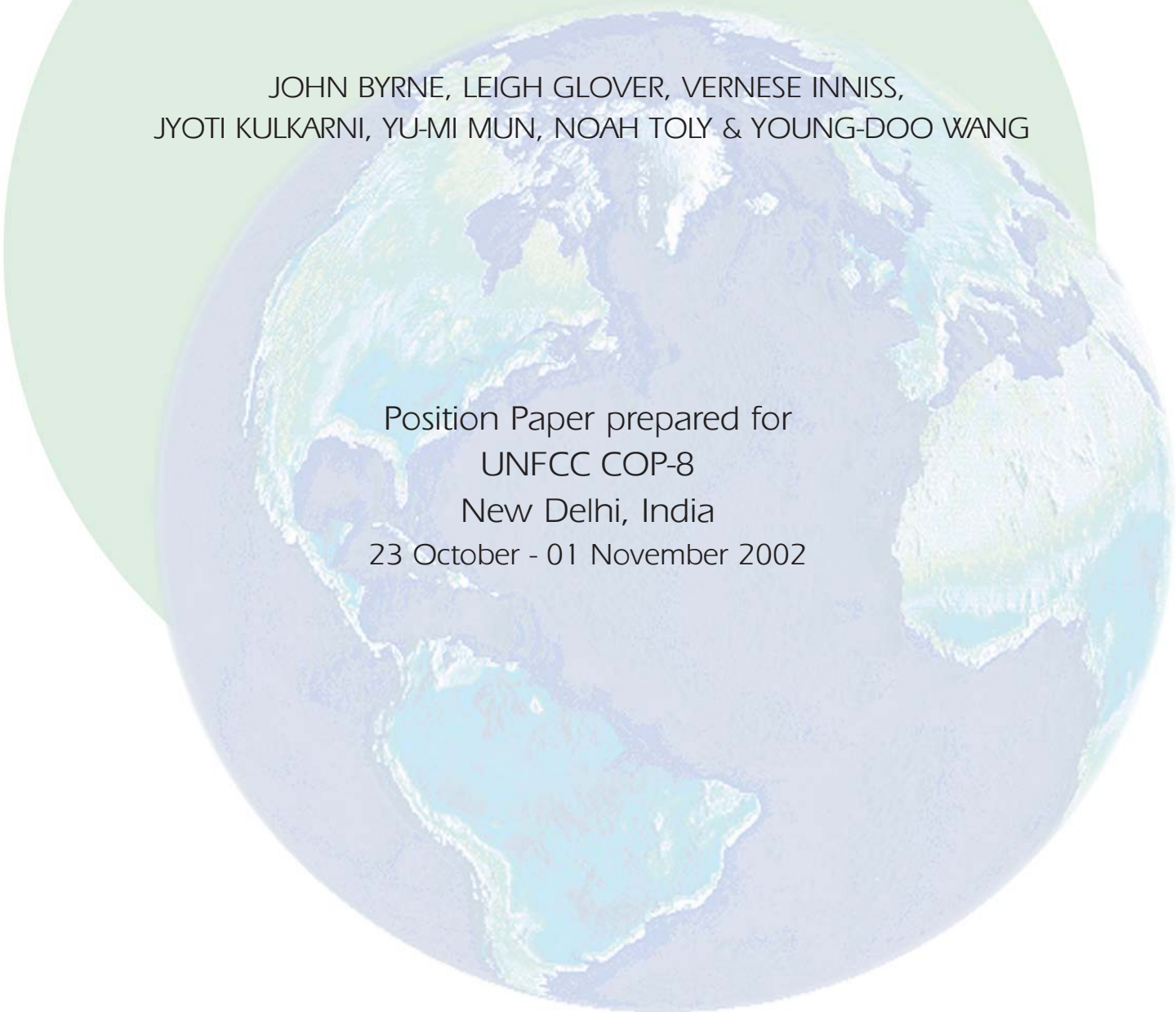
GREENHOUSE JUSTICE

MOVING BEYOND KYOTO

JOHN BYRNE, LEIGH GLOVER, VERNESE INNISS,
JYOTI KULKARNI, YU-MI MUN, NOAH TOLY & YOUNG-DOO WANG



Position Paper prepared for
UNFCC COP-8
New Delhi, India
23 October - 01 November 2002

Center for Energy & Environmental Policy

tel: 302.831.8405 • web: www.udel.edu/ceep • email: jbbryne@udel.edu

GREENHOUSE JUSTICE

MOVING BEYOND KYOTO

JOHN BYRNE, LEIGH GLOVER, VERNESE INNISS,
JYOTI KULKARNI, YU-MI MUN, NOAH TOLY & YOUNG-DOO WANG

Position Paper prepared for
UNFCC COP-8
New Delhi, India
23 October - 01 November 2002

Center for Energy & Environmental Policy

Acronyms and Abbreviations

AOSIS	Alliance of Small Island States
BAU	Business as usual
CER	Certified Emissions Reduction
CDM	Clean Development Mechanism
CEEP	Center for Energy and Environmental Policy
COP	Conference of Parties
EE	Eastern Europe
EIA	Energy Information Administration
$ESCO_2$	Equitable and sustainable carbon dioxide emission
FSU	Former Soviet Union
GHG	Greenhouse gas
IPCC	Intergovernmental Panel on Climate Change
JI	Joint Implementation
LULUCF	Land use, land-use change and forestry
MtC	Million tons carbon
$MtCO_2$-e	Million tons carbon dioxide equivalent
OECD	Organization for Economic Cooperation and Development
RPS	Renewable energy Portfolio Standards
tCO_2-e	Tons of carbon dioxide equivalent
UNFCCC	United Nations Framework Convention on Climate Change
WTO	World Trade Organization

1. Rising Resistance

Current international negotiations to address climate change are marked by growing divergence between government proposals and those advanced by civil society. The Conference of the Parties[1] (COP) process has promoted a set of market-based policy instruments as the primary means to facilitate cooperation in the task of greenhouse gas (GHG) emissions and is now focused on establishing rules for the emerging international emissions market. With the major operational uncertainties of the Kyoto Protocol[2] emissions targets and flexibility mechanisms now largely resolved under the COP-7 outcomes at Marrakech, COP-8 (New Delhi, October 23 – November 1, 2002) appears to be concerned mainly with refinements to the protocol.

The inability of governmental processes to reach agreement even on reducing greenhouse gas emissions of the wealthy nations is a troubling reminder of the largely rhetorical interest of the Parties in acting to avert global warming.

The COP process may claim success in realizing a treaty of targets and commitments to lower the release of one of the most ubiquitous chemicals associated with human activity. But the Conference's inability to satisfactorily address the reality that the world's largest GHG emitter is no longer part of the international agreement to control emissions, and is likely to profit by this decision, raises significant doubt about the efficacy and equity of the treaty. Attempts at the recent World Summit on Sustainable Development to establish goals for accelerated development of renewable energy were stymied – largely because of U.S. opposition, further slowing action on the problem of climate change. The inability of governmental processes to reach agreement even on reducing greenhouse gas emissions[3] of the wealthy nations is a troubling reminder of the largely rhetorical interest of the Parties in acting to avert global warming.

In the face of mounting evidence that the global corporate economy and the international system of states are willing to act inequitably and unsustainably on the question of climate change, the agenda of civil society has steered a quite different course centered on an interest in ecological justice. Indeed, the efforts of many strata of civil society – from the grassroots to research activists – has so firmly departed from the COP process that it is difficult to detect signs of dialogue or constructive engagement. Essentially, actions of many in civil society now constitute resistance to the COP program.

2. Negotiating a Future Climate: An Overview of the COP Process

The Kyoto Protocol sets binding emission targets for 25 developed countries and 13 countries in transition, which are listed in Annex B[4] of the Protocol. Individual Annex B countries were assigned different targets under the principle of "common but differentiated responsibility." Their collective GHG emission reduction target was set at 5% below their aggregate 1990 level. This collective reduction is to be achieved between the years 2008 and 2012 (Article 3.1 of the Kyoto Protocol to the United Nations Framework Convention on Climate Change, 1997).

The Protocol allows nations to count changes in their carbon stocks associated with afforestation, reforestation, and deforestation (to reflect the impact of carbon sequestration in terrestrial forms) as compliance actions to meet national targets. Known as carbon sinks, these changes offset GHG emissions (see Article 3.3 of the Kyoto Protocol to the United Nations Framework Convention on Climate Change, 1997). Inclusion of carbon sinks makes the Kyoto Protocol comprehensive, covering all known elements of the carbon cycle immediately affected by human activity, notably land use, land-use change, and forestry (LULUCF).

