ECOLOGICAL JUSTICE IN THE GREENHOUSE

A POSITION PAPER PRESENTED AT THE
SIXTH SESSION OF THE UNFCCC
CONFERENCE OF THE PARTIES
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NOVEMBER 13-24, 2000

WEBSITE: WWW.UDEL.EDU/CEEP

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Introduction

To date, the international community's response to the problem of global climate change has been preoccupied with concerns of markets, profit and efficiency, rather than social and environmental justice. The absence of explicit operational commitments to justice in international efforts to realize a stable future particularly clouds any possibility of global support for the fledging market-based management approaches that were created in the Kyoto Protocol in 1997 to implement the Framework Convention on Climate Change (FCCC). Because the Kyoto market mechanisms aim to transform the atmosphere from a commons resource, where it is available to all in perpetuity, into private property, the social and ecological implications of global negotiations cannot be ignored. Our assessment of the impacts of an atmospheric property system on social and environmental justice lead us to reject proposed market-based strategies and to support, instead, an equity- and sustainability-based policy response to the prospect of climate change.

Our assessment focuses on four treaty issues: 1.) proposals for market-based policies that would allow Annex I countries to trade away their responsibilities for reducing greenhouse gas (GHG) emissions; 2.) the marginalization of island concerns despite the fact that islands are the most vulnerable ecosystems and communities to climate change; 3.) efforts to substitute sequestered carbon for avoided carbon emissions as a means of meeting GHG reduction obligations among Annex I members; and 4.) initiatives calling for inclusion of nuclear power as a GHG mitigation option. We regard current proposals for emission trading, joint implementation and 'clean development' to be examples of *airy politics* in which Annex I profit concerns are allowed to override the need for real and lasting reductions in GHG releases. The failure of current negotiations to include an explicit 'island impacts' assessment standard is seen by CEEP as a form of *international triage* in which island futures are literally put at risk in order to protect the economic interests of Annex I countries. Strategies advocated since Kyoto for counting the planet's carbon store as a means of reducing Annex I mitigation burdens amounts, in our view, to a *scientific and ecological boondoggle* that seeks to shift the burden of change from society to biology. Finally, calls for the use of nuclear power as a GHG mitigation alternative are characterized as *oxymoronic policy* that will mean little for cutting GHG emissions but would greatly expand the threat of radioactive colonialism.

We argue that international negotiations have lost sight of the basic questions of justice that gave rise to decisions to initiate the FCCC. It is proposed not only that matters of justice need to be reasserted in international climate politics, but that operational principles of ecological justice are required if we are to realize a sustainable and equitable climate future.

Airy Politics: Turning the Atmosphere into a Commodity

International efforts to address the prospect of climate change are currently centered on the development of a new market system for accessing the atmosphere as a carbon storage facility. If realized, this market system will establish a new n*ature-society regime* which will govern human and non-human futures alike in profound ways (including some we surely cannot now fully grasp).

The Kyoto Protocol (hammered out in December 1997 at COP-3), sets binding reduction targets for Annex I nations (the countries of North America and Europe, and Japan, Australia and New Zealand). As a group, Annex I countries are to reduce their collective greenhouse gas emissions 5% below 1990 levels. This collective reduction is to be achieved between the years 2008 and 2012. Such a cut amounts to only a small contribution towards the 60% reduction estimated by the UN-sponsored Intergovernmental Panel on Climate Change (hereinafter referred to as IPCC) as needed to stabilize atmospheric concentrations of greenhouse gases (IPCC, 1992 and 1996). To meet this modest target, negotiators at Kyoto promulgated broad rules for the use of emissions trading and joint implementation of projects among Annex I countries that would purportedly lower the costs of meeting the Protocol's mitigation goals. Negotiators also fashioned a 'clean development' mechanism (CDM) intended to attract developing country partners for Annex I efforts to lower GHG emissions.

At COP-4 in Buenos Aries and COP-5 in Bonn, great attention was given to these instruments (called "flexibility mechanisms" in the Kyoto Protocol). This effort was partially in response to the failures of most developed nations in the initial round to effectively lower emissions by voluntary measures. These meetings mainly focused on realizing low-cost abatement options by allowing wealthy nations in the Annex I group to trade with Eastern European and other less well-off members for the opportunity to slow emissions growth among the latter (through technology transfer) in lieu of cutting their own.

