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The Left-Over Problem: The Blind Spot of the Automotive Portion of the Advanced Energy Intiative

Chris Stefan

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Editors' Note

Information about the catastrophic impacts of climate change is penetrating global society, from high culture to low culture, at a rapidly increasing rate. Scientific studies about warming trends are often slapped across newspaper covers. Likewise, stories about political pressure to subvert science supporting global warming or interest groups offering bounties to refute climate change experts have increasingly become hard to ignore. Additionally, magazines from the Economist to Vanity Fair are trying to educate people about the importance of going green.

Worldwide, thousands of people have listened to Mr. Al Gore explain the *Inconvenient Truth* about warming temperatures. Quite possibly it is the palpable effects of the unpredictable weather that is making them pay attention and demand action. The world is unable to forget the horror of the 2004 tsunami and Americans started to pay attention once climate change hit home in a big way with Hurricane Katrina's destruction of New Orleans.

With this onslaught of mass information, it is sometimes hard to isolate the direst issues. This annual issue of *Sustainable Development Law & Policy* ("SDLP") hopes to present some of the most pressing, and important, climate change topics within the legal and policy arenas. Also included are interesting new developments, historical looks at climate law, and evaluations of the effectiveness of current multilateral environmental agreements.

We hope that the reader walks away with an understanding of how multifaceted climate law has become. International, regional, domestic, and sub-national law must be utilized to tackle this problem. Scientists are finally uniting on an international scale to declare that humans have undeniably contributed to global warming; as a result, this fruitless debate must stop. Battles must no longer take place in the scientific field. Human induced climate change is a fact.

The new battle must be waged in the legal and policy fields. Those with the tools to create legal and political change must act now; the devastating (or foreboding) impacts of climate change are being witnessed around the globe. While some argue the tipping point has already occurred, it is never too late to advocate for sound solutions. We hope that this issue of SDLP helps motivate individuals within the legal and political communities to head in the right direction. The ecological footprint upon our globe must be reduced: our habitat depends upon it.

Kelly Rain

Maria Vanko
Editors-in-Chief

Features:

The Impacts of Global Warming:

The Need for Cooperation & Leadership

An Overview of This Issue

*by Senator Jeff Bingaman**

Global warming is an international issue that requires leadership across the globe. Despite progress that has been made at state and local levels, the United States has failed to provide any real international commitment and leadership on controlling greenhouse gas emissions. Members of Congress, Governors, NGO's and CEO's are increasingly pushing for leadership and certainty with regard to this issue. Everyone is familiar with the litany of possible consequences: rising sea levels, retreating glaciers, melting permafrost, more severe droughts, an increase in the intensity of storms and hurricanes, and more heat waves. The stakes are high and the risks are great. We need to begin acting against these risks while it is still relatively affordable to do so. Given the urgency of the issue and increasing acceptance from both business and the public, it is now politically feasible for the United States to implement economy-wide programs to reduce the amount of carbon dioxide which our country sends into the atmosphere.

Global warming issues are difficult, but not insurmountable. We must start by following the states' example of demonstrating the political will and resolve to work through this serious and complicated issue. Previous experiences with the Clean Air Act, the Clean Water Act, and Superfund demonstrate that as the states have moved on these issues, it is now the federal government's turn to enact policy. We can do so in a bipartisan manner that reflects the states' success, but we cannot continue to delay if we want to enact a meaningful, consistent national program. The risks associated with a changing climate clearly justify the adoption of mandatory limits on greenhouse gas emissions.

If Congress is going to manage U.S. greenhouse gas emissions effectively, it will need advice and expert analysis from the business community, the scientific community, and the legal community. There is a vast gap between what is understood about global warming by the scientific and policy community, and what is known by political leaders in the position to steer U.S. policy. We must close that gap and move our energy and industrial systems in a fundamentally different direction, or we risk pushing the planet past a tipping point.

This issue of *Sustainable Development Law & Policy* discusses many of the current issues within the climate law debate. Contributors suggest strengthening multilateral agreements, such as the Montreal Protocol, to help reduce greenhouse gas emissions. Within this issue the economics of climate change are explored. Information is provided about the United States taking a regional approach to fighting climate change, while other articles discuss the need to link carbon markets. Additionally, various other critical issues are explored in this publication.

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** Senator Bingaman won election to the United States Senate in 1982, as a Senator for New Mexico. Since then, he has been active in solving real problems facing the citizens of the United States. As Chairman of the Senate Energy and Natural Resources Committee, Senator Bingaman continues to be a leader in improving national energy policy and educating Americans about the need for action on global warming.*

Strengthening the Montreal Protocol:

Insurance Against Abrupt Climate Change

*by Donald Kaniaru, Rajendra Shende, Scott Stone, Durwood Zaelke**

Introduction

The Montreal Protocol on Substances that Deplete the Ozone Layer has been efficient and effective in reducing damage to the ozone layer. It also has contributed significantly to climate mitigation. This paper recommends further adjustments to the treaty to help finish the job of protecting the ozone layer, and to provide further though temporary insurance against the threat of abrupt climate change.[1]

The Montreal Protocol is widely considered one of the world's most successful multilateral environmental agreements, having phased out 95 percent of ozone-depleting substances ("ODSs") in developed countries and 50 to 75 percent of ODSs in developing countries — placing the ozone layer on a path to recover later this century.[2] The Montreal Protocol's success is based on its strict, flexible, and dynamic design, which has driven continuous technology innovations; its evolution through amendments, adjustments, and decisions to reflect the most up-to-date scientific and technological developments; the commitment by developed countries to provide financial assistance to developing countries to ensure its successful implementation; and its attention to compliance from the outset.[3]

Because many ODSs are also potent greenhouse gases ("GHGs") that contribute to climate change,[4] their phase-out under the Montreal Protocol has provided an often overlooked bonus for climate mitigation: by the end of the decade, the Montreal Protocol will have done more to mitigate climate change than the initial Kyoto Protocol reduction target, reducing emissions in terms of carbon dioxide ("CO_2")-equivalent by five to six times that of the climate treaty, the equivalent of eleven gigatons of carbon dioxide - equivalent per year ("$GtCO_2$-eq. yr^{-1}").[5] In effect, the Montreal Protocol has delayed climate impacts — including abrupt and irreversible impacts — by about ten years, and, with the additional measures discussed below, can delay it still further.[6]

Partly as a result of the Montreal Protocol's success, there is a public misconception that the problem of ozone depletion has been "solved." Some in the international community, referring to the Montreal Protocol, have gone so far as to ask whether the Montreal Protocol should be dismantled or merged into the still unproven climate treaty regime.

But the Montreal Protocol's work to protect the ozone layer is far from done. In 2006 scientists recorded the near largest Ozone Hole ever recorded over Antarctica, and new data indicates that the recovery of the ozone layer above the Antarctic will be delayed by fifteen years, with a return to pre-1980 levels not occurring until 2065.[7] Ozone layer recovery at mid-latitudes also is delayed and will not return to pre-1980 levels until 2049.[8] The new data does not take into account illegal trade in banned ODS, nor other challenges of compliance,[9] especially in developing countries where the 2010 ban on chlorofluorocarbons ("CFCs") is quickly approaching.[10] Without full compliance, the recovery will be delayed further.

The continuing impact of ODSs on the ozone layer, and the significant contribution ODSs and some of their substitutes are making to climate change, demonstrate that the Parties' commitment to protect the ozone layer has not yet been fulfilled, and that significant challenges remain.[11] These challenges to the future success of the Montreal Protocol — the most efficient and effective treaty to date in reducing GHG emissions and mitigating climate change, in addition to protecting the ozone layer — come at a time when the impacts of climate change are becoming increasingly apparent.[12]

National Aeronautics and Space Administration scientist James Hansen warns that we may have as few as ten years left before positive feedbacks in the climate system could accelerate global warming and push the climate system across the tipping point for non-linear change that would create "a different planet," with an ice-free Arctic and coastlines obliterated by rising sea levels.[13] Abrupt non-linear changes to the climate, also known as Rapid Climate Change Events, include the melting of the Greenland ice sheet. A complete melting of the Greenland ice sheet would raise sea levels by an estimated seven meters.[14]

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But sea levels do not need to rise by seven meters to cause global catastrophe: a 1.5 meter rise would threaten 36,000 square miles of land along the U.S. Atlantic and Gulf Coasts with flooding,[15] as well as causing devastation to vulnerable low-lying island and coastal States. The fallout from this or other abrupt climate change events could destabilize the world's social and governance institutions, which at the very least would undermine efforts to reduce GHG emissions and at worst could provoke global military conflicts.[16] In any scenario, untold millions would suffer.

The GHG reductions achievable under the Montreal Protocol offer critical low-cost insurance against abrupt changes to the climate, effectively buying the world more time to get the Kyoto Protocol's global carbon market running effectively and efficiently, and to agree on the post-Kyoto regime.

The Parties have the opportunity to take immediate action at the 20th anniversary of the Montreal Protocol in September 2007 to strengthen the ozone regime's ability to protect the ozone layer, as well as to maximize its ability to mitigate climate impacts — in an amount that may exceed the Kyoto Protocol's reductions. This may be accomplished by adjusting the Montreal Protocol to account for the climate impacts of ODSs and their substitutes, with due regard for the special situation of developing countries and without losing sight of the other challenges currently facing the ozone treaty. This is most effectively accomplished by (1) explicitly focusing on climate benefits in addition to ozone benefits, using Life-Cycle Analysis and Life-Cycle Climate Performance to assess the cumulative environmental impacts of ODS substitutes and other strategies under the Montreal Protocol; (2) minimizing the impacts by favoring the least harmful ODS substitutes, and promoting further technological innovations, including redesign of equipment, processes, substitutes, and products, as well as not-in-kind alternatives; and (3) providing incentives for the destruction of CFCs currently contained in products and equipment, or otherwise regulating end-of-life recovery and destruction.

The Montreal Protocol is widely considered one of the world's most successful multilateral environmental agreements.

These adjustments to the Montreal Protocol are consistent with its evolutionary process, as the treaty has repeatedly been adjusted over its nearly twenty year history to reflect current developments in scientific understanding and technological capabilities. Such adjustments also are consistent with more general principles and concepts of international environmental law, which create a general obligation to assess and minimize environmental impacts.

New Ozone & Climate Challenges

The ozone layer's return to pre-1980 levels at mid-latitudes can be facilitated through two actions. One is to curb higher than anticipated emissions of hydrochlorofluorocarbons ("HCFCs") by 2015. The other is to limit the adverse impacts from emissions of CFCs currently contained in products and equipment (known as "banks") that will be emitted to the atmosphere once those products and equipment reach the end of their useful life. These actions also will delay the impacts of climate change. They should be undertaken as part of a broader effort to ensure that the Montreal Protocol systematically considers and takes into account the climate impacts of ODSs and their substitutes, and minimizes the impact of its strategies on climate.

To protect the ozone layer, the Montreal Protocol mandates the focused phase-out of CFCs and other ODSs, which are used in refrigerators, air conditioning units, and a variety of foams, solvents, and other applications such as aerosol propellants, fumigants, and fire-fighting agents. To facilitate the phase-out, the Montreal Protocol, through its Multilateral Fund, provides financial assistance to developing countries to replace CFCs with chemicals less harmful to the ozone layer, such as HCFCs.[17] HCFCs have lower ozone-depletion potentials ("ODPs") and generally have lower global warming potentials ("GWPs") than CFCs. They were envisioned as short-term substitutes, scheduled for phase out by 2030 in developed countries (with 0.5 percent allowed for servicing after 2020) and 2040 in developing countries (with consumption frozen in 2016 at 2015 levels).

While HCFCs were critical in replacing the more damaging CFCs, their continued use creates problems for the ozone layer and the climate. This is both a problem of under-regulation, where the production of chlorodifluoromethane ("HCFC-22") is rapidly expanding despite the availability of superior substitutes and alternatives, and where banks are not yet regulated at all; and over-regulation, where the use of dichlorotrifluoroethane ("HCFC-123") is being phased-out despite its negligible impact on the ozone layer and the higher energy efficiency and lower GHG emissions achieved by its use in large-building air-conditioning units, know as chillers.

Under-Regulation of Inferior Substitute: HCFC-22 and Its HFC-23 By-product

In addition to delaying the recovery of the ozone layer at mid-latitudes,[18] the production of HCFC-22 results in emissions of trifluoromethane ("HFC-23"), an unwanted by-product that is a "super greenhouse gas" 11,700[19] times more powerful at warming the planet than CO_2.[20] The combined climate emissions of HCFC-22, with a GWP of 1,780, and its HFC-23 by-product, with GWP of 11,700, are projected to reach 1 $GtCO_2$-eq. by 2015 — roughly equal to the emissions reductions presently required under the Kyoto Protocol.[21]

The production and consumption of HCFCs is projected to expand to levels significantly higher than the 163,000 tonnes by

2015 originally predicted by the Technology & Economic Assessment Panel ("TEAP") in 1998. One specific country alone has an installed annual production capacity of more than 300,000 tons, and over the next decade HCFC production could increase to as much as 800,000 tons (in addition to feedstock use which is not currently controlled under the Montreal Protocol). Approximately 75 percent of all HCFC production will be from HCFC-22, a transitional chemical used in small air conditioning units and refrigerators. The projected increase in HCFC production is being driven by the transfer of the old technology from developed to developing countries, as well as by rapid economic growth in the developing countries. The Kyoto Protocol's Clean Development Mechanism ("CDM"), as applied to HFC-23, also is partly to blame.

Under Kyoto's CDM, the capture and destruction of HFC-23 emissions at facilities producing HCFC-22 can generate Certified Emissions Reductions ("CERs"). Given the relatively low cost of HFC-23 destruction compared to the value of CERs on the global carbon market,[22] the CDM is inadvertently creating a "perverse incentive" that has created windfall profits for HCFC-22 producers — effectively acting as a subsidy that is driving the expanded production of HCFC-22.[23] HFC-23 destruction projects have dominated the CDM market, accounting for 52 percent of all project-based carbon volumes transacted in 2006 and 64 percent in 2005.[24] The abundance of CERs from HFC-23 destruction projects appears to be depressing the price of carbon, which in turn harms the competitiveness of other CDM projects.[25]

This problem will not be going away anytime soon. Under the Montreal Protocol, production of HCFC-22 can expand in developing countries until 2016, when the baseline is set at 2015 levels, and then remain in production for another 34 years, with the profits from HFC-23 destruction projects discouraging the transition to superior ODS substitutes that are ozone- and climate-safe. Without the subsidy from HFC-23 destruction projects, it is likely that the projections for HCFC-22 production would be lower. The initial trend of HCFC production and consumption would be higher in such scenario, but later would be similar to developed countries, many of which have already accelerated the phase-out of HCFCs and begun the transition to superior substitutes.[26] The European Union ("EU") has already phased-out HCFCs altogether[27] and other countries such as Japan and the United States are expected to adopt phase-out dates for HCFCs ahead of the 2030 deadline imposed by the Montreal Protocol for developed countries.

Past transitions from CFCs to HCFCs and hydrofluorocarbons ("HFCs") helped drive technological innovation in substitutes, manufacturing processes, and equipment, which in many cases resulted in gains in energy efficiency, reduced leakage, or other technological improvements. To date about eighty percent of ODSs that would be in use without the Montreal Protocol have been replaced by non-fluorocarbon chemicals, which do not deplete the ozone layer. These substitutes include not-in-kind chemical substitutes and product alternatives (*e.g.* a roll-on deodorant instead of a spray can), changes to manufacturing processes, conservation measures, and doing without. The transition out of HCFCs is likely to produce similar innovations and environmental advances. But developing countries, if they continue their over-reliance on HCFC-22, will be slow to benefit from these positive changes.

Over-Regulation of HCFC-123

The Montreal Protocol does not systematically consider the climate impacts from the levels of energy efficiency achieved in equipment that uses ODSs. Equipment that achieves a high rate of energy efficiency is better for the climate, as its lower energy use results in fewer GHG emissions from power generation (assuming the power does not come from renewable sources or sources that do not result in GHG emissions but raise other environmental concerns, such as nuclear reactors). It also results in lower operating costs over the life of the equipment.

Large-building air-conditioning units, or chillers, provide a case in point.[28] The level of their energy efficiency depends in part on the type of refrigerant used, with HCFC-123 allowing for greater efficiency than others. HCFC-123 has a low ODP of 0.02, a low GWP of 76, a short atmospheric lifetime of 1.3 years,[29] and offers significant climate benefits due to its significant advantage in energy efficiency over the primary alternative, tetrafluoroethane ("HFC-134a").[30] In addition, it operates at a low pressure in chillers designed to minimize leaks and is therefore considered to have a negligible impact on ozone depletion.[31] At present, HCFC-123 offers superior performance for low pressure chillers (although more energy efficient alternatives may be developed in the future).[32]

UNEP's Refrigeration, Air-Conditioning and Heat Pumps Technical Options Committee concluded in their 2002 Assessment that "[b]ased on integrated assessments, considering the trade-offs between negligible impacts on stratospheric ozone and important benefits in addressing global warming, these studies recommend consideration of a phase out exemption for HCFC-123."[33]

But because HCFC-123 is an HCFC, it is scheduled for phase-out with the rest of the HCFCs. Chillers are very expensive (U.S. $200,000 to $600,000), and have 30-year life-cycles. As a result, the phase-out of HCFC-123 could force building owners looking to buy a chiller within the next several years to use alternatives that are less energy efficient, more costly to operate, and more damaging to the climate.[34]

Failure to Regulate ODS Banks

The Montreal Protocol does not place any controls on emissions from "banks" and provides minimal incentives for their recovery and destruction.[35] Banks are defined as the chemicals contained in equipment and products or stored in tanks.[36] Large amounts of CFCs and other ODS substitutes such as HCFCs and HFCs (not an ODS but a GHG) currently exist in refrigerators, air conditioners, insulating foams, and chemical stockpiles, where they can leak. When equipment reaches the end of its useful life, the chemicals inside are usually released into the atmosphere.

With limited incentives for recovery and destruction of ODS banks, most of the CFCs in banks will be emitted into the atmosphere over the next decade, with detrimental impacts for

both the ozone layer and the climate. In addition to contributing to the expected delay in ozone recovery, emissions from CFC banks by 2015 could equal approximately 7.4 $GtCO_2$-eq. yr^{-1} [37] — more than seven times the size of the emissions reductions initially targeted by the Kyoto Protocol.[38]

Compliance Challenges

The full phase-out of CFCs in 2010 in developing countries may present the most difficult compliance challenge yet for the Montreal Protocol.[39] Illegal trade in CFCs and other ODSs is expected to increase once the complete ban on CFCs takes effect, which will exacerbate the black market operating in both developed and developing countries.[40] Illegal trade currently is estimated to represent about ten to twenty percent of all trade in ODSs, which in CFCs alone comprises 7,000 to 14,000 tons per year, with a value of U.S. $25-60 million.[41] The Montreal Protocol instituted a licensing system for the transboundary shipments of ODSs to combat illegal trade, but compliance remains a critical issue.[42]

Other compliance challenges arise from the lack of control measures for use of ODSs, such as HCFC-22 and methyl bromide, in feedstock, process agent, and Quarantine and Preshipment ("QPS") applications. This makes it possible for ODSs produced for these applications to be used illegally in other applications that have been phased out. Feedstock and process agent applications are not subject to control measures because, in theory, the ODSs used in these applications are either converted to chemicals that do not harm the ozone layer or are destroyed in the conversion process.[43] But this does not take into account any by-products, such as HFC-23 or CTCs, nor the possibility some will be diverted to illegal trade.

Legal and Policy Analysis

Assessing Climate Impacts of ODS Substitutes

The Montreal Protocol and its Parties have previously recognized the need to consider the full environmental impacts of their strategies, especially the climate impacts of ODS substitutes, which often are the most significant impacts. Article 2F(7) of the Montreal Protocol sets forth the control measures for HCFCs and states that in addition to minimizing ozone depletion, the decision to use HCFCs should meet other environmental standards, *i.e.*: "Controlled substances in Group I of Annex C (*e.g.*, HCFCs) are selected for use in a manner that minimizes ozone depletion, in addition to meeting other environmental, safety and economic considerations."

This approach was supported by Decision V/8 (Fifth Meeting of the Parties, Bangkok 1993) which requested the Parties to consider ODS substitutes in light of Article 2F and their "environmental aspects." This was expanded in Decision VI/13 (Sixth Meeting of the Parties, Nairobi 1994), stating that the TEAP "should consider how available alternatives compare with hydrochlorofluorocarbons with respect to such factors as energy efficiency, total global warming impact, potential flammability, and toxicity . . ."

Subsequently, a group of 41 Parties also issued a Declaration at the Tenth Meeting of the Parties (Cairo 1998) reiterating their support for the consideration of climate impacts, noting the "scientific indications that global warming could delay the recovery of the ozone layer" and that "environmentally sound alternative substances and technologies are commercially available for virtually all HCFC applications." The Declaration urged "all Parties to the Montreal Protocol to consider all ODS replacement technologies, taking into account their global-warming potential, so that the use of alternatives with a high contribution to global warming should be discouraged where other, more environmentally friendly, safe and technically and economically feasible alternatives or technologies are available."[44]

The consideration of environmental impacts is part of a general obligation under principles and concepts of international environmental law. Specifically, the Environmental Impact Assessment ("EIA") principle places a general duty on States to consider the cumulative environmental impacts of proposed actions where there are possible transboundary or global impacts.[45] The EIA principle is related to the concept of Integrated Pollution Prevention and Control ("IPPC"), which was developed to respond to the fact that environmental regulations targeting a single problem can simply shift pollution from one medium to another rather than eliminate it. Broadly, it requires a holistic assessment of environmental impacts when developing regulations, particularly for the use of chemicals, and has been incorporated into numerous multilateral environmental agreements and other international instruments, including the European Commission's 1996 IPPC Directive.

IPPC requires a "life cycle analysis" of environmental impacts to measure the "cradle-to-grave" impacts of a product, chemical, or technology. This kind of Life Cycle Analysis ("LCA") was codified by the International Standards Organization 14040 Series. It was described in the IPCC/TEAP Special Report as involving an "inventory of relevant inputs and outputs of the system itself and of the systems that are involved in those inputs and outputs (Life Cycle Inventory Analysis). The potential environmental impacts of these inputs and outputs are then evaluated . . ."[46]

The concept of Life Cycle Climate Performance ("LCCP") is considered a submethod of LCA.[47] LCCP was proposed by the TEAP to calculate the "cradle-to-grave" climate impacts of the use of ODSs in equipment, measuring the "direct" GWP of ODSs as well as the "indirect" GWP from GHG emissions from power generation used in operating the equipment, placing a premium on energy efficiency. The TEAP explained LCCP:

> The concept of Life-Cycle Climate Performance (LCCP) is intended to provide a rational way of assessing only those environmental aspects affecting climate (*i.e.* only a sub-segment of item (a)) [of Decision V/8 requesting each Party " . . . to give consideration in selecting alternative substitutes . . . to: Environmental aspects . . ."]. . . The total impact on climate of any technology results from a combination of the "direct" emissions of greenhouse gases from the system throughout its life cycle and the "indirect" emissions of

> greenhouse gases associated with the energy used or saved by the system. . . When the use of a specific technology creates an incremental energy saving, the reduction in CO_2 emissions from the energy use can far outweigh the direct emissions over the expected life of the product.[48]

LCCP provides a more complete assessment than an earlier concept known as Total Equivalent Warming Impact[49] because it includes fugitive emissions from the manufacture of the ODSs and emissions from operating, servicing, and the disposal of the ODSs at the end of the equipment's useful life.[50]

Minimizing the Climate Impacts of ODS Substitutes

Based on such a holistic environmental assessment, the Montreal Protocol then must minimize the climate impacts of ODS substitutes and alternatives, an approach that is consistent with the Montreal Protocol's ultimate objective of eliminating the use of ODSs through policies based on "developments in scientific knowledge, taking into account technical and economic considerations. . ."[51]

Developments in scientific knowledge include the link between ozone depletion and climate change. The link is based on complex atmospheric interactions between ozone and climate and the fact that many ODSs are also GHGs, as described by TEAP,[52] and the joint IPCC/TEAP Special Report.[53] This is acknowledged in the Montreal Protocol, which states that the Parties are "[c]onscious of the potential climatic effects of emissions of these substances (*i.e.* ODSs)."

The IPCC/TEAP stated that "[o]ptions chosen to protect the ozone layer could influence climate change. Climate change may also indirectly influence the ozone layer."[54] The Scientific Assessment Panel elaborated further, noting that climate change is likely to obscure or even harm the recovery of the ozone layer.[55]

The replacement of ODSs with substitutes and other alternatives, including not-in-kind alternatives, will produce climate benefits to the extent the changes result in higher energy efficiency or otherwise reduce climate emissions. A more explicit and focused set of strategies is needed within the Montreal Protocol to minimize climate impacts.

This is supported by Agenda 21, which calls on Parties to "[r]eplace CFCs and other ozone-depleting substances, consistent with the Montreal Protocol, recognizing that a replacement's suitability should be evaluated holistically and not simply based on its contribution to solving one atmospheric or environmental problem."[56] This is further supported by the exclusion of gases regulated by the Montreal Protocol from the UN Framework Convention on Climate Change and the Kyoto Protocol. The exclusion was made with knowledge that many of these gases have extremely high GWPs and that their emissions can substantially contribute to climate change, thereby placing additional responsibility on the Parties to the Montreal Protocol to minimize the climate impacts of ODS substitutes.

As with the assessment requirement, the minimization requirement is based on principles and concepts of international environmental law that place a general obligation on States to: (1) ensure that the activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction; (2) prevent damage to the environment by reducing, limiting, or controlling activities that might cause such damage; and (3) cooperate in addressing environmental problems.[57]

This obligation, which has been codified in a broad form by the European Commission's Integrated Pollution Prevention and Control Directive, places an affirmative duty on States to take preventative measures against pollution.[58] More specifically, this obligation is embodied in the Substitution Principle, which is generally defined as "the replacement or reduction of hazardous substances in products and processes by less hazardous or non-hazardous substances, or by achieving an equivalent functionality via technological or organisational measures."[59]

The Substitution Principle has been codified domestically in numerous regulations governing the use of hazardous chemicals.[60] Recently, it was included in the European Union's new chemical policy entitled the Regulation, Evaluation, Authorisation and Restriction of Chemicals, which requires manufactures, importers, and users of chemical substances to "analyse the availability of alternatives and consider the risks and the technical and economic feasibility of substitution."[61]

UNEP, in conjunction with the U.S. Environmental Protection Agency, Japan's Ministry of Economy, Trade, and Industry, and the Alliance for Responsible Atmospheric Policy, has developed its own version of the Substitution Principle, known as Responsible Use, which recommends the use of technologies so long as the undesirable effects are minimized and the technology achieves higher environmental performance than its alternatives.[62] Responsible Use Principles would permit the use of ODS substitutes "only in applications where they provide safety, energy efficiency, environmental, or economic advantage"[63] and where "undesirable effects are minimized and the technology achieves higher environmental performance than its alternatives."[64]

Recommendations

An assessment of the environmental impacts of ODS substitutes, under the cumulative LCA methodology and the climate-specific LCCP methodology, would include direct impacts from a substance's ODP and GWP. Moreover, indirect impacts such as by-product emissions, leakage, charge size, recovery/destruction options, and energy efficiency also would be incorporated.

Such an assessment, together with the duty to minimize environmental impacts, dictates three immediate and attainable adjustments:

- accelerating the phase out of HCFC-22;
- allowing the continued use of HCFC-123 until superior alternatives emerge; and
- creating greater incentives for, or otherwise regulating, the recovery and destruction of ODS banks.

The problem of compliance also warrants further attention.

In addition to strengthening protection of the ozone layer, these adjustments have the potential to reduce GHG emissions

by up to 1–2 $GtCO_2$-eq. by 2015 — which is greater than the required reductions under the Kyoto Protocol.

Accelerated Phase Out of HCFC-22 and its HFC-23 By-product

The accelerated phase-out of HCFC-22 in the developed and developing countries will avoid the projected increase of HCFC-22 production and emissions of its "super greenhouse gas" HFC-23 by-product.[65] It would also reduce the perverse transfer of the old technology to manufacture HCFC-22 and its raw material to developing countries.[66]

The availability of substitutes for ODSs was affirmed by Regulation (EC) No. 2037/2000 of the European Parliament and of the Council of 29 June 2000 on substances that deplete the ozone layer, which adopts stricter control measures for ODSs, including the accelerated phase-out of HCFCs, due to the "earlier than anticipated availability of technologies for replacing ozone-depleting substances." The IPCC/TEAP Special Report also clarified the availability of substitutes for many HCFC applications, including HFC-134a, HFC blends, CO_2, hydrocarbons, and ammonia.[67] Many of these substitutes provide better energy efficiency and can be assessed based on LCA/LCCP before selection.

Under an LCA/LCCP analysis, determining which substitute offers superior environmental performance depends as much on the indirect impacts such as leakage, charge size, potential for recovery/destruction at equipment end-of-life, and energy efficiency, as it does the more direct measures of ODP and GWP. For example, HFC-134a and HFC blends would qualify as superior alternatives in minimizing climate impacts *only if* they were used in equipment that achieves greater energy efficiency than HCFC-22 and the other substitutes. Reduced leak rate and greater recovery/destruction also would enhance its standing. Use of CO_2, hydrocarbons, and ammonia would qualify as superior alternatives in minimizing climate impacts *only if* their lower energy efficiency levels were improved or offset by their low GWPs.

The accelerated phase-out of HCFCs raises several issues that must be resolved by the Parties as they proceed, including the need to ensure that developed countries will continue to fulfill their commitment to provide additional financial assistance to developing countries through the Multilateral Fund to ensure compliance with phase-out schedules.[68] While some growth in HCFC consumption may be unavoidable and economically necessary for some developing countries, an aggressive phase-out schedule is nevertheless technologically and economically feasible. It should start by moving the base year forward, *i.e.*, to 2006, perhaps with some controlled growth allowed until 2010, and then a series of step-downs to ensure continuing progress and avoid the compliance problems that would otherwise arise (*i.e.*, 35 percent reduction by 2015, 65 percent reduction by 2020, and 99.5 percent reduction by 2030, with 0.5 percent allowed for servicing until 2040). This approach, coupled with financial assistance for the transition to superior substances and technologies, would ensure immediate and continuous progress, and avoid the extremely high levels of growth otherwise projected. It also would make it possible for the global carbon market to factor in whatever CERs, if any, the CDM allows for the destruction of HFC-23 from new production beyond that allowed by the current methodology.[69] Regulators in the EU as well as the architects of the post-Kyoto regime would be able to calculate the maximum HFC-23 emissions, and the likely CDM credits possible, and set the overall emissions cap accordingly.

Continued Use of HCFC-123 Until Superior Alternatives Emerge

This same analysis applies to the need to exempt HCFC-123 from phase-out and allow its continued use until superior substitutes are developed. The continued use would be based on its negligible ozone impacts and the energy efficiency advantage of HCFC-123 chillers over the primary alternative, HFC-134a, where HCFC-123 results in lower GHG emissions associated with power generation to run the chillers, as well as lower operating costs over the 30-year life of the equipment.

At the Science Symposium held in Prague in 2004 and chaired by Dr. Mario Molina in conjunction with the 16th Meeting of the Parties, it was reported that "HCFC-123 could be allowed in specific air conditioning applications where its use promotes superior energy efficiency and assures near-zero refrigerant emissions."[70]

Without the continued use for HCFC-123 until superior alternatives emerge, the energy efficiency standard for chillers will decrease, adversely impacting the climate and lowering the threshold against which future improvements in energy efficiency will be measured. HCFC-123 has a very low ozone-depletion potential, a lower global warming potential than HFC-134a, and operates at a low pressure in chillers designed to minimize leaks. UNEP and others have stated that its continued use would have a virtually negligible impact on the ozone while offering superior environmental benefits over alternatives.[71]

Allowing the continued use of HCFC-123 would create a precedent only for ODSs that achieve superior environmental performance over existing alternatives; its continued use could be structured to encourage continuing innovation for superior alternatives, perhaps requiring re-application after 2040, or after better substitutes are identified by the TEAP, assuming existing use is permitted through product life cycles. At present, HCFC-123 is the only ODS that meets this environmentally superior criteria. Moreover, any impact on the ozone layer from HCFC-123 could be offset by requiring the destruction of ODSs from banks on a ODP-weighted basis of 1:1 or greater, which would have the added benefit of addressing the other cause of the ozone layer's delayed recovery: CFC banks expected to be emitted into the atmosphere over the next decade. It also would provide additional incentive for further innovation to find superior alternatives, as would incentive schemes like the Energy Star Program.[72]

Greater Incentives for Destruction of ODS Banks

Emissions of CFCs and other ODSs from banks could be avoided by creating greater incentives for their recovery and destruction. The Montreal Protocol should provide greater

incentives for destruction of banks, for example, by allowing credits to carry forward for more than one year and to transfer among chemical groups, where the destruction of an amount of CFCs would allow the production or consumption of an equal amount, on an ODP-weighted basis, of HCFCs.[73] The Montreal Protocol could provide still greater incentives by linking with the Kyoto Protocol to provide Certified Emissions Reductions under the Clean Development Mechanism for the destruction of ODS banks, given the high GWPs of CFCs. The destruction of banks would help ensure compliance, since the ODS in banks could not be reused or recycled after the CFC ban enters into force in 2010 in developing countries.[74]

Strengthening Compliance

The Montreal Protocol should strengthen its compliance efforts by building on work already underway in the Secretariat, UNEP OzonAction's compliance assistance program, and elsewhere, to promote an ambitious capacity building program. This can be accomplished by linking, for example, with the Green Customs Initiative of UNEP, and the International Network for Environmental Compliance & Enforcement (INECE). A much more aggressive effort is warranted by the combined ozone and climate benefits from strict compliance.

Under Decision XVII/16, the Parties to the Montreal Protocol requested a feasibility study for developing systems for monitoring transboundary movements of ODSs. The study proposed options for monitoring systems that could help reduce illegal trade in ODSs, which has become a worldwide problem as the phase-out of CFCs and other ODSs has progressed.[75] To combat illegal trade, the study made a series of recommendations, including a proposal to set up a global ODS tracking system that builds on current licensing and reporting systems and includes cross-checking of licenses and quotas in a centralized manner.[76]

With regard to the use of ODSs for feedstocks, process agents, and QPS applications, requiring mandatory periodic review of current uses and their direct and indirect impacts on the ozone and climate, utilizing a Life Cycle Analysis, would lay the groundwork for future action banning the use of ODSs where alternatives that are less harmful to the environment are available.

Conclusion

The Montreal Protocol must explicitly assess the environmental impacts, including both ozone and climate impacts, of ODSs and ODS substitutes, and implement policies that minimize these impacts by favoring ODS substitutes that are the least harmful to the environment, until superior substitutes emerge.[77] The failure to do so will jeopardize the continued success of the Montreal Protocol in protecting the ozone layer and mitigating climate change by perpetuating a market that actually works against the most environmentally-friendly ODS substitutes. Conversely, the requirement to assess and minimize the environmental impacts of ODSs and their substitutes will create a fair market that favors the most environmentally-friendly ODS substitutes, resolve the perverse incentives problem, and ensure the continued success of the Montreal Protocol in protecting the ozone layer and mitigating climate change. The Montreal Protocol also must address the significant ODSs stored in banks that otherwise will be released at end-of-life, and that represent more than seven times Kyoto's reductions in terms of climate emissions.

Ultimately, avoiding the worst impacts of climate change depends upon the successful evolution of the Kyoto Protocol (and its successor), including its international emission trading system, with universal participation and expanded targets after 2012 to reduce GHG emissions enough to avoid dangerous anthropogenic interference with the climate, including abrupt climate change events. Significant progress has been made with Kyoto's market-based mechanisms. But Kyoto and the global carbon market remain works in progress, with the prospect of achieving the substantial reductions necessary to avoid "dangerous anthropogenic interference" still many years, if not decades, away.

The emissions reductions achieved under the Montreal Protocol are buying more time to develop a sufficiently strong climate regime, with a robust and efficient global carbon market, that efficiently and effectively delivers the needed carbon reductions. It is impossible to say just how much the planet will warm before triggering an abrupt climate change event, but critical thresholds could be as near as ten years away, and it is imperative to adjust the Montreal Protocol to avoid every ton of CO_2-eq. emissions that it can. In addition to finishing the job of protecting the ozone layer, this is one of the best insurance policies the world can buy to give us time to succeed with our long-term climate controls. And it is an insurance policy that we can be confident will be delivered by the world's best environmental treaty.

Endnotes: Strengthening the Montreal Protocol

[1] Several Parties have submitted adjustments for the 20th Anniversary meeting of the Montreal Protocol in September 2007.

[2] World Meteorological Organization & UN Env't Programme, Science Assessment Panel of the Montreal Protocol on Substances that Deplete the Ozone Layer, *Scientific Assessment of Ozone Depletion: 2006*, *Executive Summary*, at 3 (Aug. 18, 2006), *available at* http://www.wmo.ch/web/arep/ozone_2006/exec_sum_18aug.pdf (last visited Feb. 3, 2007) [hereinafter Science Assessment of Ozone Depletion: 2006].

[3] Richard Benedick, Ozone Diplomacy: New Directions in Safeguarding the Planet (Harvard University Press 1991); *see also* Stephen O. Andersen & K. Madhava Sarma, Protecting the Ozone Layer: the United Nations History (Earthscan Publications Ltd. 2002); David Hunter, James Salzman & Durwood Zaelke, International Environmental Law & Policy, Ch. 9 (Foundation Press, 3d ed. 2007).

Endnotes: Strengthening the Montreal Protocol *continued on page 74*

An Overview of the International Regime Addressing Climate Change

*by Kyle W. Danish**

Introduction

The current international climate change regime comprises a network of agreements and mechanisms.[1] A high water mark in the evolution of this regime was the entry into force in February 2005 of the Kyoto Protocol to the United Nations Framework Convention on Climate Change ("UNFCCC" or "Framework Convention").[2] However, the Kyoto Protocol will not be the final word on the issue. Its emission limits cover only a fraction of the world's greenhouse gas ("GHG") emissions and those limits expire in 2012.

Addressing climate change presents unique challenges for international law, which already is complicated to negotiate and difficult to enforce. Climate policies potentially reach all activities that burn fossil fuels and therefore go to the heart of each country's economy. In addition, the nature of the issue is such that it will require a very long-term response under conditions of scientific uncertainty. For these reasons, governments are understandably cautious about making commitments under international law to limit GHG emissions and are sensitive to whether their trade competitors will commit to undertake comparable efforts.

This article will examine how governments have attempted, so far, to address the issue of climate change through international law. The article will provide an overview of the different treaties, rules, and institutions that comprise the existing international climate change regime, including a review of the negotiating history that has brought the regime to it current status.

The United Nations Framework Convention on Climate Change

The foundation for the international climate change regime is the Framework Convention, a treaty with practically global participation by governments. The Framework Convention was opened for signature in 1992 and garnered a sufficient number of ratifications to enter into force in 1994. It currently has 189 Parties, including the United States.[3] The Kyoto Protocol is a direct and formal outgrowth of the Framework Convention.

The Framework Convention is the first chapter in the evolution of the climate change regulation, serving as a constitution-like document guiding intergovernmental cooperation on this issue. The UNFCCC does not establish binding limits on GHG emissions for any countries. Rather, true to its name, it forms a framework for further action and cooperation on the issue of climate change.