In the years following adoption of the Kyoto Protocol, negotiations by the COP have focused on methodological and governance structures that would guide implementation. Rules were articulated in the 2001 Marrakech Accords that reflect significant compromises thought to be necessary to secure ratifications by key countries (e.g., Russia and Poland) needed to bring the Protocol into force—compromises that further challenged the sustainability and equity of the regime (see below). A key consideration at this stage is the potential effectiveness of the governance mechanisms adopted and refined between COP-4 and COP-7 in addressing the problems of unsustainability and inequity associated with current national emissions profiles of the Parties.

At COP-4 in Buenos Aires and COP-5 in Bonn, great attention was given to a range of market-based policy instruments (called "flexibility mechanisms" in the Kyoto Protocol) that would assist wealthy countries in lowering emissions. Under the flexibility mechanisms, Annex B countries are allowed to purchase emission permits from other Annex B countries that presently release GHGs at a rate below their Kyoto targets, or have access to lower-cost CO_2 reduction options through emissions trading. Annex B countries may also receive credits toward target reductions through project-based emission reductions or sink expansions in other Annex B countries through Joint Implementation (JI). Finally, Annex B members can earn certified emission reductions (CERs) from project activities in developing countries and apply them in order to comply with GHG reduction targets through the Clean Development Mechanism (CDM).

COP-6 (held in The Hague and Bonn) produced a number of decisions that further shaped national strategies and options under the Kyoto Protocol. The most influential of these was the permission of essentially unrestrained emissions trading. As a result, Annex B participants can take full advantage of available emission permits beyond their borders to meet national commitments (a particular problem for efforts to achieve effective emissions reduction, as explained below). One option created with these negotiations was the purchase of emission credits from Russia and other economies in transition whose current releases are well below their 1990 levels. In effect, an Annex B member can assist economies in transition to upgrade technology efficiency and then claim the difference in GHG emissions that results at the same time that economies in transition increase their emissions to 1990 levels. This so-called 'hot air' is sizable (we estimate it to be 1,170 $MtCO_2$-e, or 34% of OECD reduction commitments).

COP-6 also allowed national carbon sink enhancements to offset GHG emissions in national GHG accounting. Any claimed activities must have occurred since 1990 and have been the outcome of human activity. COP-6 revisions enabled countries to count changes in all sources of carbon sinks in LULUCF (cropland, grazing land, and revegetation), but restricted the level of claims against forest sinks.[5]

Despite acquiescence to its demands for unlimited trading and a liberal interpretation of LULUCF opportunities, the U.S. withdrew from the UNFCCC negotiations before continuation of the COP-6 meeting in Bonn (2001).

Despite acquiescence to its demands for unlimited trading and a liberal interpretation of LULUCF opportunities, the U.S. withdrew from the UNFCCC negotiations before continuation of the COP-6 meeting in Bonn (2001). Voicing nearly identical economic concerns to those of the elder President Bush in 1992, the younger President Bush indicated that the U.S. would follow its own 'voluntary' GHG reduction policy, setting in motion what has become a unilateralist policy orientation in international affairs.
Several key uncertainties and problems in the Kyoto Protocol were resolved at COP-7 in the Marrakech Accords, chief among them being the measurement of emissions and emissions reductions, questions of compliance and enforcement, and further refinement

of regulations governing the deployment of flexibility mechanisms. The Protocol, however, remains a non-binding agreement. Its legal status will not be decided until after its entry into force, and it is quite possible that the Protocol and its enforcement will remain entirely voluntary.

COP-7 also continued to polish regulations that govern the Protocol's various flexibility mechanisms and sink allocations. However, many of these decisions have the effect of reducing the level of emissions abatement necessary through domestic measures in developed nations by allowing purchase of foreign emission credits, accreditation for foreign investments that reduce emissions and enhance carbon sinks, and inclusion of an array of domestic carbon sinks as offsets to domestic emissions. Through the CDM, Annex B nations can purchase credits from non-Annex B nations for afforestation and reforestation projects, but according to a limit of 1% of a country's target emissions. Emissions trading between Annex B nations can be pursued apart from any supplementarity restriction, and full use can be made of surplus emission credits (known as hot air). Credits earned by any of the above methods can be used immediately, banked for future use (in the Protocol's second budget period, for example), or sold in the emerging emissions permits market.

Emissions from the OECD group have increased since the base year of 1990, as shown by Figure 1 below. Divided into the OECD and FSU/EE nations, because of their widely differing circumstances, the difference in emissions outputs is clear since the base year of 1990. Each signatory to the Protocol listed under Annex B has an individual national target for emissions reduction, which amounts to collective reduction of 5.2% below the collective 1990 level of emissions. The Center for Energy and Environmental Policy (CEEP) has converted these national targets into the OECD and FSU/EE groupings and derived the Kyoto Protocol target for each on a per capita basis: 11.71 tCO_2-e for the OECD and 13.23 tCO_2-e for the FSU/EE (see Figure 1). Reasons for the use of per capita emissions for comparison purposes are explained below in Section 4.

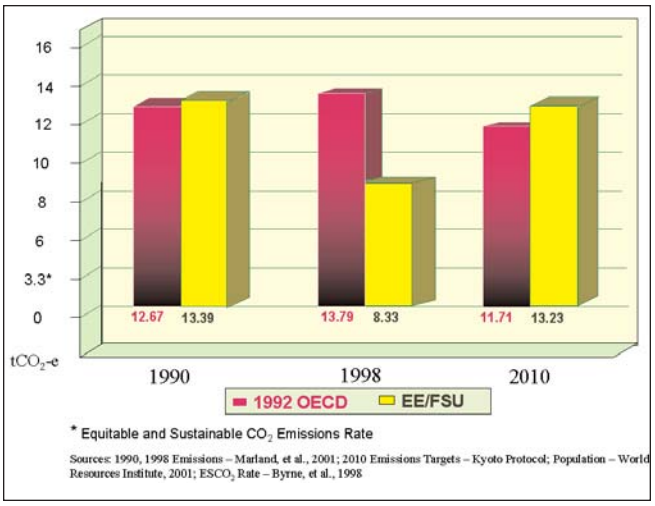


Figure 1. Actual and Targeted Per Capita Annex B GHG Emissions Under the Kyoto Protocol (1990 – 2010)

3. Commodifying the Atmosphere

Faced with the prospect of increasing emissions by the Annex B group, COP negotiators have focused on policy tools acceptable to members of the group that might lead to a reversal in this trend. Annex B has steadfastly voiced concerns that improper policy actions could harm the group's economies and, for this reason, have been least interested in high domestic emission reduction targets. Instead, the group has preferred 'practical,' 'realistic' targets and market-sensitive policies that enable individual countries to decide how to meet their obligations, including the ability to trade with other nations for the most efficient actions to reduce GHG emissions.

Led by the U.S., Australia, and Japan, Annex B has promoted the view that the transition to a low-carbon future is largely an economic and technological question best handled (with the proper incentives and enforceable rules) in the global marketplace. This shared belief in markets to guide national action on a global environmental problem reflects Annex B's core commitment to a commodity-based paradigm of policy-making. Priority in this paradigm is given to resolutions of environmental conflicts that are least-cost and, where possible, conducive to economic growth. In this sense, the atmosphere is seen as a resource

with important commodity values to be garnered (not unlike other goods and services). In this way of thinking, climate change policy represents an opportunity to obtain optimal value for the atmospheric services. The standard of 'good policy' is then defined as one that contributes to a profitable result for society. In pursuit of this standard, COP negotiations have settled on a trading regime that promotes a commodity market for reducing GHGs.

The envisioned commodity regime has identified an array of profit-making responses to the Kyoto targets.

Predictably, the envisioned commodity regime has identified an array of profit-making responses to the Kyoto targets. Indeed, a plethora of opportunities have emerged before trading has officially begun. As predictably, many of these actions are hardly positive for the environment. The means under the Kyoto Protocol for meeting Annex B obligations are critically reviewed below.

Hot air trading

As a consequence of economic recession in the FSU and EE since 1990, GHG emissions have generally fallen below 1990 baselines for assessing national performance in meeting UNFCCC objectives. This means that the FSU/EE bloc need not undertake any domestic GHG abatement programs. Instead, members are in the interesting position of being able to sell emissions growth to other Annex B nations whose releases are above the 1990 baseline.