To accomplish its low-cost objective, the Protocol requires the creation of an institutional framework for treating GHG emissions as commodities and it creates a property rights system for access to the atmosphere. This emerging system contains design features contributed by science, governments, and industries that operate increasingly at the global scale. Each of these interests has its own peculiarities and entry points into the climate change debate. Importantly, though, the three interests have evolved to embrace a consensus about the problem and its resolution. Consensus managers, drawn from each sector, speak on behalf of and work to protect the broad agreements reached so far to establish an atmospheric commodity exchange. In brief; this consensus includes the recognition of climate change as a complex physical phenomenon for which sustained scientific investigation is needed. However, enough evidence is believed to exist that warrants global discussion of response strategies. At this stage, the consensus managers are promoting the view that policy should aim to manage emission changes in a cost-effective manner with modest, practical goals used to build democratic support.

A precautionary philosophy is promoted in which science and industry work with nation-states in a democratic forum to reduce global risk in a rational, measured manner.[1] The achievement of sensible results hinges upon the enactment and implementation of a policy which

[1] Article 3 of the UN Framework Convention states that the nation-state signatories shall be guided by, among other things, precautionary measures to"...anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects." Such a precautionary philosophy means that where there are serious threats, that "... lack of full scientific certainty should not be used as a reason for postponing such measures..." Linked to such a directive is the requirement of an international management regime run by participating nation states.

allows industries and individual states the flexibility to search for practical solutions through market-style trading mechanisms. If designed properly, leaders of the science-government-industry consensus believe that global policy can constitute the atmosphere as a well-managed environmental property sustained in the interest of present and future generations, an idea broadly consistent with the environment-development consensus promoted by the Brundtland Commission.[2]

But the likely outcome of Kyoto-style flexibility almost certainly will differ from the portrait of rationality and practicality pedaled by its promoters.

What will be an 'efficient' trade under the Kyoto Protocol? The emission caps set in Kyoto for Russia and the Ukraine call for carbon dioxide emissions in 2008-2012 that are equivalent to each country's 1990 level. However, as a consequence of economic implosion on the way to their respective capitalist transitions, neither country is expected to realize 1990 emission levels by 2008-2012, even under generous business-as-usual forecasts. This is because Russia's emissions are currently 33% below their 1990 level, and Ukraine's are 56% lower. Thus, a money maker that allows 'efficient' compliance with the Kyoto Protocol will be technology transfers to Russia and Ukraine that enable them to increase their emissions by, say, 32% and 55%, respectively while permitting another Annex I country (or two, or three, or four) to increase their emissions ... but slowly. And everyone makes money.

The U.S. is counting on trading with former Soviet bloc countries to meet as much as 56% of its Kyoto commitments (see Kopp and Anderson, 1998). Through such atmospheric trades, together with other 'flexibility' measures, there is the arresting prospect that the U.S. may be able to meet its Kyoto obligation of a 7% reduction in carbon dioxide emissions from 1990 levels by *actually increasing* its carbon emissions by 12-16% (Pearce, 1997:10; and Flavin and Dunn, 1998). The purchase of so-called 'hot air' allowances, or allowances from other nations that are not accompanied by meaningful long-term domestic carbon reduction measures, has the merit of profit, if not environmental sustainability. Relying on purchased allowances also reduces the impetus for significant technological change in Annex I countries, thereby sheltering their populations from the inconveniences of 'inefficient' reductions of carbon dioxide. In effect, emissions trading allows carbon dioxide emissions growth for countries that can afford to pay for permits and relies on those who cannot to bear the de facto burden of cleaning up much of the mess.

The Kyoto Protocol also authorizes joint implementation projects among Annex I countries (Article 6). Under this policy, countries may receive 'credits' toward meeting their targets through project-based emission reductions or sink expansions (i.e. reforestation) in other countries. The private sector will lead in the execution of this mechanism.

It is not obvious how joint implementation, as defined in the Kyoto Protocol, can serve the goal of sustainability since it will only offset one Annex I country's increased emissions with

[2] See *Our Common Future*, the 1987 report of the World Commission on Environment and Development often referred to as the Brundtland Commission, after its chairperson, then Norwegian Minister of Environment Gro Brundtland.

another's reduced emissions (for example, the U. S. counts the sink value of a forest it plants in Eastern Europe in order to offset its own emission growth). With Annex I nations responsible for nearly two-thirds of cumulative carbon dioxide emissions since 1950, and with the need to reduce world carbon dioxide emissions to 60% of 1990 levels to achieve climate stability, a program of emission offsets hardly seems responsive to the magnitude of the problem at hand.