Article 3 of the Framework Convention sets forth a series of guiding "principles" that attempt to balance the aims of environmental protection, economic development, and the general division of burdens between developed and developing country Parties. One of the principles is the so-called "precautionary principle," which provides that where there are "threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing [precautionary] measures."[4] However, such measures should be "cost-effective so as to ensure global benefits at the lowest cost."[5] Furthermore, the Parties have a "right to, and should promote sustainable development," taking into account "that economic development is essential for adopting measures to address climate change."[6]

A fundamental and recurring theme in the UNFCCC is that developed and developing country Parties have common but differentiated responsibilities and respective capabilities.

A fundamental and recurring theme in the UNFCCC is that developed and developing country Parties have "common but differentiated responsibilities and respective capabilities,"[7] reflecting a view that developed countries bear a greater historical responsibility for the accumulation of GHG emissions and have greater capacity to take action. Thus, the Framework Convention divides the Parties into two main groups: the Annex I countries, which comprise primarily developed countries, and the non-Annex I countries,

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Courtesy of Ursula Kazarian

International climate change agreements and mechanisms aim to protect areas vulnerable to global warming, such as the polar regions.

which comprise primarily developing countries. In setting forth commitments under the treaty, the UNFCCC makes certain commitments general to all Parties, but also assigns certain additional obligations to the Annex I Parties.

The UNFCCC provides that all Parties will develop and submit national inventories of emissions by sources and removals by sinks,[8] implement national plans that include measures to mitigate climate change,[9] promote and cooperate in technology transfer,[10] and encourage and assist in scientific research on climate change.[11] Each Party is required to submit "national communications" reporting on its progress in meeting these various commitments.[12] The Framework Convention also states that the extent to which developing country Parties effectively implement their commitments will depend on the level of assistance from developed countries.[13]

The UNFCCC outlines certain commitments only relevant to Annex I Parties. Article 4.2 obliges Annex I Parties to adopt national policies to mitigate climate change and to report on the progress of these policies "with the aim of" returning emissions to their 1990 levels.[14] This became a "soft" commitment; Annex I Parties generally have not met this target, and many missed the target by a wide margin. However, the 1990 emissions "baseline," became a touchstone for development of binding emissions limits under the Kyoto Protocol.

The Kyoto Protocol

The Kyoto Protocol is the current apogee of international efforts to address global climate change and a significant milestone in the evolution of international environmental law generally. As a non-party, the United States has no obligations under the Protocol, nor does it currently participate in the Conference of Parties meetings Parties to the Protocol ("COP/MOP").

A Brief History

The origins of the Kyoto Protocol can be found in the report of UNFCCC COP-1 in Berlin (1995). The Parties to the Framework Convention determined that a more forceful international response to the threat of climate change was needed,[15] leading to a commitment to develop a protocol with binding emission limits.[16] Consistent with the principle of "common but differentiated responsibilities," it was agreed that such limits should apply only to the developed country Parties.

Subsequent negotiations resulted in the Kyoto Protocol, which was adopted by the Parties at UNFCCC COP-3 at Kyoto in 1997. The Protocol outlined emission limits for the Convention's Annex I Parties. However, many key details about the Protocol were not resolved and negotiations continued. During this period, the United States government negotiated under a cloud of uncertainty as the U.S. Senate passed in 1997 a near-unanimous resolution directing the government not to enter into agreements under the Convention that "mandate new commitments to limit or reduce GHG emissions for the Annex I Parties, unless the protocol or other agreement also mandates new specific scheduled commitments to limit or reduce GHG emissions for developing country Parties within the same compliance period."[17]

Negotiations surrounding the Protocol reached a crisis point at UNFCCC COP-6, which was held in November 2000 in the Hague. After nearly reaching a compromise, the negotiations collapsed. This was followed by the election of George W. Bush. The Bush Administration quickly repudiated the Protocol, asserting that it "fails to establish a long-term goal based on science, poses serious and unnecessary risks to the U.S. and world economies, and is ineffective in addressing climate change because it excludes major parts of the world."[18]

The exit of the United States from the Protocol created a crisis in the negotiations because the Protocol rules for entry into force were designed to privilege the position of the United States and Russia. The United States' repudiation of the Protocol (followed by Australia) meant that Russia became the keystone for entry into force. The Protocol received a sufficient number of ratifications to enter into force in February 2005 after Russia ratified. November of that same year saw a parallel session of the COP (COP-11) and the first meeting of Parties to the Protocol (COP/MOP-1).

Overview of the Kyoto Protocol's Structure

The Kyoto Protocol sets forth binding emission limits for developed country Parties for the period of 2008–2012. Parties effectively have full discretion in developing national measures to meet their limits. Furthermore, they can take advantage of certain "flexible mechanisms," which offer market-based approaches for achieving emission reductions across borders. The Protocol is buttressed by a compliance system that combines facilitative systems with harder enforcement mechanisms.

Emission Limits

The central element of the Protocol is its binding quantified emission limitation and reduction commitments, which are established by Article 3 and inscribed in Annex B and apply only to Annex I Parties under the UNFCCC. The commitments vary on a Party-by-Party basis and are calculated, with some variations, with reference to each Party's 1990 emissions level. Each Annex I Party must meet its commitment as an annual average

during the period 2008–2012, which is referred to as the "first commitment period." Collectively, the assigned amounts of the Annex I Parties correspond to a 5.2 percent reduction below their 1990 emissions levels.

Basket of Greenhouse Gases

Each Annex I Party's commitment applies on the basis of a "basket" of six GHGs: carbon dioxide ("CO_2"), methane ("CH_4"), nitrous oxide ("N_2O"), hydrofluorocarbons ("HFCs"), perfluorocarbons ("PFCs"), and sulfur hexafluoride ("SF_6").[19] The Intergovernmental Panel on Climate Change ("IPCC") determined the "global warming potential" of each of these types of GHGs relative to carbon dioxide.[20] The Protocol expresses each Party's limit in the form of a "carbon dioxide equivalent" in tons of GHG emissions. In addition, for HFCs, PFCs, and SF_6, the Protocol allows the use of 1995 as a base year, easing the stringency of requirements for those GHGs.[21] The "basket" approach allows each Annex I Party a degree of flexibility in determining a cost-effective combination of reductions of different types of GHGs.

Consideration of Russia and Economies in Transition.

The Protocol provides former Soviet-bloc countries, referred to in the treaty as Parties "undergoing the process of transition to a market economy," with certain flexibility. Under certain circumstances, these Parties may use a base period other than 1990 for their emission commitments.[22]

Also, Russia has a significant and somewhat controversial accommodation under the Protocol. Russia's Annex B commitment limits the country to its emissions level in 1990. However, because of the collapse of the Russian economy in the 1990s, the country's emissions are below its 1990 level and are projected to stay below that level through 2012. Accordingly, Russia has significant headroom between its projected emissions and its assigned amount. This arrangement eases Russia's compliance burden and provides the country with a potential surplus of credits it can trade for profit. The Russian surplus, among other concessions, was critical to securing the country's participation in the Protocol. However, critics deride Russia's arrangement as watering down the overall environmental effectiveness of the treaty. These critics assert that Annex I countries can reduce their need to implement "new" emission reductions in their own countries by purchasing credits from Russia that resulted from "old" emissions reductions, also called Russian "hot-air."[23]

Commitment Period Approach

One of the elements of the treaty designed to provide for cost-effective compliance is the commitment period approach. Instead of a single fixed-year limit, the Protocol's emission commitments apply as an annual average to be achieved over a five-year period. This approach responds to the concern that a country's GHG emissions could rise or fall in any particular year because of difficult-to-control factors such as the vagaries of the business cycle or weather fluctuations affecting power production. The commitment period approach makes a government's efforts to mitigate its emissions less vulnerable to such factors.

European Union "Bubble"

Article 4 of the Protocol provides that two or more Annex I Parties may agree to fulfill their Article 3 commitments jointly, in which case they become subject to a summed assigned amount, rather than their individual commitments. The European Union ("EU") opted to take advantage of this provision, replacing each Member State's Annex B commitment with a collective commitment. The EU separately negotiated a burden-sharing agreement that re-distributes emission commitments among the EU Member States.[24] Under the EU burden-sharing agreement, Member States with relatively fast-growing economies have relatively more lenient emissions commitments.

Accounting for Land Use, Land Use Change, and Forestry

Activities that lead to deforestation, or even clearing of agricultural land and disturbance of soils, result in substantial releases of carbon dioxide. For these reasons, issues related to land use, land use change, and forestry ("LULUCF") have been a significant topic of discussion at the COPs. Notwithstanding the general benefits of focusing on LULUCF for purposes of climate change mitigation, LULUCF is controversial. Data on emissions and removals associated with LULUCF activities are less certain and reliable than data associated with industrial and power generation activities. Moreover, some governments and non-governmental organizations view LULUCF activities as distracting from investments in cleaner energy technologies.

The Protocol embodies a complicated set of compromises on these issues. First, the Protocol provides that, in meeting their Article 3 commitments, Annex I countries only may take into account a finite set of relatively easily-measured activities: "net changes in greenhouse gas emissions by sources and removals by sinks resulting from direct human-induced land-use change and forestry activities, limited to afforestation, reforestation and deforestation since 1990."[25] The Protocol did not fully resolve whether forest management other than afforestation and reforestation could count toward targeted reductions.

Annex I Parties that opt to use LULUCF activities to meet their commitments must issue certain credits for the tons sequestered by these activities, referred to as Removal Units ("RMUs"). Annex I Parties may add RMUs to their assigned amount or trade them through the Kyoto flexible mechanisms; however, banking surplus RMUs for future commitment periods is prohibited.[26] Finally, the Parties established certain limits to LULUCF-related projects under the Clean Development Mechanism ("CDM").

National Policies and Measures

Central to the Protocol's structure is an understanding that Annex I Parties are free to determine what combination of policies and measures they will develop to meet their quantified commitments. Article 2.1 provides that each Annex I Party, in meeting its Article 3 commitment, shall "implement and/or further elaborate policies and measures in accordance with its national circumstances." It goes on to delineate a list of preferred examples of such policies, including enhancement of

energy efficiency, enhancement of sinks and reservoirs of GHGs, and increased use of renewable energy. In all, Article 2 is more hortatory than obligatory in form.

Annex I Parties to the Kyoto Protocol have developed or are developing a variety of different national programs to meet their Article 3 commitments. A particularly noteworthy program is the cap-and-trade program established by the European Union Member States to help contribute to compliance with their "bubble" commitment, known as the European Union Emissions Trading Scheme ("EU ETS").

The 25 EU Member States developed the EU ETS as a cap-and-trade program, which will operate over two phases. The first phase runs from 2005 to 2007 and the second phase runs for the duration of the first commitment period, 2008 to 2012. During the first phase, each Member State must include in the program all of its "installations" in the following sectors: (1) energy (electricity and refineries with direct emissions); (2) production and processing of iron and steel; (3) minerals (cement, glass, and ceramic production); and (4) pulp and paper. Approximately 12,000 installations are covered in the first phase. In addition, Phase I will cover only emissions of carbon dioxide — the covered sectors represent 46 percent of the EU's carbon dioxide emissions. In Phase II, the EU might extend the ETS to cover other sectors and other GHGs. In the years before the onset of the first commitment period, the EU ETS has been a powerful engine for the development of a global emissions trading market, generating U.S. $18.8 billion in the first three quarters of 2006.[27]

The Flexible Mechanisms

Perhaps the most important international environmental law innovation of the Kyoto Protocol is its establishment and significant reliance on market-based instruments, often referred to as the "flexible mechanisms." These mechanisms are the Article 17 emissions trading system, Article 6 Joint Implementation, and the Article 12 CDM. Each provides a pathway through which an Annex I government, and entities regulated by that government, can meet the Article 3 commitments by investing in emission reduction or sequestration opportunities in other countries.

The rationale for the flexible mechanisms is straightforward. All emissions of GHG have an identical impact on the atmosphere regardless of their location, but the cost of achieving emission reductions varies substantially. The flexible mechanisms exploit these characteristics by providing what has been referred to as "where" flexibility. In theory, "where" flexibility can ensure that reductions will be implemented wherever they can be achieved at lowest cost.

In addition to the flexible mechanisms, the Protocol has other features that promote other kinds of flexibility and cost-effectiveness. For example, the Protocol also provides "what" flexibility: it allows Annex I governments to use their discretion to promote cost-effectiveness that make sense under their national circumstances. The Protocol also provides for "when" flexibility, which also promotes cost-effectiveness. Elements of the Protocol's "when" flexibility include the multi-year commitment period approach and the ability of Annex I Parties to "bank" surplus Kyoto credits to use in subsequent commitment periods.

Article 17 Trading

As discussed above, each Annex I Party's Article 3 commitment translates into an "assigned amount," of GHG emissions over the five-year commitment period. At the end of the commitment period, an Annex I Party's emissions cannot exceed its assigned amount. The Protocol further provides that a Party's assigned amount can be subdivided into "assigned amount units" ("AAUs"), with each AAU corresponding to the right to emit one carbon dioxide equivalent ton of GHG emissions. Article 17 directs the COP to develop rules under which Annex I can trade AAUs with one another.

A concern identified during the Protocol negotiations was that the Article 17 system could create a risk of "overselling." To address this risk, the Protocol provides that an Annex I Party may not engage in trades that would bring its holdings of AAUs or other Kyoto credits below the level of its "commitment period reserve," a limit calculated for each Annex I Party. For most Parties, the commitment period reserve precludes the sale of all but ten percent of their initial allotment of AAUs.

Article 6 Joint Implementation

The Protocol also establishes a form of emissions trading among Annex I countries that revolves around projects that reduce or remove emissions, referred to as Joint Implementation ("JI"). In a JI transaction, an Annex I Party invests in a project in the country of another Annex I Party, presumably because the cost of achieving such reductions is lower in the host country than in the investing country. The host Annex I Party then transfers a corresponding portion of its assigned amount to the investing Annex I Party in the form of Emission Reduction Units ("ERUs"). The investing Annex I Party can add these ERUs to its assigned amount. ERUs may be earned only for reductions or removals occurring during the 2008–2012 commitment period.

The requirement that the project achieve mitigation results "additional to any that would otherwise occur" is a central, complicated, and controversial touchstone for project-based emissions trading — both for JI and for the CDM. At the heart of the so-called "additionality" requirement is the view that credits should not go to reductions that would have occurred even without the intervention of an investing Annex I Party or legal entity.

Article 12 Clean Development Mechanism

A significant innovation of the Kyoto Protocol is the establishment of the CDM. Through the CDM, Annex I governments (and companies or other persons authorized by them) can earn certified emission reductions ("CERs") by investing in emission reduction projects in non-Annex I countries. Like JI, the CDM provides for project-based emissions trading. In this way, the CDM has been the primary mechanism for involvement of developing countries during the Kyoto Protocol's first commitment period. Because of a perceived abundance of low-cost mitigation project opportunities in developing countries, many experts believe that Annex I Parties are likely to rely on CDM projects as a significant strategy for compliance with their Arti-

cle 3 commitments.

Article 12 of the Protocol outlines the fundamental elements and requirements for the CDM. CDM projects, like JI projects, are required to achieve reductions in emissions that are "additional to any that would occur in the absence of the certified project activity."[28] Participation in each project must be voluntary and approved by each Kyoto Party involved.[29] Governments have established "Designated National Authorities" to approve projects and project participants. Article 12 adds an overlying "purpose" for CDM projects that is additional to climate change mitigation: to assist non-Annex I Parties in "achieving sustainable development;"[30] the determination of which is left to host country Designated National Authorities.

At the heart of the CDM is its project approval cycle. The cycle is a process through which the CDM Executive Board approves a project and then issues CERs for that project. The CDM Executive Board has taken a number of steps to facilitate and expedite the project cycle — and, indeed, to avoid a full project-by-project review whenever possible. One of the steps taken by the Executive Board has been to accredit a number of private companies to serve as project reviewers; these accredited companies are known as Designated Operational Entities ("DOEs"). DOEs have the primary responsibility for validating that a proposed CDM project meets all relevant requirements and for verifying on annual basis that the project has generated reductions. A second expediting strategy adopted by the Executive Board has been to build up a library of standard emissions baseline methodologies for certain types of commonly-implemented projects. The Executive Board has encouraged project participants to use these pre-approved methodologies. New proposed methodologies go before a subcommittee of the Executive Board, referred to as the Methodology Panel.

With this overview, the discussion that follows outlines the various steps in the project cycle. The first step is for the project participant(s) to develop a Project Design Document, for which there is a specific template. The Project Design Document contains critical information about the project, including whether it has earned host country approval from the Designated National Authority. The Project Design Document also describes the project's baseline, including whether the project participant is using a standard methodology or proposing a new methodology, and sets forth the case for the project's additionality.

A DOE reviews the Project Design Document. If the DOE determines that the project meets the CDM rules, then the DOE transmits a "validation" report for the project to the Executive Board. If the Executive Board agrees with the recommendations of the DOE, it "registers" the project. A registered project is eligible to receive CERs.

For each year of the project's crediting period, the project participant must deliver a monitoring report. The participant must retain a second DOE, different than the one responsible for the validation of the project, to verify these results. The DOE delivers its verification report to the Executive Board. If the Executive Board concurs with the DOE's verification, it will issue CERs into the national registry or registries requested by the project participant. In other words, issuance of CERs is on a *post hoc* basis; it occurs only after a demonstration that the project has achieved reductions.

Recognizing that the burdens of the standard CDM project approval process might exceed the resources of the developers of small projects, the CDM Executive Board has developed a set of streamlined procedures for approval of "small-scale" projects. Eligible project categories include certain types of renewable energy projects and certain types of energy efficiency projects.

Compliance

The Kyoto Protocol compliance system is more robust than that of any other international environmental agreement and has introduced a number of innovations to international law generally. The Protocol's compliance system includes mechanisms to generate information about performance, mechanisms to facilitate compliance, and mechanisms to deter non-compliance through penalties.

The fundamental measure of compliance under the Protocol is the obligation of each Annex I Party to hold a sufficient combination of credits at the end of the commitment period to cover its emissions. To this end, the Protocol establishes a number of mechanisms to generate information about holdings of credits and emissions. For example, Article 5 of the Protocol requires Annex I Parties to develop national systems for estimating emissions by sources and removals by sinks. Article 7 requires each Annex I Party to submit an annual emissions inventory that provides information necessary to determine progress toward compliance with its Article 3 commitment.

To evaluate compliance, Article 8 of the Protocol calls for the establishment of expert review teams. These teams are empowered to audit information submitted by Annex I Parties pursuant to Article 5 and Article 7. Claims of non-compliance come before the Compliance Committee,[31] which consists of two bodies: the Facilitative Branch and the Enforcement Branch, each consisting of delegates appointed by the Parties. The Facilitative Branch, consistent with its name, has assistance and early warning functions and aims to prevent non-compliance before it occurs. It can direct financial and technical assistance to Parties. The Enforcement Branch, by contrast, has quasi-judicial functions. It assesses compliance by Annex I Parties with respect to reporting requirements and Article 3 commitments. The Enforcement Branch is empowered to determine that Annex I Parties are ineligible to participate in the flexible mechanisms and can apply adjustments to emission inventories in response to information provided by Expert Review Teams. Under certain circumstances, a Party may appeal a decision of the Enforcement Branch to the COP/MOP.

An Annex I Party that fails to fulfill its Article 3 commitment — *i.e.*, because its emissions exceed its holdings of credits — is subject to a penalty. The violating Party's second commitment period assigned amount will be reduced by a number of credits sufficient to restore it to compliance — plus a penalty "interest rate" of 30 percent. The hope is that this penalty will be sufficient to deter willful non-compliance. Yet, its deterrent effect will be diminished if the negotiation and adoption of

assigned amounts for a second commitment period extends into the first commitment period.

The Future of the International Climate Regime

Article 3.9 of the Protocol provides that the COP/MOP shall initiate no later than 2005 the consideration of commitments for subsequent commitment periods — but only with respect to Annex I countries. Article 9 provides that a broader review of the Protocol should take place at the second meeting of the COP/MOP; such a review presumably could include consideration of commitments for non-Annex I parties.

At the COP-11/MOP-1 meeting, the parties to the Protocol agreed to launch an *ad hoc* working group to consider post-2012 commitments for Annex I Parties. They also consented to extending an invitation to all Parties to submit their views on how an Article 9 review should proceed. At the same time, pressed by the United States and other large developing countries, the COP agreed on an initiative aimed at enhancing long-term cooperation on climate change through the UNFCCC, including cooperation with regard to technology.[32] The launching of these parallel consultation processes reflects the wide differences of opinion on where the international climate change regime should go after 2012.

Negotiations on possible commitments after 2012 will need to contend with the range of criticisms that have emerged about the Kyoto Protocol's architecture. One criticism is that the Protocol's emission targets do not conform to the most cost-effective approach to addressing the problem. According to many experts, reducing the risk of global climate change ultimately will require very steep reductions in emissions but that the optimally cost-effective path to achieving these reductions involves starting with relatively modest commitments and then imposing more stringent commitments over time. In this light, the Protocol is "too much, too soon," imposing sharp, near-term reductions that force costly premature retirements of capital stock while leaving uncertain the long-term path of reductions.[33]

Indeed, critics of Protocol often assert that few Annex I countries are on track to meet their Article 3 commitments and that, for several countries, compliance appears increasingly out of reach. In 2006, the government of Canada announced that it expected to miss its target. Another fundamental criticism of the Protocol is that it does not extend commitments to developing countries, including major emitters such as China and India, even though the emissions from developing countries are expected to surpass those of industrialized countries in the next two decades.

To be sure, the Protocol's architects assert that its structure is consistent with the Framework Convention's principle of "common but differentiated responsibilities." According to this view, the first commitment period necessary had to impose commitments only on Annex I Parties in order to lay the foundation for key developing countries to adopt limits in the subsequent commitment period. The text of the Protocol, however, does not make any such bargain explicit much less enforceable.

Moreover, there is some question as to whether the Protocol's architecture of absolute emissions caps can be feasibly extended to developing countries. One issue is political; developing countries are reluctant to accept fixed limits on their emissions, lest they effectively amount to limits on their economic growth. The second issue is administrative; many developing country governments lack the capacity to develop an economy-wide regulatory program that could achieve a precise numerical limit on emissions.

Indeed, the Bush Administration and like-minded critics of the Protocol argue that an emissions targets approach is fundamentally flawed. They assert that the key elements of the problem — the ultimate need for substantial reductions in emissions and the imperative of involving developing countries — point away from an emissions targets approach and toward a technology-based program. In their view, the Protocol's near-term emissions targets are a costly and inequitable distraction from this technology-based path.

Proposals for future directions of international efforts on climate change are multiplying rapidly.[34] While the majority of proposals assume the continued negotiation of commitments by governments under the auspices of the UNFCCC, a few would abandon the UNFCCC and the Protocol for some other form and forum. For instance, some proposals would bring together a more limited number of major-emitting and like-minded countries. Part of the theory behind the approaches that propose an alternative forum is the difficult of making progress under the United Nations "mega-conference" approach.

Similarly, there are different proposals as to how to develop commitments to mitigate GHG emissions. While some proposals would maintain the top-down approach of multilateral negotiation of national commitments, other proposals would encourage countries to make pledges of particular domestic measures.

In addition, experts have come forward with various approaches to the design of commitments. Some propose extending the Protocol's quantitative emission targets, but with variations. Other designs would replace or supplement the emissions targets approach with harmonized domestic policies and measures, which could take the form of coordinated carbon taxes, energy efficiency standards, or technology policies.

Conclusion

The Kyoto Protocol has broken new ground in international law. The Protocol's flexible mechanisms have spawned an international market in emissions trading, which generated upwards of U.S. $21.5 billion in transactions in the first three quarters of 2006.[35] The treaty also has established a more robust compliance system than most other international agreements. The long-term evolution of the Protocol, however, remains in question.

Endnotes: An Overview of the International Regime
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NEPA and Climate Change:

Much Needed Guidance for Transboundary Environmental Impacts

*by Ayako Sato**

The recent Supreme Court case *Massachusetts v. U.S. Environmental Protection Agency*[1] captivated those who follow the climate change debate. However, litigation regarding global climate change is not a recent trend, and lawsuits on this topic are on the rise.[2] One statute that has surfaced consistently in climate change litigation is the National Environmental Policy Act ("NEPA").[3]

NEPA requires all federal agencies to prepare a detailed statement, or what is called an Environmental Impact Statement ("EIS"), for "major Federal actions significantly affecting the quality of the human environment. . ."[4] An EIS requires a federal agency to include the environmental impacts of the proposed action and to offer alternatives to the proposed action, including a "no action" alternative.[5] While NEPA is one of the oldest environmental statutes in the United States, the issue of greenhouse gas ("GHG") emissions reveals that clearer guidance is needed under NEPA regarding the regulation of transboundary impacts.

For example, in *Friends of the Earth v. Mosbacher*[6] the United States District Court for the Northern District of California held that plaintiffs had standing to sue the Overseas Private Investment Corporation ("OPIC") and the Export-Import Bank of the United States ("Ex-Im") when they failed to undertake an environmental review of their actions pursuant to NEPA.[7] OPIC and Ex-Im, both U.S. federal government corporations, offer insurance, loan guarantees, and financing support for projects in developing nations that emit large amounts of GHGs.[8] The plaintiffs allege that the impacts of these foreign projects can be felt domestically within the United States because such projects contribute to GHG emissions that "increase the incidence and intensity of floods and droughts, raise sea levels enough to inundate up to 7,000 square miles of U.S. coastline," and contribute to other domestic environmental problems.[9] Because such impacts directly affect the United States, the plaintiffs argue that OPIC and Ex-Im were required to comply with NEPA.

This case is currently under appeal and a lingering question remains — does NEPA apply in an extraterritorial context? Typically, a presumption against extraterritoriality exists when U.S. statutes are applied abroad, mostly out of concern for foreign policy implications and national security, and this presumption applies equally to NEPA. Out of such concern, Executive Order 12,114 was written to generally exclude projects from NEPA review that have "significant effects on the environment *outside* the geographical borders of the United States and its territories and possessions. . ."[10] The projects funded by OPIC and Ex-Im take place on foreign soil; however, the effects that plaintiffs allege can be felt within the United States. Therefore, it is unclear whether Executive Order 12,114 would apply to the OPIC and Ex-Im projects or whether the agencies have to comply with NEPA.

Projects that have extraterritorial impacts are treated differently, and such impacts generally fall into two categories: (1) proposed actions that take place within the United States, but the environmental impacts are felt in other countries; or (2) proposed actions that are conducted outside the United States and the environmental impacts are typically felt outside of the United States. For the former, the White House Council on Environmental Quality ("CEQ")[11] has issued a memorandum[12] that provides guidance to federal agencies that is consistent with the Convention on Environmental Impact Assessment in a Transboundary Context and the North American Free Trade Agreement. For the latter, President Jimmy Carter issued Executive Order 12,114 in 1979, which provides special procedures for conducting an environmental review for major federal actions significantly affecting the environment outside of the jurisdiction of the United States.[13] In addition, the CEQ has supplemented the Executive Order with guidance regarding environmental effects abroad.[14]

What is missing, however, is any guidance on federal actions that take place abroad but have domestic impacts.[15] *Environmental Defense Fund v. Massey*,[16] the leading case regarding NEPA and extraterritoriality, is equally of no assistance because in that case, the federal action took place in Antarctica, which is not a sovereign nation and does not have the same kind foreign policy implications. As the world is becoming smaller and smaller, and environmental impacts can span across the globe, the time has come for clearer guidance in the area of transboundary impacts and NEPA.

Endnotes:

[1] Massachusetts v. EPA, 415 F.3d 50 (D.C. Cir. 2005), *cert. granted* 126 S. Ct. 2960 (2006).

[2] *See generally* Robert Meltz, Cong. Research Serv., Global Warming: the Litigation Heats Up (Apr. 3, 2006), *available at* http://ncseonline.org/NLE/CRs/abstract.cfm?NLEid=173 (last visited Feb. 6, 2007).

[3] *See* Meltz, *id.*

[4] 42 U.S.C. § 4332(C) (2000).

[5] 40 C.F.R. § 1502.14 (2005).

[6] The case was originally captioned Friends of the Earth v. Watson, 2005 WL 2035596 (N.D. Cal. Aug. 23, 2005), but was changed because of OPIC staff changes.

Endnotes: NEPA and Climate Change *continued on page 77*

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Legal and Policy Frameworks for Renewable Energy to Mitigate Climate Change

*by Dr. Xiaodong Wang**

Introduction

Renewable energy plays an important role in mitigating climate change by reducing carbon dioxide emissions, advancing energy security by diversifying an energy mix and reducing the impact of fossil fuel price uncertainty, and stimulating economic development by generating jobs, increasing incomes, and reducing poverty. The key to successful renewable energy development is the implementation of a sound legal, policy, and regulatory framework that will attract large-scale investment in renewable energy.

Renewable Energy — Global Status & World Bank Efforts

Renewable energy is making a difference in the way the world meets its power needs. In 2005, worldwide renewable power capacity expanded to 182 gigawatts ("GW"), excluding large hydropower, which is about four percent of global power sector capacity. Developing countries have 44 percent of this capacity. The top six countries were China (42 GW), Germany (23 GW), the United States (23 GW), Spain (twelve GW), India (seven GW), and Japan (six GW). Counting traditional biomass and large hydropower, renewable energy supplies seventeen percent of the world's primary energy. Investment in new renewable energy reached U.S. $38 billion in 2005. Forty-nine countries have renewable energy targets and promotion policies in place, including fifteen developing countries, and the list is growing.[1]

Counting traditional biomass and large hydropower, renewable energy supplies seventeen percent of the world's primary energy.

At the 2004 International Conference on Renewable Energies in Bonn, Germany, the World Bank Group ("WBG") committed to increasing lending for renewable energy ("RE") and energy efficiency projects by an average of at least twenty percent per year for the next five years. For the second year in a row, the WBG has outperformed its Bonn target. In fiscal year 2006, the WBG's financial support for renewable energy and energy efficiency was U.S. $860 million. Commitments for new renewable energy[2] and energy efficiency were U.S. $668 million, more than double the Bonn twenty percent target. This represents a 45 percent increase over the amount of commitments made by the WBG to new renewable energy and energy efficiency in fiscal year 2005.[3]

Legal and Policy Frameworks for Grid-Connected Renewable Energy

Twenty-five years of experience with successful renewable energy programs demonstrates that the implementation of an enabling environment of legal, policy, and regulatory frameworks that will attract large-scale capital investments is instrumental. Key success factors for RE policies require a legal and regulatory framework that ensures fair and open grid access and stable tariffs for Independent Power Producers ("IPPs"). Long-term price predictability through long-term power purchase agreements ("PPAs") with transparent and adequate pricing is the most important factor to attract investors.

Experience from industrialized countries shows that deregulating the power sector has the potential to expand service, attract private investment, and attract IPPs to the market, which appears to be essential for renewable energy development. However, the privatization of the power sector is inherently biased against capital-intensive investment in RE.[4] Privatized utilities are more reluctant to purchase intermittent renewable energy resources. However, an effective legal framework can establish policies to promote renewable energy.

It is essential that RE be considered early in the design of power sector reforms, not after the reforms are complete. Power sector structures influence the approach to RE market penetration. Vertically integrated utilities provide economies of scale, but the amount of RE capacity is determined by a monopoly that may be resistant to change, and there is little risk sensitivity. In an unbundled system, competition exists, and the market rules allow more flexibility. In addition, increased opportunities exist for private generators to compete though they may need special treatment, and each actor manages his/her own risk. In such cases, long-term contracts are important.[5]

To date, three major mandated market policy options to promote RE operate in the marketplace: (1) price-based feed-in laws, which require mandatory purchase of renewable energy at a fixed price (*i.e.*, used in Germany, Spain, and France); (2)

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quantity-based renewable energy portfolio standards ("RPS"), which require a minimum share of power or a minimum level of installed capacity in a given region is met by renewable energy (*i.e.*, used in Australia, Denmark, Italy, the Netherlands, some states within the United States); and (3) tendering mechanisms, which involves government-sponsored competitive bidding processes for the acquisition of renewable electricity whereby long-term contracts are awarded to lowest priced projects (*i.e.*, used in the British Non-Fossil Fuel Obligation, Ireland, and California). All these three mandated market policies ensure the right for the RE power suppliers to recover incremental costs between RE and conventional energy from consumers and to connect to the grid. Each approach has its own advantages and disadvantages.

Feed-in laws produce high penetration rates in a short period, create local manufacturing opportunities, provide strong incentives for private investments, and can be cost effective if the tariff is periodically and wisely adjusted. To date, feed-in laws demonstrate the highest installation rates for RE and are considered most desirable by investors given their price certainty. RPS mechanisms are good at reducing cost and price with competitive bidding, yet tend to favor least-cost technologies and established industry players unless separate technology targets or tenders are put in place. They are also more complex to design and administer than feed-in laws. Tendering policies are effective at reducing cost, but ensuring that signed contracts are realized is a key challenge.[6]

The types of instruments selected should be based on objectives, country conditions, and power sector structure. There is no single solution. The effectiveness of a particular policy will rely on how well it is designed and enforced. A case study of China Renewable Energy Law, described later in this article, provides insights and lessons on how these policy instruments are selected, designed, and applied. A comparison of these three policy options is summarized in the table below.

Each policy option must consider who will pay for the incremental costs between renewable energy and conventional energy sources, whenever appropriate. Passing costs onto customers by way of systems benefits charge, a carbon tax on fossil fuel, or a dedicated fund financed by the government or with donor support are the most frequently used approaches for covering this incremental costs and funding the various policy measures.

Furthermore, a range of financial incentive policies can level the playing field between conventional energy and RE investments. These policies can decrease upfront capital costs through subsidies, reduce capital and operating costs through tax credits, improve revenue streams with carbon credits, and provide financial support via loans and guarantees. Experience demonstrates that output-based incentives are generally preferable to investment-based incentives for grid-connected RE. The investment-based mechanisms do not necessarily provide incentives to generate electricity or maintain the performance of the RE plants once they are installed, while the output-based incentives promote the desired outcome — generation of electricity from RE.[8]

Finally, various models of public-private partnership for financing renewable energy exist. In general, public sector funds must be highly targeted to catalyze, not displace, private capital. Public funds can be used to support infrastructure development through methods such as loans and equity investment in companies and projects, business development, marketing campaigns, technical assistance, research and development, standards development, and public awareness.

Renewable Energy Policy Options Comparison[7]

	Quantity Of RE Development	**Cost/ Price Reduction**	**Resource Diversity**	**Market Sustainability**	**Local Industry Development**	**Investor Certainty**	**Simplicity**
Feed-In Laws	Large amounts RE in short time	Cost efficient if the tariff is periodically and wisely adjusted	Excellent	Technically & economically sustainable	Excellent	Can reduce investor risk with price guarantee & PPA	Most simple to design, administer, enforce, & contract
RPS	If enforced, can meet realistic targets	RPS and tendering best at reducing cost & price with competitive bidding	Favor least-cost technologies	Technically & economically sustainable	Favor least-cost technologies & established industry players	Lack of price certainty difficult for investors/PPA can reduce risk	More complex to design & administer & complex for generators
Tendering	Related only to quantity RE established by process	Good at reducing cost	Favor least-cost technologies sustainable if planning supported, stable funding	Tied to resource planning process	Favor least-cost technologies & established industry players	Can provide certainty if well designed (more risk than feed-in)	More complex than feed-in, simpler than RPS

Legal and Policy Frameworks for Off-Grid Renewable Energy

In many sparsely populated and remote areas, off-grid RE can provide least-cost solutions to rural electrification compared to grid extension or fossil fuel based options, such as diesel and kerosene. These renewable energy resources are fueled by indigenous resources and are environmentally benign. In addition, off-grid RE, particularly RE mini-grids, can also contribute to productive uses and social services, as well as generate heat, motive power, and other non-electric energy. Compared to fossil fuel based options, however, off-grid RE has unique characteristics with high upfront investment requirements but low energy costs.

It is essential that the rural electrification planning and policy frameworks clearly define the roles and criteria for grid expansion and off-grid options and ensure a level playing field between grid and off-grid alternatives. Grid extension and off-grid options should complement each other rather than compete. In locations where off-grid RE systems are the most economically viable option, governments should explicitly consider and encourage diffusion of these options in lieu of grid extension. In dispersed markets where often multiple service providers exist, the government should encourage business expansion and competition through the establishment of a conducive institutional and regulatory environment.

Grid extension and off-grid options should complement each other rather than compete.

The regulation of mini-grids, whether from RE or conventional sources, must be performed in different ways relative to the same regulatory tasks for grid extension. Mini-grid electrification uses different business models and often requires the need to coordinate tariffs with subsidies. Utilities and major private sector players with large financial resources generally invest in grid extensions. Mini-grids, on the other hand, are usually developed by local entrepreneurs or community-based organizations. Currently, most mini-grid service providers are often not regulated or are over-regulated. The regulatory frameworks for mini-grids should allow "light-handed" procedures and processes, and the regulator should delegate regulatory tasks to the rural electrification agency or rural electrification fund that inevitably is the *de facto* regulator. The regulatory framework should also permit private sector entities to enter the market, and ensure fair competition for all service providers.[9]

Tariffs allowing the RE providers to recover their costs are probably the single most important factor determining the long term commercial viability of mini-grid and other rural electrification projects. However, it is usually unrealistic to expect a full cost-recovery tariff, given the low ability to pay in rural areas. It is important to keep a balance between ensuring commercial viability of the service providers and meeting rural consumers' ability to pay.[10] Rural household surveys in many developing countries demonstrate that rural consumers can afford to pay up to five percent of household income on electricity and up to ten percent on all energy use, such as candles, kerosene, and dry cell and car batteries in un-electrification areas, ranging from three to twenty U.S. dollars per month.[11] When designing tariff structures for rural electrification projects, including mini-grids, a principle should be born in mind that the tariff should at least recover operation, maintenance, and management ("O&M&M") costs, and preferably partial capital investment costs.[12]

An adequate tariff structure for RE mini-grids should:[13]

- Recover at least O&M&M costs;
- Reflect cost structure — a high fixed charge (higher than typical tariff structures applied in large grid systems) to reflect fixed O&M&M costs, a variable charge to reflect fuel costs, and a levelized capital cost charge partially reflect capital investment costs; and
- Remain below consumers' ability to pay.

Following this principle, a fixed monthly fee may be a more appropriate tariff scheme for RE mini-grids since it is more directly related to the cost structure of a RE system, and it provides the operator with a clearer financial forecast. Other pricing schemes such as pre-payment and binary real time pricing as well as new solutions for intelligent metering, such as energy dispensers and behavior-based charge controllers, have been applied in a few pilot RE mini-grid projects. Such tariffs can be differentiated by customer segments with different consumption patterns in order to be more proportionate to the customer's ability to pay.[14] In addition, community involvement is critical for RE mini-grids. Communities sometimes can pay up to ten to twenty percent of the capital investment of RE mini-grids up front in the form of labor, material, and cash.

Worldwide, almost all rural electrification programs involve some form of subsidy. In principle, subsidies should be applied to access costs (connections), not to operating costs (ongoing consumption).[15] Following the principle that tariffs should recover O&M&M costs, while subsidies should buy down initial investment costs, RE mini-grids can become more attractive than diesel genset, because they require lower tariffs compared to diesel generators and are less exposed to fuel price volatility. Sometimes, in a remote area where the price of diesel is quite high, the O&M&M costs for diesel generators can be higher than the local consumers' ability to pay.

A Case Study — China Renewable Energy Law

China has the largest renewable energy capacity in the world, with an installed capacity of 42 GW in 2005, mostly small hydroelectric power. At the Beijing International Renew-

able Energy Conference in 2005, the Chinese government announced an ambitious target to achieve sixteen percent of energy consumption from renewable energy by 2020, which is equivalent to an installed capacity of 75 GW of small hydro, 30 GW of wind, and 30 GW of biomass.