The inclusion of the FSU and EE in Annex B has thus produced an opportunity for 'virtual reductions' (Byrne et al., 2001) that may be substituted for actual decreases in GHG emissions. Specifically, it is possible under the Kyoto Protocol for OECD members to assist the FSU and EE members of Annex B to 'efficiently' increase their GHG emissions, while counting this effort as a deduction to the emissions account of Annex B as a whole. This widely known implication of the trading mechanism permitted under the Kyoto Protocol has created what is now commonly termed 'hot air.'

Under BAU projections by the U.S. Energy Information Administration (EIA), the OECD countries are expected to increase their emissions by 16% over the 1998-2010 period, while total GHG emissions in the FSU and EE nations are anticipated to grow by 17% during the same period (Marland et al., 2001). Under this BAU scenario, therefore, the OECD countries will exceed the collective Kyoto target by approximately 3,400 $MtCO_2$-e in 2010; the FSU/EE bloc will release about 1,200 $MtCO_2$-e less than their Kyoto target. Thus, 'hot air' is estimated to meet 35% of the total GHG reduction requirement for the OECD countries.[6] Of course, 'hot air' availability will increase further if the FSU/EE emission forecast by EIA happens to be high, which is possible since the prospect of additional economic problems for this bloc is considerable.

Sinks

In theory, accounting for sinks as an element of the carbon cycle is unimpeachable. Some environmentalists and those seeking to bolster an array of developmental objectives embraced the inclusion of sinks in the UNFCCC as additional support for laudable objectives such as habitat and catchment protection, agroforestry, rainforest preservation, prevention of land clearance, and so on. Indeed, COP-6 reiterated that these activities contribute to the conservation of biodiversity and sustainable use of natural resources and therefore should be included as a means for nations to meet Protocol targets. Climate change policy under this provision offers the opportunity to support other environmental and development objectives while also being responsive to the need for building a 'low-carbon' future. Further, it seemingly offers a way in which climate policy can emphasize domestic action

(instead of trading away national responsibility) and at the same time economically meet reduction targets.[7] In practice, however, the inclusion of sinks in the Kyoto Protocol has been a Faustian bargain in which action on the tangible adverse environmental impacts of climate change is exchanged for uncertain environmental gains from creative accounting of the benefits of forest and soil management. Allowing sinks in the Protocol provides nations with opportunities to avoid real GHG emissions reduction. For nations with extensive land systems suitable for tree cover, the potential for enhanced carbon storage can be very large. National interests in this regard have been clearly exercised in the COP negotiations to date, driven on the one hand by those seeking to maximize allowable domestic sinks in Annex B and, on the other, by those potentially available in non-Annex B nations accessible through CDM.

Broad arrays of land-based activities are admissible as sinks and credits for them are currently unrestricted (only sinks resulting from forest management are limited under Appendix Z from COP-6). COP negotiations have only limited sink CDM activities to afforestation and reforestation in this first commitment period (i.e. 2008-2012), and capped available credit by these means to 1% of a country's target reductions.

Since the principle of crediting carbon storage as a means to meet Kyoto targets has been adopted by the COP, the race has been on to register national sinks and to partner with other nations to expand sink capacities and then take credit for them through JI and CDM. The magnitude of available sink credits through these two mechanisms is sufficient to enable certain Annex B members to avoid domestic emissions reduction entirely.

Efforts to incorporate LULUCF into the Convention have been fraught with basic uncertainties in the measurement of sequestration and fluxes compounding efforts to construct an effective sinks policy. Production of the national GHG inventories, as required under the UNFCCC, has highlighted how indeterminate the LULUCF component is, even for those nations with the best data and research bases. The IPCC's Special Report on the subject provided a sound description of the current state of knowledge, but further highlighted just how few generalizations could be made about sequestration for any given location (IPCC, 2000).

Even if the aforementioned difficulties with the measurement of these factors were resolved, there are a number of ecological concerns that raise doubts over the efficacy of LULUCF measures. For example, the most effective species for optimizing carbon sequestration will be fast-growing species with short rotations, yet this practice will reduce biodiversity. Reconciling the Kyoto Protocol's intention that LULUCF contribute to broader ecological goals with practices to enhance sequestration could prove difficult.

Climate change policy can only be effective if there are permanent reductions in global GHG emissions. At present, the rules that allow for carbon sequestration to offset emissions encourage only a temporary reduction of global emissions. Any number of events, such as fire, disease, or climatic factors, can release sequestered carbon into the atmosphere. In a sense, carbon sinks are simply deferred emissions and are therefore incomparable to actual reductions in GHG emissions as a response to the problem of rising emissions, because they fail the test of permanence. Sinks allow GHG emissions to be greater than would otherwise be allowed and pass to future generations an increased burden.

Notwithstanding concerns raised by the IPCC, the COP is proceeding on the basis that quantification, measurement, and verification of sequestration is now possible. This policy appears to be driven less by accurate knowledge than confident expectations of profit.

Notwithstanding concerns raised by the IPCC, the COP is proceeding on the basis that quantification, measurement, and verification of sequestration is now possible. This policy appears to be driven less by accurate knowledge than confident expectations of profit. How to objectively measure long-term changes in soil carbon has yet to be established and would require medium to long-term monitoring if the aim was an evidence-based policy. In lieu of such an approach, the COP moves dangerously toward an Enron-like treatment of the problem of carbon accounting; namely, if it can appear to make money, then count it. The credibility of the entire Convention is risked by compromises such as those on LULUCF.

4. Equity and Sustainability in the Greenhouse: A Case for the Atmosphere as a Global Commons

Consistent with our response to preceding COP meetings, the CEEP has adopted principles of ecological justice as the basis for acting on issues of climate change (see, e.g., Byrne, 1997; CEEP, 2000). For CEEP, two elements are critical in efforts to address the problem of climate change from the perspective of ecological justice. The first is the limitation of the extent of climate change impacts through decisions to limit global production of GHG, to levels consistent with the known properties of the carbon cycle. The second is the determination of country-specific emission targets in a manner that produces a democratic and equitable outcome. In CEEP's approach, ecological justice for climate action concerns the simultaneous pursuit of ecological sustainability and social justice through international policy.

Ecological justice for climate action concerns the simultaneous pursuit of ecological sustainability and social justice through international policy.

In this regard, CEEP has sought to contribute to civil society initiatives that advance policies guided by the concept of a global atmospheric commons (see, e.g., Agarwal and Narain, 1991; CEEP, 2000; Byrne and Glover, 2000; Meyer, 2000). Despite the progress of COP negotiations, the actual performance of wealthy nations concerning their greenhouse gas emissions since the United Nations Framework Convention on Climate Change (UNFCCC) was ratified has contradicted the avowed aim of a 'low carbon' future. Annex B countries have logged persistent emissions increases[8] with little evidence of national policy action to arrest this trend. The contradiction underlying the UNFCCC process is traceable in our view to the commitments of wealthy countries and corporate elites to commodifying the atmosphere. These commitments are most evident in the creation of 'virtual' carbon reductions through the trading of 'hot air' and the creation of LULUCF creative accounting (Byrne et al., 2001).

CEEP seeks both to reveal the ecological and social implications of the existing climate change policy regime, while also offering a means by which to build a future commons.

By contrast, civil society's embrace of ecological justice signals an intent to ground climate action on the recognition of the atmosphere as a commons, and social relations within this commons defined by principles of democratic governance. CEEP's proposal is consistent with this commons approach and considers a framework for an international policy regime that would commit to goals of ecological sustainability and social justice by setting sustainability-based emission reduction targets, abandoning the commodity regime of the Kyoto flexibility mechanisms, and installing a policy of democratic governance. In this manner, CEEP seeks both to reveal the ecological and social implications of the existing climate change policy regime, while also offering a means by which to build a future commons (see also Byrne and Glover, 2002).

Persuaded by the arguments and positions of India's Center for Science and Environment, the Alliance of Small Island States (AOSIS), and the UK's Global Commons Institute, CEEP has developed a specific

strategy to promote climate justice. Central to this strategy are commitments to ecological sustainability and democratic relations within the global atmospheric commons for all peoples.