Joint implementation can hardly be welcomed as a tool of sustainability, when, after all, it is a method of issuing licenses to wealthy countries which allows them to live beyond the planet's carrying capacity. Yet, its efficiency as an economic tool cannot be in doubt. Who better to hire to manage Eastern Europe's dwindling forests, for example, than those with the most advanced forest industries? Companies that decimated Northern forests over the past century have recently learned how to maximize the value of a forest without unvarnished clear-cutting. This know-how, when applied, can now 'efficiently' add to the stock of economic wealth and, thereby, assist the human species in consuming well beyond ecological limits. By observing the operations of corporate forestry, it is hoped by joint implementation's advocates that the less efficient in Annex I will realize their past mistakes, correct them, and become partners in the quest for efficiency (a.k.a. profitability). The effect of these transactions on atmospheric concentrations of GHGs appears, at most, an afterthought to the pursuit of earnings.

Then, there is the boldest policy initiative in the Kyoto Protocol. The 'clean development' mechanism is promoted in the Protocol as a means for North-South cooperation in lowering greenhouse gas releases. It will allow industrialized countries to earn credit for carbon reduction activities in developing countries. The rationale of the mechanism is that developed countries will be able to reduce emissions at lower cost through projects in developing countries than they could at home, while developing countries will be able to receive the kind of technology that can allow them to grow more sustainably (see Article 12 of the Protocol). Importantly, certified emission reductions under CDM are scheduled to begin in the year 2000 and will count toward compliance with the first budget period of 2008-2012.

One problem with this approach is the type of technology transfer that might ensue. Limiting the opportunities for transfer of appropriate technology to those that are profitable to Northern suppliers — which is what CDM facilitates — vests the incentive for technology transfer in the developed nations' economic strategies to 'reduce' emissions. Meeting developing nations' needs for technology would require transfers that are responsive to *their* circumstances, yet CDM may often accomplish the opposite, shaping such transfers to meet the circumstances of Northern exporters, despite the best efforts of governments in recipient countries.

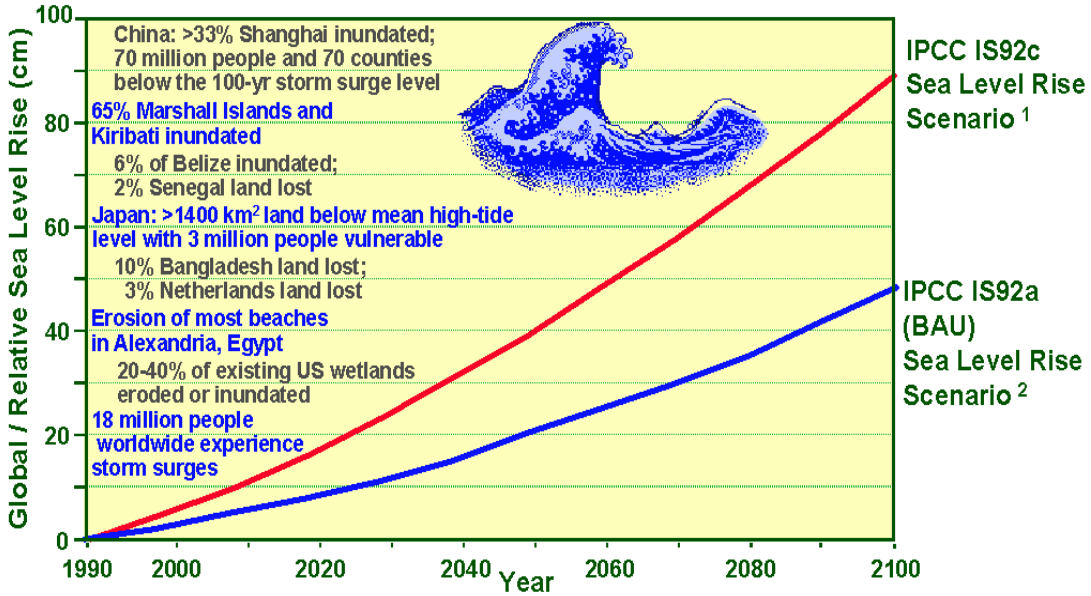
For those focused on the chemistry of the atmosphere, rather than money, CDM raises the troubling possibility of phantom emission reductions: essentially, it is in the interest of firms and project managers in developing countries to forecast really big increases in carbon dioxide emissions, unless CDM funds compensate them; then, the market efficiently substitutes present-tense emissions growth in Annex I countries for future-tense emission reductions in developing countries. That is, emissions that actually exist are counted as not existing; and those that don't exist ... well, they too are counted as not existing. Add these together and, in the brave new world of CDM, you learn that carbon dioxide emissions decline, even when they haven't.