China passed Renewable Energy Promotion Law in February 2005, which took effect on January 1, 2006, making it one of the first countries in the developing world to adopt mandated market policies for renewable energy. The World Bank China Renewable Energy Scaling-Up Program provided U.S. $213 million in International Bank for Reconstruction and Development loans and Global Environment Facility grants to assist China in implementing the Renewable Energy Law and investing in wind farms, biomass power generation, and small hydro plants.

The development of the Chinese Renewable Energy Law offers valuable insights and lessons on how RE policy instruments are designed and applied in the real world. After carefully examining the three options of the mandated market policies through study tours and workshops, the Chinese government decided to adopt the feed-in tariff approach in the Renewable Energy Law that was passed in 2005.

While the Renewable Energy Law in 2005 provided critical principles and frameworks, it did not include detailed operational guidelines for implementation and enforcement, which were left to be developed in the Implementation Regulations. While feed-in laws have produced the highest RE penetration rates and are relatively easy to administer, it is tricky to set up the feed-in tariff level at the beginning, particularly when there are no reliable cost benchmark data available on large-scale commercial wind farms and biomass power plants from real world experience in China. If the feed-in tariff is set too low, it will not provide sufficient incentives to the investors, thereby defeating the purpose. If the feed-in tariff is too high, it will create high rent and not be cost-effective. In addition, considerations in regional equity added another layer of complexity. Given the wide variations in renewable energy resources, coal resources, economic development status, and electricity tariff levels among different regions, a question of whether the feed-in tariff should be set at the national level with regional differences or at provincial level also generated a major debate. Drafts of the Implementation Regulation, circulated for public comments in November 2005, had clearly stated that the wind power tariffs would be set at baseline coal-fired power prices in each province, plus a subsidy of RMB 0.23/kWh (U.S. $0.028 US/kWh).

Contrary to expectations, the Implementation Regulation announced on January 1, 2006 did not apply the feed-in tariff to wind power, only to biomass. Biomass power tariffs are set at province-specific average coal prices plus a premium of RMB 0.25/kWh Chinese Renminbi, which is equal to three U.S. cents per kilo-watt-hour ("cents/kWh"). Wind power tariffs, however, are established through the ongoing concession process.[16]

The Chinese government introduced competitive bidding for wind farm development in 2003, to steadily ramp up new wind power capacity at the lowest possible costs. After years of high wind electricity tariffs, the government hoped that such a concession approach would drive down and reveal the cost of wind farms in China. Under the Wind Power Concession program, the National Development and Reform Commission invited international and domestic investors to develop 100 megawatt ("MW") wind farms on a potential wind site. Winning bidders are granted approval to develop the selected project site, a PPA for the first 30,000 hours of the project operation, guaranteed grid interconnection, financial support for grid extension and access roads, and preferential tax and loan conditions by the central government. This backing of the central government creates a comparatively lower-risk investment environment for wind farm developers in China.[17]

The first round of bidding took place in October 2003, with two projects awarded 200 MW. While the winning bid prices were significantly lower than any previous wind farm price in China, they were below the long-run marginal costs. The selected developers experienced difficulties in obtaining financing, and project construction was delayed. The subsequent rounds of bidding from 2004 to 2006 awarded an additional 2000 MW capacity.[18] The winning bid price for the wind concession projects to date ranged from 4.6 to 6.2 U.S. cent/kWh, while current average cost of wind power in China is estimated to be between 6.3 and 8 U.S. cent/kWh.[19]

To date, the concession caused a major concern to the wind industry in China because the bidding process resulted in prices that are too low to be financially viable. As a result, there are reduced incentives for developers to invest in this nascent industry. In addition, the number of companies attempting to bid for the concession projects actually fell from the first round of concessions to the second round, contrary to expectations that the number of participants would increase with the program's increased visibility and the "success" of the first two concessions. Furthermore, better wind resource measurement is needed to decide the selection of concession sites and the bid prices.

Conclusion

Renewable energy is an effective approach to mitigate climate change. Worldwide, renewable energy technologies are growing rapidly and have become a mainstream industry. Developing countries have done more than expected to promote renewable energy development, and China is a world leader on renewable energy capacity.

The key to success for renewable energy development is the implementation of a sound legal, policy, and regulatory framework that will attract large-scale investment in renewable energy. Successful renewable energy policies must be long-term and consistent; have a secure and predictable payment mechanism; provide fair and open grid access; possess strong governance conditions, clear administration procedures; and low transaction costs; have strong public acceptance; and enforcement is key. Countries should start simple in the design of energy policies, and always remember that "the devil is in the details."

Endnotes: Legal and Policy Frameworks

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The Buzz About Clean Coal

*by Jennifer Rohleder**

The term "clean coal" figures prominently in discussions about the future of United States energy policy, but what exactly is it, and can it really help? Coal generates over half of the electricity used in the United States,[1] and accounts for 36 percent of the United States' overall releases of carbon dioxide ("CO_2").[2] Coal-fired power plants in general are the largest source of man-made CO_2, and these plants account for over one quarter of the world's total emissions.[3]

Clean coal technology ("CCT") is actually a variety of technologies designed to reduce the environmental impact of coal-fired power plants. CCT encompasses technologies for coal preparation, coal gasification, pollutant removal, and carbon capture and storage.[4] Despite improvements to coal-fired plant efficiency, carbon emissions still remain a problem for using coal to produce electricity. Carbon capture and storage ("CCS") technology captures CO_2 and stores it deep underground, preventing the gas from entering the atmosphere.[5] CO_2 could be pumped into and stored in underground saline aquifers, or pumped into oil fields to maintain pressure and facilitate oil extraction.[6]

Coal gasification plants are considered a key element for a zero-emissions power system; however, the technology has not yet been proven on a wide-scale commercial basis.[7] When coal is gasified, it is not actually burned; rather it is broken down into its chemical components and chemical reactions are performed. Impurities are removed from the resulting gas, many of which are valuable by-products. This process also produces significant amounts of CO_2; however, unlike traditional coal-fired power plants, separating the CO_2 requires little to no additional effort or expense, making carbon capture economically feasible, particularly if the gasifier has a market for the CO_2.[8]

If captured CO_2 is used to recover more oil through enhanced oil recovery, thus encouraging more oil consumption, is there really a net benefit?[9] Supporters of CCS say yes. When using man-made CO_2, rather than natural CO_2, it is substantially decreasing what would otherwise be emitted into the atmosphere. This outcome is of course dependent on the fact that the CO_2 actually stays in the ground and does not leak out. Studies are taking place around the world, but it could be years before we know whether storage is a viable option.[10]

Clean coal technology is actually a variety of technologies designed to reduce the environmental impact of coal-fired power plants.

CCT could potentially make great strides for stabilizing and reducing U.S. and global CO_2 emissions, but it could come at the cost of the natural landscape. Additional coal demand will naturally encourage more coal mining. The face of coal mining has changed from the ubiquitous underground shafts of Pennsylvania to open pit mining in the Western states and mountain-top removal mining in Appalachia. The question remains, are we simply trading one ecological disaster for another?

* *Jennifer Rohleder is a JD candidate, May 2008, at American University Washington College of Law.*

Endnotes:

[1] Marilyn Berlin Snell, *Can Coal Be Clean?*, Sierra Mag., Jan. / Feb. 2007, *available at* http://www.sierraclub.org/sierra/200701/coal.asp (last visited Feb. 5, 2007).

[2] Snell, *id.*

[3] Craig Canine, *How to Clean Coal*, Nat. Resource Def. Council's OnEarth Mag., Fall 2005, at 22, *available at* http://www.nrdc.org/onearth/05fal/coal1.asp (last visited Feb. 5, 2007).

[4] BBC News, *Clean Coal Technology: How it Works*, (Nov. 28, 2005), *available at* http://news.bbc.co.uk/1/hi/sci/tech/4468076.stm (last visited Feb. 5, 2007).

[5] BBC News, *id.*

[6] BBC News, *id.*

[7] BBC News, *id.*

[8] Canine, *supra* note 3, at 24.

[9] Canine, *supra* note 3, at 26.

[10] Canine, *supra* note 3, at 26.

Existing Legal Mechanisms to Address Oceanic Impacts from Climate Change

*by Lucy Wiggins**

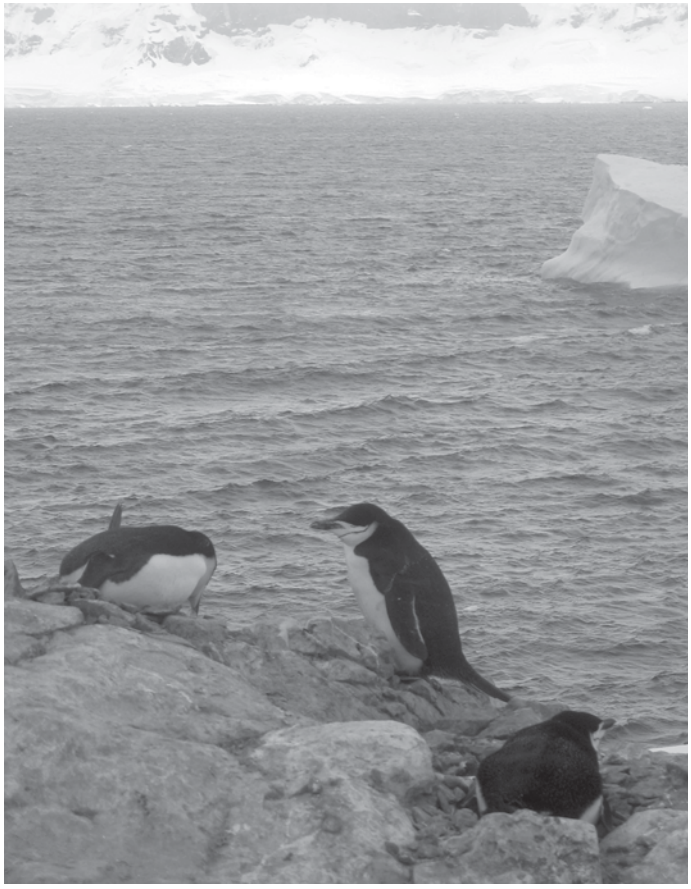
Introduction

Despite the fact that water covers approximately seventy percent of the planet, the ocean is the Earth's least protected area.[1] While the ocean absorbs carbon dioxide ("CO_2") from the atmosphere and therefore helps to mitigate some of the effects of climate change,[2] the ocean can also aggravate global warming. Warmer ocean water absorbs less CO_2, so as its temperature increases the ocean's ability to absorb CO_2 diminishes.[3] This phenomenon has the potential to create a "positive-feedback cycle" where warming temperatures increase the temperature of the ocean, resulting in less CO_2 absorbed and more CO_2 in the atmosphere, which in turn will cause higher global temperatures.[4] Higher global temperatures also cause more water vapor, a greenhouse gas ("GHG"), to evaporate from the ocean's surface, further contributing to the build up of GHGs in the atmosphere.[5]

Additionally, climate change affects animals living in and around the ocean. Birds suffer reduced nesting areas, fish move further toward the poles to escape warming waters, and creatures, such as corals, which cannot migrate to cooler waters, start to die.[6] Addressing global climate change will require a comprehensive mixture of domestic and international law because much of the ocean lies beyond the national jurisdiction of any one state. This article surveys a few of the existing international environmental treaties requiring states to curb activities that contribute to climate change and discusses gaps in their respective coverage. It concludes by suggesting a few improvements to these existing treaties to facilitate further protection of marine species and ocean habitats from the impacts of climate change.

Existing Treaties Articulate Some Protection For Oceans

Mandatory reductions in GHG emissions is the proverbial "elephant in the corner" in any international conference concerning climate change: at meeting after meeting, the participants acknowledge the scope of the problem,[7] but when it comes to recommending solutions, language calling for emission cuts is replaced with language calling for more studies.[8] With the creation of the Kyoto Protocol to the United Nations Framework Convention on Climate Change, a few dozen countries finally committed to curbing emissions of GHGs.[9] Since its adoption, however, the United States has withdrawn from the Protocol and many of the states that committed to reductions are experiencing difficulty in meeting their obligations.[10] Kyoto is further complicated by the fact that many states interpret it as a trade agreement as much as an emissions treaty.[11]



Courtesy of Ursula Kazarian

Oceans are home to numerous species threatened by climate change, such as these Antarctic penguins.

In attempting to build political pressure to force state action on climate change, it is useful to examine other instruments that articulate obligations to curb GHG emissions. Specifically, the Convention Concerning the Protection of the World Cultural and Natural Heritage ("World Heritage Convention"), the United Nations Convention on the Law of the Sea ("UNCLOS"), and the Convention on Biological Diversity ("CBD") each contain provisions imposing responsibilities on states to reduce emissions in order to protect the ocean.

The World Heritage Convention

The World Heritage Convention requires a state to "do all it can," within its capabilities to "ensur[e] the identification, protection, conservation, presentation and transmission to future generations" of areas of outstanding natural beauty or cultural

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heritage.[12] Once recognized as a World Heritage Site, protection of the site becomes the combined responsibility of the international community as a whole;[13] states cannot deliberately take measures that would damage these sites, "directly or indirectly"[14] and must adopt internal policies to protect and rehabilitate its own heritage sites.[15] It does not stretch the imagination to interpret these provisions to include cuts in GHG emissions among the many measures a state should take to "do all it can."[16]

Designation as a World Heritage Site affords some protection to threatened marine areas because the establishment of preservation areas allows species to recover more quickly.[17] For example, the listing of the Sian Ka'an biosphere reserve on Mexico's Yucatán peninsula allowed for the establishment of local non-governmental organizations ("NGOs") in the area, increased national and international funding for the reserve, and gave the local community enough political power to lobby the government to establish strict development regulations for the surrounding areas, thereby limiting the type and number of private development projects that can be built in its vicinity.[18] Increasing the number of designated World Heritage marine sites will provide additional protection necessary to allow marine species and habitats to recover or adapt to climate change.

When listing alone does not halt the decline of a heritage site, the Convention provides that sites threatened "by serious and specific dangers," can be designated as being "in danger."[19] In danger status increases the amount of funding and international attention given to a site.[20] If successfully listed as in danger, the member state must develop a "programme for corrective measures" to abate the causes of the site's deterioration.[21] Consequently, in danger status requires affirmative steps to repair damaged areas, in effect reversing the causes of the destruction in the first place, on top of the general obligation against taking deliberate measures that could harm a site.

In November 2004, a NGO in Belize tested the power of these provisions to force member states to take steps mitigating the impacts to oceans from climate change by filing a petition with the World Heritage Committee requesting that it list the Belize Barrier Reef as an in danger site.[22] While the Committee declined to place the Reef on the in danger list, forestalling a showdown over climate change at the time, it left the door open for future consideration.[23] The Committee ordered a policy paper from the World Heritage Centre on the impacts of climate change to sites.[24] It then took a decision recognizing that climate change was impacting at least 125 heritage sites and indicated that it would continue to review petitions to grant in danger status to sites threatened by climate change on a "case by case basis."[25]

Warmer ocean water absorbs less CO_2, so as its temperature increases the ocean's ability to absorb CO_2 diminishes.

In addition to foot-dragging by the Secretariat, those hoping to force action through the World Heritage Convention face other problems. For example, the Convention lacks a method for listing sites existing outside the national jurisdiction of a state.[26] This includes the approximately sixty-four percent of the ocean that constitutes the high seas and belongs to the world as a whole.[27]

The United Nations Convention on the Law of the Sea

In contrast with the World Heritage Convention, UNCLOS covers the entire ocean, not just areas within a State's territory.[28] The treaty's provisions on conservation and preservation of the marine habitat can assist in understanding states' responsibilities with regard to impacts on the ocean from climate change.[29] As an umbrella rule, UNCLOS contains a general obligation on the parties to protect the marine environment.[30] While the sovereign right to exploit national resources within the areas of territorial control somewhat qualifies the obligation to protect,[31] UNCLOS recognizes this right in conjunction with the obligation. Arguably the obligation to protect is, therefore, at least co-equal with the right to exploit. UNCLOS further clarifies that protection extends to that "necessary to protect and preserve rare or fragile ecosystems" and threatened marine life.[32] Upon discovering ocean pollution, states must "eliminat[e] the effects. . . and prevent or minimiz[e] the damage," albeit "to the extent possible," and take necessary measures to abate "pollution of the marine environment from any source."[33]

GHG emissions appear to be pollution covered under UNCLOS,[34] because UNCLOS defines "pollution of the marine environment" as "the introduction by man, directly or indirectly, of substances or energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects as harm to living resources and marine life."[35]

UNCLOS implies a collective duty on the part of signatory states to implement strategies to combat climate change.[36] For states unwilling to participate in the fulfillment of this obligation, UNCLOS conveniently contains a dispute resolution mechanism, allowing the parties to refer disputed matters to an international court or tribunal.[37] However, the provisions concerning the protection and conservation of the marine environment have not yet been interpreted by an international tribunal, leaving little guidance on how they might ultimately be applied.[38]

The Convention on Biological Diversity

The CBD is a conservation-oriented convention providing for the protection of biological diversity, the promotion of sustainable development, and the equitable sharing of benefits

derived from natural resources.[39] In similar fashion to the World Heritage Convention, the CBD only covers areas existing within the control of individual states.[40]

Under the CBD, states develop strategies for the conservation of their biodiversity and create "as far as possible and appropriate. . . a system of protected areas or areas where special measures need to be taken to conserve biological diversity."[41] In doing so, states should also "[p]romote the protection of ecosystems, natural habitats and the maintenance of viable populations of species in natural surroundings."[42] The CBD specifically includes "marine and other aquatic ecosystems and the ecological complexes of which they are part," as part of the definition of biological diversity, while mandating implementation "with respect to the marine environment consistently with the rights and obligations of states under the law of the sea."[43]

Broadly interpreted then, the Convention obligates member states to establish protected marine areas and to take steps to shelter these areas from the impacts of climate change. Additionally, because the ocean is one of the least understood and least studied areas,[44] the CBD could require states to increase their funding for scientific studies into the predicted aquatic impact from climate change. It might also require member states to consider potential ocean impacts when conducting environmental assessments or deciding whether to grant certain permits, such as those for factories intending to emit GHGs.

Under the CBD, states have been successful in establishing protected areas, but the Secretariat acknowledges that marine protected areas remain "under represented."[45] The CBD also recognizes the establishment of marine protected areas outside the areas of national jurisdiction as a priority.[46] Conceding that the impacts from climate change will not simply disappear, even if GHG emissions are cut, the CBD recommends the development of "biological corridors" to facilitate the unhampered migration of species to more suitable habitats.[47]

Suggestions for Improvement

The establishment of marine protected areas specifically to preserve regions threatened by climate change acknowledges both that marine areas have intrinsic value and that these areas are ripe for protection.[48] Marine protected areas also offer a haven where threatened species can escape the myriad pressures, including climate change, that jeopardize their existence and endanger their habitat. Amending all three treaties to allow for the multilateral establishment of marine protected areas outside the boundaries of national jurisdictions would help accomplish these objectives.

Because so much of the ocean is beyond the borders of any state, any amendment of the conventions should include a process for the establishment of protected areas on the high seas. In this process, a member states could nominate areas of the high seas for protection, subject to review by a committee before submission to the parties for inclusion within the relevant convention's protocols.[49] Since complete unanimity is rare, some sort of qualified majority of the voting parties — similar to the way chemicals are added to the Stockholm Convention on Persistent Organic Pollutants or new ozone depleting substances are included within the phase-out schedule to the Montreal Protocol on Substances that Deplete the Ozone Layer — could be enough to secure passage of the proposed protected area.[50]

Within the areas of national jurisdiction, providing incentives to designate marine protected areas could encourage states to establish new areas. For example, member states that have also signed the Kyoto Protocol could receive some sort of credit for creating the protected area. These measures might follow the Clean Development Mechanism provisions of the Kyoto Protocol that allow for the allotment of credit to industrialized countries for financing sustainable development projects in developing countries[51] or the Joint Initiative programs that foster the exchange of credits for similar projects between developed country signatories to the Kyoto Protocol.[52] States would receive credit after taking into account such factors as the size or sophistication of the protected area and its contribution to helping marine species survive climate change impacts.

Admittedly, amendment of the conventions requires extreme coordination between the parties, but amendment is feasible. Further, to avoid concerns about control over otherwise neutral areas, an international conservation committee to oversee and manage these protected areas should be established. The committee could be comprised of member state representatives and technocrats from the relevant conventions or it could fall under the auspice of the United Nations. The coordination committee will also have the added benefits of increasing communication between the various conventions and potentially result in greater cross-pollination of their respective obligations.

Conclusion

While imperfect, the existing treaties articulate a general obligation on states to reduce their GHG emissions and protect existing marine resources. Because each treaty speaks differently about a state's obligations to the ocean, taking advantage of all three instruments to establish a global network of marine protected areas provides maximum protection. Under the World Heritage Convention, designation of a World Heritage Site makes funds available for the protection of the actual site and builds pressure for protective measures in the surrounding areas. Any deterioration of a Site helps focus international attention on the underlying factors contributing to the decline. Establishing protected areas pursuant to UNCLOS does not create this same obligation, but the creation of protected marine areas will help fragile marine ecosystems and threatened species weather the climate change storm without additional human-induced pressures. Finally, protected areas under the CBD reminds parties of their responsibilities to preserve the planet's biodiversity and focuses attention on developing a holistic strategy for marine protected areas that include features, such as migratory corridors, which would allow marine species to migrate or adapt to climate change. Additionally, these protected areas should exist both within areas of national jurisdiction and on the high seas. Developing a system of protected marine areas under the World Heritage Convention, UNCLOS, and the CBD will help species recover from, and adapt to, climate change.

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The Left-Over Problem:

The Blind Spot of the Automotive Portion of the Advanced Energy Initiative

*by Chris Stefan**

In the 2007 State of the Union speech, President Bush discussed his new energy policy.[1] The President espoused environmental benefits of an increased use of hybrid vehicles and alternative automotive fuels,[2] part of the Advanced Energy Initiative. He also proclaimed that this would reduce the reliance of the U.S. economy on oil producing nations abroad.[3] Upon closer inspection, nuances appear that may frustrate both efforts.

There are approximately 250 million vehicles currently in domestic operation.[4] This year, an anticipated seventeen million new vehicles will be sold.[5] Most of these vehicles are powered by traditional automotive technology. The White House expects that it will take a total of fifteen years for effective transition to new technology.[6] Consumers will need to purchase entirely new automobiles as part of this plan, and most will finance those purchases by selling their older vehicles. The environmental benefits to hybrid and alternative fuel utilization are reduced by the existence of downstream markets.[7]

Legal mechanisms to prevent the older, less efficient vehicles from ending up in developing nations with either non-existent or non-enforced emission standards are not currently in place.[8] This means that even if the United States (and/or other developed nations) decrease overall emissions domestically by increasing hybrid and alternative utilization, emissions abroad will still increase (and probably by a higher percent since fuel refining standards are lower in the developing world). This would lead to not only *more emissions*, but also *more pollution* of other kinds. Furthermore, alternatives like ethanol and biodiesel have limited climate benefits, because they also involve carbon emissions and encourage land-use change, a major contributing factor to climate change.[9] Hybrids, even highly efficient ones, still require gasoline, and the extraction and refinement process will continue to result in emissions. This transition may be further prolonged because oil producers will continue to explore for new oil fields, and such discoveries lead to lower petroleum prices, which reduce consumer incentives for vehicle replacement.

Another complication is that as these older vehicles help developing nations grow economically, the commercial ties between the United States and these nations would also increase. Widespread ethanol utilization would magnify this effect, because arable land limitations will likely increase agricultural imports (and prices). Sea level rise and increased soil evaporation due to climate change will also intensify the problem. Oil producing nations will maintain their potential to wreak havoc upon the world economy, because developed nations will depend on developing nations for crucial commodities (such as food or fuel), and those developing nations will continue to be dependent on petroleum. The symbiotic relationship that would develop will hinder developed nations like the United States from escaping the influence of current energy geopolitics.

The issue of climate change represents a challenge that goes beyond the borders of any one nation, and the policies of any sovereign power must reflect that reality. The United States must consider potential complications to climate and energy policies prior to enactment. This "Left-Over" problem represents a foundational crack in the automotive wedge of climate stabilization in its current form.[10] The success of this strategy will require proactive measures to address this potential complication that could unravel the entire plan.

Endnotes:

[1] *See* Press Release, President Bush Delivers the State of the Union Address (Jan. 23, 2007), *available at* http://www.whitehouse.gov/news/releases/2007/01/20070123-2.html (last visited, Feb. 13, 2007) [hereinafter Bush].

[2] Bush, *id.*

[3] Bush, *id.*

[4] *See* Press Release, State of the Union: The Advanced Energy Initiative (Jan. 31, 2006), *available at* http://www.whitehouse.gov/news/releases/2006/01/20060131-6.html (last visited Feb. 13, 2007) [hereinafter State of the Union].

[5] State of the Union, *id.*

[6] State of the Union, *id.*

[7] *See* UN Statistical Abstract, Forty-Ninth Issue, United Nations, 2002–2004, at 518 (illustrating that the number of motor vehicles in use increased over time, year by year. In fact, of the 177 nations listed, 29 of them recorded a doubling of motor vehicles in less than a decade. This shows that the total number of vehicles is increasing).

[8] *See generally*, Santa Barbara County Air Pollution Control District, Old Car Buy Back Program, *available at* http://www.sbcapcd.org/edu/facts-ocbb.pdf (last visited Feb. 13, 2007) (providing an example of a voluntary buy back program. However, no larger, mandatory program is currently in force).

[9] *See* United Nations Environmental Programme, CO_2 Emissions from Land Use Change, *available at* http://www.grida.no/climate/vital/10.htm (last visited Feb. 13, 2007) (providing a map showing the location of carbon emissions from land use).

[10] *See generally* Robert Pacala & Stephen Socolow, *Stabilization Wedges: Solving the Climate Problem for the Next Fifty Years with Current Technologies*, 305 Science 968 (2004), *available at* http://fire.pppl.gov/energy_socolow_081304.pdf (last visited Feb. 11, 2007).

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Climate Change and Federal Environmental Law

*by Drs. Lara Hansen and Christopher R. Pyke**

Introduction

Human activities, particularly the combustion of fossil fuels and the large-scale transformation of land cover, affect ecosystems around the world. Changes in temperature, precipitation, and water chemistry are altering our environment. These changes will also affect environmental regulatory frameworks, either rendering them ineffective or forcing them to adapt to achieve their goals under changing conditions.

Global temperature has increased by 0.8°C over the last century. Climate scientists estimate that we are committed to an additional 0.5°C increase due to the amount of carbon dioxide ("CO_2") that is already present in the atmosphere.[1] Rising temperatures have been accompanied by a wide range of environmental changes, including, retreat of sea ice and glaciers, sea level rise, and changes in the intensity and frequency of storms and precipitation events.[2] Rising CO_2 concentrations has not only changed the composition of the air, but it is also changing the chemistry of the water: CO_2 is absorbed by the oceans, which forms carbonic acid, causing the acidification of the oceans.[3]

These changes mean that regulations intended to protect natural resources and promote conservation will be applied under conditions significantly different from those that prevailed when they were drafted. Achieving the original goals of these regulations will require a careful assessment of long-standing assumptions, as well as decisive action to change regulatory practices in ways that accommodate, offset, and mitigate climate change. Three such laws will be explored in this article: the Endangered Species Act ("ESA"), the Clean Water Act ("CWA"), and the Clean Air Act ("CAA").

Climate change undermines the ambitious goals of the ESA, the CWA, and the CAA.

Climate Change and the Endangered Species Act

The stated purpose of the ESA is "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved."[4] The architects of the ESA intended to save creatures from proximal threats, such as bulldozers and dams. Yet, today we see clear evidence that climate change creates new threats to already imperiled species by contributing to the disruption of ecological processes essential to entire ecosystems. Deteriorating conditions will impact the viability of endangered species and the practices used to protect them through implementation of the ESA (*e.g.*, listing, "take" permitting, and recovery planning).

For example, in 2006, two species of Caribbean coral, Elkhorn (*Acropora palmata*) and Staghorn (*A. cervicornis*) coral, were listed as "threatened" for their entire range under the ESA. The listing stated that "the major threats to the species' persistence (*i.e.* disease, elevated sea surface temperature, and hurricanes) are severe, unpredictable, likely to increase in the foreseeable future, and, at current levels of knowledge, unmanageable."[5] This listing identifies three key threats that all relate to climate change: rising sea surface temperatures, disease susceptibility, and hurricane-related impacts. Sea surface temperatures are closely related to increasing global surface air temperatures. A severe Caribbean coral-bleaching event in 2005 demonstrated that high temperatures cause coral bleaching and bleaching corals become more susceptible to disease.[6] Moreover, as global temperatures rise, the intensity and frequency of hurricanes may increase.[7] The timing of this listing was particularly profound as it followed the unprecedented 2005 Caribbean summer, during which the region experienced the hottest water temperatures ever recorded with large-scale bleaching followed by disease,[8] and a record breaking hurricane season.[9]

Recently, the U.S. Fish and Wildlife Service proposed listing Polar Bears (*Ursus maritimus*). The bears rely on Arctic sea ice for access to food and breeding sites. Their primary food source, the ringed seal (*Phoca hispida*), is also an ice dependent species. The loss of nearly 30 percent of Arctic ice cover over the past century, together with the possibility that the Arctic will be seasonally ice-free before the end of this century, strongly suggest that climate change will jeopardize the survival of this species.[10]

Another example is the Key Deer, which is now limited to living on two islands in the Florida Keys. Most of the Keys have less than two meters of elevation. If sea levels were to rise one meter, most the Key Deer habitat would be lost. The only way to limit sea level rise and protect remaining Key Deer habitat is to

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take action to mitigate the rate and extent of climate change.[11]

These three species represent the tip of the iceberg, so to speak. Because climatic conditions are central to basic ecological processes that control the distribution and abundance of life, the list of species that are or will be endangered by climate change is potentially enormous.[12] The most direct way to protect the ecosystems in which these species live — the mandate of the ESA — will be to address the cause of climate change: greenhouse gas emissions. However, because some impacts are inevitable, it is important that we also consider how implementation of the ESA can be used to reduce the vulnerability of imperiled species and aid in their recovery despite changing conditions.

Climate Change and the Clean Water Act[13]

The CWA provides the legislative foundation for the protection and restoration of the waters of the United States. The Act seeks to "restore and maintain the chemical, physical, and biological integrity of the nation's waters" with the goal of achieving water quality that "provides for the protection and propagation of fish, shellfish, and wildlife, and recreation in and on the water."[14] The CWA gives the U.S. Environmental Protection Agency ("EPA") the statutory authority to establish water quality standards and to regulate the discharge of pollutants into waters of the United States.

Climate and water quality are linked by hydrologic processes involved in the global water cycle. These processes move water from the oceans, into the atmosphere, and back down into rivers, streams, wetlands, and estuaries. The net result is a sustainable supply of clean, fresh water and a wide variety ecosystem services, such as recreational opportunities and food production. It has long been recognized that humans intervene in this cycle through activities that intercept, store, utilize, or otherwise alter natural hydrologic processes (*e.g.*, the expansion of impermeable surfaces, application of excess fertilizer, and removal of ecological filtration processes such as wetlands). The CWA provides a framework for understanding these sources of impairment and acts to restore impaired waters and prevent further degradation. Over time, the CWA contributed to significant improvements in surface water quality in the United States despite a steadily growing population and expanding economy.

Climate change adds a new and potentially disruptive element to these long-running efforts. The Intergovernmental Panel on Climate Change predicts a wide variety of changes, including rising air temperature, more frequent heat waves, more intense precipitation events, and increasingly severe dry-spells and droughts.[15] These changes reflect the biophysical consequences of an overall acceleration of the global hydrologic cycle, and these general conclusions have been a feature of the scientific literature for nearly twenty years. However, the local and regional consequences of these complex processes remain difficult to predict. The key conclusion for local and regional decision makers is that "change" will be the operative word, and historic observations will provide an increasingly unreliable guide to future conditions. Changes in hydrologic processes will be reflected in changes in the quantity and quality of surface waters, and, in many cases, they are likely to undermine important assumptions used in the implementation of the CWA. For example:

- More intense precipitation events will increase nonpoint source pollution loads.
- Increasing storm water volumes may exceed expectations and design specifications for water treatment works and sewer infrastructure.
- Decreases in flow volume may increase in-stream pollutant concentrations and reduce the ability of waters to accommodate pollutant discharges.
- Increases in ambient air temperature will raise temperatures in surface waters and threaten aquatic ecosystems.
- Humans may respond to some climate change-related impacts through increased use of some pesticides, fungicides, and fertilizers, increasing the concentrations in surface and groundwater (*e.g.*, expanding nuisance species).
- Climate change may also decrease the toxicity thresholds of bioindicators to these pollutants.

These changes have significant implications for the most important and far-reaching CWA programs, including the control of point source discharge, management of nonpoint source pollution, and environmental monitoring.

Point source discharges are typically managed by engineered systems. Most modern systems are designed to accommodate a relatively wide range of environmental conditions. However, there are limits, and climate change may drive systems unexpectedly close to their design tolerances — sometimes risking catastrophic outcomes (*e.g.*, levies surrounding New Orleans). Changes to long-term, capital-intensive investments such as sewer and stormwater facilities are costly and time consuming. Consequently, those involved in their design, construction, and operation need to begin anticipating the impacts of climate change immediately.

Nonpoint source pollution represents a different kind of problem. By definition, nonpoint loads come from many small sources. Pollution is controlled by means of so-called Best Management Practices ("BMPs"), such as riparian buffers, retention ponds, and cover cropping. Climate change will alter both the volume and concentration of nonpoint source pollution and the effectiveness of BMPs. Managing nonpoint source pollution under changing climatic conditions will require thoughtful monitoring and attention to the relative sensitivities of different land uses and BMPs. In many cases, thoughtful land use planning and the selection of climatically-robust BMPs may be able to achieve many nonpoint source pollution control goals despite changing conditions.

CWA programs are based on observations of the actual water quality conditions and activities that may contribute to impairment. Observations include information about a water body's physical, chemical, and biological condition. These indicators are used to assess compliance with water quality standards and attribute degradation to specific sources. This process typically assumes that drivers of change can be found within a given watershed. However, climate change will alter water quality regardless of local actions and, in most cases, climate-related changes will compound or exacerbate on-going water quality

problems and a myriad of existing conditions and on-going restoration activities. In other words, climate change will make an already complicated analysis significantly more challenging.

Untangling complex, changing mixtures of factors contributing to water quality will require monitoring systems that allow for separation of climatic and non-climatic factors. The EPA uses a system of bioindicators to evaluate the biological integrity of surface waters.[16] These are typically fish, aquatic insects, and other organisms that have well-known responses to changes in water quality. These bioindicators provide synthetic measures of water quality that can help diagnose specific causes of impairment or degradation. However, bioindicators are themselves part of ecological systems that will respond to changes in both climate and water quality.[17] The myriad examples offered in toxicological literature demonstrate that elevated temperature and altered water chemistry can exacerbate the toxicity of pollutants. Consequently, the use of this important information for attribution will require understanding the response of specific bioindicators to changing conditions and specifically selecting indicators with methods that allow for partitioning between climatic and non-climatic impacts.[18]

Climate Change and the Clean Air Act

The stated purpose of Title IV of the CAA is "to reduce the adverse effects of acid deposition."[19] It seeks to address Congressional findings that:

(1) the presence of acidic compounds and their precursors in the atmosphere and in deposition from the atmosphere represents a threat to natural resources, ecosystems, materials, visibility, and public health;

(2) the principal sources of the acidic compounds and their precursors in the atmosphere are emissions of sulfur and nitrogen oxides from the combustion of fossil fuels;

(3) the problem of acid deposition is of national and international significance;

(4) strategies and technologies for the control of precursors to acid deposition exist now that are economically feasible, and improved methods are expected to become increasingly available over the next decade; and

(5) current and future generations of Americans will be adversely affected by delaying measures to remedy the problem.[20]

The CAA is primarily targeted at reduction of sulfur ("SO_X") and nitrogen oxides ("NO_X"). It also may be interpreted or amended to apply to greenhouse gases. Rising atmospheric CO_2-levels acidify ocean water and threaten marine resources and ecosystems. Reducing CO_2 emissions would help mitigate this global problem, potentially using CAA mechanisms originally designed for SO_X and NO_X. For example, Title IV of the CAA encourages "energy conservation, use of renewable and clean alternative technologies, and pollution prevention as a long-range strategy, consistent with the provisions of this title, for reducing air pollution and other adverse impacts of energy production and use."[21] These activities also reduce CO_2 emissions and in so doing mitigate the effect of atmospheric CO_2 on the ocean.

Finally, CO_2 acidification, like SO_X and NO_X, is a problem of national and international scope. Current and future generations will be affected by any delay in taking action. Due to the fact that roughly half of anthropogenic emissions end up in the oceans and because CO_2 remains in the atmosphere for a substantial period of time, CO_2 will continue to acidify the Earth's oceans for decades or centuries to come. Failure to limit anthropogenic emissions will only perpetuate this problem. The likelihood that reducing greenhouse gas emissions will limit acidification is very high.

To date, the EPA has been unwilling to regulate CO_2 as an air pollutant, and legal action by states and municipalities on this issue awaits a decision by the U.S. Supreme Court. Interpreting or amending the CAA to regulate CO_2 as an acidifying agent may be an effective mechanism for curbing CO_2 emissions.

Climate and water quality are linked by hydrologic processes involved in the global water cycle.

Conclusion

The ESA, the CWA, and the CAA form the foundation of the effort to protect and restore the environment in the United States. Climate change undermines the ambitious goals of these laws. Changes in climate can jeopardize the survival and recovery of endangered species. Climate change is likely to alter hydrologic processes in ways that could undermine the goal of providing clean, safe water resources. Climate change can also exacerbate long-standing air quality issues by increasing the likelihood of unhealthy or ecologically-damaging conditions. The first step is to take our collective foot off our fossil fuel-powered accelerator by implementing prompt and deliberate measures to reduce the emission of greenhouse gases.

This first step, while necessary, is not sufficient. We are already committed to significant levels of climate change due to the accumulation of CO_2 in our oceans and atmosphere. Achieving conservation and resource protection goals will require developing robust and resilient practices that explicitly anticipate and address the potential for changing conditions. In the years ahead, efforts to mitigate and adapt to climate change will constitute important, new dimensions to these critical pieces of environmental legislation.

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Methane Emissions from Waste Management in Developing Nations

*by Scott Johnson**

Greenhouse gas ("GHG") emissions from energy production and transportation often dominate the anthropogenic climate change debate. While the attention paid to non-carbon dioxide ("CO_2") GHGs in economic analyses of GHG abatement has increased in recent years,[1] developing nations must not ignore, and should promote the mitigation of, methane ("CH_4") emissions from municipal solid waste ("MSW") management.