To establish a benchmark for ecological sustainability, CEEP turned to the work of the Intergovernmental Panel on Climate Change (IPCC), which has estimated the level of emissions reduction necessary to achieve long-term stabilization of atmospheric GHG concentrations. The IPCC has reported that a 60% reduction of current CO_2 (and CO_2 equivalent) emissions is necessary to avert further risks of human-induced climate change (IPCC, 1992, 1996). With the emissions reduction target for the first commitment period under the Kyoto Protocol set at merely a 5% reduction for wealthy nations (see Figure 1 below), it is clear that the Kyoto Protocol's target reductions are not sufficient to arrest the process of climate change. For this reason, CEEP has pursued a strategy that necessitates reductions well beyond those of the Kyoto Protocol.

A democratic approach to allocating the global burden of emissions reduction between nations is by a regime of per capita responsibilities whereby global emissions reduction respects the norm of equal treatment of all the world's citizens in their relations with the atmosphere. Under the guidance of a per capita norm, a commons relation between society and nature is asserted. Each nation's climate action responsibility is then established on the basis of the democratic relation of their population to the atmospheric commons. Accordingly, the atmosphere is regarded and respected as a 'global commons' to which all peoples have equal access and share equal responsibility.

Combining these two norms – a sustainability commitment based on the IPCC's estimate of a 60% emissions reduction requirement and a democratic commitment of per capita emissions equality that reflects the commons character of the atmosphere, CEEP has advanced an equitable and sustainable GHG emissions rate, or $ESCO_2$ (see Byrne et al., 1998). Our calculations suggest that this equitable and sustainable rate of per capita annual emissions is 3.3 tons of carbon dioxide and equivalents (tCO_2-e) (Byrne et al., 1998). CEEP has used the longer-term 2050 stabilization target to establish emissions reduction goals for the first budget period of the UNFCCC (2008-2012), with OECD countries required to reduce emissions by 20% from 1990 levels by 2010. The emissions of transitional economies and developing countries are permitted to rise above 3.3 tCO_2-e in the first budget period, but these nations would be expected to arrest this trend in the second budget period and begin a steady decline to the $ESCO_2$ rate.

5. Identifying Greenhose Debtors

By an $ESCO_2$ standard, emissions trends of the wealthy industrial tier are alarming. Since signing the UNFCCC, for example, GHG emissions from the OECD countries have posted steady annual increases. Of this group, only a few can claim to be on a path of emissions reduction (arguably Germany, the United Kingdom, and Sweden). Other countries such as Australia, Canada, Greece, Ireland, Portugal, Spain, and the U.S., increased their emissions by more than 10% between 1990 and 1998. Most obvious in its continued emissions growth is the world's largest source of GHG emissions, the U.S. As discussed below, the current attitude of the U.S. government to ignore its UNFCCC obligations, presents a fundamental challenge to principles of ecological justice.

The GHG profile of the Annex B group is not uniform. The OECD bloc has seen substantial economic growth over the decade since the Earth Summit, while nations of the former Soviet Union (FSU) and Eastern Europe (EE) have languished economically. This bifurcation in economic paths has its parallel in GHG emissions. While emissions of the OECD group have grown by 9% between 1990 and 1998, those of the FSU and EE have actually declined by 38%.

With collective GHG emissions from the OECD group still rising, global emissions are also growing. Unfortunately, the current policy architecture based on unrestrained flexibility mechanisms and the inclusion of sink measures further augments this unsustainable trend.

With collective GHG emissions from the OECD group still rising, global emissions are also growing. Unfortunately, the current policy architecture based on unrestrained flexibility mechanisms and the inclusion of sink measures further augments this unsustainable trend. Using forecasted emissions levels and information on current emissions, it is possible to consider the implications of the decisions of the COP for the task of meeting the Kyoto Protocol targets for the first commitment period in 2010. Converting national emission rates to per capita releases for the OECD, EE/FSU, and non-Annex B country groups, a pattern of inequitable and unsustainable society-nature relations is evident (see Figures 2a and 2b). Per capita emissions from the OECD grew from 12.67 $MtCO_2$-e in 1990 to 13.79 in 1998, and are forecast by the EIA to continue increasing to 15.97 $MtCO_2$-e by 2010 (EIA, 2001). In contrast, the emissions of developing nations (non-Annex B under the Kyoto Protocol) will rise to only 3.13 $MtCO_2$-e by 2010. Economic recovery within the FSU and EE will boost emissions, but at 2010 these are projected to remain substantially below their 1990 total. In Figure 2b, these developments are shown in relation to the $ESCO_2$ rate of 3.3 tCO_2-e per capita, which furnishes a portrait of environmental debtors living well beyond the sustainable rate deduced from the earth's carbon chemistry. Bars in this graph that extend upward from the $ESCO_2$ rate demonstrate the amount of environmental debt incurred by the OECD and EE/FSU blocks, and the bars below the $ESCO_2$ rate show credits maintained by non-Annex B societies.

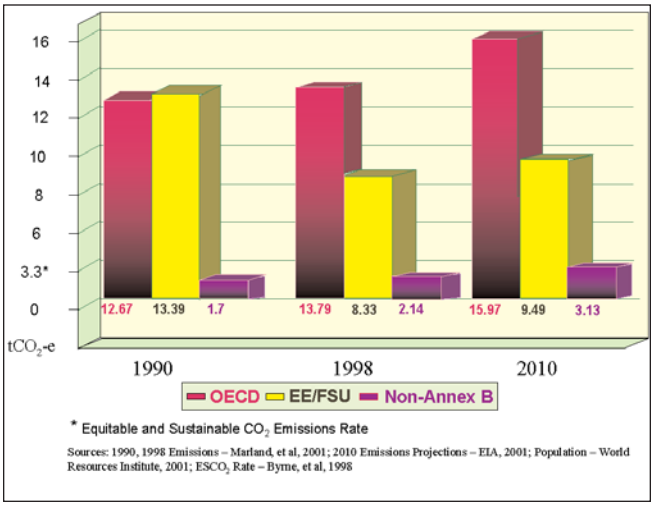


Figure 2a. Forecasted Global Per Capita GHG Emissions Under Business-as-Usual Assumptions (1990 – 2010)

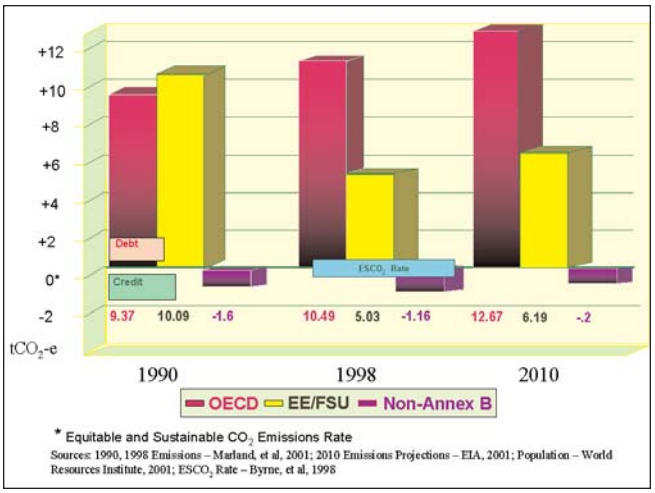


Figure 2b. Forecasted Global Per Capita GHG Debtors and Creditors Under an ESCO2 Standard (1990 – 2010)

6. A Commons-based Critique of the Kyoto Protocol

A comparison of Annex B emissions with the $ESCO_2$ emissions rate offers a ready means to assess the sustainability and equity implications of the Kyoto Protocol. At present, there is an enormous disparity in national per capita releases of GHGs by region and income. For example, average annual per capita emissions of OECD countries were 13.8 tCO_2-e in 1998, nearly four times the $ESCO_2$ rate. Whereas average

non-Annex B 1998 per capita emissions were 2.1 tCO_2-e, roughly 36% below the $ESCO_2$ rate of 3.3 tCO_2-e. A policy response described as "contraction and convergence" (Meyer, 2000) would seem logical, whereby countries that exceed sustainable per capita emissions rates would be obliged to undertake reductions, while those below this rate are permitted increases, so that both groups 'converge' on the same 'ecologically just' level of emissions. Through this process, total emissions contract to achieve climate sustainability.

Instead of realizing the goal of contraction and convergence, however, the Kyoto flexibility mechanisms – made even more flexible at Marrakech – have introduced the possibility of worsening inequality between Annex B and non-Annex B countries and slowing progress toward sustainability.