As the above review should suggest, there are serious social and ecological flaws in current proposals for the development of emission markets to avert climate change. While some approaches under consideration would clearly be better (or worse) for the environment and society than others, a fundamental objection to primary reliance on an emissions trading regime exists: it cannot deliver the scale of change and timeliness of action required for climate stability and it could deepen global inequality.

Ecological Triage: Gambling with the Future of Islands

The IPCC IS92 scenarios for projected sea level rise and their impacts on selected coasts and islands worldwide, as well as sea level rise resulting from stabilization of CO_2 emissions at 450 parts per million (ppm), are depicted in Figure 1. At a 20 cm rise, 18 million additional people worldwide will experience yearly storm surges, and at an 80 cm rise in sea level, 65% of the Marshall Islands and Kiribati will be inundated. It is estimated that a 100 cm rise in sea level could inundate 70 percent of the landmass of the Seychelles (UN/DPI, 1999). The implications for coastal land loss under these scenarios are severe. Further, UN releases from the 1999 Special Session on Small Islands note that there have already been reports of extensive coastal erosion on many islands. The South Pacific Regional Environmental Programme (SPREP), for example, indicates that rising sea levels have already swamped several small islets in Kiribati and Tuvalu, destroyed coastal roads and bridges, and caused traditional burial places to collapse into the ocean.

Figure 1
Impacts of Climate Change-Induced Sea Level Rise on Selected Coasts and Islands Worldwide



Notes: [1] IS92c assumes high climate sensitivity parameters.
[2] IS92a assumes medium climate sensitivity parameters.
Source: Gaffin, 1999, Environmental Defense Fund.

For islands, coastal land loss or damage raises a host of concerns. Island populations are concentrated along coastal zones. Their tourism industries are typically coastally based, and likewise most of their physical and economic infrastructure is concentrated in coastal zones. These factors, along with the coastal concentration of industrial infrastructure, dependence on fisheries and other coastal resources, the potential loss of marine resources which island countries have yet to develop, the potential loss of agricultural land and other impacts related to salt water intrusion, are all likely to have severe economic, social and cultural repercussions for island communities. The looming possibility of more frequent and intense storms further exacerbates the problem.

Despite substantial risks to their survival, island countries can have little impact on CO_2 emissions, since their per capita emissions are small compared to other countries. The average 1996 per capita emissions for 32 island states and territories that are members of the Alliance of Small Island States was 0.9 metric tons of CO_2 equivalent (see ORNL, 1999). By contrast, most developed countries exceed 6 tons of CO_2 per capita, with the US in excess of 19 tons per capita.

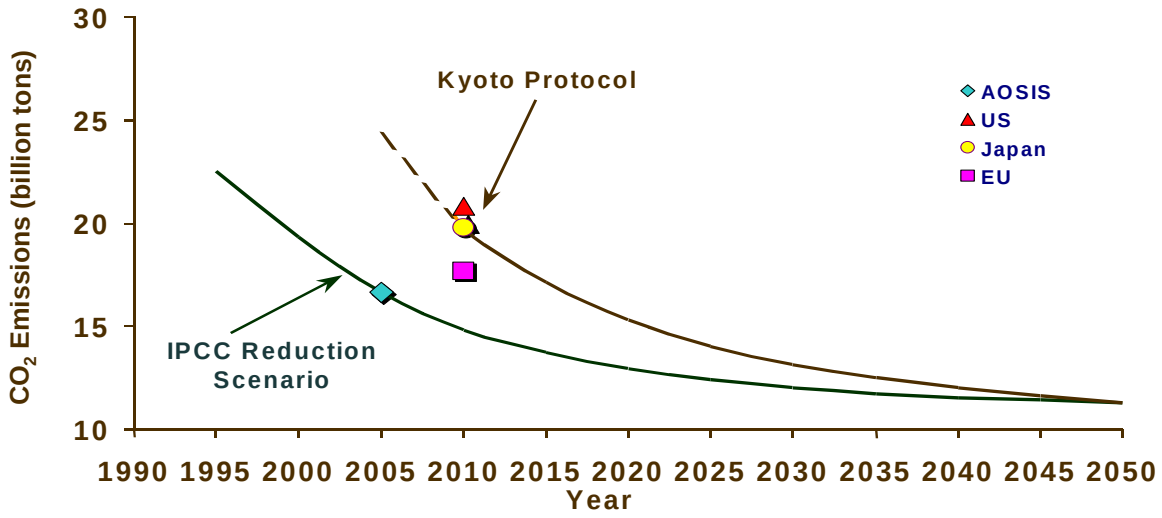
Given this backdrop, and considering the need for significant cuts in emissions stipulated by the IPCC (1992, 1996), island countries in the UN process have consistently kept equity and sustainability concerns central to the negotiating positions they have taken. The draft protocol submitted by the Alliance of Small island States (AOSIS) to the first Conference of the Parties sought to require industrialized country Parties to reduce their emissions of CO_2 by 20% by 2005, and to establish a process for adding targets and timetables for the reduction of emissions of other greenhouse gases (UNFCCC/CP/1995/7: 22). This was based on the Toronto Targets called for at the 1988 meeting of scientific experts and ministers of government. In the scramble to privatize the global atmospheric commons and establish a market-based management system, however, initial support for such strong measures waned. Labeled “unrealistic and unachievable,” the proposal was set aside in favor of the much reduced, politically and economically expedient target of a 5% reduction in emissions from 1990 levels by 2008-2012 (Figure 2).