As organic wastes decompose in the anaerobic conditions of modern, sealed landfills ("sanitary landfills"), landfill gas forms,[2] which consists of approximately 50 percent CH_4, 50 percent CO_2, and small concentrations of other organic compounds.[3] A potent GHG,[4] CH_4 accounted for approximately fifteen percent of total global GHG emissions in 2000.[5] Waste management, including MSW landfilling, was responsible for approximately 21 percent of such methane emissions.[6]

While most developed nations regulate landfill CH_4 emissions, many developing countries do not.[7] Historically, developing nations have not been significant landfill CH_4 emitters,[8] due to the use of open dumps, which allow oxygen to permeate the waste and limits CH_4 formation.[9] However, rapid increases in population, income, and industrialization increase MSW generation.[10] Developing nations also face escalating CH_4 emissions[11] as they divert more MSW into sanitary landfills, a practice intended, paradoxically, to improve public health and environmental conditions.[12] Thus, as MSW generation and sanitary landfilling increase, global atmospheric CH_4 emissions also likely will increase,[13] perhaps by as much as nine percent between 2005 and 2020.[14]

Non-CO_2 GHG emissions growth, including CH_4 emissions, is predicted to be greatest from 1990–2020 in the Middle East (197 percent), Africa (104 percent), Latin America (86 percent), South and Southeast Asia (64 percent), and China/Centrally Planned Asia (58 percent), while projected emissions in developed nations are expected to increase only ten percent during that period.[15] China is illustrative of the potential risk, as it now generates more MSW than any other nation, a dubious honor that until recently belonged to the United States.[16]

While population growth in China, which more than doubled between 1950 and 1990, is stabilizing, its annual per capita economic growth, averaging approximately nine percent over the past 25 years, is unprecedented.[17] Presently, China's quarterly GDP growth exceeds ten percent,[18] having hovered steadily around that level since 2001.[19] Moreover, many urban centers in China are transitioning to sanitary landfilling as their primary MSW management strategy, while they continue to struggle with unsurpassed generation increases, changing MSW stream composition, and minimal waste reduction efforts.[20] MSW generation in urban China alone could increase 250 percent from its 2004 volume by 2030.[21] Never has a nation experienced as large, or as rapid, an increase.[22]

In light of the potential for increased CH_4 emissions from rapidly developing nations, policymakers and the public in such nations, as well as the international community, should recognize and seize the opportunity to reduce atmospheric CH_4 concentrations. Because CH_4 is the primary constituent of natural gas[23] and is recoverable for use as an alternative energy resource,[24] such programs may simultaneously and effectively serve the dual purposes of abatement of landfill CH_4 emissions and reduction of fossil fuel consumption. By doing so, developing nations that pose a potential CH_4 emission risk might achieve a substantial reduction of that risk while at the same time being able to use recovered energy for further development.

Developing nations also face escalating CH_4 emissions as they divert more municipal solid waste into sanitary landfills.

Endnotes:

[1] U.S. Environmental Protection Agency, International Analysis of Methane and Nitrous Oxide Abatement Opportunities: Report to Energy Modeling Forum, Working Group 21 1 (June 2003), *available at* http://www.epa.gov/nonco2/econ-inv/pdfs/methodologych4.pdf (last visited Jan. 31, 2007).

[2] U.S. Environmental Protection Agency, Global Anthropogenic Emissions of Non-CO_2 Greenhouse Gases: 1990–2020 6-2 (June 2006), *available at* http://www.epa.gov/nonco2/econ-inv/pdfs/GreenhouseGasReport.pdf (last visited Jan. 31, 2007) [hereinafter Anthropogenic Emissions]; U.S. Environmental Protection Agency, Global Mitigation of Non-CO_2 Greenhouse Gases, Section III. Waste, at 1 (June 2006), *available at* http://www.

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The Evolving Scope of Significant Effects on the Environment:

The National Environmental Policy Act and Climate Change

*by Chris McChesney**

Introduction

On Wednesday, November 29, 2006, the United States Supreme Court heard the oral arguments for *Massachusetts v. Environmental Protection Agency*.[1] The case revolves around the ability of the U.S. Environmental Protection Agency ("EPA") to regulate carbon dioxide ("CO_2") under the Clean Air Act ("CAA"); a seemingly minute point of law, unimportant to those outside of the environmental community and those regulated by the EPA.[2] In reality, the case has the potential to affect how the United States goes forward in developing a policy to address climate change.[3] It is the first time the Supreme Court will deal with the issue of climate change. The opinion of the Court will surely have a ripple effect: impacting pending climate change cases in lower courts, shaping the future of the standing doctrine, and spurring Congress to develop a climate change policy in the face of an administration that has, to date, decided not to mandate any regulation of CO_2 emissions.[4]

Unsatisfied with the administration's response, many environmental groups, states, and local governments are looking to current environmental and tort law to begin regulating the emission of CO_2 and other greenhouse gases ("GHGs") through court orders.[5] This is evident by the litany of current litigation ranging from states bringing nuisance suits against power companies and automakers to the line of cases arguing for federal regulation under the CAA, such as *Massachusetts v. EPA*.[6] Another line of cases falls under the National Environmental Policy Act ("NEPA").[7] While unable to force the regulation of CO_2, NEPA does require federal agencies to consider the environmental impacts of their actions, potentially including the impacts of CO_2 emissions.[8] Though the usefulness of bringing NEPA litigation for the lack of or inadequacy of consideration given to CO_2 emissions is debatable,[9] this article will focus on a narrow question: Can courts force federal agencies to take a "hard look" at the impacts of climate change due to the release of CO_2 emissions stemming from the agency's actions?

While NEPA does not provide a means to create, or force the administration to develop, any such regulations,[10] NEPA can force federal agencies to at least consider and disclose to the public the impacts their actions will have due to contributions to CO_2 emissions. This article examines the requirements and case law of NEPA with respect to climate change and explores a hypothetical lawsuit concerning the lack of federal environmental documentation for the planned reliance on coal-fired power plants ("CFPPs") to provide the majority of the nation's new sources of electric power.[11] Next, this article will introduce the basic requirements of NEPA and the Council on Environmental Quality's ("CEQ") implementing regulations, and the science of climate change. The article will analyze what little case law there is on NEPA and climate change, including *Border Power Plant Working Group v. Department of Energy*, *Mayo Foundation v. Surface Transportation Board*, and *Friends of the Earth v. Mosbacher*, two of which are currently pending. Finally, the article will discuss the planned future reliance on CFPPs and a hypothetical lawsuit challenging such plans as a violation of NEPA.

Any net increase in CO_2 emissions from the U.S. will only serve to exacerbate the impacts of climate change.

NEPA and Climate Change

National Environmental Policy Act

The National Environmental Policy Act requires federal agencies to take a "hard look" at the environmental consequences of their proposed actions.[12] Section 102, the action forcing section, requires agencies to write Environmental Impact Statements ("EIS") for "major Federal actions significantly affecting the quality of the human environment."[13] NEPA separates all federal agency actions into three categories: major actions, non-major actions, and categorical exclusions.[14] Of these three, only major actions fall under the purview of NEPA.[15] Major federal actions are further broken down into two categories: those that have a significant impact on the quality of the human environment and those that have no significant impact.[16] In making the determination if an action will have a significant impact, agencies begin by preparing an Environmental Assessment ("EA").[17] Much more concise than an EIS, EAs provide public documentation of what the agency took into con-

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sideration to determine whether their proposed action will have a significant impact on the environment.[18] If there is no significant impact, the agency issues a document explaining how the agency came to their conclusion called a Finding of No Significant Impact ("FONSI").[19] On the other hand, if it appears that the proposed action will have a significant impact, the agency must prepare a full EIS.[20] Courts have maintained that NEPA is purely procedural and has no enforceable substantive mandates.[21] Therefore, as long as an agency follows the appropriate procedure in making decisions, an agency can take a course of action that is not the most environmentally sound.[22]

In order to satisfy the requirements of NEPA, an EIS must discuss, among other things: environmental impacts, including adverse effects, of the proposed action; alternatives to the proposed action; and irreversible commitments of resources.[23] The CEQ, through its implementing regulations, further clarified and expanded upon the requirements set out in section 102(C) of NEPA, primarily through defining "effects" as those that are, "direct, indirect, or cumulative," and "cumulative impacts," as, "past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions."[24] It is through these definitions that NEPA has the potential to evolve and broaden its scope as the scientific understanding of the environment grows of just how significant the impacts of climate change, induced by anthropogenic emissions of CO_2 and other GHGs, truly are.

Climate Change is a Significant Impact

The necessity of constraining GHG emissions is a global problem, but the United States is responsible for largest percentage of the problem, compared to all other nations.[25] CO_2 is not the only GHG, but it is by far the most prevalent, and in 2002, the United States accounted for over twenty percent of the world's total CO_2 emissions.[26] While a large portion of the world is trying to decrease emissions, any net increase in CO_2 emissions from the U.S. will only serve to exacerbate the impacts of climate change.[27] Nevertheless, the question remains whether U.S. emissions are "significant" under NEPA? One effect of a major federal action may be a slight, seemingly miniscule, increase in worldwide CO_2 emissions.[28] An increase in CO_2 emissions that amounts to less than one percent of worldwide emissions of CO_2 is not the sole cause of climate change, and preventing or lessoning that amount of the CO_2 emissions will not stop climate change.[29] It is also currently not possible to determine the correlation between the CO_2 emissions from one action and the increase in temperature.

Perhaps a direct correlation between cause and effect and comparing the CO_2 emissions from one action to total worldwide emissions is the incorrect approach, both in theory and in law. After all, NEPA and the CEQ regulations require the consideration of cumulative impacts.[30] As stated earlier, cumulative impacts include those that are, "past, present, and reasonably foreseeable."[31] Moreover, "cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."[32] The release of CO_2 emissions and impacts of climate change could arguably fall under the scope of cumulative impacts. The court's interpretation of cumulative impacts, however, has likely neutered this approach.[33] Cumulative impacts must be related to the proposed project and within the affected area.[34] Because of the narrow view of "cumulative impacts," it is unlikely that impacts of the CO_2 emissions from any one project and related activities will be seen as significantly impacting the environment via climate change.

Another potential option to have the impact of an increase in CO_2 emissions deemed significant is through Programmatic Environmental Impact Statements ("PEIS"). Along with individual agency actions, programs also fall under the purview of NEPA.[35] These broader EISs have the ability to look at the larger scale impacts of multiple projects that may later each get their own NEPA analysis. It remains to be seen if federal agencies or courts will ever view the emissions of CO_2 as "significantly affecting the quality of the human environment," and the outcome of pending cases may determine which of the approaches, if any, will be successful.

Current Climate Change Litigation Involving NEPA

The perceived inaction on climate change has given rise to several lawsuits.[36] Of these, a court has decided only one NEPA case,[37] while three other NEPA cases are currently pending.[38] The cases follow one of two strategies: (1) Attacking individual actions by agencies, and their corresponding NEPA documentation, for failure to consider impacts GHG emissions; or (2) Attacking agency programs on a broader scale for their failure to do a PEIS. This article will analyze three of these cases. The first, *Border Power Plant Working Group v. Department of Energy* (hereinafter "*BPPWG*"), was successful in requiring the Department of Energy ("DOE") to include CO_2 emissions and impacts on climate change, however, DOE ultimately skirted the issue by dismissing the amount a CO_2 emitted as "negligible" in their EIS.[39] The second case, *Mayo Foundation v. Surface Transportation Board* (*Mid State Coalition for Progress v. Surface Transportation Board*) (hereinafter "*Mayo*"), was also successful in requiring an agency to consider the impacts of climate change.[40] Again, the agency skirted the issue by stating that the increase in emissions would be minor.[41] The plaintiffs are now challenging the adequacy of the Supplemental Environmental Impact Statement ("SEIS").[42] The final case, *Friends of the Earth v. Mosbacher*, formerly *Friends of the Earth v. Watson* (hereinafter "*FOE*"), differs as it takes the approach that the defendant agencies are required to do a PEIS under NEPA.[43]

Border Power Plant Working Group v. Department of Energy

In *BPPWG*, plaintiffs challenged a DOE FONSI for permitting transboundary transmission lines entering the United States from Mexico.[44] The planned transmission lines were to originate from two different power plants, the La Rosita Power Complex ("LRPC") and the Termoelectrica de Mexicali power plant ("TDM").[45] After determining the plaintiffs had standing, the court moved to the merits of the case — did the emissions of the power plants fall under the purview of NEPA via indirect

effects.[46] The court, after analyzing the case law, concluded that the "indirect effect" must be causally linked to the federal action.[47] In order to determine if DOE needed to consider the emissions of power plants, the court looked at the likelihood of each plant operating without the transmission lines, thereby establishing, or not, a causal link to the federal action.[48] The first plant, LRPC, consisted of four turbines — two for production of electricity for use primarily in Mexico, and two for the export of electricity to U.S. markets.[49] All of the turbines at the TDM power plant were for the production of electricity to export to U.S. markets.[50] Based on this, the court held that the impacts from the two LRPC turbines and all the TDM turbines had to be considered under NEPA, while the impacts from the two LRPC turbines for use in Mexico did not need to be considered.[51]

The District Court in BPPWG fashioned a well-reasoned opinion to require DOE to take into account CO_2 emissions from the power plants. Though exclusion of the two LRPC turbines is not desirable, it is understandable: even without the transmission lines, those turbines would exist and emit CO_2.[52] It is reasonable to see the pollution from those two turbines as unconnected to the federal action. Unfortunately, after such a favorable court opinion, DOE summarily dismissed the CO_2 emissions as "negligible."[53] Such actions begs the question, are the emissions from any one federal action ever enough to be considered significant? The following two cases try to deal with this question and find a means around it.

Under NEPA, it is possible that CO_2 emissions from an individual coal fired power plant need to be considered.

Mayo Foundation v. Surface Transportation Board

Before the court in Mayo is the Surface Transportation Board's ("SBT") Section on Environmental Analysis's ("SEA") EIS that approved new rail lines and upgrading of older lines.[54] The plaintiffs in Mayo challenged the EIS in a prior lawsuit, and the court found the EIS to be inadequate, in part because, "SEA wholly failed to consider the effects on air quality that an increase in the supply of low-sulfur coal to power plants would produce."[55] SEA argued that the rail lines would not affect the demand for coal.[56] The court did not agree with SEA's argument, and agreed with the intervener rail company's ("DM&E") assessment that it would increase the demand for coal.[57] However, DM&E argued that despite the increased demand, SEA's EIS did not need to consider the impacts on air quality because they were too speculative.[58] The court, to the contrary, viewed the "speculative" impacts as "indirect impacts" and therefore NEPA still required their consideration.[59] Indirect impacts must still be "reasonably foreseeable."[60] The court found that even though the "extent" of the impacts is not certain, the "nature" of the impacts was reasonably foreseeable.[61] SEA also argued that because the pollutants emitted were regulated under the CAA, any emissions from increased use of coal would not be significant.[62] The court also found this argument unconvincing.[63] Ultimately, the court held that even though some of the gases emitted into the air would be capped under the CAA, they would still have an environmental impact, and not all of the gases emitted, notably CO_2, are regulated under the CAA.[64] The court went as far as to say that the EIS's lack of analysis with respect to the increased coal consumption was "irresponsible."[65]

After the 2003 court decision, STB published an SEIS.[66] The SEIS, using models of coal supply and demand, concluded that any increases in coal consumption would be minor.[67] Therefore, STB reasoned, that any increase in emissions would not have significant impacts.[68] The plaintiffs from the 2003 case have brought suit again claiming the SEIS's consideration of the impacts is inadequate, including the treatment of climate change.[69] How the Eighth Circuit treats this new challenge may determine how plaintiffs proceed with NEPA lawsuits as a means to address climate change. As with *BPPWG*, *Mayo*'s defendant agency ultimately did discuss climate change in its EIS. However, both agencies dismissed the amount of emissions as not significant, and therefore did not fully analyze their contribution to the broader impacts on the environment due to climate change. If the court finds that STB did adequately consider the impacts, the decision has the potential to allow all agencies to dismiss the impacts of GHGs as minor because each individual project does not emit a large percentage of total worldwide emissions.

Friends of the Earth v. Mosbacher

FOE is attempting to get around the problem of negligible emissions by arguing the defendant federal agencies, the Overseas Project Investment Corporation ("OPIC") and the Export Import Bank ("EIB"), must do a PEIS. OPIC and EIB provide financing for oversea projects, including fossil fuel projects without any NEPA analysis.[70] Collectively, plaintiffs asserted that the defendants must write a PEIS and the projects they support account for eight percent of worldwide emissions.[71] With a larger percentage of worldwide total emissions affected by the agencies' actions, this case could prove to require the agencies to actually consider the impacts of climate change instead of brushing them aside as negligible.

The only decision in regards to the case, in August of 2005, allowed the plaintiffs to survive a challenge to their standing and the claim that there has been no final agency action.[72] On April 14, 2006, the court heard arguments on the merits of the case.[73] The court's 2005 opinion denying the defendants' motion for summary judgment is optimistic. In determining the plaintiffs have standing, the court recognized that potential injuries caused by climate change and increased emissions are not speculative,[74] and in moving forward on the merits, the defendants have con-

ceded that their actions do impact the environment and are instead arguing that they are not subject to NEPA.[75] While compelling, those arguments do not need to be addressed for the purposes of this article.

Coal Fired Power Plants Hypothetical

As of September 2006, the National Energy Technology Lab, an agency under DOE, estimates there are currently 154 proposed or new (since 2000) CFPPs, and by 2030, there could be as many as 300 new CFPPs.[76] Though it is difficult, if not impossible, to estimate the increase in CO_2 emissions these plants will create, one thing is certain: the forecasted dependence on a large number of new CFPPs will affect climate change.[77] Absent a mandatory federal policy on climate change,[78] it is unclear if the emissions of CO_2 from the new CFPPs will be regulated or even analyzed for their total cumulative impacts. Under NEPA, it is possible that CO_2 emissions from an individual CFPP need to be considered, but it is unlikely that individual CFPP's emissions would exceed 0.5 percent of world CO_2 emissions and therefore, pending the decision in *Mayo*, could be considered "negligible."[79] In order to gain a better understanding of how much of a significant impact the over 150 new CFPP CO_2 emissions will have on climate change, a more comprehensive analysis should be done under NEPA via a PEIS, but determining which federal agency is responsible for the PEIS could prove to be a fatal flaw in such an approach.

The continued reliance on coal presents a tremendous environmental challenge. In order to even begin to understand just how much of an increase in CO_2 emissions will result from the new "boom" in CFPPs, some sort of environmental analysis is needed from the federal government. However, it is difficult to determine which federal agency is responsible for these new CFPPs. While DOE tracks the construction, production, and emissions of these new plants, they have little to no actual permitting or regulatory authority over them.[80] The majority of the authority to permit the construction and operation of the plants rests with the states the CFPP resides in or with EPA under the CAA.[81] Even under the CAA though, EPA has delegated the majority of its permitting authority to the states and is not required to do any NEPA review.[82] With no clear solution, a broader approach must be taken. The plaintiffs in the above-discussed cases took such approaches in order to get at the underlying issue — GHG emissions from the combustion of coal and other fossil fuels.[83] In order to address the issue of new CFPPs in their entirety, a PEIS is needed. However, such broad programs that have causal connections to the construction of new CFPPs are not abundant, and the ones that do exist likely have PEISs in place or in production. If so, prospective plaintiffs can challenge the PEIS if it did not adequately discuss the impacts of increased CO_2 emissions from CFPPs.

One such potential agency program that may have a causal link to increased emissions of CO_2 is the Department of Interior's Office of Surface Mining ("OSM"). OSM, among other things, regulates mountaintop mining — a process in which the top of a mountain is removed through the use of explosives to get the coal within the mountain.[84] For this, OSM, in conjunction with the Army Corps of Engineers, the U.S. Fish and Wildlife Services, and the EPA, produced a lengthy PEIS.[85] Within the over 500 pages of analysis — that do not mention climate change, CO_2, or other related issues — lays a potential challenge due to inadequate consideration of the indirect effects of increase in the coal supply, analogous to *Mayo*, but on a wider, programmatic level, such as in *FOE*.[86] In event that neither *Mayo* nor *FOE* produces a favorable outcome, a lawsuit attacking the mountaintop mining PEIS may still succeed. Such a suit would not face the dilemma of the scope of significant impacts, as mountaintop mining has a much greater impact than either a single CFPP or railroad. Additionally, the proposed suit would not face similar issues raised by the defense in *FOE*, as there is clear final agency action; a PEIS has already been published. The main issue blocking a decision on the merits for this proposed lawsuit is, however, on the first page of the PEIS. The agencies do accept that the PEIS was required under NEPA.[87] If such a suit is possible depends, as all suits do, on multiple other factors as well, all of which need more review and will not be discussed in this paper.

Conclusion

With climate change becoming a certainty, the United States needs to take mandatory action to reduce its share of emissions. In the absence of such regulation, groups are attempting to address the problem through existing U.S. law, including through NEPA. The impacts of climate change are significant under NEPA, and federal agencies need to consider their contributions to climate change prior to taking action. Some agencies are accepting that emissions cause an impact, but the trick is now in finding a way around dismissing each action's individual emissions as negligible. After all, it is now easy for a court to accept climate change. However, it is more difficult for a court, and not necessarily scientifically accurate, to accept that the small increase in worldwide emissions from a single project will have a correlative impact on the environment via climate change. This very dilemma turned the seeming victory of *BPPWG* into nothing more than a Pyrrhic victory. The pending court case, *Mayo* and *FOE*, will play a large role in the future of climate change litigation and NEPA analysis. If one of the cases is successful and the agencies are either required to broaden their scope of impacts in terms of climate change or required to do a PEIS that takes a "hard look" at the impacts of CO_2 emissions, a door will open for further litigation. This litigation can serve to not only gain a better understanding of climate change and the impacts it will have on our environment, but also to aid in demonstrating the need for mandatory regulation. With continued efforts to evolve the scope of NEPA to encompass the full impacts of climate change, future litigation can succeed without losing the greater struggle.

Endnotes: The Evolving Scope of Significant Effects on the Environment *on page 80*

Potential Causes of Action for Climate Change Impacts Under the United Nations Fish Stocks Agreement

*by Dr. William C.G. Burns**

Introduction

While the international community developed institutional responses to climate change in the 1990s, through the United Nations Framework Convention on Climate Change ("UNFCCC")[1] and the Kyoto Protocol to the UNFCCC,[2] these have proven to be wholly inadequate to the task. Resistance by several nations, most prominently, the United States, to mandatory reduction targets for greenhouse gas emissions led the drafters to resort instead to "constructive ambiguities" and "guidelines, rather than a legal commitment."[3] Thus, the UNFCCC merely calls on the Parties in Annex I (developed countries and economies in transition) to "aim" to return their emissions back to 1990 levels.[4]

This article examines a potential international forum in which the threat of climate change might be addressed, specifically the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea ("UNFSA").[5] Actions to address climate change under UNFSA could be salutary for several reasons. First, the commercial fisheries sector may be profoundly and adversely affected by climate change. This includes many fish stocks regulated under UNFSA: highly migratory species, which have wide geographic distribution and undertake significant migrations,[6] and straddling stocks, which occur both within and beyond Exclusive Economic Zones ("EEZs").[7] Second, the United States, both the world's largest emitter of greenhouse gases ("GHGs") and a State with an abject record in addressing climate change, is a Party to UNFSA, and has played an active leadership role in its implementation.[8] UNFSA thus presents an excellent forum in which to engage the United States, as well as other major GHG emitters, including the European Union and China, on climate issues. Finally, unlike the other international fora for a where climate change actions have been pursued to date, UNFSA provides a dispute resolution mechanism with teeth.[9]

A Party to UNFSA pursuing an action based on climate change damages would face some imposing barriers, though none need prove fatal.

An article of this length necessarily cannot discuss all of the intricate scientific and legal issues that an action of this nature would invoke; rather, it seeks to lay a foundation for further research and discussion. In this pursuit this article will: (1) outline the potential impacts of climate change on fish species, with an emphasis on the potential impacts of climate change on highly migratory fish species and straddling stocks; (2) provide an overview of UNFSA and potential actions for climate change damages under the Agreement; and (3) briefly discuss potential barriers to such actions.

Urgency of Examining Additional Fora to Address Global Warming

While the Kyoto Protocol constituted an important step forward because it established binding commitments by industrialized parties to reduce emissions,[10] it by no means is a panacea to the specter of climate change. First, the United States, responsible for 25 percent of the world's GHG emissions, rejected the Kyoto Protocol in 2001.[11] While the Bush administration has touted a voluntary, technologically-driven approach,[12] the UNFCCC Secretariat recently projected that U.S. GHG emissions in 2010 will be more than 32 percent above 1990 levels, and more than 50 percent above 1990 levels by 2020.[13] To date, the United States has failed to present a realistic scenario for stabilizing or reducing its GHG emissions.

Second, it is by no means clear that many of the Parties to the Protocol will even meet their modest commitments under Kyoto.[14] Finally, the Protocol's initial commitments constitute only an extremely modest down payment on what ultimately must be done to stabilize atmospheric concentrations of GHG emissions. Climate researchers have estimated that full implementation of Kyoto would reduce projected warming in 2050 by only about *one twentieth of one degree*.[15] By contrast, stabilization of atmospheric GHGs will ultimately require the global community to reduce GHG emissions by 60 to 70 percent.[16] This will necessitate industrialized countries, including the United States, committing themselves to

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reductions of as much as 80 percent by the middle of the century if developing nations are to be permitted some growth in their emissions levels.[17] It will also ultimately necessitate deep cuts by large developing States with rapidly growing emissions, such as China and India.[18]

At this point, it is difficult to be sanguine about the prospects. While the UNFCCC Secretariat lauded the purported "Spirit of Nairobi" at the latest Conference of the Parties held in Kenya,[19] in reality the Parties made very little progress developing a framework for long-term reductions in GHG emissions. Rather, the focus was on adapting to climate change impacts that increasingly seem inevitable.[20]

The inadequacy of domestic legislation and treaty responses to climate change to date has led to a parallel commencement of judicial and quasi-judicial actions. Several actions related to climate change have been initiated in national courts and regulatory agencies in several countries,[21] as well as two actions in international fora, the Inter-American Commission on Human Rights,[22] and the World Heritage Committee.[23]

The Potential Impact of Climate Change on Fish Species

Fish species are ectothermic (cold blooded); thus, water temperature is the primary source of environmental impact on fish, including growth and maturity rates, distribution and migration patterns, and incidence of disease.[24] Substantially rising oceanic temperatures throughout this century will likely have negative impacts on highly migratory and straddling stocks species in many regions, especially those near the edge of their temperature tolerance range. For example, the range of colder water fish species, such as capelin, polar cod and Greenland halibut, is likely to shrink, resulting in a decline in abundance.[25] A decline in nutrient upwelling as a consequence of increased stratification between warmer surface waters and colder deep water in warming oceans could also result in a decline in big eye and yellow fin tuna in the central and western Pacific.[26]

Warming oceans could also radically change the distribution of some straddling stock and high migratory species. For example, rising ocean temperatures could result in a shift of the distribution of herring northward, upsetting a delicate agreement in the Northeast between coastal States who harvest herring within their EEZs and distant water fishing nations who fish on the high seas.[27] Should cooperative management agreements collapse, it might lead to "strategic over fishing" of a stock that is currently recovering from a historical decline.[28] Warming in the Pacific could similarly result in a redistribution of tuna resources to higher latitudes, such as Japan and the western equatorial Pacific.[29]

Temperature increases will also adversely affect prey species of many straddling stocks and highly migratory species. For example, in the North Atlantic, strong biogeographical shifts in copepod assemblages associated with warming trends could substantially reduce the abundance of fish in the North Sea and ultimately result in the collapse of the stocks of cod, an important straddling stock species.[30]

There may also be direct biological effects from rising levels of carbon dioxide entering the oceans. By the end of this century, projected increases in atmospheric carbon dioxide will result in an almost threefold increase in surface ocean carbon dioxide concentrations relative to pre-industrial levels.[31] This, in turn, could result in the average pH of the oceans falling by 0.5 units by 2100, which would translate into a three-fold increase in the concentration of hydrogen ions, making the oceans more acidic than they have been in 300 million years.[32] Acidification of the oceans will result in a decrease in the concentration of carbonate and related ions that reef building and other calcifying organisms[33] draw upon to produce calcium carbonate.[34] Among the species that might be severely affected are a snail species, the pteropod. In the Ross Sea, the subpolar-polar pteropod *Limacina helicina* sometimes replaces krill as the dominant zooplankton species in the ecosystem.[35] A recent study indicates that increased acidification of pteropod habitat in the Sea might ultimately result in the disappearance of the species from Antarctic waters, or shift its distribution to lower latitudes.[36] The potential exclusion of pteropods from other polar and subpolar regions could also have negative impacts on several straddling stock species for which it is a prey species.[37]

It is by no means clear that many of the Parties to the Protocol will even meet their modest commitments under Kyoto.

Given the severe impacts that climate change may have on straddling stocks and high migratory species, it is germane to next assess the prospects for enhancing their protection through the primary international legal instrument for their management and conservation.

Overview of UNFSA

The Third United Nations Conference of the Law of Sea convened in 1973 and culminated nine years later in the adoption of the United Nations Convention on the Law of the Sea ("UNCLOS").[38] UNCLOS entered into force in 1994 and currently has 148 parties.[39] UNCLOS consists largely of provisions for the regulation of fisheries, with an emphasis on the sovereign rights of coastal States to explore, exploit, conserve, and manage living natural resources, including fish stocks, within their respective 200-mile EEZs.[40]

While many have characterized UNCLOS as "a constitution for the oceans,"[41] it provides only general governing principles

for the management of straddling stocks and high migratory species. In cases where stocks are found within the EEZs of two or more coastal States, or an EEZ and an area beyond it, UNCLOS merely requires that the pertinent fishing States "seek" to agree upon management measures either directly or through sub-regional or regional organizations.[42] In the case of highly migratory species, coastal States and other States with nationals fishing in the region are exhorted to cooperate directly or through international organizations "with a view" to ensuring conservation and optimal utilization.[43] A proposal by some coastal States for an arbitration clause was beaten back by distant-water fishing nations and subsequently withdrawn.[44]

The lack of binding obligations in UNCLOS for high migratory species and straddling stocks was largely attributable to the fact that fishing in these regions was not considered to be a major issue in the early 1980s.[45] However, as coastal States began to claim their rights within their EEZs, large distant-water fishing fleets were increasingly displaced from their traditional fishing grounds, placing increasing pressure on stocks on the high seas and straddling stocks.[46] This shift quickly took its toll. In 1994, the UN Food and Agriculture Organization ("FAO") reported that straddling fish stock catches in EEZs and high seas had been declining since 1989, and that many highly migratory fish stocks, including a majority of tuna species, were depleted, in some cases, severely.[47]

In 1992, the participants at the UN Conference on Environment and Development called for an intergovernmental conference under the auspices of the United Nations to address to promote effective implementation of UNCLOS provisions related to straddling stocks and highly migratory species.[48] In 1993, the UN General Assembly convened an intergovernmental conference, culminating in UNFSA. UNFSA entered into force in December of 2001 and currently has 62 Parties,[49] "including most States with significant interests in international fisheries."[50]

The Agreement's overarching objective is to "ensure long-term conservation and sustainable use of straddling fish stocks and highly migratory fish stocks."[51] The Agreement's primary means of effectuating this is through engendering cooperation between coastal States and States fishing on the high seas, through, *inter alia*:

- Seeking agreement between coastal States and States on the high seas to agree upon necessary measures for conservation of stocks in the high seas areas and straddling stocks through direct agreements and cooperation in Regional Fisheries Management Organizations;[52]
- Collecting and exchanging of critical data with respect to straddling stocks and highly migratory species;[53] and
- Expanding the duties of Flag States to ensure enforcement of and compliance with the Convention's provisions, as well as the rights of other States, including port States, to ensure compliance with the Agreement.[54]

However, the focus of UNFSA is on the relationship between coastal States and States fishing in areas beyond EEZs, there are a large number of provisions that could give rise to claims associated with climate change impacts on straddling stocks and highly migratory species.

UNFSA and Climate Change

It should be noted at the outset of this section that UNFSA adopts the well-recognized "no harm rule" of international environmental law,[55] providing that "States Parties are liable in accordance with international law for damage or loss attributable to them in regard to this Agreement."[56] Many of the provisions of UNFSA, in turn, could provide the basis for a Party to bring an action against one or more other Parties for climate-related damages to fisheries.

As indicated above, the Agreement's primary objective is to ensure the long-term conservation and sustainable use of straddling fish stocks and highly migratory species,[57] mandating that its Parties take conservation and management measures to further this objective. While the Agreement's primary focus is on the impacts of the harvesting of fish stocks, it clearly contemplates the regulation of other potential factors that could inflict damages on fish stocks. For example, UNFSA requires the Parties to assess the impacts of "other human activities and environmental factors on target stocks and species belonging to the same ecosystem or associated with or dependent upon the target stocks."[58]

Moreover, the Agreement requires the Parties to "minimize pollution."[59] While the Agreement does not define the term "pollution," given the relationship of the agreement to UNCLOS it would seem reasonable to apply its definition of this term. In pertinent part, UNCLOS defines "pollution of the marine environment" as:

> the introduction by man, directly or indirectly, of substances or energy into the marine environment . . . which results or is likely to result in such deleterious effects as harm to living resources and marine life . . . hindrance to marine activities, including fishing.[60]

While rising ocean temperatures related to climate change could not reasonably be construed as a "substance" under UNCLOS, it would likely be construed by a dispute resolution body as "energy," much as introduction of heat, such as waste water from production processes, appears to fall under this rubric.[61] Moreover, as developed above, the uptake of carbon dioxide into the oceans can result in direct deleterious impacts on marine life, which clearly brings carbon dioxide under the definition of a polluting "substance" under UNCLOS.

Where necessary, UNFSA also imposes obligations on the Parties to adopt conservation and management measures for "species belonging to the same ecosystem or associated with or dependent upon target species" and to "protect biodiversity of the marine environment."[62] Thus, to the extent that climate change may diminish certain stocks, or alter their distribution in a way that adversely affects the interests of discrete Parties, a cause of action could arise under the Agreement.

Rare among international environmental agreements, UNFSA provides for a binding dispute resolution mechanism where efforts to resolve the dispute through non-binding methods proves to be unavailing. Part VIII of the Agreement applies

the dispute resolution mechanism set out in Part XV of UNCLOS to any dispute under the Agreement, even where one or more of the disputants are not Parties to UNCLOS.[63]

As one scholar observed, UNCLOS "creates a binding system of obligations and dispute resolutions, which confers on a forum international jurisdiction, authority, and implementing powers that exceed those of other international environmental law forums and rival those conferred on the World Trade Organization."[64] Part XV of UNCLOS provides States with four potential fora for settlement of disputes:[65] the International Tribunal for the Law of the Sea ("ITLOS"),[66] the International Court of Justice; an arbitral panel; or a special arbitral panel.[67] States may choose to declare their choice of forum, but in cases where they have not, or Parties to a dispute have not accepted the same procedure for dispute settlement, the dispute must be submitted to binding arbitration unless the Parties agree otherwise.[68] To date, the vast majority of Parties to UNCLOS have, *de facto*, chosen arbitration by their silence on the matter, as have most Parties to UNFSA.[69]

Potential Barriers To Causes Of Action Under UNFSA

A Party to UNFSA pursuing an action based on climate change damages would face some imposing barriers, though none need prove fatal.

General Causation

In many cases, declines of fish stocks or shifts in distribution may be attributable to a number of factors, including over fishing,[70] habitat destruction,[71] or diminution of prey species.[72] A Party defending itself against a claim of climate change may thus contend that it is not possible to link species decline or distribution shifts solely to climatic factors, and thus it cannot be held liable under UNFSA. This argument should not prevail. First, even if other factors may constitute threats to regulated species, clearly, climate change is a substantial peril for many of these species. A tribunal or panel could assess the extent of this threat by employing statistical probability analysis[73] to support a finding of liability at a reasonable level of probability. This would in turn trigger the responsibility[74] of major emitters of GHGs to adopt measures to reduce these emissions to levels that substantially reduce the threat to high migratory and straddling stock species. Second, UNFSA provides for wide application of the precautionary approach to protect living marine resources.[75] Thus, even under scenarios of uncertainty about a given threat "[t]he absence of adequate scientific information shall not be used as a reason for postponing or failing to take conservation and management measures."[76]

Substantially rising oceanic temperatures throughout this century will likely have negative impacts on highly migratory and straddling stocks species in many regions.

Specific Causation

The target of a climate-related UNFSA action might argue that climate change is caused by a multitude of anthropogenic sources, and thus, any specific harm cannot be attributable to a specific Party, even a large GHG emitting State such as the United States. While this is certainly the case, an UNFSA action likely would not seek monetary damages, where the issue of specific causation would be clearly germane. Rather a Party bringing such an action would likely be seeking a commitment by the targeted Party to fulfill its "duty to cooperate" under the treaty[77] by enacting effective measures to contribute to the goal of "long-term sustainability of straddling fish stocks and highly migratory fish stocks."[78] Thus, any Party failing to meet this obligation could be found to be in violation of the treaty.

Reluctance of Dispute Resolution Bodies to Address Climate Change

Experience with climate change litigation to date in the United States, at least, has demonstrated some reluctance on the part of members of the judiciary to address climate change issues given their limited scientific expertise. Consider, for example, Justice Scalia's flippant but telling comment in the recent oral arguments in the recent Supreme Court oral arguments in *Massachusetts, et al. v. Environmental Protection Agency*:[79]

> JUSTICE SCALIA: . . . your assertion is that after the pollutant leaves the air and goes up into the stratosphere it is contributing to global warming.
>
> MR. MILKEY: Respectfully, Your Honor, it is not the stratosphere. It's the troposphere.
>
> JUSTICE SCALIA: Troposphere, whatever. I told you before I'm not a scientist.
>
> (Laughter.)
>
> JUSTICE SCALIA: That's why I don't want to have to deal with global warming, to tell you the truth.[80]

Parties bringing an action before ITLOS or an arbitral panel might experience similar reservations on the part of the dispute resolution body to grapple with the complicated technical issues associated with climate change, especially since the primary area of expertise of tribunal or panel members may be more traditional fisheries issues, such as the impact of harvesting on species. UNFSA provides two mechanisms to help address this concern. First, in cases where "a dispute concerns a matter of a technical nature," the States involved in a dispute may refer the dispute to an "ad hoc expert panel," which will confer with the

Parties and seek to resolve the dispute without recourse to binding procedures.[81] A Party seeking to press a climate change claim could certainly seek to engage another Party in such negotiations initially, and should this fail to resolve the dispute, seek to introduce the panel's scientific findings in a binding dispute resolution forum. Additionally, if both Parties agree to it, cases of this nature can be referred to a "special arbitral panel." Under UNCLOS's dispute resolution provisions in this context, which UNFSA fully incorporates, a panel hearing a climate change-related dispute could be constituted by experts in the fields of fisheries, marine environmental protection, marine scientific research, drawn from the FAO, the United Nations Environment Program and the Intergovernmental Oceanographic Commission,[82] all of whom have expertise on the nexus of fisheries and climate change.

Perhaps an even more imposing barrier to a cause of action under UNFSA may be the perceived threat to the legitimacy of a dispute resolution body should it enter a decision against a hegemonic State. As Strauss observes, international tribunals carefully marshal their political capital in an effort to preserve and enhance their legitimacy:

> While the official function of international tribunals is to find the pre-existing law; in reality, for judges to have their decisions so accepted, they must engage in the creative process of negotiating the differing global interests to formulate results that are in accord with the international community's normative center of gravity. In arriving at politically viable legal standards, in addition to formally reviewing submitted briefs and memoranda and informally reading other legal commentary, judges engaged in a pragmatic assessment of the political situation, by factoring in the relative power of the protagonists and the interests of other important international actors.[83]

The primary threat to the legitimacy of a UNFSA dispute resolution body in the context of climate change may be that a powerful State would choose to not comply with the decision given the dramatic policy changes that it might necessitate. As Silk recently observed, States may choose to not to comply with "binding" decisions when they deem it against their interests:

> In international law, even allegedly binding dispute settlement mechanisms such as arbitration may be ignored when a state disagrees with the decision. To illustrate, in the Beagle Channel dispute between Chile and Argentina, Argentina challenged the validity of the arbitrators' decision on dubious grounds and, despite the implausibility of Argentina's repudiation, the decision was never enforced . . . . Under UNCLOS, there might be strong domestic and international pressures to sign a fishery agreement regardless of the costs of compliance, but when the time for compliance comes, narrower national interests may prevail.[84]

Indeed, the fear that decisions against the United States might be ignored may explain the recent decisions of the Inter-American Commission on Human Rights and World Heritage Committee to reject petitions to address climate change under these respective regimes.[85]

Conclusion

In a perfect world, the threat of climate change would be effectively addressed through the international institutional responses developed in the 1990s. Unfortunately, the specter of climate change looms larger now than it did a decade ago, and the prospects for adequate responses within the UNFCCC framework appear increasingly remote. Now more than ever, those most vulnerable to the impacts of climate change must explore alternatives that may finally galvanize the major greenhouse emitting States into action. UNFSA is one option that deserves further exploration.