Instead of realizing the goal of contraction and convergence, however, the Kyoto flexibility mechanisms – made even more flexible at Marrakech – have introduced the possibility of worsening inequality between Annex B and non-Annex B countries and slowing progress toward sustainability. The application of unlimited emissions credits trading, joint implementation, and clean development mechanisms will allow OECD countries to increase emissions (to the level of BAU projections, we assume) permitting escalation of per capita CO_2-e emissions to 12.67 tons per year above the $ESCO_2$ rate by 2010 (see Figure 3). The forecasted rise in OECD emissions is likely to be the largest contribution to international unsustainability in 2010. 1990 OECD per capita emissions were nearly 9.5 tons above the $ESCO_2$ rate. Rather than decreasing per capita emissions by 5% by 2010, OECD countries are expected to increase per capita emissions by 26%. 'Hot air' would probably be the largest offsetting factor masking this negative trend, accounting for 35% of the 'virtual' GHG reduction requirements for OECD countries. Sink accounting will benefit both the OECD and EE/FSU blocs, with 6% of the OECD's 'virtual' reduction possibly derived from this source. CDM projects and Annex B-to-Annex B trading would furnish the remaining 'virtual' reductions. Under one plausible scenario (see Figure 3) the OECD group, on net, increases its per capita emissions under Kyoto.

After CDM and Annex B-to-Annex B trading credits are generated and transferred to OECD countries to offset BAU growth, the average annual per capita emission of the non-Annex B countries is projected to remain below the $ESCO_2$ rate. Thus, the likely result of the Kyoto-Marrakech Protocol is for the non-Annex B group to contribute to lower emissions so that the Annex B bloc may deepen its commitment to unsustainability.

Figure 3 depicts the likely broadening gap between Annex B (OECD and EE/FSU) countries and non-Annex B countries in projected average per-capita tCO_2-e emissions under the Kyoto's flexibility mechanisms. The OECD group is expected to exceed the $ESCO_2$ rate by 12.67 tCO_2-e in 2010, while the EE/FSU is likely to surpass their 1990 levels (6.19 tCO_2-e beyond the $ESCO_2$ rate). By contrast, non-Annex B nations are likely to remain below the equitable and sustainable emissions rate of 3.3 tons per person per year. In effect, uncapped flexibility mechanisms are

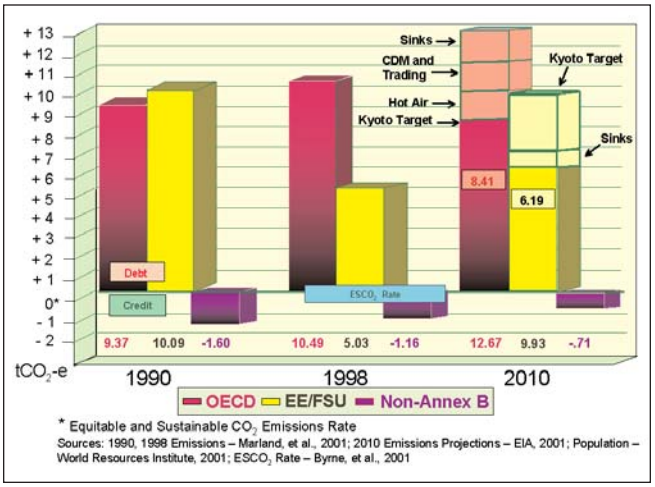


Figure 3. Possible Per Capita Global GHG Emissions When Kyoto Flexibility Mechanisms are Fully Employed (1990 – 2010)

likely to nullify any substantial claim on the part of the Protocol to sustainability or equity, abandoning the need for the OECD to reduce emissions, substituting instead a 'virtual reality' of 'efficient' emissions adjustments that disguises a 'real' reality of actual emissions expansions (Byrne et al., 2001).

The inequity of the Protocol's inclusion of unrestrained flexibility mechanisms amounts to trading for the rights to jeopardize entire populations in some countries while decreasing access to the atmospheric commons.

The inequity of the Protocol's inclusion of unrestrained flexibility mechanisms amounts to trading for the rights to jeopardize entire populations in some countries while decreasing access to the atmospheric commons. Indeed, while OECD countries are least vulnerable to the pernicious effects of climate change, developing countries are most directly exposed to the phenomenon's harmful consequences (such as sea-level rise and intensified storm season and drought cycles). The Protocol's architects may defend the package as a 'first step' and the only practical pathway politically available at this time, but the COP's deference to economic growth and an allied ideology of efficiency better explain the treaty's content, in our view. Even if it is supposed that an efficient allocation of resources will prevail because of the flexibility mechanisms, and emissions reductions will therefore occur at considerably more cost-effective levels, it is a false choice from a commons perspective on the atmosphere. The scenario depicted in Figure 3 represents deepening social and ecological risk, especially for the least advantaged two-thirds of the world's population. The privileged one-third cannot seriously expect this situation to be regarded as justifiable or sustainable.

7. A Failure to Govern: U.S. Withdrawal and the Kyoto Protocol

COP-7's major contribution to future climate change governance was arguably its establishment of a compliance regime for the Kyoto Protocol. The basic elements of an enforcement system were delimited, including an effort to penalize nations failing to meet their emission reduction commitments in the first commitment period. Countries that exceed emissions quotas in the first budget period (2008-2012) will be required to compensate for the excess in the second period, 2013-2017, while assuming a penalty equal to 30% of the shortfall and being excluded from emissions credits trading until compliance is realized. A basic institutional design for overseeing the compliance system was also agreed, featuring committees, expert reviewers, voting procedures, appeals, and other matters. Several commentators have commended the efforts at COP-7, some proclaiming the compliance system a breakthrough in international environmental policy (see Dessai, 2001; Ott, 2002; Wiser, 2002).

Despite COP-7's successful design of a compliance system, a basic flaw remains – there is no guidance on the overwhelming compliance problem facing climate change governance today, namely the withdrawal of the U.S. from the Kyoto Protocol.

Despite COP-7's successful design of a compliance system, a basic flaw remains – there is no guidance on the overwhelming compliance problem facing climate change governance today, namely the withdrawal of the U.S. from the Kyoto Protocol. In this respect, the Protocol is fundamentally weakened by not devising a penalty for the instance of the refusal of the world's largest GHG emitter to participate in the emissions reduction regime. The U.S. stands to take advantage of other nations by its withdrawal, and may also reap certain advantages upon re-entry

to the Protocol. Nevertheless, the Protocol's compliance policy is silent on the matter.

U.S. President George W. Bush marked his incoming foreign policy stance with an immediate decision to withdraw the U.S. from the Protocol prior to the Bonn COP-6 meeting. Further, the Administration has since proposed a new national energy plan that gives priority to increasing energy supply from fossil fuel use. Two reasons were advanced for the Administration's foreign policy decision: the threats to the national economy in responding to the Protocol; and the supposed inequity of only requiring wealthy nations to reduce emissions in the first budget period (2008 – 2012).

Abundant low-cost opportunities for U.S. emissions reduction through energy conservation and improved energy efficiency have been identified by leading U.S. research institutions (e.g., IWG, 1997; 2001). Moreover, at the insistence of the U.S. government, the Kyoto Protocol was revised to permit the counting of national sink management as a mitigative measure. And the Parties agreed to the U.S. demand of unlimited trading in meeting a nations' reduction obligation. Still, the U.S. withdrew.

The absence of the U.S. from the UNFCCC process is in all likelihood temporary. In the market-based policy mechanisms being developed under the Kyoto Protocol, a new global market is being opened based on the trading of GHG emission credits. This will create many opportunities for the world's largest economy, and its corporations, to profit from carbon trading. Indeed, the world's first carbon trade in London was executed by the local office of the U.S. corporate giant, DuPont (Cormier and Lowell, 2001). Far from being an aberration, U.S. firms can be expected to participate in the profits available in the emerging carbon trading market to the extent possible under U.S. foreign policy. U.S. firms will lobby their Government to be allowed to participate without restraint, an activity doubtless already underway. Indeed, trading with the former Soviet bloc was anticipated by the Clinton administration to provide as much as 56% of its Kyoto commitments (Kopp and Anderson, 1998). Through such trades and other market-based policies available under the Protocol, there is the arresting possibility that the U.S. could meet its Kyoto obligation for reducing emissions by actually increasing its carbon emissions by 10% (Flavin and Dunn, 1998; Pearce, 1998).