The Kyoto target is based on the principle of economic efficiency rather than sustainability. This global least-cost strategy, determined by the use of cost-benefit analysis of policy options among wealthy countries, will direct actions on emission trades that are cheap to buyers (principally the wealthy OECD countries) and easily managed in national portfolios. Participation in the Kyoto mechanisms will depend largely on the comparative advantage of states to trade emissions or, in the case of joint implementation and CDM, to attract foreign investments for environmentally benign projects. This almost certainly will favor partnerships with large, continental nations who have the infrastructure and bioresources that are well suited to embrace the technological and economic strategies of the OECD. By contrast, island states offer very small-scale emissions reduction projects, often with special technical and economic needs.

With the earth's atmosphere having been placed on the global market place, island countries will have to jostle with the rest of the world if they expect not merely to participate, but to negotiate terms of participation that are to their advantage. These mechanisms may constitute the best pathway to accessing much- needed funds for adaptation to climate change. This is

doubly ironic. First, island states will be forced to hustle for the opportunity to reduce their emissions cheaply, even though their releases did not cause the problem. Second, precisely because their emissions are small, they will be unattractive candidates for trading. With regard to the latter point, the latest synthesis report on Activities Implemented Jointly (AIJ) already has signaled the existence of a project distribution problem. The report reveals that of a total of 122 projects, funded by 11 investor Parties in 33 host countries (including 22 non-Annex I Parties), two-thirds of the projects are conducted between wealthy OECD countries and Economies in Transition (EITs); 54 projects took place in just 3 EITs, 5 in Africa, and only four AOSIS countries are involved in AIJ activities (Foundation for International Environmental Law, 1999). Thus, in taking the decision to continue the AIJ pilot phase, COP-5 requested that "such continuation should address the issue of geographic imbalance, in particular the lack of projects in Africa and small island states" (Decision 13/CP.5).

Figure 2
Climate Change Negotiating Positions



Island countries must also struggle with the problem of ensuring that the Kyoto measures are used in a manner that is consistent with the objective of reducing GHG emissions. In the case of AIJ, there are still methodological problems regarding the determination of baselines, additionally, the assessment of benefits and procedures for technology transfer. Island countries need to guard against efforts to conclude the pilot phase before these problems are resolved, and to ensure that AIJ projects are not transferred to full joint implementation (JI) projects if they do not actually meet the aim of reducing emissions. This poses a difficult enforcement problem, technically and politically, on which AOSIS must expend a great deal of energy, even though there is likely to be little financial gain to its members even if monitoring is successful.

The clearest indicator of the quandary of small islands is the disturbing upward trend in Annex I emissions. The UNFCCC Secretariat has reported, based on national communications

from Parties, that GHG emissions (excluding land use change and forestry) increased in 1996 compared to 1995 levels for all reporting Parties, and that the increase in emissions for the period 1995-1996 was larger than the average annual increase in emissions over the period 1990-1995. It was also noted that inclusion of the land use, land use change and forestry (LULUCF) sector does not alter the increasing trend in emissions (UNFCCC Secretariat, 1999).

In brief, the Kyoto framework may represent a significant barrier to island sustainability. The framework is shaped by continental interests who, because of their comparatively lesser vulnerability (especially those of North America, Europe and Australia), can "go slow" (Nordhaus, 1991) and are able to consider adaptation strategies that are simply not available to small islands. In a reverse of the more typical triage strategy, those at greatest risk are being left to fend for themselves, while continental states are provided 'flexibility' in order to protect their self-interest (Byrne and Inniss, 2000).