Endnotes: Potential Causes of Action for Climate Change

[1] United Nations Framework Convention on Climate Change, May 9, 1992, 31 I.L.M. 849, *available at* http://unfccc.int/essential_background/feeling_the_heat/items/2913.php (last visited Feb. 8, 2007) [hereinafter UNFCCC].

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[5] UN Doc. A/CONF.164/37 (Aug. 4, 1994).

[6] Pacific Fishery Management Council, *Background: Highly Migratory Species*, http://www.pcouncil.org/hms/hmsback.html (last visited Feb. 8, 2007); *see also* S.M. Garcia, *World Review of Highly Migratory Species and Straddling Stocks*, UN Food and Agriculture Organization, FAO Fisheries Technical Paper No. 337 (1994), *available at* http://www.fao.org/docrep/003/T3740E/T3740E00.HTM (last visited Feb. 8, 2007); *see also* NOAA Fisheries, Office of Sustainable Fisheries, *Highly Migratory Species*, http://www.nmfs.noaa.gov/sfa/hms/ (last visited Feb. 8, 2007).

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[9] *See contra* Inter-American Commission on Human Rights, *What is the IACHR?*, *at* http://www.cidh.org/what.htm (last visited Feb. 8, 2007).

[10] Kyoto Protocol, *supra* note 2, at art. 3(1).

[11] Press Release, Remarks by the President on Global Climate Change (June 11, 2001), *available at* http://www.whitehouse.gov/news/releases/2001/06/20010611-2.html (last visited Feb. 8, 2007).

[12] Press Release, *id.*

[13] UNFCCC Secretariat, *Data Appendices to UNFCCC Presentation at the AWG Workshop*, Nov. 7, 2006, at 6, *available at* http://unfccc.int/files/meetings/cop_12/in-session_workshops/application/pdf/061107_6_ghg_app.pdf (last visited Feb. 8, 2007).

[14] Ikuko Kao & Neil Chatterjee, *Japan's Kyoto Gap Widens as Emissions Rise*,

Endnotes: Potential Causes of Action for Climate Change *on page 81*

The Day After Tomorrow Scenario:

What if Global Warming Causes Rapid Climate Change?

*by Michael K. Lee**

In a 2004 Hollywood movie entitled "The Day After Tomorrow," a climatologist tries to save his son who is stuck in frozen New York because the world was suddenly plunged into a new Ice Age. The movie was an exaggeration to be sure; designed to entertain moviegoers. Nonetheless, a growing consensus of both scientists and policymakers are taking rapid climate change seriously. What if global warming causes rapid climate change and what are the policy implications if that did happen?

Scientific evidence confirms that over the past millions of years the global climate has been on a pendulum from warm or interglacial periods to cold glacial conditions. The grand climate shifts occur during spans of tens of thousands of years, caused by a combination of changes in the tilt of the Earth's rotational axis (every 41,000 years), changes in the orientation of the Earth's elliptical orbit, called the "precession of the equinoxes" (every 23,000 years), and changes in the shape (more or less round) of the elliptical orbit (every 100,000 years).[1] Consequently, the traditional scientific view of climate change is that it is slow and gradual over a span of tens of thousand or at least thousands of years.

However, through ice cores from Greenland and Antarctica, evidence has been mounting since the 1970s that, in between the grand shifts in climate, there are serious oscillations in climate — occurring within the span of decades rather than thousands of years.[2] This phenomenon, called "rapid climate change," is followed by long interludes at equilibrium in significantly warmer or colder states. The best known example is the Young Dryas cooling of 12,000 years ago, a transitional climate event that is thought to have begun and ended within a decade and, for the one thousand year duration thereafter, the North Atlantic region was five degrees Celsius cooler.[3] A shorter cool period occurred more recently in the Little Ice Age which occurred from 1300 AD to about 1800 AD.[4] Historical events, such as the Vikings leaving Greenland, have been attributed to the Little Ice Age.[5] Scientific evidence, through lake sediment as well as ice core studies, suggests that rapid climate change occurs with relative frequency: "during the past 110,000 years, there have been at least [twenty] such abrupt climate changes."[6]

Scientists are unclear what causes rapid climate change but one highly viable mechanism is an ocean dynamic called the "Great Ocean Conveyor Belt."[7] The Great Ocean Conveyor Belt is a circulation system that transports heat throughout the world's oceans. Much of the ocean circulation is dependent upon the salinity of the oceans. As warmer weather melts the ice around Greenland and the Arctic, the melted fresh water makes major North Atlantic Ocean regions less salty, and the cold, less salty water then sinks. Fresh water is less dense and does not sink as readily, which would slow down the Ocean Conveyor. The significance of this slowdown is that presently, "[t]he conveyor circulation increases the northward transport of warmer waters in the Gulf Stream at mid-latitudes by about 50 [percent] over what wind-driven transport alone would do."[8] Should serious disruption in the Great Ocean Conveyor occur, model calculations indicate the potential for cooling of three to five degrees Celsius in the ocean and atmosphere — causing weather repercussions of the same magnitude as the Little Ice Age.[9]

Developing nations will be most affected by the struggle for food, energy, and water as they lack the resources and capacity to quickly adapt to the climate change.

Various government, intergovernmental entities, and non-government organizations have researched the possible public policy implications in the event such rapid climate change occurs. According to one study done in the United States,[10] rapid climate change may potentially cause: (1) an annual average drop in temperature by up to five degrees Fahrenheit over North America and Asia, and a drop of six degrees Fahrenheit in northern Europe, making northern Europe's climate more like Siberia's; (2) an annual temperature increase by up to four degrees Fahrenheit in areas throughout South America, Australia, and Southern Africa; (3) the persistence of drought-like conditions for a majority of the decade in important agricultural regions and in areas providing water resources for population

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centers in eastern North America and Europe; (4) shortages of food because of decreases in overall global agricultural production; (5) commercial fisherman that fish in a specific region will have difficulty in adapting to the massive fish migrations; (6) decreased quality and availability of fresh water in important regions because of shifting precipitation patterns, which will likely cause more frequent droughts and floods; (7) restricted access to energy supplies because of extensive sea ice and storms; and (8) mass migrations, including those stemming from northern Europe.[11]

Developing nations will be most affected by the struggle for food, energy, and water as they lack the resources and capacity to quickly adapt to the climate change.[12] In particular, for the over 400 million people living in drier, subtropical, often over-populated and economically poor regions, climate change and its effects are likely to pose severe risk to political, economic, and social stability.[13] Some nations, especially those with poor relations with their neighbors, are also likely to be involved in struggles over food, clean water, and energy.[14] Meanwhile, nations with relatively intact resources, such as the United States, "may build virtual fortresses around their countries, preserving resources for themselves."[15]

A growing consensus of both scientists and policymakers are taking rapid climate change seriously.

As the science on rapid climate change improves, nations should prepare for its contingency and inevitable effects. Suggestions on preparations include determining which countries will be the most vulnerable to changing climatic conditions, identifying strategies to enhance water management capabilities, and rehearsing various adaptive responses.[16]

Endnotes:

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[2] Adams, *supra* note 1, at 3-4.

[3] Adams, *supra* note 1, at 4.

[4] Ocean and Climate Change Institute, Common Misconceptions about Abrupt Climate Change, *at* http://www.whoi.edu/institutes/occi/viewArticle.do?id=10149 (last visited Feb. 11, 2007).

[5] Ocean and Climate Change Institute, *id.*

[6] Weather Underground, The Science of Abrupt Climate Change, *available at* www.wunderland.com/education/abruptclimate.asp (lasted visited 01/15/2007). *See generally*, Committee On Abrupt Climate Change, Abrupt Climate Change: Inevitable Surprises (National Academy Press 2002).

[7] Weather Underground, *supra* note 6.

[8] Ocean and Climate Institute, *supra* note 1.

[9] Ocean and Climate Institute, *supra* note 1.

[10] Peter Schwartz & Doug Randall, *An Abrupt Climate Change Scenario and Its Implications for the United States National Security* (October 2003), *available at* http://www.climate.org/PDF/clim_change_scenario.pdf (last visited Feb. 11, 2007).

[11] Schwartz & Randall, *id.*

[12] Schwartz & Randall, *id.* at 5.

[13] Schwartz & Randall, *id.*

[14] Schwartz & Randall, *supra* note 10, at 2.

[15] Schwartz & Randall, *supra* note 10.

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An Economic Framework for Coordinating Climate Policy with the Montreal Protocol

*by Stephen J. DeCanio and Catherine S. Norman**

Introduction

This article proposes a method to account for the concurrent environmental benefits of stratospheric ozone protection and greenhouse gas ("GHG") reductions when evaluating investments in new technologies. The method demonstrates how the phaseout of ozone-depleting substances ("ODSs") under the Montreal Protocol can be consistent with climate policy when the global warming potential and energy-efficiency characteristics of substitute technologies are fully considered. This approach would increase investment to rapidly phase out ODSs, resulting in significant environmental benefits by avoiding both climate change and increased incidence of harmful ultraviolet radiation. This article illustrates the possibility of gains from coordinating global warming and ozone depletion policies through a modification of the Montreal Protocol on Substances that Deplete the Ozone Layer to allow production and consumption of HCFC-123 when GHG emissions are reduced to near zero levels and these emissions are offset by collecting and destroying ODSs contained in existing equipment and foam — sources of ODS emissions that are not currently controlled.

The Kyoto Protocol and Montreal Protocol Disconnect

Although the physical and chemical processes responsible for depletion of the stratospheric ozone layer and climate change are related,[1] coordination between the Montreal Protocol and the global effort to avoid "dangerous anthropogenic interference"[2] in the climate system has been limited and unsystematic. The Montreal Protocol does not properly take account of the global warming impacts of the ODSs it regulates or the greenhouse gas hydrofluorocarbons ("HFCs") that are chemical replacements for some applications. The Kyoto Protocol, on the other hand, excludes from its list of controlled substances those covered by the Montreal Protocol. As such, economic incentives under Kyoto cannot be applied to a more rapid phase-out of ODS greenhouse gas production and consumption, or to the collection and destruction of ODSs contained in refrigeration and air conditioning equipment and thermal insulating foam.[3] One could argue that this construction of the Kyoto list of controlled substances implicitly empowers the Montreal Protocol to address the global warming impacts of the substances it regulates; however, this option has not yet been exercised by the Parties to the Montreal treaty. More significantly, the Multilateral Fund of the Montreal Protocol has no access to Clean Development Mechanism funds under the Kyoto Protocol, and the emissions trading options of Kyoto cannot be applied directly to ODSs.

Coordinating Environmental Efforts

Given the interaction between the stratospheric ozone layer and the climate system, and the fact that all the ODSs regulated by the Montreal Protocol (with the exception of halons) are powerful GHGs,[4] coordination of the two regulatory regimes is necessary to effectively address the environmental concerns at stake. Yet, it is not easy to see how this can be done in practice. For example, how might the environmental and economic desirability of two projects, both of which affect greenhouse gas emissions and emissions of ODSs, be compared?

The net benefits from the climate change mitigation and ozone layer protection aspects of the projects are extraordinarily difficult to quantify.

The net benefits from the climate change mitigation and ozone layer protection aspects of the projects are extraordinarily difficult to quantify.[5] The aggregate benefits can be monetized only by making highly contestable assumptions about the "value of a statistical life" across countries in different stages of development. A method for comparing costs and benefits across generations has not been agreed upon. A major component of the benefit of climate stabilization depends on what assumption is made about risk aversion (and not all those affected can be presumed to share a common degree of risk aversion). Estimates of the cost of greenhouse gas reductions range from negative to positive, with the magnitudes of the positive cost estimates differing by a factor of four.[6] Even if the aggre-

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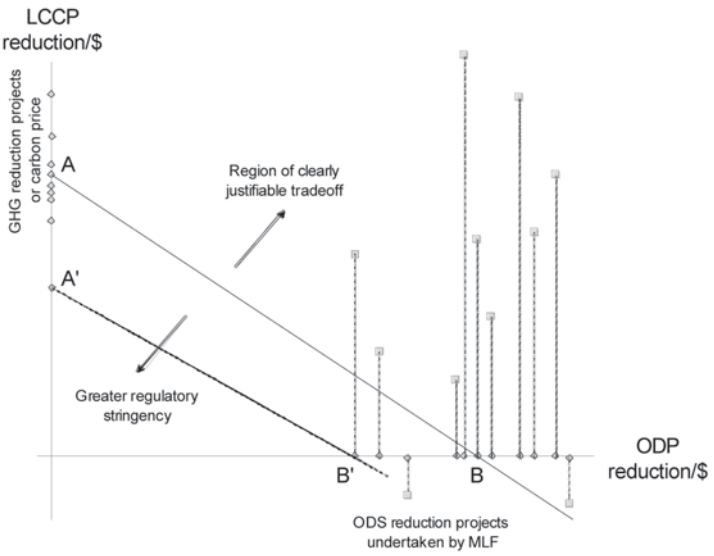
gate impacts were known with more certainty than seems possible with today's knowledge, the response curves of impacts to changes in GHG or ODS emissions are almost certainly non-linear. Therefore, the marginal effect of specific projects cannot be inferred from aggregate impacts. More fundamentally, it is debatable whether cost-benefit analysis is the appropriate tool for analysis of problems that are global in scope, non-marginal in impact, cover centuries of time, and involve the fate of non-human species as well as human beings.[7]

Nevertheless, real money has been and is being spent to reduce both ODS and GHG emissions. (It should be noted at the outset that this article will ignore those emissions-reduction projects that can be undertaken at a pure profit by private-sector firms or governmental agencies. These "no regrets" opportunities should be seized regardless of their environmental benefits and are uncontroversial from a policy perspective.)[8] The current expenditures for emissions reductions provide a benchmark of the "political willingness to pay" ("PWTP") of present-day governments.[9] Political willingness to pay demonstrates collective decisions to finance the most important functions of society such as homeland security, national defense, public health, education, and environment even when traditional cost-benefit calculations are inappropriate or impossible. Although the decisions to invest in ozone layer protection and climate change mitigation have been made independently, the expenditures on these projects provide a basis for estimating the current level of combined regulatory stringency of the two Protocols.

Developing a Common Economic Framework

Consider a two-dimensional mapping of project characteristics with reductions in ozone depletion potential ("ODP") per dollar spent on one axis and reductions in "life-cycle climate performance" ("LCCP")[10] per dollar on the other. Data on the money spent to eliminate or reduce ODSs are available in the database maintained by the Multilateral Fund operating under the Montreal Protocol,[11] or from case studies of ODP reduction projects undertaken by firms or government entities. From these data, it is possible to infer the maximum PWTP to reduce ODP, as well as various measures of the central tendency of PWTP. Similarly, information is available on the cost of GHG reduction projects undertaken by private firms, international projects certified under the Clean Development Mechanism of the Kyoto Protocol, and the prices of CO_2 emissions permits traded on the European Climate Exchange. The ODP or LCCP reductions per dollar spent on these projects can be represented in the kind of diagram familiar to economists by points along the two axes as shown in Figure 1. The circles on the axes represent the emissions changes per dollar of the different projects (either ODP or LCCP reductions).[12] The square "dots" reflect the fact that most ODP reductions have also reduced the global warming impact. This occurs because either the replacement technologies use gases with a lower direct global warming potential than the CFCs they replaced, or the new technologies have been more energy-efficient, or both. Nevertheless, it is possible for an ODP reduction to be associated with an increase in GHG emissions so that the "improvement" in LCCP/$ is negative. Cases of this type would show square dots below the horizontal axis.

Figure 1 - Balancing ODS and GHG Reductions

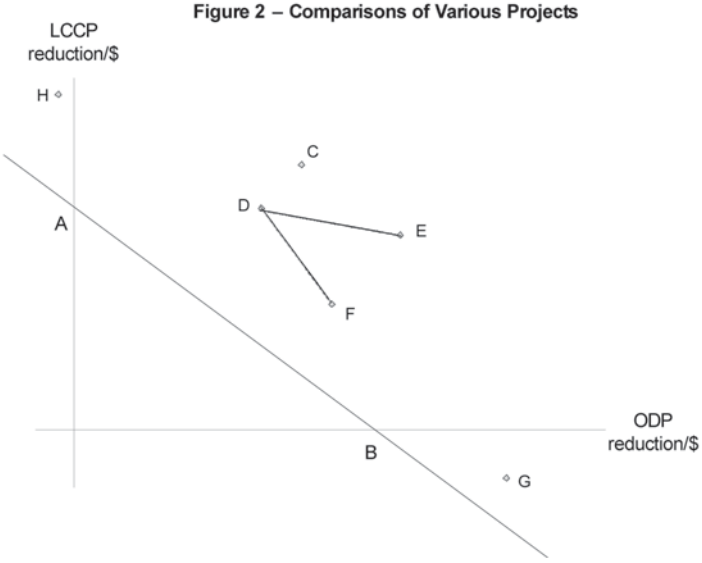


The diagonal line AB, in Figure 1, is drawn to reflect the combined degree of stringency implicit in the two regulatory regimes. This line connects the central tendencies (*e.g.*, the means or medians) of the distributions of the LCCP reduction project points and the ODP reduction project points. Shifting the AB line towards the origin represents an increase in regulatory stringency; if the axes had been drawn in units of $/ODP reduction and $/LCCP reduction, increasing regulatory stringency would be expressed by a movement away from the origin.[13] The slope of AB is a rough measure of the dollar tradeoff between LCCP reductions and ODP reductions embodied in current levels of PWTP.

The tradeoff line could also have been drawn in other ways. For example, the dotted line A'B' connects the most expensive emissions reduction projects.[14] It could be maintained that A'B' more accurately reflects the PWTP frontier than AB because all projects currently funded lie above and to the right of A'B'. Alternatively, if it were decided under the successor to Kyoto that there should be, for example, a global emissions charge of $125/tonne of CO_2, the anchoring point of the AB line on the vertical axis would be at 0.008 (=1/125) with the LCCP axis scaled in tonnes of CO_2 equivalent per dollar.

The area above and to the right of the AB line (or of the A'B' line, if the more inclusive definition of PWTP is being used as the standard) represents those projects that are "clearly justified" at the current levels of regulatory stringency of the two Protocols, while projects falling in the area below and to the left of the line AB (or A'B') are not so clearly justified. This is not to suggest that projects on the axes below point A or to the left of point B should not have been undertaken. Indeed, if A and B are central tendencies, a considerable number of projects will lie on either side of these points by definition. It may also be the case that PWTP has not yet caught up with the socially desirable degree of emissions reductions, so a shift of line AB (or A'B') down and to the left would improve general welfare. Note also that if only the Montreal Protocol proceeds to a complete phase-

Figure 2 – Comparisons of Various Projects



out of the substances controlled under it, the line AB would rotate about point A until it coincides with the vertical axis. Similarly, a complete ODS phaseout under A'B' would pivot on A' until the point B' coincides with the origin.

Practical Policy Applications of a Common Economic Framework

This conceptual framework offers two advantages. First, it enables policy makers to evaluate projects with both global warming and ozone-protection benefits in a unified way, given the current levels of regulatory stringency implicit in the two Protocols. Second, this framework shows how projects might be compared in the cases in which one is not preferable to the other along both dimensions. Thus, in Figure 2, Project C is preferable to Project D because C results in more cost-effective reductions in both ODP and LCCP. But what about comparisons between Project D and Project E, or between Project D and Project F? All three lie in the region above and to the right of line AB, so in one sense all three should be undertaken at current levels of regulatory stringency. However, E is preferable to D at the current tradeoff rate between LCCP/$ and ODP/$ as indicated by the slope of AB. On the other hand, D is preferred to F at the AB tradeoff rate, but F could be preferred to D if the slope of the tradeoff line were steep enough (*i.e.* sufficiently negative). Figure 2 also shows the case of point G, a project with a large enough ODP-reduction potential to be worth undertaking even though it has an undesirable global warming impact.

This analytical framework has direct applicability to some of the immediate issues that need to be considered in strengthening the Montreal Protocol. For example, the use of HCFC-123 in large chillers has up to a 13.5 percent energy efficiency advantage over the best alternatives.[15] HCFC-123 also has a significant refrigerant emission advantage because it is a liquid at atmospheric pressure and temperature and operates at a partial vacuum in air conditioning equipment. On the other hand, HFC-134a (the best competing alternative) is a gas at atmospheric pressure and temperature and operates at high pressure in air conditioning equipment, increasing the risk of uncontrolled emissions. The ODP of HCFC-123 is very low (0.012) but not zero, while HFC-134a has an ODP of essentially zero.[16] HCFC-123 is scheduled for complete phaseout in 2030 in the developed countries (with a 99.5 percent phaseout by 2020). However, HFC-134a is not controlled under the Montreal Protocol, but rather is controlled under the Kyoto Protocol as one of the basket of greenhouse gases. HFC-134a has also been targeted by the European Union for phaseout in automobile air conditioners.[17] The lack of coordination between Montreal and Kyoto could discourage building owners from selecting HCFC-123 systems as the environmentally superior technology. With the substantial energy efficiency advantage and near-zero refrigerant emissions over the 30-year lifetime of a large chiller, selection of HCFC-123 instead of HFC-134a in this application would fall in the region above the line AB because of the very large LCCP gain from the greater energy efficiency of the HCFC-123 chiller. This is illustrated by point H in Figure 2, with the very small ODP of the HCFC-123 chiller compared to an HFC-134a chiller indicated by the placement of H slightly on the negative side of the ODP/$ axis.[18]

Worldwide, in both developed and developing countries, there are approximately 65,673 — 105,076 CFC chillers containing 24,173 — 38,676 ODP-weighted tonnes of CFC.[19] If all of these CFC chillers were immediately replaced with HCFC-123 chillers, global greenhouse gas emissions would be significantly reduced. Destruction of the CFCs in the old equipment could offset the lifecycle HCFC-123 emissions not only for the replacement chillers, but also for chillers required in new construction for decades to come. Mindful of the continuing climate benefits, by the time the offsets run out the ozone layer is expected to have largely recovered and might tolerate some ODS emissions.

The framework proposed in this article would automatically incorporate policies designed to allow for destruction credits associated with permission to use ODSs, either in a Montreal-only framework or in an integrated framework requiring destruction sufficient to move a project to a combined regulatory stringency boundary. Thus, in the preceding example of the HCFC-123 chiller, the welfare improvement would be unambiguous (regardless of the slope of AB) if the HCFC-123 used in the chiller were offset by destruction of an equivalent or greater amount of ODP. As such, HCFC-123 chillers are unequivocally environmentally superior if designed and maintained for superior energy efficiency and near-zero refrigerant emissions offset by collection and destruction of ODSs currently contained in existing equipment and foam products.

This example shows how the Montreal Protocol could be strengthened with an accelerated ODS phaseout while at the same time contributing to climate protection by reducing greenhouse gas emissions. All that is required is that controls for developed countries and financing for developing countries guide the choice of alternatives and substitutes for ODSs towards those technologies offering the lowest LCCP. In addition, as in the chiller example, companies should be permitted to offset HCFC-123 emissions by destruction of other ODSs when significant improvements in energy consumption are available.

Conclusion

Several policy guidelines emerge from this approach. First, it is environmentally and economically superior to choose alternatives or substitutes for ODSs that are ozone-safe (zero ODP) *and* that also have lower direct and indirect greenhouse gas emissions. Second, it can be economically preferable to choose alternatives or substitutes to ODSs that have a small impact on ozone (non-zero ODP) *if* it is judged, based on current or projected future PWTP, that the resulting lower direct and indirect greenhouse gas emissions justify the ozone depletion. Third, it is unequivocally preferable both economically and environmentally to choose alternatives or substitutes to ODSs that have a small impact on ozone (non-zero ODP) *provided* that impact is offset by destruction of existing "legacy" ODS, the destruction of which is not mandated by the Montreal Protocol and which is not already required to be destroyed by other national or regional legislation, *and if* the replacement technologies result in lower direct and indirect greenhouse gas emissions.

Using a unified analytical framework, we have shown how it is possible to combine the political willingness to pay to protect the ozone layer and mitigate greenhouse gas emissions. This approach can be applied to both the current effort to strengthen the Montreal Protocol and the search for consensus on how to move beyond Kyoto to mitigate climate change. Practical applications of this approach would favorably shift investment toward technology that satisfies broad criteria of environmental protection and sustainable development and would use emissions trading to reduce the cost of both ozone and climate protection while expanding the flexibility of business choice. Economic considerations should never obscure the ethical principles that must primarily guide these policies, but by eliminating perverse incentives and avoiding expensive mistakes, economics has an important role to play in promoting cost-effectiveness. The approach outlined here retains the flexibility and openness to new scientific understanding that have been hallmarks of the Montreal Protocol's success. In building on what has been accomplished thus far, our obligation to future generations requires nothing less than effective and intelligent integration of measures for protection of the ozone layer and stabilization of the climate system.

Endnotes: An Economic Framework

[1] UN Env't Programme, *The Implications to the Montreal Protocol of the Inclusion of HFCs and PFCs in the Kyoto Protocol* (Oct. 1999), *available at* http://www.uneptie.org/ozonaction/information/mmcfiles/4254-e-teap99hfcpfc.pdf (last visited Jan. 27, 2007); *see also* Intergovernmental Panel on Climate Change (IPCC), *Safeguarding the Ozone Layer and the Global Climate System: Issues Related to Hydrofluorocarbons and Perfluorocarbons* (2005), *available at* http://arch.rivm.nl/env/int/ipcc/pages_media/SROC-final/SpecialReport-SROC. html (last visited Feb. 6, 2007) [hereinafter IPCC/TEAP Report]; *see also* Stephen O. Andersen, *Ozone and Climate Instruments — the Dilemma's in the Detail*, OzonAction, No. 46, 6 (Dec. 2003); Stephen O. Andersen & Jose Pons, *Two Protocols: One Integrated Solution*, OzonAction, Sept. 2005, at 8.

[2] Implementation of the UNFCCC thus far has been through the Kyoto Protocol, through various domestic initiatives by the United States, Australia, and other nations that have not ratified Kyoto, and through bilateral or multilateral projects involving China, India, and other developing countries that are not presently committed by Kyoto to any specific reductions in their greenhouse gas emissions. United Nations Framework Convention on Climate Change ("UNFCCC") website, http://unfccc.int (last visited Feb. 13, 2007).

[3] Some halogenated chemicals, in particular hydrofluorocarbons ("HFCs") and perfluorocarbons ("PFCs"), are explicitly included in Kyoto. *See* Kyoto Protocol to the United Nations Framework Convention on Climate Change arts. 11, V, Annex A, Dec. 10, 1997, 37 I.L.M. 22, *available at* http://unfccc.int/resource/docs/convkp/kpeng.html (last visited Feb. 13, 2007) (containing Articles II and V lists which exclude substances covered by Montreal, and Annex A lists substances controlled under Kyoto).

[4] IPCC/TEAP Report, *supra* note 1, at 6.

[5] Computations of the net losses from ozone depletion and global temperature increases have been published. For the ozone case, *see* Stephen J. DeCanio, *Economic Analysis, Environmental Policy, and Intergenerational Justice in the Reagan Administration: The Case of the Montreal Protocol*, Int'l Envtl. Agreements: L & Pol. 299, 299-321 (2003); for climate, *see* Climate Change 1995: Economic And Social Dimensions Of Climate Change 178-224 (Cambridge University Press 1996); Climate Change 2001: Impacts, Adaptation, And Vulnerability 913-967 (Cambridge University Press 2001); Stern Review On The Economics Of Climate Change 150 (HM Treasury), *available at* http://www.hm-treasury.gov.uk/media/8AC/ CC/Chapter_6_Economic_modelling.pdf (last visited Feb. 13, 2007).

[6] Terry Barker & Paul Ekins, *The Costs of Kyoto for the U.S. Economy*, The Energy J. 3d Q., at 53-71 (2004); *see also* Stephen J. DeCanio, Economic Models Of Climate Change: A Critique (Palgrave Macmillan 2003).

[7] On the limitations of cost-benefit analysis. *See* Frank Ackerman & Lisa Heinzerling, Priceless: On Knowing The Price of Everything And the Value of Nothing (The New Press 2005); *see also* Stephen J. DeCanio, *Is Economics the Wrong Language for Addressing Climate Policy?* (Nov. 16-17, 2006) *available at* http://www.aceee.org/conf/06modeling/ucsb.pdf (last visited Feb. 13, 2007).

[8] Interlaboratory Working Group on Energy-Efficient and Clean-Energy Technologies, Scenarios For A Clean Energy Future, Oak Ridge National Laboratory and Lawrence Berkeley National Laboratory, ORNL/CON-476 and LBNL-44029 (Nov. 2000), *available at* http://www.ornl.gov/sci/eere/cef/ (last visited Feb.13, 2007); World Resources Institute, Ozone Protection in The United States: Elements Of Success (1996), *available at* http://www.wri.org/climate/pubs_description.cfm?pid=2692 (last visited Jan. 19, 2006).

[9] Stephen J. DeCanio and Catherine S. Norman, *Economics of the 'Critical Use' of Methyl Bromide under the Montreal Protocol*, 23 Contemp. Econ. Pol. 376, 376-393 (2005).

[10] The "life-cycle climate performance" ("LCCP") is a measure of the total effect on GHG emissions of a change in technologies, including both the direct global warming impact of the emissions and differences in indirect emissions due to differences in the energy efficiency of the technologies over their lifetimes. Reduction of LCCP mitigates climate change. LCCP is more comprehensive than the earlier concept of "total equivalent warming impact" ("TEWI"), which ignored the energy embodied in product materials, the greenhouse gas emissions during chemical manufacturing, and the impacts of weight on energy consumption of mobile equipment. *See* William R. Hill, *North America Projects to Develop Standard Tests for MAC Efficiency*, presentation at International Energy Agency Workshop, "Cooling Cars with less Fuel" (Oct. 23–24, 2006), *available at* http://www.iea.org/Textbase/work/workshopdetail.asp?WS_ID=247 (last visited Jan. 4, 2007); S. K. Fischer et al., *Energy and Global Warming Impacts of CFC Alternative Technologies* (1991), *available at* http://www.ciesin.org/docs/011-459/011-459.html (last visited Jan. 19, 2007) (containing description of the original TEWI methodology).

[11] This institution finances the "agreed incremental cost" of ODS replacement

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What Next for the Alliance of Small Island States in the Climate Change Arena?

*by Daniel Brindis**

Small Island States ("SIS") fight a high stakes uphill battle in advocating their interests in climate change treaty negotiation. This class of 43 nations represents only five percent of the world's population, a miniscule portion of the world's gross domestic product, and is the most vulnerable class of states to global climate change.[1] The isolation of these states and their limited capacity to adapt to natural disasters stand to aggravate the harmful effects of climate change.[2]

SIS suffer from changing weather patterns, and scientists predict that some island nations stand to lose substantial portions of land due to sea level rise.[3] Losing this land threatens these islands' development efforts as natural resources on the islands become sparse.[4] Island tourism, a major source for investment in many of these States, also suffers due to shrinking resources and unpredictable changing weather patterns.[5] In recognition of the common threat and vulnerabilities of the SIS, the Alliance of Small Island States ("AOSIS") was born.[6]

In 1994, members of AOSIS met in Barbados and formulated a strategy to confront climate change, improve SIS adaptability to climate change, and make SIS development more sustainable.[7] In 2004, the impacts of the devastating tsunami underlined the vulnerability of these island nations. Motivated by this environmental catastrophe, the AOSIS drafted the Mauritius declaration, a pro-active policy strategy declaration that outlines the SIS struggle to exist in the face of the threat of climate change. These nations, gathering at the UN Conference on Small Islands in 2005, adopted the Mauritius Declaration and reaffirmed and expanded the Barbados Programme of Action.[8]

Additionally, the Kyoto Protocol and the United Nations Framework Convention on Climate Change represented lightning rods of participation and cooperation among SIS to encourage the reduction of greenhouse gas ("GHG") emissions.[9] As a result, participation in these meetings represented a positive initial step in cooperation among the SIS.[10] The synergy of SIS gave the states more representation, resulting in SIS gaining concessions to provide for financial aid and resources to help the developing island nations adapt to climate change.[11]

The isolation of these states and their limited capacity to adapt to natural disasters stand to aggravate the harmful effects of climate change.

The cooperation of such isolated States is an encouraging example of how vulnerable parties with aligned interests can represent themselves with a force that outweighs the sum of its parts. The expansion and broadening of this alliance for cooperation beyond SIS themselves could strengthen its force. AOSIS and non-governmental organizations working on behalf of SIS should focus efforts of alliances beyond climate change vulnerable states to also work with vulnerable populations and coastal lowland communities in industrialized nations that are resistant to the GHG reduction. Although St. Lucia, for instance, and the United States have different goals and interests at the Kyoto Protocol negotiation table, this small island nation has its interests well aligned with areas such as Louisiana or Massachusetts, areas that are particularly sensitive to rising sea levels. Groups like the Climate Institute in Washington, D.C. have begun to plan such efforts through their Endangered Islands Campaign.[12] This campaign proposes various partnership programs between SIS and low coastal cities in larger countries, one example being "[w]orking with the International Hurricane Research Center in Miami to ensure that state of the art techniques for storm surge and wind resistance planning in South Florida are adapted for use in [SIS]."[13]

Much is left to be desired in terms of having an international climate change policy that can protect the citizens of SIS from rising sea levels and increasingly unpredictable and extreme weather patterns. By broadening the links between all vulnerable areas of the world at sub-state levels, SIS can raise awareness of their vulnerability and lobby for the major GHG producers to curb their emissions. The coming decades present potential grave consequences for SIS and the major GHG producers have a moral duty to the front line victims of climate change.

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Bridging the Transatlantic Divide:

Legal Aspects of a Link between Regional Carbon Markets in Europe and the United States

*by Michael A. Mehling**

Introduction

European Union ("EU") Directive 2003/87/EC establishes a scheme for greenhouse gas ("GHG") emission allowance trading ("EU ETS") within the European Community ("EC"). Under Article 25(1) of this directive, the European Commission has a mandate to negotiate and conclude agreements with third countries establishing a link to national or regional GHG emissions trading schemes.[1] Aside from increased market liquidity and, by consequence, reduced compliance costs, such a link promises to lessen competitive distortions between the participating states, counteract the threat of leakage, and potentially improve the prospects for a truly global carbon market.[2] With various regional trading schemes currently under development in the United States,[3] the concept of linking emissions-trading markets attracts attention on both sides of the Atlantic. Accordingly, the European Council of Environment Ministers, which essentially decides on the adoption of environmental legislation in the EU, recently expressed "its commitment to developing a strong global carbon market by linking the EU ETS with other emissions trading schemes at national or regional level."[4] Meanwhile, an Executive Order adopted by the Governor of California explicitly calls for the development of a "program that permits trading with the European Union (. . .) and other jurisdictions."[5]

Separate trading schemes can be considered linked if allowances can flow between the respective schemes.

Indeed, the subject of linkages between GHG emissions trading has become a widely discussed issue in climate negotiations and among climate experts. In his review of the economic costs of climate change, for instance, the acclaimed economist Sir Nicholas Stern considered linking national, regional, and sectoral carbon markets as an international priority and a valuable opportunity to define a global price for carbon.[6] Unsurprisingly, several studies have addressed this issue by outlining conceptual issues and assessing the mutual compatibility of trading schemes,[7] although few have specifically addressed the legal challenges raised by such a market link. As a survey of existing scholarship reveals, a great majority of the conceptual challenges identified thus far are largely political in nature and rarely involve legal considerations. While essential for the operation of a trading link, for instance, the mutual recognition of allowances has been ultimately declared a "political issue," and monitoring, reporting, and verification requirements mainly considered vital for their effect on confidence in the market.[8] In the end, relatively few design elements need to be compatible for a link to become legally viable,[9] with a high degree of harmonization between connected markets arguably desirable for political and economic reasons, but not essential as a matter of law.

When considering a market link between emissions trading schemes, questions of law are likely to emerge in two respects: *first*, during the process of implementation, which invariably necessitates recourse to recognized sources of law and legal procedures, and, *second*, during actual operation of the market link, where the latter may conflict with substantive norms and principles of international, regional, or domestic law. Questions pertaining to the operation of a future trading link cannot be addressed in a comprehensive manner at this stage, given the current uncertainties about its ultimate design.[10] Drawing on the example of a link between the current market in the EU and evolving markets in different regions of the United States, this article will provide an overview of legal challenges apparent in the preparatory process, focusing on the legal nature of a linking arrangement and the procedural constraints imposed on its adoption.

Legal Nature of a Linking Agreement

As one scholar succinctly described it, "[t]wo national emissions trading schemes are linked if one country's allowance can be used, directly or indirectly, by a participant in the other country's scheme for compliance purposes."[11] In other words, separate trading schemes can be considered linked if allowances can flow between the respective schemes. As a result of such a link

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between trading programs in the United States and the EU, for instance, participants in the North American market could buy allowances in the EU ETS for compliance with their domestic reduction targets, and vice versa. However, a trading link does not necessarily have to operate in both directions. Rather, one jurisdiction may choose to create a unilateral link to other markets, especially if the latter allow any legal or natural person to own allowances with the option of having these retired or cancelled. To this end, the jurisdiction in question could simply decide to recognize allowances purchased and cancelled in a foreign trading scheme for compliance purposes at home.[12] Although a trading link could also be construed to encompass the transfer of credits through an overarching framework, such as the Clean Development Mechanism ("CDM") set out under the Kyoto Protocol,[13] this article will disregard such indirect approaches to focus on arrangements suitable for the establishment of a direct bridge between the EU ETS and regional trading schemes in the United States.

While a unilateral link between trading schemes can be established through a simple legislative amendment specifying the conditions for recognition of foreign allowances, a bi- or multilateral link will typically require negotiations between the legislators of all affected trading schemes, resulting in some form of mutual understanding. Conventionally, this understanding could be reached by way of: (1) a purely political arrangement; (2) a binding international treaty; or (3) mutual recognition of allowances by way of reciprocal rules in the domestic law of participating jurisdictions. Another approach could involve transboundary contracts entered individually or collectively under private law, although this option is unlikely to offer the certainty and political acceptance needed for a comprehensive market link.

The concept of linking emissions-trading markets attracts attention on both sides of the Atlantic.

Political Arrangements

A political solution based on informal consultations has the benefit of obviating lengthy negotiation and ratification procedures. Aside from mere declarations of intent, for instance through joint statements at political summits, a more formal way of documenting a convergence of will can lie in the conclusion of a Memorandum of Understanding, documenting a desired line of action, but lacking the binding power of a legal commitment. Adding to the less cumbersome procedure, such informal arrangements are also easier to modify and adapt than binding treaties. However, given the economic ramifications of a trading link and the importance of certainty and transparence for smooth market operation, pressure from stakeholders in the market will likely prompt legislators to opt for a more reliable, legally binding solution.