COP-7's failure to deal with the withdrawal of the U.S. has several consequences that the global community needs to contemplate. Because COP-7 demurred on a domestic reduction obligation, the burgeoning world carbon market now seems more assured than the possibility of real GHG emissions reduction. Global emissions (to say nothing of Annex B emissions) are now projected to fall by no more than 1.5% by 2010 under full implementation of the Kyoto mechanisms and if forestry offsets are included, emissions reductions may be only 0.8% (Nordhaus, 2001). The U.S. will be uniquely advantaged by its decision to withdraw from this global agreement because of the weakness of the COP-7 decisions on the compliance system. Although no longer required to incur the costs of emissions reduction that all other major economies have agreed to undertake, there are no provisions in the Kyoto Protocol to prevent the U.S. from profiting in the global carbon market. At the same time, the U.S. can market its products at higher carbon intensities, and lower prices.

Not only has the COP process reneged on a commitment to a sustainable and equitable emissions reduction regime, the negotiations are now unable to invoke a penalty for a single country's action that likely reduces the Protocol's impact to one-fifth of its intent.

Clearly, the circumstance represents a failure of governance. Not only has the COP process reneged on a commitment to a sustainable and equitable emissions reduction regime, the negotiations are now unable to

invoke a penalty for a single country's action that likely reduces the Protocol's impact to one-fifth of its intent. Here again, it is difficult to understand how the Protocol's architects can reasonably expect civil society's support for its compromised objectives.

8. Proposals for Increasing Equity and Sustainability in the Atmospheric Commons

The Kyoto Protocol cannot resolve the problem of rising emissions and lacks the substantive commitments needed to reach climate stabilization in a sustainable and equitable manner. Attempts to limit the use of the flexibility mechanisms to fulfill the commitments of the Parties have repeatedly been thwarted. What remains of these efforts is included in the Marrakech Accords under the principle of supplementarity, consistent with Articles 6.1 (d), 17 and 12.3 (b) of the Kyoto Protocol.[9] While this decision rhetorically supports some measure of sustainability and equity, the effectiveness of the principle is likely to be minimal since there is no quantitative definition of "significant element," but there are decisions approving unlimited trading.

Table 1. Characteristics of Two CEEP Equity and Sustainability Policy Approaches

Features	Reforming Kyoto	Beyond Kyoto
Nations involved	Annex B	All nations
Emission target	As per the Kyoto Protocol	$ESCO_2$ rate
'Hot air' trading	Not used	Not used
Joint Implementation	Not used	Not used
Sinks (national and other party)	Not used	Not used
Flexibility mechanisms (Clean Development Mechanism)	Capped at 25% of Kyoto Protocol national per capita reduction target	Capped at 25% of $ESCO_2$ per capita reduction target
Renewable Energy Portfolio Standard	Not used	Included

CEEP has concluded that a different regime is necessary. Below we present analyses of two approaches to bring the international policy response to climate change closer to the goals of ecological justice. Table 1 summarizes the policy mechanisms used in a 'Reforming Kyoto' scenario, intended for near term consideration, and 'Beyond Kyoto,' a proposal that CEEP advocates. In the first approach, the basic architecture and targets of the Kyoto Protocol are maintained, with revisions made to those existing policy initiatives that currently make the Protocol inequitable and ecologically unsustainable. Under the 'Beyond Kyoto' approach, all nations pursue the goal of ecological justice consistent with IPCC findings and the democratic principles of commons relations advocated by Agarwal and Narain (1991) and our Center (2000; see also Byrne, 1997).

The effective 'expansion and divergence' generated by the current architecture of the Kyoto Protocol can be reduced to some degree by prohibiting or capping the use of flexibility mechanisms and obliging Annex B countries to adopt domestic emission reduction measures.

Reforming the Kyoto Protocol

The effective 'expansion and divergence' generated by the current architecture of the Kyoto Protocol can be reduced to some degree by prohibiting or capping the use of flexibility mechanisms and obliging Annex B countries to adopt domestic emission reduction measures. Excluding 'hot air' trading, JI, and carbon sinks would require OECD nations to reduce emissions largely through effective domestic actions. Capping CDM's contribution to national emissions reduction at a quarter of the national emissions reduction target necessitates that 75% of activity to reduce greenhouse gas emissions is undertaken domestically. This is the percentage promoted by CEEP in its 2000 position paper.

Under the 'Reforming Kyoto' approach, genuine GHG emissions can be achieved, as the results shown in Figure 4 indicate. Before the CDM offset, OECD per capita emissions under this approach are stabilized at 9.47 tCO_2-e above the equitable and sustainable rate, an improvement over the Kyoto Protocol, but far short of the $ESCO_2$ target. EE and FSU nations that, under the Kyoto Protocol, will have per capita emissions of 6.19 tCO_2-e above the $ESCO_2$ rate at 2010, are held steady under the reformed Kyoto Protocol approach. Developing countries experience some increase in emissions, but remain greenhouse creditors.[10]

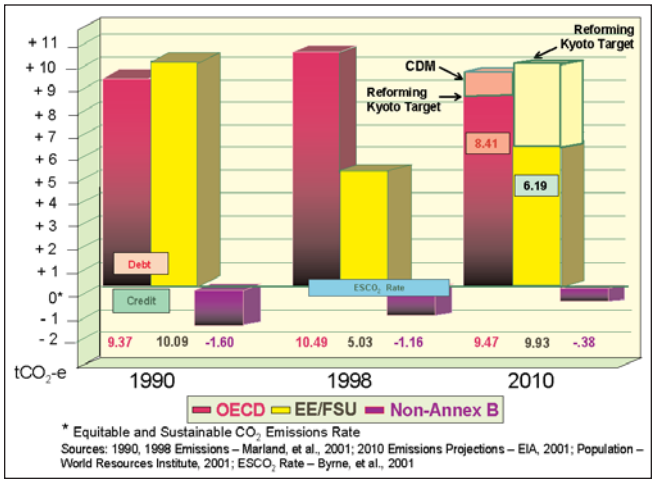


Figure 4. Global GHG Emissions Under 'Reforming Kyoto' on a Per Capita Basis as Compared with ESCO2 Rate (1990 – 2010)

Beyond the Kyoto Protocol

CEEP advocates an alternative approach that features equity and sustainability using IPCC's estimate of required reduction for climate stability. This approach sets far higher emissions reduction targets (at both aggregate and individual levels) than the Kyoto Protocol and allocates national emission reduction targets according a commons-based equity principle.

In this approach, global GHG emission targets are set to achieve stabilized atmospheric concentrations by 2050 and are allocated nationally on per capita levels established on the basis of commons equity, according to the approach and levels established in Byrne et al. (1998). Nations whose per capita emissions exceed the allocation necessary to reach the global stabilization goal must reduce emissions, while nations whose per capita allocations are below target levels are permitted to increase theirs. CEEP utilizes a transitional per capita equity and sustainability target for the year 2010 of 20% below the 1990 national baseline for greenhouse debtors for principal greenhouse debtors. There is a differentiation of responsibility expressed by the requirement for wealthy nations to greatly lower emissions and for developing nations who are currently below the $ESCO_2$ rate to be able to increase their emissions. In CEEP's 2000 position paper, exceedance of the $ESCO_2$ rate is anticipated through 2020, before convergence by Southern nations is expected.[11]

In order to facilitate this transition, several Kyoto mechanisms, and their expansion under the Marrakech Accords, have been rejected. Most notably, our 'Beyond Kyoto' scenario cancels the trade of surplus GHG emission credits, abandons JI, and places a restriction on the use of CDM by Annex B Parties. As to the latter, Annex B nations are able to use CDM for only 25% of the emissions reductions claimed in the commitment period. An additional policy initiative is the requirement of a Renewable Energy Portfolio Standard (RPS) for Annex B nations that establishes an obligatory level of renewable energy development equal to 15% of domestic use in 2010. A given country may exceed the 25% CDM allowance, provided it has matched the excess percentage with an equal increase in their RPS, thereby quickening the pace of renewable energy's entry into the global energy system.

Results of the 'Beyond Kyoto' approach are presented in (Figure 5). Before the CDM offset, per capita emissions targets at 2010 for OECD nations under the 'Beyond Kyoto' architecture represent a 20% reduction from 1990 levels. After the offset, OECD emissions remain 9% below 1990 levels, assuming full use

of the 25% offset allowed for CDM. For the EE/ FSU group under the same target, per capita emissions meet a target of proportional effort to that required of the OECD bloc. Just as the OECD block is expected to reduce emissions at roughly three times the Kyoto reduction requirement, we have set the 'Beyond Kyoto' target for the EE/FSU at three times their original Kyoto obligation.