A Greenhouse Boondoggle: Carbon Sequestration

Besides emissions trading, J1 and CDM—all of which represent efforts to find least-cost technology strategies to meet the Kyoto targets, land use patterns and activities are also being considered as possible sources of credits for Annex I members in lieu of cutting their own emissions. The Kyoto Protocol allows human-induced sequestration undertaken since 1990 as a way to meet binding greenhouse emission rates. Article 3 of Protocol focuses on net changes in GHG emissions as a result of human-induced land-use change and forestry activities. The activities it considers are afforestation, reforestation and deforestation. Only verifiable post-1990 activities will be counted.

Young, fast growing trees are a favored means of expanding sequestration capacity because they have a small stock but large flux. Old growth forests have little carbon flux and a large carbon stock. The amount of carbon sequestered in long-lived wood products is also increasing. As well, timber harvests can be accompanied with reforestation which sequesters carbon (although second growth forests may not store as much carbon as their old growth counterparts). Globally, tropical forests are on the decrease while boreal, temperate forests are increasing. Significantly expanded human intervention in the determination of types of forest cover and the presumption that global management should decide worldwide species selection, harvest rates, re-growth rates, etc., alarm many environmentalists and scientists, and may represent a new threat to indigenous peoples as their forests may be found to be an inefficient form of land cover in the global greenhouse.

As atmospheric concentrations of carbon dioxide increase, a 'fertilization' effect could boost overall plant growth. However, such increases will vary greatly between species and locations. Despite considerable research into plant response to elevated concentrations of atmospheric carbon dioxide, many uncertainties remain, especially in the translation of laboratory results to the field. High rates of increased growth found in some experiments are highly unlikely to be replicated in real conditions, where water, nutrients, competition and other factors will counteract atmospheric fertilization effects. Accordingly, forecasts of global sequestration rates contain uncertainties and represent the aggregation of a wide range of variables.

By contrast, estimates of energy consumption are standardized. Most national accounting systems fairly readily measure fossil fuel consumption. Purchase, sale and use of fossil fuel is monitored and regulated with a high degree of accuracy in Annex 1 nations. Commodity trades are institutionalized in a manner that allows for a fair degree of scrutiny, as required to make national greenhouse gas accounting accountable. Assessment of vegetative coverage and growth rates presents an inherently more difficult challenge to those who would measure and independently forecast its national and international contents.

One factor that diminishes the attractiveness of large-scale reforestation for sequestration purposes is its ecological, as well as financial uncertainties. Carbon sequestered carefully over decades or longer in forests can be released in moments through forest fire, pestilence, and other disturbances, dissipating the stored carbon. Climate change impacts on weather systems could also reduce forest growth in some areas, lowering actual sequestration rates over those forecasted by experts. Whereas reductions in fossil fuel use are permanent; sequestration is temporary.

An implication of the loss of sequestered carbon from lighting strikes or other unpredictable events that forms part of an 'emissions trade' is that the 'offset' for the greenhouse gas emissions is lost without corresponding diminution in emissions. In the case of fire, a portion of the combusted forest material will enter the atmosphere as carbon dioxide. If accidents occur in managed forests, atmospheric concentrations of greenhouse gases inevitably rise, defeating the rationale of the trading policy. Accordingly, the inclusion of national vegetative sequestration in an accounting of the global carbon balance and for 'trading' purposes under the FCCC will be highly dependent on the state of science. Yet inescapable scientific uncertainty over sequestration has the potential to undermine the goal of sustainability and the efforts to attain it through these approaches.

The issues raised by sequestration credits extend beyond the scientific, accounting and ecological problems created by efforts to manage carbon storage. The principle of equity in the FCCC is articulated in several areas, including it its commitment to common but differentiated responsibility for the mitigation of global climate change, and in the polluter-pays principle. Carbon sequestration as an additional policy option under the Convention challenges the stated commitment to global equity by presuming anthropocentric control of nature by some countries with respect to the carbon cycle and by encouraging the use of sequestration as a substitute for changed patterns of behavior with regard to production and consumption.

Carbon sequestration by means of land-use, land-use change and forestry (LULUCF) is poised for cooptation by those countries with the institutional, technological and economic resources needed to invest in this option. Annex I members have significant advantages in preparing forecasts of national sink capacity (including the capacities of other nations' sinks) and developing seedlings and nutrient support for engineered forests.