Binding International Treaties

Article 25(1) of Directive 2003/87/EC has chosen to follow this latter path by referring to the procedure in Article 300 of the Treaty Establishing the European Community ("EC Treaty"),[14] which specifies the adoption of international treaties by the European Community. A treaty is one of the recognized sources of international law.[15] Its binding force follows from the customary maxim of *pacta sunt servanda*,[16] which ultimately reflects state sovereignty limited through voluntary consent.[17] The violation of duties under a treaty counts as a breach of international law, incurring state responsibility and the possibility of sanctions, often defined in the treaty itself as part of a negotiated compliance mechanism. While offering a high degree of certainty, the adoption of an international treaty entails a lengthy and often contentious ratification process. Likewise, subsequent amendments to the treaty or a withdrawal from it are again subject to sophisticated rules of international law.[18] Nonetheless, due to the formal nature and the transparency they offer, international treaties are likely to be the instrument of choice for a future linking agreement. Still, it bears restating that such treaties can only be concluded by formal subjects of international law, a limitation of major relevance for any transatlantic linking agreement between regional trading markets.

Reciprocal Commitments

Rather than approving an international arrangement with binding force, different trading markets could also enter a political commitment to adopt reciprocal legislation within their respective jurisdictions, thereby ensuring the mutual recognition of emission allowances. Such an arrangement would ultimately entail an adaptation of the respective registry systems and thus derive its authority from domestic law, although it would result from formal or informal negotiations and preparatory meetings between states. Relative to an international treaty, of course, such a construction would not have the capacity to bind participating jurisdictions, allowing for unilateral amendment or termination of the trading link without prior consent of other parties. In certain situations, this aggregate solution might be the only available means to connect separate markets while offering the legal certainty and transparency of formal law. In that instance, unilateral digression is unlikely for as long as participants retain the common interest in an operational trading link.

Contractual Arrangements

A final vehicle for the implementation of a linking arrangement is private law, that is, the law governing the mutual relations between natural and legal persons, notably the law of contracts and torts as it is called in the common law, or the law of obligations as it is called in civil legal systems. Different

approaches are conceivable under private law, although these will all involve some form of contract, either to establish a longer contractual relationship or purely negotiated *in casu* to govern individual transactions. Whether a formal link has been created or not, transactions leading to a transfer of allowances will generally involve a contract specifying the terms of a particular transaction, such as the price and volume of allowances, the delivery date, a *force majeure* clause, and default or liability provisions.[19] Even in the absence of a formal link, market participants could use private law to create a bridge between otherwise separate trading systems by establishing a system for the conversion of permits. An example of this would be a system of private brokers leveraging arbitration opportunities. Such arrangements are legally viable due to the fact that many trading schemes, including the ETS, impose no restrictions on account ownership, allowing virtually anyone to open an account an thereby enter the market. Moreover, there is a vital difference between trade in allowances, which is theoretically open to everyone, and actual transfer, which is usually limited to market participants.[20] In the voluntary sector, private transactions across trading schemes have already occurred.[21]

Unlike public international law and the rules adopted by the EC, private law is not a body of norms adopted across national frontiers. Instead, it differs from state to state, often with vast differences between historically separate regulatory traditions such as the common law, which is based largely on judicial precedent, and civil law, which is based largely on codified rules. Of course, the United Nations Convention on Contracts for the International Sale of Goods[22] has gone some way to establish a uniform law of sales, but its application to emissions allowances — the legal nature of which, while not entirely clear, rules out classification as a good or service[23] — is questionable.[24]

A trading link to the EU ETS would not violate the Commerce Clause of the U.S. Constitution.

In the absence of a harmonized normative framework, the contractual arrangements for a trading link will thus be governed either by the private law of a particular state as specified in the contract, the most likely case, or by the private law of the state determined by way of international private law. This latter set of rules, also known as conflict of laws, merely helps regulate transboundary relations between private law subjects by determining which of the competing legal systems is applicable. The choice of law in contractual relationships is typically selected based upon either the place where the transaction physically occurred (*lex loci actus*) or the doctrine of the proper law, which is the law with the closest connection to the facts of the case. Altogether, this allows for great flexibility in the development of a trading link based on private law, although the scope of application will tend to remain limited to individual transactions or trading on a smaller scale. As mentioned earlier, market participants are likely to insist on a transparent, legally binding framework for transactions between their respective trading schemes, favoring the predictability of formal legislation over a contractual solution based on private law.

Procedural Considerations of a Linking Arrangement

As stated in the preceding section, the use of different linking arrangements can trigger differing formal procedures. While a political solution and contractual arrangements will generally pose no major challenges in this regard, both international treaties and domestic legislation mandating the mutual recognition of foreign allowances may only be adopted in accordance with sophisticated provisions of legislative procedures and the institutional distribution of powers. With a view to the express reference contained in Article 25(1) of Directive 2003/87/EC, this section will begin with an assessment of the procedural framework for international agreements linking the EU ETS with other emissions trading schemes.

Procedural Issues under European Community Law

First and foremost, the mandate set out in Article 25(1) of Directive 2003/87/EC limits participation in a linking agreement to "third countries listed in Annex B to the Kyoto Protocol which have ratified the Protocol," a limitation which, for the time being, precludes an international treaty with the United States because it has withdrawn from the Protocol. Thus, the usefulness of the Directive in guiding a transatlantic linking arrangement is limited and the foregoing restriction will have to be repealed by way of a legislative amendment. A review process that may result in an amendment is scheduled to conclude by June 2007. In this connection, the European Commission recently indicated its intention to link with trading schemes currently under development in the United States.[25]

Although a transatlantic market link based on Article 25(1) of Directive 2003/87/EC may be ruled out for now, the procedure mandated therein may still serve as a likely model for future arrangements. Given that Directive 2003/87/EC is only derived legislation, without prejudice to the powers conferred on the EC under its constitutive treaty, it is conceivable that the Council would move forward without observing the constraints imposed by the foregoing mandate. Article 25(1) does not even specify the legislative procedure itself, but instead refers to Article 300 of the EC Treaty, a general provision setting out the process for adoption of international agreements with third states or international organizations. A sophisticated procedure, Article 300 involves several stages and participation by the European Commission, the Council, and the Parliament.

Essentially, the Commission is charged with negotiating international agreements, while the Council approves their subsequent adoption. Before opening negotiations, the Commission requires authorization by the Council to conduct negotiations on behalf of the EC, usually through a Council decision based on a draft by the Commission which occasionally sets out confidential negotiating guidelines. Upon approval of an agreed text, the Commission proposes a decision on its conclusion by the Council, which may sign or reject the agreement.[26] As in the domestic sphere, ratification is a separate act, again occurring though a decision adopted subsequently by the Council on the initiative of the Commission.

Directive 2003/87/EC was adopted on the basis of Article 175(1) and in application of the procedure set out in Article 251 of the EC Treaty, which merely requires a qualified majority in the Council. Pursuant to Article 300(2) of the EC Treaty, a linking agreement may likewise be adopted with a qualified majority. It is uncertain whether the European Parliament will merely need to be consulted or has the capacity to reject a trading link, given that the respective agreement might be understood as "establishing a specific institutional framework by organi[z]ing cooperation procedures." Requiring approval — rather than a mere opinion — by the European Parliament could have significant implications for the prospects of a linking agreement, because the Parliament has traditionally been more reserved than the Commission and the Council in deploying market instruments.

On a more general level, it merits noting that the EC is unique in that Member States delegate a significant part of their treaty negotiation powers to the Community level. Reflecting the legal and political realities of the EC as a supranational entity composed of sovereign states, treaty practice has become increasingly dominated by "mixed agreements," that is, agreements to which both the EC and its Member States are party as a result of shared competences.[27] In accordance with the doctrines of attributed powers and the parallelism between internal and external competences, the adoption of a linking agreement pursuant to Article 300 of the EC Treaty will require consideration of its subject matter to determine the allocation of powers between the Community and the Member States.

In the case of environmental agreements, the Community derives its competence from Article 175(1) of the EC Treaty, which sets out a general mandate for action on environmental protection. It holds this power concurrently with the Member States, which retain authority to regulate the environment until the EC has acted. Additionally, the Treaty allows Member States to adopt more stringent environmental measures under Article 176, and generally leaves the enforcement of EC law to their domestic authorities.

When the EC adopts common rules internally to regulate an environmental issue, Member States are generally precluded from entering into international agreements that affect such rules or alter their scope.[28] Article 176 of the EC Treaty allows Member States to introduce more stringent measures,[29] however, and Article 174(4) clarifies that:

> Within their respective spheres of competence, the Community and the Member States shall cooperate with third countries and with the competent international organisations. The arrangements for Community cooperation may be the subject of agreements between the Community and the third parties concerned, which shall be negotiated and concluded in accordance with Article 300.
>
> The previous subparagraph shall be without prejudice to Member States' competence to negotiate in international bodies and to conclude international agreements.

Ultimately, clarifying the division of competences within the EC is a difficult task, with boundaries constantly evolving.[30] Depending on their substance and the competencies touched upon, environmental agreements entered into by the EC may — but do not have to — be adopted as mixed agreements.[31] In effect, it may be in the interest of both the Community and its Member States, and possibly also of third states, to opt for an agreement concluded by the Community only, notably to speed up the adoption process. At the same time, where competence for the subject matter of an agreement is shared between the Community and the Member States, actual implementation will usually require the participation of both. Past experience shows the Member States insisting upon mixity even in instances when it is not required by law.[32]

In fact, it is perhaps no coincidence that nearly all treaties on environmental protection have been concluded as mixed agreements,[33] including the Framework Convention on Climate Change and the Kyoto Protocol. With Directive 2003/87/EC leaving ample discretion to the Member States in its implementation, there is a certain probability that the latter would insist on active participation in the negotiations preceding a linking agreement, prompting recourse to a mixed agreement as the most suitable instrument. Legal challenges can arise as a result, specifically regarding the allocation of responsibilities under the agreement between the Community and the Member States. Unless their respective duties are separately specified, both the Community and the Member States will be responsible for observance of all commitments entered under the agreement. Likewise, if only part of the Member States chooses to ratify a mixed agreement alongside the Community, the entirety of Member States will nonetheless be bound by its provisions, a departure from the usual notion that each party is only responsible for the performance of its own obligations.[34] Altogether, this adds to the complexity of a linking agreement, and it is more than questionable whether the vehicle of choice should be an international treaty concluded simultaneously by the Community and its Member States.

Procedural Issues under United States Law

In the United States, federalism can raise similar concerns with regard to the admissibility of a regional linking agreement between individual states, or groups of states, and the EU ETS. Described by a commentator as altogether "terse" in this regard,[35] the U.S. Constitution contains only four articles pertaining to treaty powers. Of these, Article I is the most relevant

for a potential market link, given that its Section 10 prohibits any state from entering into a "treaty, alliance, or confederation" or from entering "without the Consent of Congress. . . into any Agreement or Compact. . . with a foreign Power."[36] In essence, this provision denies States international legal personality, limiting their ability to participate in diplomatic relations and altogether barring them from the conclusion of an international treaty.[37] Regarding international treaties, the scope of this restriction is wide, covering all binding international arrangements "regardless of title, designation, or form."[38] Clearly, then, the States could not enter into a linking agreement with the European Community under the terms set out by Article 25(1) of Directive 2003/87/EC if such an arrangement were to be designed as a formal treaty.

While U.S. States may be precluded from entering into a treaty with the EC, they are empowered to adopt a binding "compact" or "agreement" with the consent of Congress, resulting in the question of how these differ from formal treaties. However, to date no agreement between a State and foreign power has been successfully challenged due to the lack of authority of the State.[39] Therefore, there appears to exist a potential avenue for a link between regional trading schemes in the United States and the EU ETS.

Article I, Section 10 of the U.S. Constitution makes the conclusion of such an agreement conditional on approval by Congress. However, even in the absence of Congressional endorsement, individual States may, under certain circumstances, enter into an agreement with foreign powers.[40] As the United States Supreme Court has notably declared, a compact with a foreign power requires Congressional approval only if it tends "to the increase of political power in the States which may encroach upon or interfere with the just supremacy of the United States."[41] Consent to an agreement is thus only required if the agreement tends to give the state elements of international sovereignty, interferes with the full and free exercise of federal authority, or deals locally with a matter on which there is or might be national policy.[42] As the Restatement Third of the Foreign Relations Law of the United States comments, "agreements involving local transborder issues, such as agreements to curb a source of pollution. . . have been considered not to require Congressional consent."[43] Accordingly, it appears possible, albeit not certain, that a linking agreement could be adopted without federal endorsement by way of a state compact or agreement. Still, Congress can always supersede such state arrangements by legislation.

Should the preceding options prove unfeasible, U.S. States can always resort to amending their internal legislation with a view to including rules on the mutual recognition of foreign allowances. Because neither party is legally bound to maintain its law, reciprocal legislation adopted concurrently by two or more jurisdictions does not constitute a treaty, nor an agreement requiring Congressional consent.[44] Affording means of circumnavigating the constraints of international and constitutional law, such reciprocal recognition could be based on an informal understanding setting out the substantive provisions required to create an operational trading link. Any institutional responsibilities could be assigned to a private body established and funded by the respective participants, obviating the need for recourse to international law. Operating through a Memorandum of Understanding at the preparatory stage, the Northeastern States participating in the Regional Greenhouse Gas Initiative ("RGGI") have already evidenced the feasibility of an informal arrangement to decide certain features of their future trading scheme. More importantly, States have concluded past reciprocal arrangements with foreign powers also to overcome procedural constraints.[45] Likewise, the EC has in the past resorted to informal understandings as a vehicle for the settlement of contentious transatlantic issues.[46] Accordingly, States could amend the legislation implementing their regional trading scheme, while the EC could adopt a directive amending Directive 2003/87/ EC.

The European Commission recently indicated its intention to link with trading schemes currently under development in the United States.

In all foregoing cases, a transatlantic market link would not appear to contravene the supremacy of federal law because, to date, the federal government has not adopted legislation precluding state law in the area of GHG emissions trading. Likewise, a trading link to the EU ETS would not violate the Commerce Clause of the U.S. Constitution. Contained in Article I, Section eight, Clause three, the Commerce Clause empowers Congress to "regulate Commerce with foreign Nations, and among the several States."

As the concept of commerce can also be applied to environmental markets,[47] the Commerce Clause has raised doubts about the legality of RGGI provisions constraining energy imports from outside in order to prevent leakages.[48] As long as the United States fails to regulate international trade in GHGs, however, this clause will remain dormant and merely prohibit states from passing legislation that improperly burdens transboundary commerce. Regarding the latter, the U.S. Constitution does "not prohibit every state law or regulation that has some effect on interstate or foreign commerce."[49] The Supreme Court has summarized the applicable jurisprudence as follows:

> Where the Statute regulates even-handedly to effectuate a legitimate local public interest, and its effects on

> interstate commerce are only incidental, it will be upheld unless the burden imposed on such commerce is clearly excessive in relation to the putative local benefit. If a legitimate local purpose is found, then the question becomes one of degree. And the extent of the burden that will be tolerated will of course depend on the nature of the local interest involved, and on whether it could be promoted as well with a lesser impact on interstate activities.[50]

The creation of a market link facilitates commerce. But even if a linking arrangement were, in any way, to be considered burdensome on domestic or international commerce, it appears likely that its environmental and economic benefits could outweigh such effects under the foregoing proportionality assessment.

Conclusion

The goal of this article was to examine the possible legal ramifications resulting from a linking arrangement between regional trading schemes in Europe and the United States. While many legal issues have yet to emerge as such a link begins to operate in practice, this initial analysis allows for an important conclusion: even on the austere level of constitutional doctrines and legislative procedures, a range of legal options is available for the implementation of a future trading link. Arising obstacles may be avoided through careful selection of the legal instrument embodying the market link. Admittedly, some issues will prove challenging to resolve, such as the creation of a global market involving various participants, of which only some are party to an overarching regime based on a common currency. Even in such a situation, conceptual solutions have already been proposed to bridge regime boundaries, such as the creation of a clearinghouse or gateway facilitating the transfer of otherwise incompatible units.[51]

As they have evolved to date, carbon markets have proven to be complex entities, embedded in sophisticated networks of contingent interests, traditionally diverse approaches to governance, and distinct regulatory constraints. Reconciling the inevitable differences between two or more trading schemes is not solely a task for lawyers or the law, but a matter of bringing together divergent preferences and expectations. In essence, the establishment of a link between different trading schemes will mainly call for political deliberation, mutual concession, and, to some extent, the willingness to tolerate remaining differences. For lawyers, the challenge will be to translate the negotiated consensus into legally viable arrangements, observing applicable rules of domestic, regional and international law. The rest remains a matter of political agreement. One might argue with another scholar that, wherever an economic incentive exists to bridge different systems, "money will cross the divide."[52] And in the end, Stuart Eizenstat, who helped negotiate the Kyoto Protocol on behalf of the United States, may have stated it best by observing: "The market is pulling the law along."[53]

Endnotes: Bridging the Transatlantic Divide

[1] *See* Council Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a Scheme for Greenhouse Gas Emission Allowance Trading within the Community and Amending Council Directive 96/61, 2003 O.J. (L275) 32-46, Art. 25(1):

> Agreements should be concluded with third countries listed in Annex B to the Kyoto Protocol which have ratified the Protocol to provide for the mutual recognition of allowances between the Community scheme and other greenhouse gas emissions trading schemes in accordance with the rules set out in Article 300 of the Treaty.

[2] Niels Anger Et Al., Linking the Eu Emissions Trading Scheme Under Alternative Climate Policy Stringencies: An Economic Impact Assessment 19 (2006), *available at* http://www.wupperinst.org/uploads/tx_ wibeitrag/linking-EU-ETS.pdf (last visited Feb. 11, 2007).

[3] In the U.S, Northeast and Mid-Atlantic, a group of seven states — Connecticut, Delaware, Maine, New Hampshire, New Jersey, New York and Vermont — has agreed to establish a Regional Greenhouse Gas Initiative ("RGGI") by January 1, 2009, with the aim of constraining emissions from the electricity sector, *see* Regional Greenhouse Gas Initiative Memorandum of Understanding (Dec. 20, 2005), *available at* http://www.rggi.org/docs/mou_12_20_05.pdf (last visited on Feb. 11, 2007); Regional Greenhouse Gas Initiative Model Rule (Aug. 15, 2006), *available at* http://www.rggi.org/docs/model_rule_8_15_06.pdf (last visited on Feb. 11, 2007) [hereinafter RGGI Model Rule].

[4] European Council of Environment Ministers, Council Conclusions of the 2773rd Environment Council Meeting, Brussels ¶ 4 (Dec. 18, 2006), *available at* http://www.consilium.europa.eu/cms3_applications/applications/newsroom/LoadDocument.asp?directory=en/envir/&filename=92249.pdf (last visited on Feb. 11, 2007).

[5] *See* Exec. Order No, S-20-06, ¶ 5 (Oct.17, 2006) by the Governor of the State of California, *available at* http://gov.ca.gov/index.php?/executive-order/4484/ (last visited on Feb. 15, 2007).

[6] Nicholas Stern, The Economics of Climate Change: The Stern Review 479-481 (Cambridge University Press 2006), *available at* http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/stern_review_report.cfm (last visited Feb. 11, 2007).

[7] A recent count revealed more than 15 studies and published reports addressing the issue (individual citations on file with author).

[8] *See* Organisation for Economic Co-operation and Development, *Linking Non-EU Domestic Emissions Trading Schemes with the EU Emissions Trading Scheme*, COM/ENV/EPOC/IEA/SLT(2004)6 (Jun. 2004) (*prepared by* William Blyth & Martina Bosi), *available at* http://www.oecd.org/dataoecd/38/7/32181382.pdf (last visited Feb. 15, 2007).

[9] *See* Pew Center, *Linking U.S. and International Climate Change Strategies* 5 (Apr. 2002) (*prepared by* Daniel Bodansky), *available at* http://www.pewclimate.org/global-warming-in-depth/all_working_papers/wp_linking.cfm (last visited Feb. 15, 2007) (identifying the tradable commodity and the registries used to track transfers of this commodity between trading schemes as crucial aspects in a trading link).

[10] Christian Egenhofer Et Al., The Eu Emissions Trading Scheme: Taking Stock and Looking Ahead 12 (Jul. 2006), *available at* http://shop.ceps.be/downfree.php?item_id=1360 (last visited Feb. 15, 2007) (correctly affirming that "it is difficult to provide an assessment of the feasibility of such linking as those schemes which could be linked are still in development, with yet uncertain design options").

[11] Organisation for Economic Co-operation and Development, *Harmonisation between National and International Tradable Permit Schemes* (Mar. 2003) (*prepared by* Erik Haites), *available at* http://www.oecd.org/dataoecd/11/63/2957623.pdf (last visited. Feb. 15, 2007).

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Sustainable Soccer:

How Green Projects at International Sporting Events Benefit the Fans, the Global Climate, and Local Populations

*by James Mitchell**

From solar-powered stadiums to free public transportation, the "Green Goal" project not only drastically reduced the environmental impact of the 2006 World Cup games through such preventative measures, but it went further: for the first time, an event of this magnitude was "climate-neutral."[1] Through a multilateral effort involving the United Nations Environment Programme ("UNEP"), the Institute for Applied Ecology, the International Football Federation, and the German Football Association, 100,000 tons of CO_2 will be saved through climate protection projects in India and South Africa, more than compensating for the 90,000 tons incurred by the games.[2]

Preference for projects that blend global environmental concerns with lasting benefits for local populations appears to be a trend for event planners. One such investment project is based in Tamil Nadu, an area in southwest India that was ravaged by the 2004 tsunami.[3] It involves creating facilities that turn cow dung into biogas, and then channels the energy source into homes via new pipes.[4] Not only will the eco-friendly biogas protect the local forests and decrease global greenhouse gas ("GHG") emissions, but it will reduce the number of respiratory illnesses associated with traditional wood and kerosene-burning stoves.[5]

Preference for projects that blend global environmental concerns with lasting benefits for local populations appears to be a trend for event planners.

South Africa will host the World Cup in 2010 and seeks to emulate Germany's carbon-neutral success. For example, the German public transportation system was a surprisingly successful feature of the Green Goal Project. By providing free use of trains and buses to all ticketholders, a full 77 percent of fans relied on public transportation, far surpassing the goal of fifty percent use.[6] Noting Germany's success, and aware of its own shoddy public transportation system, in August 2006 the South African Government agreed to a multi-million dollar initiative to revamp its bus and rail services in time for the 2010 World Cup games.[7] Teaming up with UNEP and the Global Environment Facility ("GEF"), South Africa developed "pilot projects in some of the nine. . .World Cup cities. . .aimed at developing sustainable transport alternatives that deliver [GHG] reductions above and beyond those currently planned."[8]

Recognizing that in urban metropolitan areas over a third of GHG emissions are attributable to the transportation sector,[9] both the World Bank and the GEF have implemented various transportation projects across the world, with particular success in Latin America.[10] Bus rapid transit ("BRT") systems feature dedicated bus lanes, a restricted number of stations, efficient routes, and little downtime.[11] South Africa 2010 planners are envisioning "feeder routes" that link poorer communities to the BRT system via conventional bus/taxi networks.[12] Implementing these networks, along with bicycle paths, will not only alleviate congestion during the games and decrease GHG emissions, but leave a lasting impact on local populations by improving regional air quality and health, and saving the average South African commuter time and money.[13]

The International community is shifting away from viewing major sporting events as exploitative opportunities, and moving towards a greener mindset that involves both economic and environmental development. UNEP and the Beijing Organizing Committee for the Olympic Games are striving to make the 2008 Olympic Games "the greenest ever, from cutting air, water and noise pollution to transportation, landscaping and disposal of solid waste."[14] Instead of leaving behind massive concrete stadiums, events are providing sustainable systems that benefit local inhabitants. Far from mere publicity stunts, greener games and the offsetting of GHG emissions instills a sense of environmental consciousness and global camaraderie connecting all fans and athletes, thus serving as a catalyst for future multilateral efforts to improve our environment.

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States Tackle Global Warming

*by Dale Bryk**

Introduction

Despite widespread support for federal action to limit global warming pollution,[1] the White House and many in Congress continue to sit on their hands, swayed by the Washington naysayers who claim that a safe, sustainable energy system is too expensive, especially now when fuel prices are at record highs. But as is so frequently the case in the environmental arena, the States are demonstrating that quite the opposite is true. This article provides an overview of State initiatives in the Northeast and California to combat global warming that can serve as a roadmap for federal policy-makers.

States Contend Carbon Controls Good for Local Economy

In August 2006, California adopted the first economy-wide cap on global warming pollution after concluding that doing so would increase State revenues by four billion dollars and bring eighty thousand new jobs to the Golden State.[2] The Northeast Governors[3] came to a similar conclusion in December 2005, adopting a cap on carbon dioxide emissions from power plants — the Regional Greenhouse Gas Initiative ("RGGI") — after economic modeling showed they could reduce pollution by ten percent from current levels while lowering energy bills for the average homeowner by over $100 per year.[4] And its not just the "tree-huggers" on the coasts who are gearing up to tackle the most pressing environmental problem of our time: Governors in Arizona, New Mexico, Washington, and Oregon have just announced a plan to collaborate with California on mandatory pollution caps; their counterparts in Montana, North Carolina, and Illinois are also rolling up their sleeves to tackle global warming,[5] as are over three hundred mayors nationwide.[6]

How have these leaders come to conclude that they can reduce global warming pollution in a smart way that is good for the local economy and will bring new clean energy businesses — and jobs — to their States? By focusing on finding solutions and recognizing that we need well-designed policies in order to bring these solutions to market in a big way. States are taking a fresh look at cap-and-trade program design, developing innovative features, and avoiding some of the flaws that have plagued precursor programs. They are approaching global warming in the context of a comprehensive review of energy policy, targeting the perverse incentives of current regulation, as well as the market barriers that hinder investment in the cheapest zero-emission resource — energy efficiency.

Carbon Auction Proceeds to Support Clean Energy

With respect to cap-and-trade design, the most exciting innovation is the agreement among RGGI States to use at least 25 percent of the value of allowances (pollution permits) to benefit consumers and promote clean energy. To date New York, Massachusetts, Vermont, Connecticut and Maine have announced plans to use one hundred percent of their allowances to benefit consumers, most likely by distributing allowances to an entity that will auction them to the owners of regulated power plants and use the proceeds to invest in energy efficiency. This is a huge shift from existing practices. In the Acid Rain Program, the NOx Budget Program, and the European Emissions Allowance Trading Scheme for greenhouse gases, governments established mandatory caps and allowed trading, but provided almost all of the allowances to the polluting sources free of charge.

In the electric sector giving away carbon allowances serves no legitimate public policy purpose and will result in windfall profits to power plant owners. Because allowances are tradable, they carry an opportunity cost, and therefore power plant owners will pass the cost of allowances onto customers regardless of whether or not they pay for them.[7] In Europe, free distribution of allowances has already resulted in hundreds of millions of dollars in windfall profits to owners of polluting plants.[8] These dollars could have been used to reduce the cost of the program for energy consumers, for example, by promoting investment in energy efficiency or sustainable power generation technologies. Granted, the Northeastern States have only committed to use 25 percent of the allowances in a wise fashion, but if one follows the logic behind this commitment (as all States that have decided this issue have done), there is no public policy justification to use less than one hundred percent of the allowances for public benefit purposes, and as the States head into their individual rulemakings they have the opportunity to do just that.[9]

Additional Energy Efficiency Savings Possible

The Northeastern States conducted extensive modeling of the emissions cap under different scenarios and determined that by increasing end-use efficiency for customers they could actually reduce energy bills while implementing the cap.[10] Despite the fact that the Northeast States are among the most energy efficient in the nation, their analyses showed that they could triple investment in efforts to speed the adoption of high-efficiency heating and cooling systems, more efficient lighting, and energy-saving "green" building design without running out of opportunities to save energy for less than it costs to generate additional electricity.

Proceeds from the sale of allowances will enable the Northeastern States to increase the number and size of the programs

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those States are implementing to transform markets for energy intensive products, but they will not be sufficient to promote investment in all cost-effective energy efficiency opportunities. To accomplish the latter, the States must also adopt more rigorous building energy codes, which effectively require developers to consider the occupants' energy bills when they design buildings and choose materials. In addition, the States must adopt increasingly stringent efficiency standards for energy-using appliances and equipment. The reduced demand for energy from such efforts would translate into sizable cuts in energy prices — for example, a five percent reduction in demand for natural gas would reduce the price of gas by a whopping twenty percent.[11] It's a simple application of the law of supply and demand, yet our nation's myopic focus on supply-side solutions has prevented us from taking advantage of it.

States Must Create Regulatory Frameworks That Reward Investment in Energy Efficiency

One of the main reasons for this perspective is that few utilities have any incentive to aggressively promote energy efficiency, because their profits are entirely dependent on how much power they sell, instead of on how well they meet their customers' energy service needs. From the utilities' perspective, even the most cost-effective investments in high efficiency heating systems, advanced industrial motors, or fuel cells produce the same effect: a reduction in utility sales and, as a result, reduced revenues and profits. The utilities' interest in high volume energy sales makes it unwise for their industry to invest in energy efficiency or clean distributed energy technologies which would enable them to play a central role in efforts to reduce global warming pollution.

If we change the way we regulate the industry and allow utilities to profit from energy-saving as well as energy-making investments — regardless of how much power they sell — we will quickly find many more ways to cut waste and lower customer bills. These kinds of reforms are good for customers, good for shareholders, and good for the environment. They are just the sort of innovative answers that the Northeastern States will be counting on to deliver global warming pollution cuts at minimal or no cost to consumers.

California is already leading the way on this front. In the aftermath of the State's 2001 energy crisis, utilities, regulators, and environmental advocates worked to reform a regulatory framework that had utterly failed to deliver low-cost, environmentally sound energy services to customers. The State's Public Utilities Commission adopted a regulatory structure and procurement rules that require the utilities to act as "portfolio managers" for their customers by investing in all cost-effective energy efficiency resources, promoting rational, economically efficient consumption decisions by customers, and assembling a diverse portfolio of supply resources through a combination of short-and long-term contracts that are designed to minimize electric bills, the volatility of electric prices, and environmental impacts.

During this period, California also enacted the most ambitious appliance efficiency standards in the nation, ridding the local marketplace of the worst performing products. By the time the California legislature passed Assembly Bill 32, its global warming bill last year, the State was already well on its way to meeting the law's pollution reduction requirements in the cheapest, fastest way possible.

Courtesy of Jessica Wiles

The Everest Base Camp Valley is an example of the natural landscape at risk due to climate change.

Conclusion

The United States has quite a long way to go before reaching a truly sustainable energy future, but the States are moving the country in the right direction. They are demonstrating how to reduce pollution in much smarter ways by adopting policies that foster long-term investment in least-cost, sustainable energy resources, promote technological innovation and economic development, and avoid subsidies for mature, polluting industries. It is a pretty good start.

Endnotes: States Tackle Global Warming

[1] *See Conference Before the Committee on Energy and Natural Resources, United States Senate, on Climate Change*, 109th Congress (2006) (statement of Exelon, Public Service Electric & Gas, Pacific Gas & Electric, PNM, Walmart,

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Inter-American Commission on Human Rights to Hold Hearing after Rejecting Inuit Climate Change Petition

*by Jessica Gordon**

The Inter-American Commission on Human Rights ("IACHR") held a hearing to "address matters relating to Global Warming and Human Rights" on March 1, 2007.[1] Weeks before announcing the hearing, the IACHR declined to consider a petition alleging that the United States' government's refusal to limit the country's greenhouse gas emissions constitutes a threat to Inuit human rights.[2] The Inuit Circumpolar Council ("ICC"), which represents 150,000 people in northern Alaska, Canada, Greenland, and Russia,[3] along with nonprofits Earthjustice and the Center for International Environmental Law submitted the petition in December 2005.[4] The groups asserted that climate change disproportionately affects the Inuit, threatening their lives, health, traditional land rights, personal property, and livelihoods.[5] The petition asked the IACHR, an international legal body affiliated with the Organization of American States ("OAS"),[6] for "relief from human rights violations resulting from the impacts of global warming and climate change caused by acts and omissions of the United States,"[7] which is the world's largest greenhouse gas producer[8] and has rejected any mandatory reduction agreements to cut emissions and curtail global warming.[9]

Although the IACHR does not have the authority to compel the United States to restrict its greenhouse gas emissions or compensate the Inuit, the petitioners hoped that such a ruling would increase public awareness of the detrimental effects of climate change and alert governments and corporations to their potential liability for global warming.[10] The petitioners also anticipated that a favorable ruling would establish a future legal basis for holding countries, companies, and industries responsible for their greenhouse gas emissions,[11] even inducing a "stream of litigation, somewhat akin to lawsuits against tobacco companies."[12] In a letter dated November 16, 2006, however, the IACHR informed the petitioners that the Commission would not consider the petition because the information it provided was insufficient for making a determination. Sheila Watt-Cloutier, chair of the ICC when the petition was submitted, asked the IACHR for further explanation of its decision and "invited [C]ommission members to visit the Arctic for a hearing 'to provide testimony and documentation on these problems which are seriously affecting Inuit survival.'"[13]

On February 1, 2007, the IACHR informed the petitioners that it would hold the March 1 hearing at the OAS in Washington, DC, to address matters raised by the petition without revisiting the petition itself.[14] Despite the disappointment of the petition's rejection, Martin Wagner, attorney for Earthjustice, remarks, "We believe that our petition may have helped educate the Commission concerning the relationship between global warming and human rights, and thus may have contributed to the Commission's desire to investigate the issue. Whatever its genesis, however, this hearing is a very positive step in the direction of recognizing States' obligations to prevent human rights violations resulting from their contribution to global warming."[15] The environmental community now waits to learn whether the hearing will achieve any of the goals of the petition it supplants.

Endnotes:

1 Letter from Ariel E. Dulitzky, Assistant Executive Secretary, Inter-American Commission on Human Rights, to Sheila Watt-Cloutier, Petitioner (Feb. 1, 2007), *available at* http://www.earthjustice.org/library/legal_docs/inter-american-commission-on-human-rights-inuit-invite.pdf (last visited Feb. 13, 2007).

2 *See* Andrew C. Revkin, *Americas: Inuit Climate Change Petition Rejected*, N.Y. Times, Dec. 16, 2006.

3 Revkin, *id.*

4 Nunatsiaq News, *ICC Climate Change Petition Rejected* (Dec. 15, 2006), *available at* http://www.nunatsiaq.com/news/nunavut/61215_02.html (last visited Jan. 29, 2007).

5 Sheila Watt-Cloutier, *Petition to the Inter American Commission on Human Rights Seeking Relief from Violations Resulting from Global Warming Caused by Acts and Omissions of the United States*, Dec. 7, 2005, at 7, http://www.ciel.org/ Publications/ICC_Petition_7Dec05.pdf (last visited Jan. 29, 2007).

6 Nunatsiaq News, *supra* note 4.

7 Watt-Cloutier, *supra* note 5, at 1.

8 BBC News, *Climate Change: The Big Emitters* (July 4, 2005), *available at* http://news.bbc.co.uk/2/hi/science/nature/3143798.stm (last visited Jan. 29, 2007).

9 Nunatsiaq News, *supra* note 4.

10 Donald Goldberg & Martin Wagner, *Human Rights Litigation to Protect the Peoples of the Arctic*, 98 Am. Soc'y Intl L. Proc. 227, 229 (2004).

11 Goldberg & Wagner, *id.*

12 Andrew C. Revkin, *Eskimos Seek to Recast Global Warming as a Rights Issue*, N.Y. Times, Dec. 15, 2004.

13 Nunatsiaq News, *supra* note 4.

14 Dulitzky, *supra* note 1.

15 E-mail from Martin Wagner, Petitioner, to author (Feb. 14, 2007, 04:20:00 PST) (on file with author).

* *Jessica Gordon is a JD candidate, May 2009, at American University Washington College of Law.*

Implementation & Utilization of Geoengineering for Global Climate Change Control

*by Alan Carlin**

Introduction

There is increasing interest in the possibility of using geoengineering to solve, or at least to help solve, global climate change problems.[1] Geoengineering has been defined as "intentional large-scale manipulation of the environment."[2] The geoengineering proposal receiving the most interest involves adding small particles to the stratosphere to scatter some of the incoming sunlight so that it does not reach the Earth. The outcome would be a reduction in global temperatures that would offset rising temperatures that many scientists believe result from increasing levels of greenhouse gases ("GHGs") such as carbon dioxide in the atmosphere. This approach differs from current popular proposals attempting to reduce man-made emissions of GHGs because instead of trying to indirectly affect average global temperatures by human decisions to increase or decrease GHG emissions, the resulting average global temperatures would be directly determined by explicit human action.

The author has previously argued that such intentional reductions in solar radiation reaching the Earth, which the author has referred to as "engineered climate selection," represent the most effective and efficient first step towards the solution of most, but not all, of the problems associated with climate change.[3] The practical question to consider is how engineered climate selection — or other geoengineering approaches — might actually be implemented in organizational terms. Even the best program may turn out badly if poorly implemented, and the need for a program to be carefully executed is of the utmost importance due to the risk of unintended consequences.[4] This article will explore some of the possibilities.

One prominent member of the U.S. scientific establishment recently called for encouraging research, but also for a moratorium on large-scale field experiments of geoengineering proposals.[5] Although it is encouraging to see that some members of the scientific community may take a more open approach towards research and publication in this area, efforts that impede future large scale experimentation are not consistent with the sense of urgency expressed by advocates of climate change control and those who favor extremely large expenditures for GHG emission controls to immediately begin.

A successful program needs to be subject to limited legal liabilities resulting from any adverse consequences from such large-scale geoengineering activities.

Ideal Goals for Geoengineering Implementation

Presumably, the goals of any organization charged with implementing geoengineering for global climate change control would include several components. There needs to be global political legitimization of any geoengineering activity. People and governments are likely to want some assurance that their interests are being heard and taken into account by any organization that would be charged with carrying out such projects. These projects need to be subject to a high level of scientific review and scrutiny. Likewise, the organization involved needs to hold a positive view towards such a program and have the capability to manage high technology projects.

Ideally, the organization should be cost-efficient while striving for the rapid achievement of proposed physical climate change control goals. One of the reasons for selecting engineered climate selection and other geoengineering approaches is the speed with which they could be implemented. Quickly reaching these results should be an important criterion in selecting an organization to do the implementation.

Despite the need for a low-cost and expeditious program, any geoengineering program needs to be subject to careful implementation and testing. Given the risk of unintended consequences, careful testing, subscale experiments, and quality control of all aspects of the program are essential. Moreover, any

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program undertaken needs to have the capability for intermediate course corrections in case important new information becomes available. Although it is well established that at least some technical approaches to engineered climate selection would be effective in controlling global temperatures,[6] there are a number of unanswered questions that require research and development.[7] Such research may result in the need for mid-course corrections in the implementation program, necessitating a need for organizational capability to make such modifications.

A successful program also needs to be subject to limited legal liabilities resulting from any adverse consequences from such large-scale geoengineering activities. It appears likely that any attempt to implement engineered climate selection will result in lawsuits claiming damages for adverse weather conditions allegedly resulting from the project.[8] Unless these claims are prohibited in some way or greatly minimized, they could greatly impede the program.

Implementation Phases

Any engineered climate selection or other geoengineering program might ideally follow a number of phases; these phases, however, need not be carried out by the same organization:

(1) The first phase might be careful laboratory investigation of any critical uncertainties of the program such as trying to verify the lack of significant adverse environmental effects and research on ways to reduce or eliminate them.

(2) The second phase might focus on careful real world testing of the proposed engineered climate selection or other geoengineering techniques. After initial modeling of engineered climate selection proposals in (1), scientists might conduct subscale real world experiments at increasing scales to verify remaining uncertainties, leading to development of a detailed plan for final implementation.