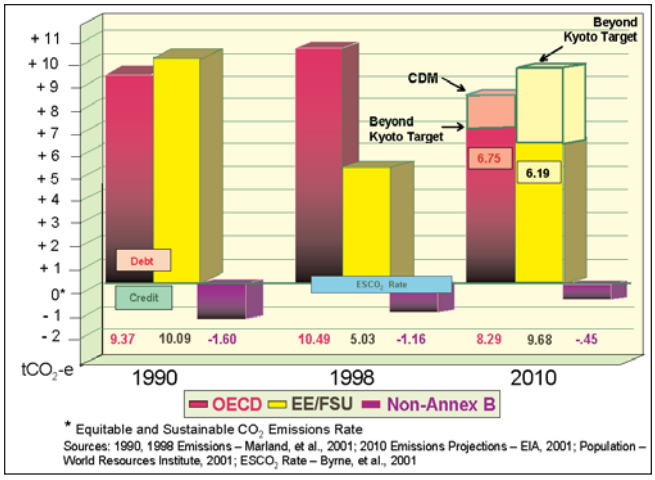


Figure 5. Projected Per Capita Global GHG Emissions Under a 'Beyond Kyoto' Scenario (1990 – 2010)

It is possible to compare progress toward ecological justice among the policies analyzed here by considering the ratio of per capita emissions of the wealthy and developing nations. Termed an 'Inequality Ratio,' comparisons using this metric are reported in Table 2. While the Kyoto-Marrakech Protocol actually exacerbates inequality, the 'Reforming Kyoto' scenario would represent a 15% reduction in per capita inequality. However, emissions reduction among OECD nations would be modest (only 5% for the OECD bloc before the CDM offset). Our 'Beyond Kyoto' proposal fares much better, reducing inequality by 20% and lowering OECD emissions by nearly 20% from the 1990 baseline before the CDM offset. These results are consistent with the objectives of ecological justice and sustainability.

Table 2. Allowable Per capita Emissions* under the Existing Kyoto Protocol and Two CEEP scenarios in 2010 (tCO_2-e).

Country Blocs	BAU	Kyoto Protocol	Reforming Kyoto	Beyond Kyoto
OECD	15.97	15.97	12.77	11.59
EE/ FSU	9.49	13.23	13.23	12.98
Non-Annex B	3.13	2.59	2.92	2.85
Inequality Ratio**	**5.10**	**6.16**	**4.37**	**4.06**

* Allowable emissions are those emissions possible given a policy scenario's targets and full employment of flexibility mechanisms, and based upon reductions required from projected emissions levels.
** The Inequality Ratio is informed by dividing an OECD emissions rate by a corresponding non-Annex B rate. Perfect equality would be represented by a 1:1 ratio.
Note: These per capita figures are not adjusted for ESCO2 conditions and, therefore, should not be directly compared with rates reported in Figures 2b – 5.

9. A Penalty Structure for Environmental Debtor Nations Failing to Respect the Atmospheric Commons

Not unexpectedly, the prospect of advantages accruing to the U.S. from its withdrawal from Kyoto has drawn sharp criticism and some efforts to prevent its occurrence. Members of the European Commission have publicly expressed their anger over the action. For example, EU Commissioner for the Environment, Margot Wallstrom, has commented, "[President Bush's declaration is a] very, very serious statement and totally unacceptable to the outside world and I think this is what we have to make absolutely clear" (Castle, 2001).

Several civil organizations have filed a class action suit in a U.S. district court against the U.S. Export/Import Bank and the Overseas Private Investment Corporation, citing violation of the U.S. National Environmental Policy Act over the global warming consequences of their loans for fossil fuel energy projects (EV World, 2001). The island nation Tuvalu announced it would take legal action against the U.S. and Australia for their stand on global warming and the consequences of the inundation of their homelands (Reuters News Service, 2002).

Actions by civil society and governments in legal venues, regardless of the success of individual cases, will not resolve the inadequacy of the existing compliance system of the Kyoto Protocol. There is a pressing need to reform the compliance system so as to prevent the U.S. or any other nation with similar intentions from undermining the integrity and effectiveness of policies aimed at restoring the atmosphere to commons status. Several precedents exist for cases where nations are in contravention of international environmental agreements and offer lessons in considering penalties for U.S. intransigence.

Under the Montreal Protocol, nations who are party to the agreement may not trade with non-Parties in substances controlled by the Protocol. Similarly, the Basel Convention on the Transboundary Movement of Hazardous Wastes prohibits the movement of waste between Parties to the Convention and non-Parties without special agreements being in place. And the Convention on International Trade in Endangered Species of Flora and Fauna imposes strict limits on relations between participating nations and non-parties. Researchers have considered ways of applying such types of restrictions on countries electing not to participate in the Kyoto Protocol (see Dannenmeier and Cohen, 2000).

CEEP follows a similar line of reasoning and advocates explicit prohibitions of Parties to a climate change protocol from entering into agreements with U.S. firms or U.S. government entities for international emissions trading.

CEEP follows a similar line of reasoning and advocates explicit prohibitions of Parties to a climate change protocol from entering into agreements with U.S. firms or U.S. government entities for international emissions trading. Simultaneously, the prohibition prevents the U.S. from profiting from its current position and offers a clear incentive to re-enter the Protocol as soon as possible. Clearly, U.S. re-entry can only be accepted by its ratification of the Protocol and its unambiguous commitment to adhere to the emissions reduction target established by the current Protocol or the alternatives advocated here.

10. Conclusion

Decisions at COP-7 finalized the Kyoto Protocol as a market-based policy regime for addressing climate change. In this form, it sacrifices principles of social equity and ecological sustainability for efficient emissions management. Our analysis suggests that the Protocol's implementation could lead to a worsening of climate injustice by encouraging trading behavior that increases GHG releases while accounting for them as reductions. This Enron-esque policy strategy cannot be expected to win civil society support. Policies that seriously address the complex issue of climate change must demonstrate contraction of GHG emissions and convergence upon a sustainable per capita level in order to satisfy principles of ecological justice.

CEEP proposes such an approach. In its 'Beyond Kyoto' scenario (reported in this position paper), per capita emissions equity is advanced. Reductions along a path of genuine sustainability are achieved without unusual or untested policy options. A remedy is also offered to the governance failure embedded in the current Kyoto Protocol that would prevent nations from profiting from the Kyoto mechanisms without being party to the agreement. Consistent with precedents offered in other international environmental agreements, the recommended penalty is that Parties to the Protocol be prevented from engag-

By moving beyond Kyoto, the international community can renew a commitment to ecological justice and thereby embrace the common obligation to achieve a climate future based on real, permanent, globally equitable, and ecologically desirable reductions in greenhouse gases.

ing in trade that utilizes Protocol mechanisms with nations that have failed to ratify the treaty. These elements of a policy regime are believed by CEEP's members to redress serious flaws in the existing Protocol.

No alternative protocol can ensure ecological justice in the greenhouse. Only continuous efforts of societies to live within equitable and sustainable GHG emissions limits can guarantee this. But by moving beyond Kyoto, the international community can renew a commitment to ecological justice and thereby embrace the common obligation to achieve a climate future based on real, permanent, globally equitable, and ecologically desirable reductions in greenhouse gases. This is a future worthy of international effort.

Notes

1. The Conference of Parties is comprised of the 161 signatories of the United Nations Framework Convention on Climate Change and is charged with negotiating revisions to the treaty and procedures for its implementation.

2. The product of COP-3 in 1997, this Protocol set specific greenhouse gas emission reduction targets for Annex B countries (which include nations of the Organization for Economic Cooperation and Development (OECD) and those of the Former Soviet Union (FSU) and Eastern Europe (EE). Membership of the Organization for Economic Cooperation and Development has expanded since 1992 when the UNFCCC was signed. New entrants include South Korea and Mexico, neither of whom has been assigned GHG reduction targets under the Kyoto Protocol. Therefore, in this paper all references to the OECD designate the composition of the organization at the time of the signing of the UNFCCC.

3. Mainstream researchers such as Nordhaus (2001) and Ott (2002) have concluded that full compliance with the Kyoto Protocol, after its revisions at Marrakech (COP-7), will yield little or no emissions reductions from 1990 levels among Annex B countries (those with reduction/stabilization requirements).