Further, these countries will have the advantage of being able to claim credits for what are essentially management activities not necessarily implemented in response to the problem of

global climate change. Under Article 3.3 of the UNFCCC as it is now formulated, developed countries can take credit for sink accumulations resulting from routine measures taken to correct domestic problems of tree removal. A recently completed US study, for example, has concluded that improved forest management practices, the regeneration of previously cleared forest areas, and modified timber harvesting have resulted in an increase in the annual net uptake of carbon between 1990 and 1997 (US EPA, 1999). Thus, a study may provide the US with the opportunity to take credit for expanded domestic sinks unrelated to climate change.

The use of carbon sequestration as a climate change policy option continues to evade and postpone addressing the IPCC conclusion that a 60% reduction in emissions from 1990 levels is needed to achieve climate stability. It is a policy option that fails to deal directly with the problem of reducing per capita emissions of carbon dioxide to the atmosphere, but rather, allows high energy-consuming and high carbon-emitting countries to continue the behavioral patterns within their national borders that created the problem in the first place.

The successful commodification of forests by industrialized society, made possible through technological manipulation, lays bare the ecologically unjust foundations of modernity. Carbon sequestration serves to exacerbate the problem because of the risk of unintended and unforeseeable consequences of technological manipulation. Specifically, human efforts to divide and manage the carbon cycle, as sequestration through LULUCF practices would inevitably entail, would disregard the right of all living things to the biosphere. Monoculture plantations of trees which rapidly sequester carbon present an attractive, cost-effective option to countries anxious to expand their carbon absorptive capacity quickly. Such an option, however, increases the species' susceptibility to disease and reduces global biodiversity.

Conversion of carbon sequestration into a commodity and its subsequent marketization sets in train those market operations that will lead to future accumulations and deprivations of wealth, clearly to the disadvantage of those nations whose exposure to the efficiencies of the market results in wealth diminution. In practice therefore, it is not the trading of carbon that proffers the greatest threat to future generations, but its institutionalization as a system that erodes the need for emissions reduction through the use of sequestration offsets. Operation of this system reduces the rate of emissions abatement, and all other things being equal, will lead to that set of climate change impacts whose effects will be unequally distributed. Such impacts will occur to a greater extent and rate than might have been the case had emissions abatement been more rapid. Because poorer nations have less capacity to deal with future climate change impacts, Annex I members' avoidance of domestic emissions abatement through sequestration can only spell greater iniquity toward the South.

An Ecological Oxymoron: Nuclear Energy as a 'Clean Development Mechanism'

Proponents of nuclear power are currently attempting to have the technology recognized in the FCCC as a means to reduce GHG emissions. Their proposals seek to use climate policy to resurrect an industry that collapsed two decades ago except in a handful of countries. Such efforts come at a time when the prospects for nuclear power continue to worsen in the face of

repeated accidents and environmental problems. Specifically, the industry seeks to have the Kyoto mechanisms include (or, at least, not exclude) nuclear energy projects (especially, CDM and JI).

While the nuclear industry has argued from the outset of the climate change debate that nuclear energy is a CO_2-free energy source, COP-6 represents the first time that it has garnered enough support to put the option on the agenda for negotiation. With Annex I nuclear states—notably, France, the UK and Japan—as well as possible partner countries—such as China, India, and Vietnam—strongly supporting the nuclear option, it is likely to become one of the most important and controversial issues to be debated at COP-6.

Demystifying the 'Climate-Friendly Claims of Nuclear Power'

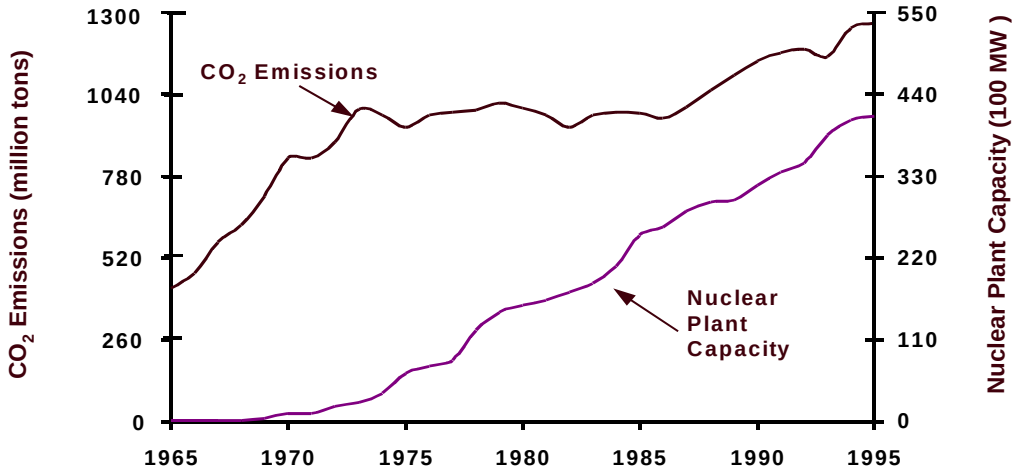
A core process with the newest round of nuclear advocacy is the claim that the technology does not emit CO_2. Unlike other conventional energy sources such as coal, oil, and natural gas, argues nuclear power's advocates, the generation of electricity by nuclear energy plants provides services without increased GHG emissions. Despite heavy publicity from the industry on this score, their claim that nuclear power is 'climate friendly' fails the tests of evidence and logic.