(3) Gaining acceptance of the plan by legitimizing organization(s) might likely be the third phase. Additionally, incorporating requested appropriate modifications might ensue.

(4) The fourth phase might be the plan's implementation, including revisions to the plan based on new information found after initial approval of the plan.

(5) The last phase would presumably consist of maintaining the resulting system after initial implementation.

Implementation Options

Most likely the quickest and simplest approach would be for one nation with the needed technical and financial resources to carry out all phases of the project, perhaps with the assistance of contracts to the best qualified aerospace (or possibly other) companies to carry out each phase. The cost would be quite small compared to major military weapon systems and the administrative procedures for such a system's development are fairly well established in most countries with large military development programs. Finally, the initial implementation could probably be accomplished in a few years' time if there were no delays caused by non-technical issues.

One obvious possibility at the opposite extreme would be for the United Nations ("UN") to implement such a program. The UN is already deeply involved in climate change issues and has an established organization to deal with them. An intermediate possibility might be an organization of the countries listed in Annex I of the Kyoto Protocol that are interested and willing to make a financial contribution to the effort. One such organization might be the Organization for Economic Co-operation and Development ("OECD"). Another possibility might be the North Atlantic Treaty Organization ("NATO"). Although NATO does not include several of Kyoto's Annex I nations, it does have experience with large aerospace procurements.

Less developed countries ("LDCs") generally express the view that climate change has been mainly caused by developed countries; thus in their view it is the developed world's responsibility to solve it. As a result, the choice of an organization representing developed countries would seem appropriate. Presumably only those countries willing to make a financial contribution would be involved so as to minimize the number of players and improve the speed with which decisions could be made. It would also be reasonable for the organization to retain control over all policy issues, but to contract out the actual implementation, presumably on the basis of competitive bidding.

Comparison of Choice of Organizations Using Criteria

Of the three implementation options discussed, the greatest political legitimization would presumably result from using the United Nations to oversee such a project. Restricting the countries involved tends to result in an action appearing less legitimate. In brief, the more countries involved, the stronger the legitimacy.

With respect to strong review and scrutiny of a geoengineering project, the UN has built a strong scientific advisory capability in the form of the Intergovernmental Panel on Climate Change, although it is not clear how receptive it would be to geoengineering. The OECD has a tradition of encouraging social science input into its deliberations. Various countries have numerous approaches towards encouraging scientific contributions to their technically related endeavors. However, the criterion of strong scientific review probably does not strongly favor any of the approaches considered here over any of the others.

The importance of a positive view towards the program and the capability to manage high technology projects favors a nation, or a small group of nations, managing the project. It is the author's opinion that the United Nations has been so closely identified with a regulatory emissions reduction approach to global climate change control that one can question whether they would be likely to give geoengineering a fair trial. Additionally, the UN also may not have much experience managing high technology aerospace projects.

Rapidly achieving physical climate change control goals is more likely to occur where there are fewer countries involved since fewer voices are likely to result in greater speed in implementing a solution. Though it may jeopardize legitimacy, an individual country, or a small group of countries, running the program would be the quickest option.

Cost minimization also favors a single country approach. Presumably the more countries there are involved in a program, the higher the cost of deciding what to do. Likewise, there is a greater likelihood that some country or countries will have to be "bought off" by added expenditures desired by that country. However, because the costs should be modest, this may not be a major consideration.

The capability for intermediate course corrections in case of important new information and careful implementation and testing criteria could presumably be achieved in all three organizational approaches. These criteria relate to the structure of the endeavor. Presumably, this capability could be equally well included in all three — although there may be differences between how long they might take to actually implement the plan.

Minimizing or handling any resulting legal liabilities for alleged adverse consequences, as discussed elsewhere,[9] is likely to be a significant problem with regard to any of the three approaches. Presumably there are ways to set up a geoengineering climate change control program that either minimizes such liability or at least provides for an orderly way to settle such disputes. This is obviously an important area for future legal research. Important questions to consider are: (1) to what extent would the exemption provisions of the U.S. Federal Tort Claims Act apply if the geoengineering were carried out solely by the United States Government; (2) what if alleged damages did not occur in the country of origin; and (3) what are the consequences of other governments or organizations being involved? Once again, an unrefined answer would seem to be that the fewer countries involved, the fewer the complications, but this may be overly simplistic.

The Benefits of Legitimization Support a Multilateral Approach

A single country approach has many benefits when assessed in relation to a number of the individual criteria. However, in the author's view these benefits are strongly outweighed for the plan acceptance, implementation, and maintenance phases, and probably for the real world testing as well. Real world testing is already controversial, and is likely to continue to be so even if gradual scaling up and other safeguards are used. A single country approach to anything beyond laboratory testing would likely result in international anger towards the lone country, many lawsuits by groups claiming damages, lack of worldwide public support, and possible lack of support in the country itself. A political consensus would appear to be fundamental to a successful effort in each of these phases.

Thus, multilateral options appear to be more likely to succeed. Using the UN or possibly another international organization to oversee such a program might appear somewhat unwieldy and cumbersome, but offers much larger advantages in terms of increased political legitimization. The experience to date, primarily in drafting the Kyoto Protocol, is not particularly encouraging since in order to gain LDC support, the developed nations felt that they had to agree to shoulder the entire bill. This led to a lack of support for the Kyoto Protocol in some countries, mainly the United States.

One possibility would be for one country to carry out the laboratory research, because no real world experiments or implementation decisions would be made during this phase. In the case of the United States, one observer has suggested the use of an organization modeled on a mini-energy-version of the U.S. Department of Defense's Advanced Research Projects Agency.[10] Increasing interaction with other countries and political legitimization would become even more important as the plan development progressed in order for it to be accepted by other countries. Finally, the actual implementation and maintenance would also be best handled by a politically very legitimate international organization.

Conclusion

If geoengineering represents the most efficient and effective first step towards a solution of the global climate change problem, it is important to analyze how an effective geoengineering effort might best be organized. It would appear that there would be some advantages for any laboratory research to be done by a single country, or perhaps a small group of countries. Overall, international organizations appear to be best situated to handle real world testing, plan acceptance, initial implementation, and maintenance of such a program.

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[7] *See* Lowell Wood, Earth Albedo Engineering, Presentation to Energy and Engineering Study Group, Lawrence Livermore National Laboratory, Livermore, CA (Apr. 7, 2005).

[8] *See* Carlin, *supra* note 3, at Part VI.B.

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Economic Growth and the Environment:

India Confronts the Link Between Automobiles and Climate Change

*by Rahul Saksena**

As a result of economic growth, India is experiencing vast changes in the country's social, political, and environmental landscape. One such change is the rapid increase in automobile usage. This drastic increase has serious environmental implications, but addressing the issue — and solving the problems that it creates — will not be an easy task.

India is riddled with transportation problems. As India's population increases, this problem further intensifies. Economic growth has precipitated the expansion of India's cities and suburbs. Between 1980 and 2003, India's urban population nearly doubled, and it is expected that in 2031, 40 percent of India's total population, estimated to be 1.42 billion, will reside in urban areas.[1] Predictably, India's urban growth is accompanied by a sharp increase in motor vehicle ownership: "the total number of registered motor vehicles increased from 1.86 million in 1971 to 62.7 million in 2003."[2]

As India's urban population expands, so do the geographic boundaries of Indian cities. Poorly-planned urban and suburban expansion often leads to environmentally-unfriendly sprawl, longer commutes, and bad traffic caused by an increasing dependence on automobiles. One of the numerous negative results of increased urban air pollution is the emission of greenhouse gases, which contribute to the global problem climate change.[3] Locally, the impacts of climate change are evidenced by the shrinking of the Himalayan glaciers, reminding lawmakers that this problem cannot be ignored.

A number of policies have already been implemented in different parts of India to deal with automobile pollution. In Delhi, for example, pursuant to Supreme Court orders, the city's fleet of 80,000 buses, taxis, and auto-rickshaws has been converted to run on Compressed Natural Gas.[4] The cleaner public transportation requirements resulted in a noticeable improvement to the city's air quality.[5] Delhi has also completed the first stage of a massive, ultra-modern subway system, designed to decrease road traffic.[6]

The cleaner public transportation requirements resulted in a noticeable improvement to the city's air quality.

While these improvements are a step in the right direction, they are not enough, and, more importantly, they have not been implemented in other Indian cities. The major cities of India need to take further steps by improving public transportation infrastructure, putting more resources and effort into sustainable urban and suburban planning, and implementing stricter emissions regulations on private automobiles.

While automobile pollution may be just one factor affecting global climate change, it is an important factor, and it needs to be addressed in India, where economic growth is bringing opportunities to implement sustainable development. India must take advantage of these opportunities immediately, as the shrinking Himalayan glaciers are proof that the disastrous effects of climate change are not too far in the future.

* *Rahul Saksena is a JD candidate, May 2008, at American University Washington College of Law.*

Endnotes:

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The Big Black Hole in the Kyoto Protocol:

Was the Exclusion of Black Carbon Regulation a "Fatal Flaw"?

*by Jon Feldon**

Introduction

Claiming that the Kyoto Protocol ("Protocol") was "fatally flawed in fundamental ways,"[1] on June 2001, U.S. President George W. Bush simultaneously condemned the landmark international agreement against climate change and announced that the United States would withdraw from participation in it.[2] The United Nations Framework Convention on Climate Change ("UNFCCC") drafted the Protocol in 1997 in order to fight the potentially catastrophic effects of climate change through an international carbon dioxide ("CO_2") emissions reduction plan.[3] Over 160 nations ratified the Protocol. The United States and Australia are the only countries in the developed world not to participate.[4]

While the United States signed the Protocol under the Clinton administration, President Bush withdrew, citing economic concerns and dismay that large, CO_2-emitting countries such as China and India would be exempt from Protocol emission restrictions as developing nations.[5] Particularly troubling, however, was President Bush's assertion that the Protocol's strategy itself was "fundamentally flawed." In the view of the Bush Administration, the Protocol improperly focused on CO_2 emissions to the exclusion of the greater problems of black carbon ("BC") and tropospheric ozone.[6] President Bush implied that without a plan to limit BC efforts, curbing worldwide CO_2 emissions is not sufficient to address global warming.

Emerging evidence indicates that BC does play a significant role in contributing to global climate change.

If the Bush Administration's assertion is true, the implications are staggering. Could it be possible that the countries of the world had come together and devised a way to address one of the most urgent global environmental concerns of the century, only to completely misidentify the nature of the problem? Equally important is to evaluate whether or not the Bush Administration's assertion is justified. Emerging evidence indicates that BC does play a significant role in contributing to global climate change. This article argues that the Kyoto Protocol is, and will continue to be, a powerful force against climate change whether or not it addresses BC. While BC is unquestionably a powerful contributing factor to climate change, CO_2 remains the largest contributor to the problem, and a long-term solution requires CO_2 reductions as soon as possible.[7] If the Kyoto Protocol can be amended to incorporate measures to reduce BC emissions without alienating participating countries, then it is ideal to do so. Nonetheless, the overall mission of the Protocol remains sound, even in the face of new information about other contributing factors to climate change.

What Is Black Carbon, and Why Is It a Problem?

BC in the atmosphere consists of incompletely burned, microscopic particulate matter resulting from inefficient combustion.[8] Specifically, when carbon is burned to generate energy and heat the burning process also produces CO_2 and BC emissions; the amount of matter remaining depends upon how completely the carbon is burned.[9] If the process does not burn away all solid matter, or if the byproduct is not sequestered, the resulting particulates of solid carbon become atmospheric BC.

BC is not only a byproduct of power production. Additionally, in developed countries the primary source of BC is from industrial pollution and motor vehicle emissions.[10] Less developed nations mainly produce BC by burning sooty fuels, using wood-burning stoves and heaters, and clearing land by burning crops and forests.[11] Industrialized countries release more CO_2 than BC, because their technology allows them to burn carbon with high efficiency.[12] On the other hand, half of the world's atmospheric BC comes from the burning of fields and forests; 30 percent comes from residential burning of coal, firewood, and dung; and ten percent comes from diesel engines.[13] For this reason, the worldwide BC problem rests largely on developing nations.

Problems With Black Carbon

BC causes a variety of health problems if inhaled, including lung disease, asthma, heart disease, and cancer.[14] The estimated health cost of particulate pollution in industrialized countries ranges from U.S. $200,000 to $2.75 million per ton, per year.[15] Further perspective is given by a figure released by the World Health Organization that air pollution accounts for the deaths of 2.7 million people annually.[16]

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Atmospheric BC also affects weather patterns. Unlike greenhouse gasses, which trap heat rising from the earth's surface, atmospheric BC, visible as haze or smog, or incorporated into clouds, absorbs incoming sunlight due to its dark color. BC has the effect of cooling regions directly below it while increasing the net temperature of the earth.[17] These changes in temperature destabilize regional weather patterns.[18] For example, NASA scientists link increasing droughts in northern China and flooding in southern China to atmospheric BC.[19]

BC's role in climate change occurs on two levels. Directly, BC's dark coloration absorbs heat that would otherwise escape the atmosphere into space.[20] BC also has several indirect contributory effects. Atmospheric BC can be incorporated into clouds, darkening them, and causing them either to absorb the 40 to 90 percent of solar radiation that they would otherwise reflect[21] or to overheat and burn away entirely.[22] Either result prevents clouds from keeping the planet cool.[23] Unlike CO_2, which can stay in the atmosphere for 50 to 200 years, BC only stays aloft for a few weeks or months.[24] Unfortunately, once out of the air, BC can collect on ice, snow, mountains, and glaciers.[25] The darkened snow and ice have a reduced albedo, or reflectivity, resulting in faster melting and less sunlight reflected out of the atmosphere.[26] Including all the different ways BC interferes with Earth's heat loss, experts estimate that BC causes more than 25 percent of all observed global warming. When combined with methane ("CH_4") and other pollutants, these particulates account for least as much global warming as CO_2.[27]

Black carbon's dark coloration absorbs heat that would otherwise escape the atmosphere into space.

The Kyoto Protocol

The Kyoto Protocol is an international agreement made under the UNFCCC at the third Conference of the Parties[28] whereby 165 member nations agreed to reduce their emissions of CO_2 and other greenhouse gases.[29] Under the Kyoto Protocol, developed member nations agree to reduce their greenhouse gas emissions by an average of five percent below their 1990 emission levels.[30] Developing nations do not have to reduce their emissions, but can participate in the Clean Development Mechanism ("CDM"). The CDM enables developed member countries to invest in emission-reducing programs in developing countries in exchange for credits that count towards their emission reduction goals.[31] Although many national governments agreed to address climate change at the 1992 United Nations Conference on Environment and Development in Rio de Janeiro, the Kyoto Protocol is the first international agreement to protect the environment that is actually binding and enforceable.[32] BC emissions were not considered under the Kyoto Protocol, largely due to a lack of understanding at the time about the role that aerosolized BC plays in accelerating climate change.[33]

Recently, the United Nations Intergovernmental Panel on Climate Change released the results of a six-year study of global warming.[34] The study shows average global temperatures could rise by 1.5 to 5.8 degrees Celsius within this century, and that the changes are 90 percent likely to have been caused by human activity.[35] To prevent or mitigate permanent environmental damage, a strong, effective international effort will be necessary. Currently, the Kyoto Protocol is the only binding international agreement reflecting the world's reaction to this problem.[36] With the Protocol set to expire in 2012, the issue of whether or not the agreement is irredeemably flawed by not regulating BC is critically important.

The Argument for Including Black Carbon in The Kyoto Protocol

Black Carbon Significantly Contributes to Climate Change

The primary argument that the Kyoto Protocol mishandles global warming lies in the fact that BC contributes significantly to global warming, but is not addressed by the Protocol's terms. Stanford University Professor Mark Z. Jacobson states that reducing BC levels "may slow global warming more than may any emission reduction of CO_2 or CH_4 for a specific period."[37] Studies conducted by Jacobson and others show that BC warms air much more than CO_2 does, per square unit.[38] Ignoring BC could be dangerous, because even though BC is less common in the atmosphere than carbon dioxide, governments could do more harm than good if they increase the release rate of BC in their attempts to decrease CO_2 emissions. For example, tax laws in the European Union ("EU") favor diesel vehicles[39] because they get 25 to 35 percent better mileage while emitting less carbon dioxide than gasoline cars.[40] But diesel vehicles release much more BC than gasoline vehicles.[41] If the Bush Administration and Jacobson are correct, the Kyoto Protocol resulted in European policies that may actually encourage global warming.

Reducing Black Carbon Emissions Will Result in More Immediate Effects

A second argument against a Kyoto Protocol without BC regulations is that BC emission cuts are much more reasonably accomplished, and will result in more immediately noticeable effects.[42] Whereas CO_2 stays in the atmosphere, trapping heat for decades, BC remains aloft for days or weeks at the most.[43] Reduced BC production would have climate and health benefits right away, while lowering CO_2 emissions will not have noticeable effects for decades.[44] A notable proponent of this argument is Dr. James Hansen, head of the Goddard Institute for Space Studies at NASA. He believes that CO_2 cuts are unreasonable for modern society whereas BC reductions can easily be achieved

with current technologies.[45] Reducing BC, Hansen says, would give policy-makers a much easier sell to their constituents, who could appreciate the tangible benefits of reducing BC in their daily lives.[46] Moreover, countries like China, exempt under the Kyoto Protocol as a developing nation, *could* be required to meet BC reduction standards, because the technology to do so is available and affordable. Reducing BC would also improve societal health.[47] Hansen argues that it would be better to resume focusing on CO_2 emissions in the future, when technology will allow for realistic and significant CO_2 emission reductions.[48]

The Problems With Adding BC Regulations to the Kyoto Protocol

A Complicated Scenario

Despite the role that BC plays in climate change, and despite the benefits to reducing BC emissions, there are a few problems with declaring the Kyoto Protocol a failure based on the BC issue. For one, BC and other contributory substances have extraordinarily complex interactions which are not yet completely understood.[49] For example, BC is virtually always accompanied by organic carbon ("OC"), a white soot-like substance that reflects light and heat away from the earth and protects clouds and glaciers from the effects of BC darkening.[50] While most scientists agree that substances like BC should be reduced wherever possible, no one yet knows how much OC offsets the problems caused by BC.[51] By contrast, scientists have clearly established that CO_2 produces more global temperature increase than any other substance, including BC.[52] Therefore, reducing CO_2 emissions should be the primary focus because its role in climate change is so prominent and so clearly understood.[53] Even though the Kyoto Protocol does not address BC, the agreement has already begun to see progress in reducing CO_2 emissions worldwide.

Logistical Issues

While the EU might be misguided in their encouragement of diesel engines, the practice has worked to reduce net EU CO_2 emissions. Revamping regulations now might do more harm in terms of CO_2 emissions than good in terms of BC output. Similarly, the areas where BC is produced in the highest quantities (developing countries) are also areas where emissions quotas would be difficult, if not impossible, to meet.[54] True, cities produce a great deal of BC, but comparatively, the planet's highest producers of atmospheric BC are poor populations in China, India, South America, and the former Soviet Union who use domestic wood burning stoves for cooking and heating and utilize slash and burn agricultural techniques.[55] In countries where older technologies for heating, cooking, and land-clearing prevail, efforts to address BC issues are unlikely. By contrast, focusing on CO_2 has the advantage of requiring the most from those with the most capacity to reduce emissions today: developed nations.

Conclusion

The Kyoto Protocol is not "fatally flawed," nor is it perfect. BC is a large contributor to climate change. However, CO_2 is as much, if not more, of a factor as well. Ideally, the international community would work together to reduce output of both. Unfortunately, international agreements are difficult to initiate and complex to enforce. In this context, the ratification of a binding agreement which imposes costs on participating nations in the short-term is a highly respectable achievement in its own right. Incorporating BC regulations into the Kyoto Protocol is an excellent idea — provided that member nations would actually comply with them, and that such requirements would not hamper the larger goal of reducing the number one long-term cause of global warming, CO_2. Success will come with worldwide consensus that a BC problem exists and that the countries best equipped to handle the issue should take the lead in addressing it. The processes that affect climate change are complicated. Any effort to address the problem, even one that does not account for absolutely every factor, should be commended rather than discounted.

Endnotes: The Big Black Hole in the Kyoto Protocol

[1] Press Release, President Bush Discusses Global Climate Change (June 11, 2001), *available at* http://www.whitehouse.gov/news/releases/2001/06/20010611-2.html (last visited Feb. 5, 2007) [hereinafter Bush].

[2] Bush, *id.*

[3] Kyoto Protocol to the United Nations Framework Convention on Climate Change art. 3(1), Dec. 10, 1997, 37 I.L.M. 22.

[4] UNFCCC website, Parties to the Kyoto Protocol, http://maindb.unfccc.int/public/country.pl?group=kyoto (last visited Feb. 5, 2007).

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[13] Redman, *supra* note 9, at 49.

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Carbon Offsets:

Are Such Credits Effectively Helping Mitigate Climate Change?

*by Catherine Verdier**

Each year, the Oxford University Press selects a word to be added to the *New Oxford American Dictionary* — a word that not only reflects the events and concerns of the proceeding year but also is forward-looking. In 2006, the word of the year was "carbon neutral."[1] Numerous airlines, businesses, athletes, entertainers, international institutions, and more have expressed their commitment to carbon neutrality.[2]

An average citizen can reduce his or her net impact on the world's climate by voluntarily purchasing carbon offset credits at a relatively low cost. Carbon offsets are credits for emission reductions achieved by investments in either renewable energy projects or carbon sinks. Companies that provide offsets allow consumers to calculate their emissions from travel or home energy usage.[3] Consumers typically make a payment to an offset provider, and that contribution is passed to another firm promoting carbon dioxide reductions. As of late 2006, about 40 operations worldwide offered carbon offsets.[4]

The majority of carbon offset providers invest in some form of reforestation, concentrating on preserving existing forests or restoring native tree species in a particular threatened area. Other companies instead use revenue to fund renewable energy projects such as wind farms, solar power, and methane capture.[5] For example, one company in the United Kingdom has pledged to introduce energy-efficient wood-burning stoves to developing world communities; each household stove would reduce carbon emissions by about 1.5 metric tons a year.[6]

Criticisms of carbon neutral programs abound. Some doubt that such schemes actually promote carbon neutrality, and others outright dispute the program's effectiveness in controlling climate change. Many critics view carbon offset programs as a way to alleviate personal consumer guilt instead of an effective means to lower greenhouse gas emissions. Some believe that offsets give consumers a license to pollute, instead of a reason to cultivate more energy-efficient habits.[7]

Reforestation offsets especially have come under scrutiny. For instance, calculations concerning the amount of carbon saved through tree-planting programs are based on the assumption that the trees will last at least one hundred years, but there is no guarantee that the trees planted through reforestation programs will not succumb to disease or forest fire before that one hundred year mark. Some scientists suggest that a rise in temperature of two to three degrees Celsius could cause the trees to die early, break down into methane, and actually worsen the climate change situation.[8]

Critics claim that the lack of regulation in the offset market allows disreputable organizations to sell the same carbon credit many times over. Additionally, consumers cannot ensure that their money is actually reaching the intended programs. There are also concerns that calculations by off-set groups are unreliable: different providers often arrive at very different price estimates for offsetting the same amount of carbon.[9]

The privatized market for carbon offsets could, critics fear, have ominous effects on public policy. Voluntary offset programs should not be seen as a substitute for government regulations to control climate change. Indeed, some say that purchasers of carbon offsets are creating an environment that enables governments to avoid creating legislation to slow global warming.[10]

The general public reaction to carbon offsets has been "better safe than sorry." The more optimistic see voluntary carbon offsets as a temporary measure for controlling climate change until more comprehensive legislation can be enacted, and the more pragmatic believe that carbon offset purchasers are preparing for an economy in which carbon dioxide and other greenhouse gases are closely regulated and heavily taxed.[11]

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[2] What You Can Do: Go Carbon Neutral, David Suzuki Foundation website, http://www.davidsuzuki.org/Climate_Change/What_You_Can_Do/carbon_neutral.asp (last visited Feb. 4, 2007).

[3] For example, in one year, a midsized car that is driven 12,000 miles will create about 3.55 tons of carbon dioxide; companies charge anywhere between U.S. $4 and $30 to offset one metric ton of carbon. *See* Seattle Post-Intelligencer, *Feel Less Than Green?* (Nov. 20, 2006), *available at* http://seattlepi.nwsource.com/ business/292969_carbonoffsets20.html (last visited Feb. 4, 2007).

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Global Climate Change Creates a New Carbon Business for U.S. Companies

*by Michael J. Zimmer**

Introduction

Attempts to manage and mitigate global warming can emerge as a major U.S. business opportunity. A sensible, sustainable policy to mitigate climate risk can earn returns, promote lower energy and operating costs, and create high quality, productive jobs built on technology and climate based business solutions. Ancillary banking, trading, insurance, venture capital, and private equity activities will compliment the opportunity and promote economic development. Companies in the United States are just starting to appreciate the business prospects in the formation of their strategic plans.

The U.S. stimulus for action is coming from states, certain companies, and consumers recognizing that climate change creates risks for companies we operate and support, invest in, and manage. As part of a global economy, U.S. companies operating abroad are already participating in carbon management schemes because of local Kyoto compliance obligations in their host countries. Disclosures of climate risk increasingly appear in lending decisions, credit reviews, and in financial reporting. Industries are being assessed, and how companies respond and measure this issue already counts. In the near future, climate risk strategies may assume levels of fiduciary responsibility with shareholder, stockholder, and litigation exposure.

We are already seeing the potential impacts on corporate value from carbon discussions. Presupposing that corporate counsel can help the company manage these impacts requires several areas of critical contribution working with the financial, engineering, marketing, public affairs, and technical staffs of the company. The development of a portfolio of strategies to recognize and diversify the basis for climate risk over as broad a base is no longer merely pioneering, it is prudent. Company performance, market survival, competitive market positions and opportunities are at stake because carbon is now a commodity.

Carbon Business Opportunity

Climate change management can emerge as a major U.S. business opportunity independent of Kyoto compliance obligations as well as a critical economic development imperative for U.S. businesses.[1] Companies face escalating international pressure, natural pressures, rising energy prices, water supply uncertainty, and mounting concerns about air quality affecting their business operations. A sensible, sustainable carbon policy to mitigate climate risk can earn returns, promote lower energy and operating costs, and create high quality, productive jobs for U.S. companies built on cleaner technology and climate solutions integrated into their core business activities.[2] A company's management of these issues can create market differentiation translating to corporate value. Opportunities are not limited to manufacturing or utility companies, but also include service companies and commercial buildings in their operations and business choices. New stakeholders such as banking, trading, insurance, venture capital, engineering, pension plans, and private equity firms will enhance the opportunity and promote economic development with global benefits.[3] U.S. companies are just starting to appreciate the business prospects in the formation of their business plans and competitive models to manage climate-based change.

At present, federal and state initiatives do not dictate solutions for the private sector; instead the policies encourage domestic companies to address these challenges with balance. This industry-driven policy approach could be more lasting because government is pointing business in the right direction through various Department of Energy and Environmental Protection Agency climate-based programs, whose policy guidance compliments the interests of the insurance, pension, financial, and banking interests that promote separate risk management objectives. Instead of mandating change, the government thus serves as an incubator for new solutions regarding climate management in a process similar to the formation of the advance markets for biotech, defense, homeland security, satellite communication, clean energy, and the internet industries in the U.S. economy.

Carbon management, stewardship, and sustainability will ultimately become good business in the United States as companies examine and alter their business models for the future[4] precisely because the old rules of competitive market advantage have changed. New market strengths and business models are required that go beyond the old metrics of cheap labor, energy, raw materials, and commodities. These new models will be centered on capital, innovation, efficiency, transportation, raw energy transformation into new fuels, and technology deployment in the new carbon economy. The old metrics reward risk management and the bottom line; whereas, the new paradigm in a carbon constrained world centers on branding and reputation enhancement, creating a competitive edge, developing new products or systems, reducing fossil fuel consumption, or the "greening" of existing products.

Once again, as part of a global economy, U.S. companies are already being forced to and manage an array of climate risks. The time horizon for risk management is accelerating and busi-

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ness models are changing as a result. Advanced technologies and new energy strategies will offer new models for the future and strand the assets of companies built on the past. Disclosures of climate risk are now appearing in lending decisions, credit reviews, and in financial reporting.[5] Industries are being reassessed, and how companies respond and measure climate challenge already counts. In the near future, climate risk strategies may assume levels of fiduciary responsibility with shareholder, stockholder, and litigation exposure.[6]

Corporate Value

We are already seeing carbon discussions impact corporate in leading U.S. companies across industries. Positive impacts on new investments in infrastructure improvements are arising that create Clean Development Mechanism benefits under the Kyoto Protocol. These investments are being explored by the manufacturing sector, as well as the oil and gas industry mining and chemical industries. U.S. multinationals have retained Wall Street firms for this purpose since 2005.

The electric industry experiences direct costs for emissions abatement through the purchase of allowances and shifts in fuels, deployment, or geographic location of plants.[7] Differences do exist within the industry over the preference of various control strategies such as using a cap and trade system or a carbon tax. Indirect costs to cap emissions are recognized and valued through, market perceptions of shareholder value, as confirmed in the Carbon Disclosure Project's annual carbon reporting and disclosure exercises.

Assessments for insurance, bonding, and costs of capital reflect climate risk factors; this in turn impacts the price and availability of underlying insurance coverage.[8] As a result, new insurance products coupled with financial risk management techniques are appearing in the United States. Climate change is creating a new evaluation of risk factors for investment decisions versus credit purchases, business units for sales, or acquisitions.[9]

For the future, transportation logistics impacts and arbitrage opportunities for fuel, supply, international trade for import products, airlines, ports and harbors, railroads, and new industries like biofuels will become even more critical in a carbon constrained world.[10] Energy conversion from fuels, environmental, transportation, environmental finance, and climate change management strategies are converging. Certain industries are leading, while dramatic prospects lie ahead for electric utilities, oil and gas, commercial real estate, airlines, mining, and transportation sectors to develop more dynamic, market-centered carbon strategies.[11]

Future Contributions to Carbon Operations by Counsel

Counsel working with the financial, engineering, marketing, public affairs, and technical staffs can help a company in several areas of critical contribution to carbon operations.

Standardization is an area whereby counsel can provide assistance. Counsel can help promote standard terms, definitions, and protocols in contracting, procurement, and chain of supply transactions. Counsel can also provide assistance by linking carbon and tax or accounting treatments into financial services, financing and product evaluations. If a company has contingent liabilities caused by climate exposure, how would the auditors report those liabilities?[12] The degree and extent of reporting disclosure on this subject would be a concern for the U.S. Securities and Exchange Commission or the Financial Accounting Standards Board.[13]

Carefully assessing the legal nature of a carbon allowance or credit is another area counsel would be able to provide assistance. For example, counsel would be able to deem if it is a financial investment, commodity, intangible, derivative, or security. The utilization of metrics for measurement, which will provide new tools to gauge corporate performance are changing, and should include technical emissions, accounting and economic data on products and services, is another area requiring legal expertise.[14]

Integrating carbon strategy with procurement, logistics, transportation, environment, and fuel conversion into energy functions of a company will be another topic requiring legal assistance. Such functional integration requires top down management direction and support because the efficiencies will create cost offsets.[15] Single dimensional analysis of merely costs without applying savings efficiencies does not offer the complete picture enhanced though cross-functional terms.

Counsel will also be able to help businesses keep current with regulatory advice and strategy in Canada, Europe, and Asia since they are setting the trends for the future to 2012. After Kyoto expires or is transitioned to a new regime, understanding regulatory strategies for extension of carbon management and trading is essential for protection of corporate assets, divestitures, targets, and merger strategies.[16]

Assisting companies with linkages to competitive market intelligence by industry, peer groups, trade associations, and other benchmark activities on carbon management and finance will be another responsibility of counsel. Monitoring market intelligence is of vital importance to ensuring maintenance of a company's competitive edge. Additionally, information technology linkages will also require the assistance of counsel. Speed of information management is important, but also creates new risks.

Counsel must also work with companies to help expand risk management strategy over carbon for insurance, bonding, construction, fuels, safety codes, material securities disclosures, and corporate governance obligations of the company.[17]

Supporting interactive energy, environment, and fiscal budgeting tools to measure these new performance parameters and a new analytical paradigm for carbon is another potential responsibility of counsel. Intensity and productivity are new metrics of the future. Counsel must be careful with internet and data management platforms compromising a company's confidentiality and data security interests.

Communicating a company's results to stockholders, shareholders, employees, regulators, and governance bodies to establish a leadership position and brand on carbon management is another issue counsel can provide assistance. Further, companies will need aid from counsel to manage fiduciary responsibilities. Guidance will likely be sought to help establish internal systems

to measure risks, liability, and to minimize future litigation by early actions that have a strong governance base grounded in fiduciary responsibility.

Counsel will also be able to provide companies with assistance to reduce environmental/energy costs in existing operations, creating potential profitability, productivity and sustainability benefits. Additionally, if carbon disclosure is measured in lending and insurance underwriting, counsel can help evaluate whether carbon disclosures should become incorporated into representations, warranties in financing, and mergers and acquisitions transactions for companies.[18]

Conclusion

Developing a portfolio of strategies to recognize and diversify the basis for climate risk over as broad a base as possible is now prudent, not pioneering, because a company's economic performance, markets, competitive market positions, and opportunities are at stake. Investors will demand a management approach for carbon to assess financial risk from liabilities, investment opportunities in green products, process or technology, and for stakeholder and public relations.[19] Responsible companies will benefit, others will pay.

Carbon is now a commodity with economic value. The United States must now participate in offset projects in foreign countries and between industries and in supply chain planning to satisfy its carbon objectives. Comparable links to carbon trading platforms in other countries will make a U.S. system more efficient and effective while successfully participating in a global economy. Moreover, the recognition of such opportunities will provide the linkage of capital and innovation with clean energy and carbon management to capture and support the major sustainable investments and growth of the twenty-first century. This can only be powered by fundamental business recognition of Thomas Friedman's current admonition that: "Green is the new red, white and blue,"[20] and that the United States must lead in a changing global economy by incurring the short-term costs, in creating new high tech jobs to achieve improved, sustainable corporate performance.

But in the execution of new policy and a new order of things, the devil is the details. The United States cannot afford to create structural errors in a global economy with developing markets that do not carry the same burdens and responsibilities. Change is needed. Carbon management and implementation cannot become a tool to alter the competitive balance of the world economy and convert the important corporate mission merely into a new environmental financial derivative. Legacy markets would face their demise, crippling under costs they cannot pass-through; developing markets would gain the new competitive edge in costs, labor, commodities, and materials, and the only final market winners will be the traders of a derivative for a newly conceived commodity product with little long-term global value.

The new arbiter of competitive advantage will become innovation, access to capital, new products and processes, sophisticated technology deployment, fuel conversion into more refined forms of energy, and managing the strength and costs of the transportation system and logistics to move, store, and ship products. This will ensure that physical assets stand behind carbon management in the new business model to sustain value and not merely proprietary financial trading with little physical support nor reality.

Endnotes: Global Climate

[1] *See generally* Andrew J. Hoffman, *Getting Ahead of the Curve: Corporate Strategies That Address Climate Change* for the Pew Center on Global Climate Change (2006), *available at* http://www.pewclimate.org/docUploads/Synthesis_ Report_CorpStrategies.pdf (last visited Feb. 8, 2007).

[2] Hoffman, *id.* at 1.

[3] Hoffman, *id.* at 2.

[4] Abyd Karmali, *Best Practice in Strategies for Managing Carbon*, *in* The Finance of Climate Change: A Guide for Governments, Corporations and Investors 259, 259-270 (Kenny Tang ed., 2006).

[5] *See Investors Seek Climate Change Information*, N.Y. Times, June 15, 2006, at C8.

[6] *See* Security and Exchange Commission's website, http://www.sec.gov (last visited Feb. 15, 2007) (providing basic information regarding disclosure requirements).

[7] Deloitte Research, Which Way to Value? The U.S. Power and Utility Section 2005–2010 (2005), *available at* http://www.deloitte.com/dtt/cda/doc/content/DTT_DR_WW2V_Sept05a.pdf (last visited Feb. 8, 2007).

[8] *See* Pew Center on Global Climate Change, The Agenda for Climate Action, *available at* http://www.pewclimate.org/docUploads/PCC_Agenda_2.08.pdf (last visited Feb. 8, 2007) (reporting that European insurers are showing leadership, while U.S. companies are escalating their own activities).

[9] Jeffrey A. Smith, *The Implications of the Kyoto Protocol and the Global Warming Debate for Business Transactions*, 1 N.Y.U. J. L. & Bus. 511, at 511-550 (2005).

[10] Sen. Energy & Nat. Resources Comm., *Hearing Notice*, *available at* http://energy.senate.gov/public/index.cfm?FuseAction=Hearings.Hearing&Hearing_ID=1607 (last visited Feb. 8, 2007) (hearing to be conducted on Biofuels before full committee on February 1, 2007).

[11] *See Companies and Climate Change: Can Business Be Cool?*, Economist, June 10, 2006 at 70; Marilyn A. Brown et al., Pew Center on Global Climate Change, *Towards A Climate — Friendly Built Environment* (2005), *available at* http://www.pewclimate.org/docUploads/Buildings_FINAL.pdf (last visited Feb. 8, 2007).

[12] This determination ventures into risky grounds. *See*, SEC Regulation S-K, 17 C.F.R. § 229.101 (2005).

[13] *See* SEC Regulation S-K, 17 C.F.R. § 229.303(a)(1) (2005) (requiring management discussion and analysis to disclose "known certainties" that could result in material consequences. This disclosure includes "currently known trends, events, and uncertainties, that are reasonably expected to have material effects").

[14] Hoffman, *supra* note 1, at 10.

[15] Hoffman, *supra* note 1, at 37-45.

[16] *See* Carbon Disclosure Project (4th Ed. 2006).

[17] *See* 17 C.F.R. §§ 229.101-303 (2005); *see also* TSC Industries v. Northway, 426 U.S. 438, 448 (1976) (demonstrating that "materiality" is a matter or development that has significantly altered the total base of information made available to the investor).

[18] *Cf.* Letter from Investor Network on Climate Risk (INCR) Investor Group to Christopher Cox, Chairman, Securities & Exchange Commission (June 14, 2006), *available at* http://www.ceres.org/pub/docs/Ceres_INCR_SEC_letter_061406.pdf (last visited Feb. 8, 2007).

[19] Ceres, *Investors Call on SEC to Require Corporate Disclosure on Climate Change* (June 14, 2006), *available at* http://www.ceres.org/news/news_item.php?nid=197 (last visited Feb. 8, 2007).

[20] Thomas Friedman, Speech to American Council on Renewable Energy (ACORE) Policy Conference (Nov. 30, 2006).

Litigation Update

The Global Warming Case:

Massachusetts v. Environmental Protection Agency

*by Meryl Eschen Mills**

Introduction

On November 29, 2006, the Supreme Court heard oral arguments in *Massachusetts v. Environmental Protection Agency*,[1] the decision of which may have major implications for the regulation of carbon dioxide ("CO_2") and other greenhouse gases ("GHGs"). The case addresses whether the Environmental Protection Agency ("EPA") has statutory authority under the Clean Air Act ("CAA") to regulate CO_2 and other GHGs emitted by new motor vehicles, and if it does, whether such authority is mandatory or discretionary.[2] The case was brought by twelve states, three cities, an American territory, and various environmental organizations. Although the Court is unlikely to take a stand on the scientific legitimacy of climate change, its decision will have important implications for future climate-related claims, specifically regarding standing and regulatory issues.