4. The Annex B nations of the Kyoto Protocol are identical to the Annex 1 nations of the UNFCCC, except for Turkey and Belarus, which are not included in the Annex B group, and Kazakhstan, which voluntarily joined Annex B.

5. Forest sink limits for Annex B nations are listed under COP-6's Appendix Z. While most quotas are relatively small, a few nations were allocated significant sinks (notably, Canada – 12 MtC, Japan – 13 MtC, and the Russian Federation 33 – MtC).

6. While most FSU and EE nations in Annex B have some 'hot air' to sell, about 95% of 'hot air' would likely be provided by Russia, Ukraine, and Romania.

7. Research has suggested that domestic sequestration offers low-cost emission offset options.

8. See the 'National Communications' of national GHG accounting held by the UNFCCC Secretariat.

9. Decision 15/CP.7 stipulates that "the use of the mechanisms shall be supplemental to domestic action and that domestic action shall constitute a significant element of the effort made by each Party included in Annex B to meet its quantified emission limitation and reduction commitments under Article 3, paragraph 1" (UNFCCC, 2002).

10. The higher emissions rate under 'Reforming Kyoto' than under our projections in Figure 3 is due to a cap on CDM. However, this presumes that emissions in Southern countries will only fall if technology transfer from the North occurs. Recent experience in China suggests that this assumption may be false (see, e.g., Dunn, 2002). In this regard, the projection for developing countries should be regarded as conservative. CEEP staff believe that the actual emissions rate could be lower.

11. This pathway of sustainability and equity adjusts for historical patterns of overuse of the atmosphere as a carbon store by the Annex B nations. While some may argue that the adjustment is insufficient, CEEP's position is based on the view that the South is likely to pursue a non-imitative development path, if neo-colonial control of its policies and options is broken.

References

Agarwal, A., and Narain, S. (1991). *Global Warming in an Unequal World: A Case of Environmental Colonialism*. New Delhi: Centre of Science and Environment.

Byrne, J. (1997). *Equity and Sustainability in the Greenhouse: Reclaiming our Atmospheric Commons*. Pune, India: Parisar.

Byrne, J., and Glover, L. (2000). Climate Shopping: Putting the Atmosphere up for Sale. *Tela: environment, economy, and society*(5). from http://www.acfonline.org.au/publications/tela/intro.htm

Byrne, J., and Glover, L. (2002). A Common Future or Towards a Future Commons: Globalization and Sustainable Development Since UNCED. *International Review for Environmental Strategies, 3*(1), 5 - 25.

Byrne, J., Glover, L., Alleng, G., Inniss, V., Mun, Y.-M., and Wang, Y.-D. (2001). The Postmodern Greenhouse: Creating Virtual Carbon Reductions From Business-as-Usual Politics. *Bulletin of Science, Technology, and Society, 21*(6), 443 - 455.

Byrne, J., Wang, Y.-D., Lee, H., and Kim, J.-d. (1998). An equity- and sustainability-based policy response to global climate change. *Energy Policy, 26*(4), 335 - 343.

Caslte, S. (2001, March 19). European Union Sends Strong Warning to Bush Over Greenhouse Gas Emissions. from http://www.ecoline.ru/automail/enwl-eng/200103/010320034448.txt

Center for Energy and Environmental Policy (CEEP). (2000). Ecological Justice in the Greenhouse: A Position Paper Presented at the Sixth Session of the UNFCCC Conference of the Parties, The Hague, Netherlands. J. Byrne, Y.-D. Wang, G. Alleng, L. Glover, V. Inniss and Y.-M. Mun. Newark, Delaware: Center for Energy and Environmental Policy.

Cormier, L., and Lowell, R. (2001). DuPont and Marbeni Execute First UK Greenhouse Gas Emission Allowance Trade. New York: Natsource Environmental Division. from http://www.natsource.com/print.asp?n=69&s=2

Dannenmeier, E., and Cohen, I. (2000). *Promoting Meaningful Compliance with Climate Change Commitments*. Arlington, VA: Pew Center on Global Climate Change.

Dessai, S. (2001). *The Climate Regime from the Hague to Marrakech: Saving or Sinking the Kyoto Protocol. Tyndall Centre for Climate Change Research Working Paper No. 12*. Norwich, UK: Tyndall Centre for Climate Change Research. from http://www.tyndall.ac.uk/publications/working_papers/wp12.pdf

Dunn, S. (2002). Reading the Weathervane: Climate Change Policy from Rio to Johannesburg, Worldwatch Paper 160. Washington, D.C.: Worldwatch Institute.

EV World. (2001, August 31, 2001). Class Action Law Suits Filed Against Two U.S. Government Agencies. *EV World*. from http://www.evworld.com/databases/storybuilder.cfm?storyid=402

Flavin, C., and Dunn, S. (1998). Responding to the Threat of Climate Change. In *State of the World*. New York: W. W. Norton and Company.

Intergovernmental Panel on Climate Change (IPCC). (1992). Climate Change: The IPCC Scientific Assessment. In J. T. Houghton, J. G. J and E. J. J (Eds.). New York: Cambridge University Press.

Intergovernmental Panel on Climate Change (IPCC). (1996). *The IPCC Second Assessment Synthesis of Scientific-Technical Information Relevant to Interpreting Article 2 of the UN Framework Convention on Climate Change*. New York: United Nations Environment Program.

Intergovernmental Panel on Climate Change (IPCC). (2000). Land Use, Land Use Change, and Forestry: Special Report of the IPCC. R. T. Watson, I. R. Noble, B. Bolin, N. H. Ravindranath, D. J. Verardo and D. J. Dokken. Cambridge, UK: Cambridge University Press.

Interlaboratory Working Group on Energy-Efficient and Low-Carbon Technologies (IWG). (1997). *Scenarios of U.S. Carbon Reductions: Potential Impacts or Energy Technologies by 2010 and Beyond*. Washington, DC: United States Department of Energy.

Interlaboratory Working Group on Energy-Efficient and Low-Carbon Technologies (IWG). (2001). *Scenarios of U.S. Carbon Reductions: Potential Impacts or Energy Technologies by 2010 and Beyond*. Washington, DC: United States Department of Energy.

Kopp, R. J., and Anderson, J. W. (1998). *Estimating the Costs of Kyoto: How Plausible are the Clinton Adminstration's Figures?* Washington, DC: Resources for the Future.

Kyoto Protocol to the United Nations Framework Convention on Climate Change. (1997). from http://unfccc.int/resource/docs/convkp/kpeng.html

Marland, G., Boden, T., and J, A. R. (2001). *National CO_2 Emissions from Fossil-Fuel Burning, Cement Manufacture, and Gas Flaring: 1751 - 1998*. Oak Ridge, TN: Oak Ridge National Laboratory. from http://cdiac.esd.ornl.gov/ftp/ndp030/nation98ems.htm

Meyer, A. (2000). *Contraction and Convergence: The Global Solution to Climate Change*. Foxhole: UK: Green Books for the Schumacher Society.
Nordhaus, W. D. (2001). Global Warming Economics. *Science, 294*(November, 2001)
Ott, H. (2002). *Climate Policy after the Marrakesh Accords: From Legislation to Implementation*. Wuppertal, Germany: Wuppertal Institute for Climate, Environment, and Energy. from http://www.wupperinst.org/download/ott-after-marrakesh.pdf
Pearce, F. (1998). Playing Dirty in Kyoto. *New Scientist, 157*, 48
Reuters News Service. (2002, August 30). Tuvalu Seeks Help in U.S. Global Warming Suit. from http://www.planetark.org/dailynewsstory.cfm/newsid/17514/story.htm
U.S. Energy Information Administration (EIA). (2001). *Annual Energy Outlook 2001*. Washington, DC: United States Department of Energy (DOE). from http://tonto.eia.gov/ftproot/forecasting/0383(2001).pdf
United Nations Framework Convention on Climate Change (UNFCCC). (2002). *Report of the Conference of the Parties on its Seventh Sessions, Held at Marrakesh 29 October to 10 November 2001: FCCC/CP/2001/13/Add.1, Add. 2 and Add 3.*
Wiser, G. (2002). *Kyoto Protocol Packs a Powerful Compliance Punch*. Washington, DC: The Bureau of National Affairs, Inc. from http://www.ciel.org/publications/inter_compliance.pdf
World Resources Institute (WRI). (2000). *Earth Trends: The Environmental Information Portal, Demographic Indicators*, from http://earthtrends.wri.org/pdf_library/data_tables/hd1n_2000.pdf