusion of superior technologies
- **Voluntary Agreements**
 - Already in place (U.S. Climate Change Action Plan)
 - But will play limited role in meeting future targets

Market-Based Policy Instruments

- Can be cost-effective, provide dynamic incentives, and address concerns about distributional equity.

1. Domestic Carbon Taxes

- Fossil-fuel carbon tax, combined with sequestration tax credit (linked with land use changes)
- BTU tax on fossil fuels 20-40% more costly
- Economic effects depend on use of revenues
 - Revenue recycling can lower costs of carbon tax
 - But, there's no free lunch.

2. Domestic Tradeable Permits

- Fossil-fuel carbon rights, held by fuel producers and importers (similar to lead phasedown program)
- Can distribute freely (“grandfathering”) or by auction
- Auction revenue — like tax revenue — can be used to reduce pre-existing distortionary taxes
- Grandfathered permits (like carbon taxes with lump-sum redistribution) can exacerbate distortions
- Considerable experience in United States

International Instruments:

- Greenhouse problem is fundamentally global
- How could community of nations address collective target?
 - How could responsibility for meeting target be allocated among nations?
- Consider three international instruments.

1. International Carbon Taxes

- Carbon tax imposed on nation states by an international agency
 - Need tax rate & formula for revenue allocation
 - What agency could really impose & enforce?
- Alternative: harmonized domestic carbon taxes.
 - Stipulates same tax level for all nations (c/e)
 - Requires ongoing payments (from rich to poor countries for distributional equity)

2. International Tradeable Permits

- Coalition countries receive permits for net emissions
- Whatever initial allocation, trading can lead to C/E (if small TCs); can pursue C/E *and* equity objectives
- Institutional questions (enforcement) are paramount

3. Joint Implementation (JI) (Henry Lee)

Implementation Issues: Free-Riding and Emissions Leakage

- Most prominent: currency of regulation, market power, transaction costs, *free-riding*, and *emissions leakage*.
- Question: can a unilateral or even multilateral policy (by a group of cooperating countries) be effective in abating global greenhouse gas emissions?
 - Answer depends on how non-cooperating nations respond: **free-riding** and **leakage** can undermine any initiative, market-based or conventional.
- ***Free-riding*** arises when countries that do not contribute to abatement still benefit from global abatement.
- Voluntary participation in int'l agreement, free-riding incentive ---> below-optimal global abatement.
- Trade sanctions could support fuller participation
 - but introduce distortions in global economy
 - Free-riding is itself distortionary
 - So, it's an empirical question.

- ***Emissions Leakage*** arises when abatement by cooperating countries alters world relative prices and thus leads non-cooperating countries to increase their emissions.
- Three channels:
 1. An agreement may shift comparative advantage in *carbon-intensive goods* towards non-participating countries ...

so production of these goods and hence CO₂ emissions rise outside coalition.
 2. A unilateral policy may lower demand for *carbon-intensive fuels*, and so reduce world price for fossil fuels ...

and so demand for these fuels (and CO₂ emissions) can rise outside coalition.
 3. If non-cooperating countries unilaterally abate up until their MB = their MC,

and if MB to non-coop. countries decrease with higher levels of global abatement,

then increase in abatement by cooperating countries causes non-coop. countries to reduce abatement.

So, leakage can occur even in absence of trade.

- What can be done to reduce emissions leakage?
 - If coalition is net importer (exporter) of *carbon-intensive products* in absence of carbon tax,
 - then a tariff (subsidy) imposed on these net imports (exports) can reduce emissions leakage through terms of trade.
 - But tariff (subsidy) has to be set proportionately to carbon-intensity of *every* product; impractical.
 - Further, whether welfare loss caused by tariffs are greater or less than welfare loss reduced by cutting emissions leakage is open question.
 - Finally, such border tax adjustments may conflict with multilateral trading rules.

Comparative Assessment of Greenhouse Policy Instruments

Conventional Regulations vs. Market-Based Instruments

- Costs of addressing GCC will be exceptionally great,

and so relative cost effectiveness of alternative instruments is of central importance.
- Market-based instruments — taxes and tradeable permits — can be c/e, and provide dynamic incentives.
- Taxes — and to some degree, auctioned permits — will make costs of climate-change protection more visible.
 - Problematic in short term politically
 - But, in long term, this clearly signals and educates public about real tradeoffs.