Background

Section 202(a)(1) of the Clean Air Act provides that "[t]he Administrator shall by regulation prescribe (and from time to time revise) in accordance with the provisions of this section, standards applicable to the emission of any air pollutant from any class or classes of new motor vehicles or new motor vehicle engines, which in his judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare."[3] Several states and environmental groups claimed that under this section, the EPA must regulate various GHGs, including CO_2, methane, nitrous oxide, and hydrofluorocarbons.[4] EPA sought public comment, and the White House requested the assistance of the National Academy of Sciences ("NAS") in researching the issue.[5]

EPA found that the public comments it received did not add any significant insight to the information studied by the NAS.[6] The agency therefore decided to rely on the NAS's finding that a causal link between the emission of GHG and climate change could not be "unequivocally established."[7] Based on the scientific uncertainty of the causes of climate change, EPA chose not to regulate CO_2, nor several other GHGs, under Section 202 of the CAA.

Petitioners brought suit against EPA in the U.S. Court of Appeals for the District of Columbia Circuit to compel EPA to regulate the gases under the CAA.[8] The court however found in favor of EPA, holding that the Administrator "properly exercised his discretion under Section 202(a)(1)."[9] The court reasoned that the Administrator relied on several factors in making his decision, including policy judgments in addition to the scientific uncertainty cited by the NAS report,[10] and that "[i]n requiring the EPA Administrator to make a threshold 'judgment' about whether to regulate, Section 202(a)(1) gives the Administrator considerable discretion."[11]

Petitioners appealed the decision of the U.S. Court of Appeals for the District of Columbia and the Supreme Court granted certiorari.

The Arguments

The questions presented to the Supreme Court were: (1) whether Section 202(a)(1) of the CAA authorizes the EPA Administrator "to regulate air pollutants associated with climate change;" and (2) whether the Administrator may "decline to issue emission standards for motor vehicles based on policy considerations not enumerated" under Section 202(a)(1)?[12]

In their brief, petitioners argued that the CAA authorizes EPA to regulate pollutants associated with climate change and that EPA may not base its decision not to regulate on policy considerations not laid out under the CAA.[13] More specifically, petitioners argued that the GHGs associated with climate change are "air pollutants" subject to regulation under the CAA, that Congress did not intend to forbid EPA from regulating air pollutants associated with climate change under the CAA, and that the Agency's interpretation did not deserve deference under the standard in *Chevron v. Natural Resources Defense Council* because the text was unambiguous, or alternatively because the Agency's interpretation was arbitrary and capricious.[14]

Petitioners further argued that the Administrator's decision should be based only on whether air pollutants emitted from motor vehicles "may reasonably be anticipated to endanger public health or welfare," as provided under Section 202(a)(1) of the

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CAA, or in the alternative, that the CAA makes clear that three of the factors relied on by the Administrator in making his decision were irrelevant. In short, the Agency appropriately considered scientific uncertainty, but it failed to relate such uncertainty to the statutory endangerment requirement.[15] Petitioners also argued that although Section 202(a)(1) refers to the Administrator's "judgment" in regulating air pollution, such "judgment" does not imply "unfettered discretion."[16]

The EPA first responded by arguing that petitioners lacked Article III standing to bring the suit.[17] The Agency claimed that petitioners failed to demonstrate that regulating the pollutants under the CAA would affect climatic conditions in Massachusetts, that the effects of the requested regulation were too speculative to satisfy causation and redressability requirements, and that petitioners' references to other regulatory actions do not establish standing.[18] Furthermore, EPA argued that its conclusion that the CAA does not authorize it to regulate GHGs associated with climate change was reasonable because the main CAA provisions do not appear to apply to GHGs. Further, the EPA argued that Congress intended the Agency to collect additional information before regulating GHGs, made evident through several federal statutes, and that regulation of GHGs could have potentially detrimental economic and political consequences.[19]

Finally, EPA argued that even if the CAA authorized the Agency to regulate GHG emissions, its decision to decline exercising such authority was reasonable. First, it claimed that the principles of administrative law afford federal agencies broad discretion in choosing whether or not to initiate rulemakings.[20] Second, the EPA noted that Section 202(a)(1) does not require the Agency to make a determination regarding GHGs and the endangerment standard within a particular time frame, evidencing Congress' intent that such a determination is discretionary.[21] Finally, the Agency argued that its denial of petitioners' requested regulation was "a reasonable exercise of agency discretion" based on the numerous factors it considered.[22]

The Hearing

During petitioners' oral argument, the Justices focused primarily on questions of standing and interpretation of the CAA's statutory authority.[23] With respect to standing, Justice Scalia questioned whether the harm alleged by petitioners was in fact "imminent," asking "when is the predicted cataclysm?"[24] The Justices were also concerned with the relationship between the potential harm and regulating GHGs. Justice Alito inquired whether such potential harm could even be traceable to the emissions petitioners sought to reduce.[25] Chief Justice Roberts noted that even if EPA regulated GHG emissions, the potential harm may not be reduced; it "depends upon what happens across the globe."[26]

With respect to the statutory authority issue, Justice Scalia focused on the Act's endangerment requirement and where the effects of global warming occurred. He posited, "is it an air pollutant that endangers health? I think it has to endanger health by reason of polluting the air, and this does not endanger health by reason of polluting the air at all."[27] He went on to note that the CAA is about "air pollution. It's not about global warming and it's not about the troposphere."[28]

The Justices also focused on the issue of standing during the government's oral argument. In particular, the Justices seemed to suggest that EPA was requiring too strict a correlation between the potential harm of GHGs and their effect on climate change relating to petitioners. For example, Justice Souter asked, "But why do [petitioners] have to show a precise correlation as opposed simply to establishing what I think is not really contested, that there is a correlation between GHGs and the kind of loss that they're talking about; and it is reasonable to suppose that some reduction in the gases will result in some reduction in future loss."[29] Justice Souter went on to remark, "They don't have to show that it will stop global warming. [Petitioners'] point is that [regulation of GHGs] will reduce the degree of global warming and likely reduce the degree of loss."[30]

With respect to the statutory authority argument, the Justices inquired as to whether air pollution encompassed global warming, and if not, how to reconcile that with the fact that acid rain, while being an effect and not a pollutant, was regulated under the CAA.[31]

Conclusion

Massachusetts v. EPA is certain to become a landmark case in environmental and administrative law. Although public awareness and concern over climate change has existed for many years, this is the first time that the Supreme Court has entered the climate change debate. Its decision, expected by June,[32] could set important precedent regarding standing requirements, federal discretion in regulating environmental harms, and establishing causation.

Endnotes: Litigation Update

[1] Massachusetts v. EPA, 415 F.3d 50 (D.C. Cir. 2005), *cert. granted* 126 S. Ct. 2960 (2006).

[2] Massachusetts v. EPA, *id.* at 53.

[3] 42 U.S.C. § 7521(a)(1) (2000).

[4] Massachusetts v. EPA, 415 F.3d at 56.

[5] Massachusetts v. EPA, *id.*

[6] Massachusetts v. EPA, *id.* at 57.

[7] Massachusetts v. EPA, *id.*

[8] Under Section 307(b)(1) of the Clean Air Act, the Court of Appeals for the District of Columbia has exclusive jurisdiction over "nationally applicable regulations promulgated, or final action taken, by the Administrator." 42 U.S.C. Section 7607(b)(1).

[9] Massachusetts v. EPA, 415 F.3d at 58.

[10] Massachusetts v. EPA, *id.*

[11] Massachusetts v. EPA, *id.* at 57-58.

[12] Br. for the Pet'r, Massachusetts v. EPA, No. 05-1120 (S. Ct. Aug. 31, 2006) at I, 2006 WL 2563378.

[13] Br. for the Pet'r, *id.* at 11, 35.

[14] Br. for the Pet'r, *id.* at 12, 20, 32.

[15] Br. for the Pet'r, *id.* at 35, 39.

[16] Br. for the Pet'r, *supra* note 12, at 44.

[17] Br. for the Resp't, Massachusetts v. EPA, No. 05-1120 (S. Ct. Oct. 24, 2006) at 10, 2006 WL 3043970.

Endnotes: Litigation Update *continued on page 85*

Book Review

The Upside of Down:

Catastrophe, Creativity, and the Renewal of Civilization

by Thomas F. Homer-Dixon, Island Press

*Reviewed by Jennifer M. Rohleder**

The world is facing a convergence of numerous social, economic, and environmental problems, and many say that it is the first time in human history that this has happened on such a scale. Yet history, particularly the rise and fall of previous civilizations, may help us understand what is coming, and how to handle it so that we do not risk the fall of the human civilization. In *The Upside of Down: Catastrophe, Creativity, and the Renewal of Civilization*, author Thomas F. Homer-Dixon looks to the Roman Empire to examine what will likely happen when society breaks down under the weight of the problems we face, and to learn how to prevent the collapse of our civilization. The pervasive issue of climate change is the key example used throughout the book.

The author compares the buildup of societal stresses to the tectonic stresses in the Earth's crust. "Breakdown is often like an earthquake: it's caused by the slow accumulation of deep and largely unseen pressures beneath the surface of our day-to-day affairs. At some point these pressures release their accumulated energy with catastrophic effect, creating shock waves that pulverize our habitual and often rigid ways of doing things." The author identifies five tectonic stresses that he believes are accumulating beneath the surface of our societies: population stress, energy stress, environmental stress, climate stress, and economic stress. The author presents an in-depth survey of each of the stresses he identified that can cause civilization change, and documents how each of the stresses interact and combine to produce far wider effects than any one stress could cause individually.

- *Population Stress.* Currently, humankind is in the process of transitioning from a system of high birthrates and death rates to low birthrates and death rates, as seen in most modern industrial societies. Although birthrates have declined sharply in many rich and even some poorer countries, the steady population growth in most poor countries will more than compensate for it. The author warns that the key issue is that by the year 2050, while the population of rich countries will be almost the same as it is today (around 1.2 billion), the population of poor countries will have surged from about 5.3 billion to 7.8 billion, further straining already inadequate resources.
- *Energy Stress.* The author considers energy as society's critical resource as it has enabled human societies to sustain complex social order and maintain steady improvements to our quality of life. Homer-Dixon explains facing declining energy returns on investment ("EROI"), since new deposits of our critical fossil fuels are more difficult to find, and are located in areas more difficult to reach and costly to extract. Declining EROI means higher prices, and as price surges continue to recur, tensions will escalate over access to critical oil supplies.
- *Environmental Stress.* The author presents the view that environmental crisis is engulfing the entire planet despite statistics showing that people's lives are generally improving, with longer average life expectancy, more food availability, and lower infant mortality. The author contends that these statistics provide false comfort. Although in the short-term humans can continue to generate wealth by using nature's capital, eventually, when nature's capital nears exhaustion, overstressed ecosystems will lose their resilience and suddenly collapse.
- *Climate Stress.* Homer-Dixon feels that abrupt warming is likely because the Earth's climate is an extremely complex

The author presents the view that an environmental crisis is engulfing the entire planet.

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system with the potential of containing a number of stable states. Although it can be difficult to shift such a complex system from one equilibrium state to another, when the shift does occur, it can happen abruptly and unexpectedly. The author acknowledges that warming could produce benefits, however the author contends that harmful outcomes will be far more common and serious, particularly for poor countries that cannot easily adapt to changing environmental patterns.

- *Economic Stress*. Economic instability can generate frustration, resentment, and anger that can, under the right conditions, tear countries apart. The author addresses the income gap between rich and poor countries as creating an inequality of opportunity, which in turn produces discontent and social instability.

Although each of these stresses individually can raise the risk of social breakdown, Homer-Dixon warns that it is the convergence of these stresses that pose the greatest threat by making breakdown both more likely and rapid. The upside of all of these dire predictions is that the author believes that breakdown is not necessarily a bad thing. With breakdown comes the opportunity for the creative renewal of technologies, institutions, and societies in the absence of a rigid bureaucracy. The author terms this type of breakdown "catagenesis," and emphasizes that this is the type of breakdown management for which we should strive when the inevitable social earthquakes occur.

To achieve catagenesis rather than catastrophe, Homer-Dixon counsels that we must as a society become comfortable with change so that we can use imagination in adapting to new circumstances, rather than blindly trying to maintain the status quo. We must develop integrated, rather than compartmentalized, solutions by bringing together experts of many different fields to develop proactive policies. Finally, we must value resilience over efficiency with regards to our vital goods supply, like energy and food. A distributed supply of our critical infrastructure needs will provide society with a margin for error that can handle supply disruptions.

Resilience and flexibility are the key characteristics for ensuring that a society can adapt to change.

According to the author, resilience and flexibility are the key characteristics for ensuring that a society can adapt to change and bounce back from breakdown. Despite the author's prolific examples of doomsday scenarios that arise from the accumulation of the various stressors, the author is optimistic that we, as a society, can choose among the plausible futures that are shaping in front of us. The challenge will be overcoming the tendency to try and preserve the status quo, and instead adapt to and thrive in a world of constant change.

World News

*by Scott Johnson**

Europe

European Commission Proposes a New Energy Plan Less Than One Month Before Release of Landmark IPCC Report on Climate Change

On January 10, 2007, as various meteorological organizations suggested a high probability that 2007 will be the world's warmest year ever,[1] the European Commission ("EC") announced a new plan to intensify its campaign to limit greenhouse gas emissions and bolster energy security with a new energy policy for Europe.[2] The policy, grounded in goals of: (1) an internal European energy market; (2) use of low-carbon energy; and (3) increased energy efficiency, proposes that, under a future "global agreement," developed nations should reduce greenhouse gas emissions to an average of 30 percent below 1990 levels by 2020, and by 50 percent of 1990 levels by 2050.[3] In the interim, the EC noted that the EU should lead the way by reducing its emissions by twenty percent by 2020.[4] The EC will seek endorsement of its proposals during the Spring European Council scheduled for March 2007, and will propose legislation following discussions there.[5] The United Nations reacted positively to the proposal, and Yvo de Boer, head of the UN Climate Secretariat in Bonn, "urged EU governments to adopt the goals quickly."[6] Other groups, including Greenpeace, criticized the proposal as a "political and scientific blunder" more the result of "political bargaining . . . than climate change science."[7]

On February 2, 2007, the Intergovernmental Panel on Climate Change ("IPCC") issued a report entitled *Climate Change 2007: The Physical Science Basis* ("IPCC Report"), which concluded, with 90 percent certainty, that human activity is responsible for marked increases in atmospheric carbon dioxide, methane, and nitrous oxide concentrations since 1750.[8] The IPCC Report attributed the carbon dioxide increase primarily to fossil fuel use and land-use change, and the methane and nitrous oxide increases primarily to agriculture.[9]

Organizations across the globe reacted differently when the IPCC report was released in Paris. For example, Exxon Mobil Corporation, a former supporter of groups that question climate change science, appears to have changed its position, stating that the debate is no longer about whether human-induced climate change is happening, but what should be done to remedy it.[10] Exxon officials assert the company has stopped funding skeptics of climate change science.[11]

Africa

Research Suggests Profound Impact of Global Warming on African Continent

Global warming is likely to affect Africa profoundly, as long-term droughts intensify and uncertainty regarding the effect of climate change persists,[12] and recent studies suggest that continued warming in Africa poses serious risks to food security and peace.[13] While climates across Africa always have been variable, recent research suggests that "new and dangerous extremes" are evident, as historically dry areas become drier, and wet areas wetter, threatening escalating drought in places already desperate for water, and flooding where too much rain already falls.[14] Prior to his departure from the UN in December 2006, former UN Secretary General Kofi Annan highlighted the problem at a UN climate summit in Nairobi,[15] equating the danger of climate change in Africa to "conflict, poverty, and the spread of weapons."[16] At that summit, Mr. Annan announced a UN plan to advance clean development in Africa, including renewable energy projects and forestry programs designed to minimize greenhouse gas emissions.[17] Such efforts, however, could be futile, considering that some commentators maintain that Africa itself has played "virtually no role" in climate change.[18] The UN also recently highlighted the lack of means in Africa to detect and adapt to changing patterns of drought, flooding, and disease, and announced a new initiative, "ClimDev Africa," to intensify climate observation and risk management in eight African countries, later to expand to half of the continent.[19]

Asia

China's First National Climate Change Assessment Warns of Continued Warming

China, which is among the most significant global greenhouse gas emitters, recently released its first national assessment of global climate change.[20] The assessment, as reported by Chinese state media, suggested that temperatures in China might increase significantly in coming decades.[21] The Chinese government, in contrast to the position often taken by the United States prior to the IPCC Report, is not shy with respect to recognition of the effect of human activity on climate change and the potential impact that such change could have on the China's ability to

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develop.[22] Among the potential effects of warming in China are worsening drought, extreme weather, glacial and river decline, and permafrost loss.[23] In addition, as recently reported by the Chinese State Forestry Administration, the risk of forest fires, wood-destroying pests, and tree disease also are expected to increase, as 2007 is expected to be the warmest year ever in parts of China.[24]

On February 6, 2007, China inaugurated a three-year, $1.7 million domestic carbon dioxide credit exchange program, assisted by the UN and prominent steel producer Arcelor Mittal, which, if successful, could be the first such program established in a developing nation.[25] Centers in twelve western Chinese provinces will assist investors in locating local industries in which to fund clean development projects.[26] Emphasizing the importance of clean development in China, UN China coordinator Khalid Malik noted that many "market-based instruments [have] emerged to support this effort, with carbon trading emerging as a major opportunity."[27]

Australia/ New Zealand

Australian Prime Minister Changes Position on Climate Change

On January 25, 2007, Australian Prime Minister John Howard, a self-described "climate change skeptic," indicated a shift in his position, claiming himself a "climate-change realist," and saying, while delivering a national plan for Australian water security, that "he now accepts [that] global warming has contributed to Australia's long-running drought."[28] Howard noted that Australia's "current trajectory of water use and management was not sustainable," and that while Australian "rainfall has always been highly variable . . . [t]he deviation around average rainfall is enormous . . . [and] seems to be getting bigger."[29] Following this change of position, Australia's developing carbon trading may receive increased support. On February 7, 2007, New Zealand's Climate Change Minister, David Parker, said New Zealand would study the carbon trading system Australia is designing "to see if it is possible to set up a transtasman market."[30]

North America

NOAA Also Recognizes Anthropogenic Influence on Climate

On January 9, 2007, reported as the first time under the Bush administration, the National Oceanic and Atmospheric Administration ("NOAA") stated, in a press release, that anthropogenic greenhouse gas emissions contribute to climate change.[31] NOAA's statement, which indicated that 2006 was the warmest year on record for the contiguous United States since recordkeeping began in 1895,[32] surprised some critics, who had complained in the past that the administration and NOAA had not been "open" with such information.[33] Despite such recognition, however, even with the recent shift in control of the U.S. Congress, certain political commentators do not expect that the United States' position on the Kyoto Protocol will change, particularly without concurrent change in China's position.[34] Another new potential factor in the United States climate debate is recent research from the University of California at Davis, which, contrary to the view that climate change impacts are likely to be gradual and easily anticipated, provides support for concerns that climate shifts could be unexpectedly severe and erratic as atmospheric greenhouse gas concentrations continue to increase.[35]

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[16] *UN*, *id.*

Endnotes: World Vews *continued on page 85*

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Endnotes: Strengthening the Montreal Protocol

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[6] Velders, *supra* note 5 (describing an accelerating series of measures to strengthen the protection of the ozone layer, including the phase-out of HCFCs, promoting the transition to low GWP substitutes and more energy efficient equipment, and increasing the recovery and destruction of ODS banks that will further reduce GHG emissions by approximately 1.2 $GtCO_2$-eq. yr. and delay the onset of climate change, and stating that the climate benefits of an accelerated phase-out depend on the use of low GWP substitutes and more energy efficient equipment).

[7] Science Assessment of Ozone Depletion: 2006, *supra* note 2, at 21.

[8] Science Assessment of Ozone Depletion: 2006, *supra* note 2, at 21.

[9] Science Assessment of Ozone Depletion: 2006, *supra* note 2, at 21.

[10] *See* Envt'l Investigation Agency, *An Unwelcome Encore: The Illegal Trade in HCFCs* (Oct. 2006) at 6 (noting that illegal trade in ODS began to grow after the 1999 freeze date for CFCs in developing countries) [hereinafter EIA Illegal Trade in HCFCs].

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[12] *See* Intergovernmental Panel on Climate Change, Climate Change 2007: The Physical Science Basis Summary For Policy Makers 10 (2007).

[13] Steve Connor, *If We Fail to Act*, *We Will End Up With a Different Planet*, The Independent, Jan. 1, 2007; *see also* James Hansen, *A Slippery Slope: How Much Global Warming Constitutes 'Dangerous Anthropogenic Interference'?* 68 Climate Change 269 (2005).

[14] *See supra* note 12.

[15] James G. Titus & Charlie Richman, *Maps of Lands Vulnerable to Sea Level Rise: Modeled Elevations along the U.S. Atlantic and Gulf Coasts*, 18 Climate Research 205 (2001). Even after passing a critical threshold, melting of the Greenland Ice Sheet could take hundreds or even thousands of years. *See* Hansen, *supra* note 13.

[16] Peter Schwartz & Doug Randall, *An Abrupt Climate Change Scenario and Its Implications for United States National Security* (2003). *See also*, Durwood Zaelke, Oran Young, & Scott Stone, *After 'The Day After Tomorrow': What Will Society Learn from the Inevitability of Rapid Climate Change Events*, National Strategy Forum Review, Fall 2006.

[17] Allowing the use of HFCs and HCFCs as one of the ODS substitutes was instrumental in the successful phase out of CFCs. U.N. Env't Programme, HFC and PFC Task Force of the Technology and Economic Assessment Panel, *The Implications to the Montreal Protocol of the Inclusion of HFCs and PFCs in the*

Kyoto Protocol, at 36-38 (Oct. 1999) [hereinafter TEAP Oct. 1999]. HFCs do not deplete the ozone layer but they are potent GHGs regulated under the Kyoto Protocol for their contributions to climate change. The failure of the Montreal Protocol to account for the climate impacts of HFCs creates a regulatory environment where the best chemicals to protect the atmospheric environment — considering both ozone and climate — are not favored. *See* IPCC/TEAP Special Report, *supra* note 4. This raises the question of how Parties to the Montreal Protocol could expand jurisdiction to regulate all ODS substitutes to minimize their overall environmental impacts and create a regulatory environment that favors the chemicals and other alternatives that are least harmful to both the ozone layer and the climate. It also raises broader governance issues presented by the Montreal Protocol's focused approach to regulation compared to the Kyoto Protocol's over-arching approach, and specifically whether there are other climate sources and sinks that would be better regulated under more focused regimes like the Montreal Protocol, although still coordinated with the overarching approach.

[18] Science Assessment of Ozone Depletion: 2006, *supra* note 2. In addition, the short-term ODP of some HCFCs rivals that of CFCs, meaning that they will cause near-term damage to the ozone layer at a time when it is expected to recover. *See* Susan Solomon & Dan Albritton, *Time-Dependent Ozone Depletion Potentials for Short- and Long-Term Forecasts*, 357 NATURE 33 (2007).

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[20] Another result of HCFC-22 production is the production of carbon tetrachloride ("CTC"). CTC has an ODP of 1.1 and a GWP of 1,400. It is produced as a by-product of chloromethane, which generates four by-products: methyl chloride, methylene chloride (or dichloromethane), chloroform (or trichloromethane) and CTC. HCFC-22 production requires chloroform, but results in unwanted CTC. As production of HCFC-22 increases, so will unwanted CTC, only a portion of which will be consumed as feedstock. *See* UN Env't Programme, *Report on the Intermediate Evaluation of CFC Production Sector Phase-Out Agreements*, United Nations Env't Programme, UNEP/OzL.Pro/ExCom/ 42/12 (March 3, 2004), *available at* http://www.multilateralfund.org/files/evaluation/4212.pdf (last visited Feb. 14, 2007).

[21] Environmental Investigation Agency, *Turning Up the Heat: Linkages Between Ozone Layer Depletion and Climate Change: The Urgent Case of HCFCs and HFCs*, at 7 (August 2006), *available at* http://www.eia-international.org/files/news324-1.pdf (last visited Feb. 14, 2007) [hereinafter "EIA Report"]. HFC-23 are projected to increase from 0.195 $GtCO_2$-eq $yr.^{-1}$ in 2002 to 0.330 $GtCO_2$-eq $yr.^{-1}$ in 2015. IPCC/TEAP Special Report, *supra* note 4 at 11. In addition, HCFC emissions by 2015 under a business-as-usual trajectory are projected to be 0.828 $GtCO_2$-eq. $yr.^{-1}$ UN Env't Program, *Supplement to the IPCC/TEAP Report*, at Annex (Nov. 2005), *available at* http://unep.ch/ozone/teap/REPORTS/TEAP_REPORTS/teap-supplement-ippc-teap-report-nov 2005.pdf (last visited Feb. 3, 2007) [hereinafter IPCC/TEAP 2005 Supplement]. *See also* Velders, *supra* note 5. The emissions reductions in CO_2-eq. achieved by an accelerated phase-out would depend upon the technology innovations driven by an accelerated schedule, including improvements in energy efficiency, charge size, leakage containment, end-of-life recovery, destruction, etc., as well as the relative GWP of any substitutes selected, although not-in-kind alternatives with low ozone and climate impacts would be expected for much of the transition as was the case for most of the previous ODS phase-outs where eighty percent of the ODS were replaced by the non-fluorocarbon alternatives, including not-in-kind alternatives, alternative products, changes in manufacturing processes, and conservation. Velders, *supra* note 5. Criteria, guidelines, and funding practice of the Multilateral Fund also could strongly influence the size of the ultimate climate benefits. *See* UN Env't Programe, Multilateral Fund for the Implementation of the Montreal Protocol, *Policies*, *Procedures*, *Guidelines and Criteria*, at 582 (as of July 2006), *available at* http://www.multilateralfund.org/ files/Policy49.pdf (last visited Feb. 14, 2007) (requesting project reviews to consider ODP and GWP impacts) [hereinafter Policies Report].

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[43] *See* IPCC/TEAP Special Report, *supra* note 4, at 77-82.

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[51] Montreal Protocol, Preamble, *available at* http://www.unep.org.OZONE/pdfs/Montreal-Protocol2000.pdf (last visited Feb. 3, 2007).

[52] TEAP Oct. 1999, *supra* note 17, at 13.

[53] IPCC/TEAP Special Report, *supra* note 4, at 3-4. *See also* Velders, *supra* note 5.

[54] IPCC/TEAP Special Report, *supra* note 4, at 3-4.

[55] Science Assessment of Ozone Depletion: 2006, *supra* note 2, at ch. 5. Destruction of the ozone layer also results in some cooling that offsets the contribution of ODSs to global warming. Velders, *et. al.* calculate that the cooling offset is approximately twenty percent of direct positive radiative forcing. Velders *supra* note 5.

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[61] Regulation (EC) No 1907/2006 of the European Parliament and of the Council, Dec. 18 2006, *at* http://eur-lex.europa.eu/LexUriServ/site/en/oj/2006/l_396/l_39620061230en00010849.pdf (last visited Feb. 3, 2006).

[62] *Responsible Use Principles for HFCs*, at http://www.arap.org/textonly/responsible.html (last visited Feb. 3, 2007).

[63] TEAP Oct. 1999, *supra* note 17, at 82.

[64] Andersen & Zaelke, *supra* note 28, at 168.

[65] *See* Velders, *supra* note 5.

[66] Accelerated phase out of HCFC-22 provides additional collateral benefits by reducing the unnecessary production of cholromethanes (four chlorinated products manufactured in one process: Methyl Chloride, Methylene Chloride, Chloroform, and Carbon Tetra Chloride-CTC).

[67] *See* IPCC/TEAP Special Report, *supra* note 4.

[68] The next replenishment for the Multilateral Fund for the period 2009-2011 will be decided by the Parties in 2008; adjustments at the September 2007 MoP on additional control measures can be conditioned on the availability of funding in the future. *See e.g.* UN Env't Programme, *Report of the Tenth Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer*, UNEP/OzL.Pro.9/12, at Page 25 (Sept. 25, 1997), *available at* http://ozone.unep.org/Meeting_Documents/mop/09mop/9mop-12.e.pdf (last visited Feb. 14, 2007) (regarding Decision IX/5: Conditions for control measures on Annex E substance in Article 5 Parties).

[69] *See* Revision to the approved baseline and monitoring methodology AM0001 "Incineration of HFC-23 waste streams," Clean Development Mechanism — Executive Board, at http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_GJ7T352O90TABWUMR95QDQXMJWC6EM (last visited Mar. 4, 2007).

[70] UN Env't Programme, *Report of the Sixteenth Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer*, UNEP/ OzL.Pro.16/17 (Nov. 22–26, 2004).

[71] RTOC Report, *supra* note 30.

[72] *See* Andersen & Zaelke, *supra* note 28, at 70-83 (discussing Energy Star Program).

[73] *See* Velders, *supra* note 5 (noting that greater incentives for the recovery and destruction of ODS banks would remove a significant threat to both the ozone layer and the climate).

[74] Even more cost effective destruction could be possible by initiating the consideration of the common "packaged" incinerator that destroys not only CFCs and HFCs, but also other hazardous chemicals like persistent organic pollutants.

[75] Chatham House & Env't Investigation Agency, *ODS Tracking: Feasibility Study on Developing a System for Monitoring the Transboundary Movement of Controlled Ozone-Depleting Substances Between the Parties* (Sept. 2006).

[76] Chatham House & Env't Investigation Agency, *id.* at 6.

[77] A discussion of these and other issues is under way. At the 18th Meeting of the Parties to the Montreal Protocol, held in New Delhi, India, in October–November 2006, the Parties agreed to convene a two-day "dialogue" in mid-2007 on future challenges facing the Montreal Protocol. *See* U.N. Env't Programme, "In the decision on dialogue on key future challenges to be faced by the Montreal Protocol," UNEP/OzL.Pro/L.2/Rev.1, Decision XVIII/34 (2006). In addition, the Stockholm Group is discussing key challenges facing the Montreal Protocol.

Endnotes: An Overview of the International Regime *continued from page 15*

[1] Because of their multi-faceted character, the various international laws and institutions addressing climate change aptly fit the definition of what international relations scholars refer to as a "regime," *i.e.*, a "persistent and connected set[s] of rules (formal and informal) that prescribe[s] behavioural roles, constrain activity, and shape expectations" in a particular issue area. *See* Robert O. Keohane, International Institutions and State Power 3 (Boulder: Westview Press, 1989). For an extensive and detailed analysis of the international climate change regime, *see* Farhana Yamin and Joanna Depledge, The International Climate Change Regime: A Guide to Rules, Institutions, and Procedures (Cambridge University Press, 2004).

[2] Kyoto Protocol to the United Nations Framework Convention on Climate Change, Feb. 16, 2005, 37 I.L.M. 32, *available at* http://unfccc.int/resource/docs/convkp/kpeng.pdf (last visited Feb. 11, 2007) [hereinafter Kyoto Protocol].

[3] UNFCCC, Status of Ratification, http://unfccc.int/essential_background/convention/status_of_ratification/items/2631.php (last visited Feb. 11, 2007).

[4] United Nations Framework Convention on Climate Change, art. 3, May 9, 1992 31 I.L.M. 849, *available at* http://unfccc.int (last visited Feb. 11, 2007) [hereinafter UNFCCC].

[5] UNFCCC, *id.*

[6] UNFCCC, *id.* at art. 3.4.

[7] UNFCCC, *id.* at art. 3.1.

[8] UNFCCC, *supra* note 4, at art. 4.1(a).

[9] UNFCCC, *supra* note 4, at art. 4.1(b).

[10] UNFCCC, *supra* note 4, at art. 4.1(c).

[11] UNFCCC, *supra* note 4, at art. 4.1(g).

[12] UNFCCC, *supra* note 4, at art. 12.

[13] UNFCCC, *supra* note 4, at art. 4.7.

[14] UNFCCC, *supra* note 4, at arts. 4.2(a) and (b).

[15] The Berlin meeting coincided with the publication of the Intergovernmental Panel on Climate Change's "Second Assessment Report," which outlined a stronger basis for concern about the risks of human-induced climate change.

See generally, CLIMATE CHANGE 1995: THE SCIENCE OF CLIMATE CHANGE: CONTRIBUTION OF WORKING GROUP I TO THE SECOND ASSESSMENT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (J.T. Houghton, *et al.,* eds., Cambridge University Press 1995).

16 *See* UNFCCC, *Report of the Conference of the Parties on its First Session*, FCCC/CP/1995/7/Add.1 (June 6, 1995), *available at* http://unfccc.int/resource/docs/cop1/07a01.pdf (last visited Feb. 11, 2007).

17 143 Cong. Rec. S8138-39 (daily ed. July 25, 1997).

18 ANALYSIS OF THE KYOTO PROTOCOL, U.S. GLOBAL CLIMATE CHANGE POLICY BOOK (2002), *available at* http://www.whitehouse.gov/news/releases/2002/02/climatechange.html (last visited Feb. 10, 2007).

19 *See* Kyoto Protocol, *supra* note 2, at Annex A.

20 *See* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2001: THE SCIENTIFIC BASIS 6.1.2 (2001).

21 Kyoto Protocol, *supra* note 2, at art. 3.8.

22 Kyoto Protocol, *supra* note 2, at art. 3.5.

23 S*ee e.g.*, David M. Driesen, *Free Lunch or Cheap Fix?: The Emissions Trading Idea and the Climate Change Convention*, 26 B.C. ENVTL. AFF. L. REV. 1, 60-61 (1998).

24 Council Decision 2002/358/EC of 25 April 2002 concerning the approval, on behalf of the European Community, of the Kyoto Protocol to the United Nations Framework Convention on Climate Change and the joint fulfilment of commitments thereunder *OJ L 130, 15.5.2002 P. 0001-0003*.

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27 Philippe Ambrosi & Karen Capoor, *State and Trends of the Carbon Market 2006* 1, Oct. 2006, *available at* http://www.ieta.org/ieta/www/pages/getfile.php?docID=1667 (last visited Feb. 15, 2007) .

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31 *See generally* Decision 25/CMP.1, FCCC/KP/CMP/2005/8/Add.3.

32 *Summary of the Eleventh Conference of the Parties to the United Nations Framework Convention on Climate Change the First Conference of the Parties Serving as the Meeting of Parties to the Kyoto Protocol*, Nov. 28–Dec. 10 2005," EARTH NEGOTIATIONS BULL., Dec. 12, 2005, at 14.

33 *See, e.g.*, Robert Stavins, *Can an Effective Global Climate Treaty be Based on Sound Science, Rational Economics, and Pragmatic Politics?* (Resources for the Future, Discussion Paper 04-28, May 2004), *available at* www.rff.org/Documents/RFF-DP-04-28.pdf (last visited Feb. 11, 2007).

34 *See* Daniel Bodansky, *International Climate Efforts Beyond 2012: A Survey of Approaches* (Pew Center on Global Climate Change, Dec. 2004) *available at* http://www.pewclimate.org/docUploads/2012%20new%2Epdf (last visited Feb. 15, 2007).

35 Ambrosi & Capoor, *supra* note 27, at 1.

ENDNOTES: NEPA AND CLIMATE CHANGE

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7 *See Friends of the Earth*, 2005 WL 2035596, at *1.

8 *See Friends of the Earth*, 2005 WL 2035596, at *3 (finding that plaintiffs presented evidence that OPIC and Ex-Im are directly or indirectly responsible for approximately 1,911 million tons of carbon dioxide and methane emissions annually, which accounts for almost eight percent of the world's emissions).

9 Pl.'s Mot. for Summ. J., *Friends of the Earth v. Mosbacher*, 2005 WL 3971170 (N.D. Cal. filed Dec. 23, 2005).

10 Exec. Order No. 12,114 (Jan. 4, 1979).

11 Congress established the Council on Environmental Quality through NEPA § 202. The CEQ has the power to issue regulations implementing NEPA, and court give deference to CEQ's interpretation of the statute. *See* Edward A. Boling, *Back to the Future with the National Environmental Policy Act: History, Purposes and Current Direction of NEPA*, SL063 ALI-ABA 217, 223 (Feb. 8–10, 2006).

12 Memorandum to the Heads of Agencies on the Application of NEPA to Proposed Federal Actions in the U.S. with Transboundary Effects (July 1, 1997).

13 More specifically, major federal actions include those that: (1) significantly affect the environment of the global commons outside the jurisdiction of any nation; (2) significantly affect the environment of a foreign nation not participating with the United States or otherwise involved in the action; (3) provide a foreign nation with a product, emission, or effluent prohibited or strictly regulated by federal law in the United States because its toxic effects create a serious public health risk; and (4) significantly affect natural or ecological resources of global importance designated for protection by the President or Secretary.

14 Memorandum for Heads of Agencies with International Activities: Implementation of Executive Order 12,114 (Mar. 21, 1979).

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7 Proceedings, *id.*

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9 KILIAN REICHE ET AL., ENERGY MINING BOARD SECTOR BOARD, PROMOTING ELECTRIFICATION: REGULATORY PRINCIPLES AND A MODEL LAW (July 2006), *available at* http://siteresources.worldbank.org/INTENERGY/Resources/EnergyPaper18.pdf (last visited Feb. 9, 2006).

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11 Douglas Barnes, *Meeting the Challenge of Rural Electrification in Developing Nations: The Experience of Successful Programs*, the World Bank Group (Apr. 2005), *available at* http://wbln0018.worldbank.org/esmap/site.nsf/pages/7-26-05_KES (last visited Feb. 11, 2007).

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[30] The United Nations Convention on the Law of the Sea, pmbl. art 192, Dec. 10, 1982, 1833 U.N.T.S. 397 ("Recognizing the desirability of establishing . . . a legal order for the seas and oceans which will facilitate . . . the conservation of their living resources, and the study, protection and preservation of the marine environment") [hereinafter UNCLOS].

[31] UNCLOS, *id.* at art. 193.

[32] UNCLOS, *id.* at art. 194(5).

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ENDNOTES: METHANE EMISSIONS FROM WASTE MANAGEMENT *continued from page 29*

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[6] ANTHROPOGENIC EMISSIONS, *supra* note 2, at 1-3 (Table 1-2).

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ENDNOTES: THE EVOLVING SCOPE OF SIGNIFICANT EFFECTS ON THE ENVIRONMENT *continued from page 33*

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[7] *See* Mayo, No. 06-2031; FOE, 2005 WL 2035596; and BPPWG, 260 F. Supp. 2d 997.

[8] *See* 42 U.S.C. 4321, et al.

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[10] *See* 42 U.S.C. 4321, et al.

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[12] *See* Robertson v. Methow Valley Citizens Council, 490 U.S. 332 (1989).

[13] 42 U.S.C. 4332(2)(C); 40 C.F.R. 1500.1(a) (stating "Section 102(2) contains "action-forcing" provisions to make sure that federal agencies act according to the letter and spirit of the Act).

[14] 42 U.S.C. 4332(2)(C); 40 C.F.R. §§1501.3-1501.4, 1508.4.

[15] 42 U.S.C. 4332(2)(C); 40 C.F.R. §§1501.3-1501.4, 1508.4.

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[19] 40 C.F.R. §§1501.4(e), 1508.13.

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[40] Mid State Coalition for Progress v. Surface Transportation Board, 345 F.3d 520 (8th Cir. 2003).

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[81] *See* Trinity Consultants, *Air Quality Permitting for a New Coal-Fired Power Plant: a Timeline*, *at* http://trinityconsultants.com/downloads/tp_coal_fired.pdf (last visited Feb. 5, 2007).

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[13] The choice of whether to use ODP/$ and LCCP/$ or $/ODP and $/LCCP as units on the axes is arbitrary. The substantive application of the methodology being proposed here is not affected, so long as consistency is maintained in describing the projects. Of course, the tradeoff line could have curvature, but that is a second-order consideration that will not be discussed here.

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