Domestic Tradeable Permits vs. Domestic Taxes

- In principle, little fundamental difference
- Symmetry breaks down in presence of uncertainty, transaction costs, other market imperfections, and in political context.
- Final choice will likely depend on political factors.
- U.S. political system has revealed its strong preferences for quantity instruments in grandfathered form.
 - But these instruments generate no revenues with which distortionary taxes can be reduced.
- Preferred domestic greenhouse instrument in U.S. in short run may be grandfathered tradeable carbon rights,
- ... and in the long run, revenue-neutral carbon taxes.

International Taxes vs. International Tradeable Permits

- An international carbon tax system requires agreement on how tax receipts are shared.
 - Most important, what institution could impose and enforce such a system?
- Harmonized domestic carbon taxes require agreement on:
 - pre-carbon-tax net tax rates on fossil fuels,
 - and compensatory international financial transfers.
 - So, likely that tax harmonization agreement would fail to be adopted or fail after implementation.
- Institutional barriers also face int'l tradeable permits.
 - But such system requires no ongoing side payments,
 - and countries can choose their domestic policies.
- So, evidence favors — in the long run — a permit scheme over a tax system at international level.
- In short run, there's critical lack of institutional structure

Future Policy

- For single country, even cost-effective domestic instrument will be desirable only if target is part of accepted, **broad-based**, multilateral agreement.
- Need to maintain **international** focus for global problem.
- Need to think of policy **time-paths**, not simply end points.
- Prescription: broad-based (if not global), low-cost cooperative measures should precede any dramatic (high-cost) goals and use of sophisticated instruments:
 - This is a “**broad, then deep**” policy architecture
 - Begin with low-cost, simple agreements, including all significant players
 - Build up institutions
 - Increase stringency of targets, as appropriate
 - Implement cost-effective policy instruments

APPROACHES FOR IMPLEMENTING CLIMATE TREATY

The following presents some broad categories of options for domestic implementation of any agreed-upon target under the Climate Convention. Further development of these approaches will be useful in preparing the necessary economic analyses.

Tradeable Permit/Allowance Schemes

An emissions trading program could be structured along the lines used for acid rain controls under the Clean Air Act, in which the use of tradeable permits for sulfur dioxide emissions is a key element. Greenhouse gas (GHG) emissions would be capped at a specific level per year consistent with limits agreed to under the treaty. Firms would be prohibited from producing or using carbon-based fuels, or emitting GHGs, without a permit. The creation of a permit system establishes new and valuable property rights, involving a number of important issues:

- How compliance and property rights in tradeable permits/allowances would be monitored and enforced
- How to allocate permits. They could be distributed to current or past producers or users of carbon-based fuels in a "grandfather" regime, auctioned to the highest bidder, allocated on the basis of population, distributed to all citizens, etc.
- Whether a new institution to oversee transfer of permits/allowances would be required
- The time period over which permits can be used (e.g., only in a single year or banked and used in some future period)
- Whether the permit system covers all sources (and sinks) of emissions, or just focuses on major sources and sinks (and whether there is an emissions threshold defining who participates).

Technology Development and Diffusion

PNGV for passenger cars and many of the existing Climate Change Action Plan activities fall within this category. The goal would be to bring down the cost of fossil fuel alternatives and energy efficiency improvements and to remove barriers to market penetration. Examples of areas of significant potential beyond PNGV include: expanded research/subsidies to support biomass development and use; expanded support for improving and deploying solar technologies; development of financing options for overcoming "first cost" barriers to adoption of energy efficiency measures; and expanded building energy efficiency technologies and codes.

Voluntary Measures

Voluntary measures currently form the basis for the Climate Change Action Plan, but they will not be sufficient to stabilize emissions at 1990 levels. Voluntary programs could be expanded by raising the visibility of, and then rewarding (e.g. Baldrige Awards), private-sector efforts. Voluntary programs could be used in conjunction with other approaches, assuming they received appropriate credit.

Other Actions

Utility restructuring, ISTEA reauthorization and the ozone/particulate standard each represents an area of on-going policy development which could affect both the quantity and costs of achieving greenhouse gas reductions. Each needs to be reviewed closely to determine the potential opportunities and impacts on climate change objectives.