First, nuclear power *does* emit CO_2 during its fuel-cycle—from uranium mining to power plant construction to waste disposal. Full fuel-cycle accounting of CO_2 emissions by nuclear power indicates that 30-40 grams of CO_2 (e) are released per kWh of generated electricity (Oeko, 1997; Serchuk, 2000). The emission rate is expected to increase in the future with the exhaustion of higher grade uranium, because the use of lower grade uranium ores requires proportionately larger quantities of fossil fuels to be combusted during mining and processing operations (Mortimer, 1990). Even at current rates, a nuclear electricity regime would release on a full fuel-cycle basis more CO_2 per kWh than all genuine renewable energy alternatives (including solar cells, wind, small-head hydropower and biogas). A full-purpose energy system providing not only electricity, but also heat and motive power that relies on nuclear power for electricity and oil products for other services would release more CO_2 per unit of energy supplied than one using natural gas cogeneration for electricity and heat, and oil products for motive power.

Second, there is no empirical evidence that increased use of nuclear power has contributed to actually reducing a country's CO_2 emissions. In fact, Takagi (1997) has shown that in Japan—one of the few remaining pro-nuclear states, nuclear power development has coincided with rapid *increases* in national CO_2 emissions (see Figure 3). There are several explanations for Japan's experience. For example, nuclear power is limited to supplying electricity. When non-electrical energy options are better suited to social needs, CO_2 emissions will climb even while the use of nuclear power increases. But there is a fundamental reason why nuclear power almost certainly will not reduce CO_2 emissions overtime. This technology is an expensive source of energy service—casting roughly $2.0-3.0 billion per plant—and can only attain economic viability in an economy that relies on high levels of energy use. Nuclear power tends to require and promote a supply-oriented energy policy and energy-intensive development path. This is because the economics of nuclear power depends upon sustained growth in electricity demand over the 30-year life of the equipment. Energy-intensive societies of the type

consistent with nuclear power development will unavoidably increase fossil fuel use alongside the expanded use of nuclear power.

Figure 3
CO_2 Emissions and Nuclear Power: Japan's Experience



Source: Dr. Jinzaburo Takagi, Citizens' Nuclear Information Center

Third, analysis of the cost effectiveness of various means to reduce GHG emissions also undercuts advocacy of nuclear power in an international CO_2 mitigation strategy. A cost-effectiveness analysis of energy options to reduce CO_2 by Keepin and Kats (1988) showed that each dollar invested in electric efficiency in the U.S. electricity system displaced nearly seven times as much CO_2 as did a dollar invested in nuclear power. This comparison reveals that every 100 dollars invested in nuclear power (instead of energy efficiency) *adds* an additional ton of carbon that could have been avoided (Keepin and Kats 1988).

Fourth, the most tragic consequence of playing the 'nuclear card' to avert global warming is the preemption of genuinely peaceful and ecologically benign options from our energy future. As Amory Lovins pointed out more than 20 years ago (1977), society cannot simultaneously choose so-called hard path technologies, such as nuclear power, and soft path options of energy conservation and renewable energy. The two paths are mutually exclusive and contradictory—one cannot, on the one hand, pursue the politics, economics and technics of large-scale, centralized energy supply systems in which ever-increasing consumption is necessary to keep such systems solvent and, on the other hand, advocate the political, economic, technological, and ecological values of a decentralized, moderate-scale energy system where *less* energy consumption is essential to success.

Nuclear Power and International Inequity

Over the past three decades, nuclear power has gone from a much-touted (and subsidized) conventional energy option to one beset with numerous problems that have led most western

countries to abandon its development. The technology has experienced not only serious environmental problems, but also mounting financial problems (see Goldberg, 2000). Its dismal economic performance has been in evidence especially since utility deregulation in Europe and the US. Indeed, a new category—stranded cost—was created to compensate utilities that invested in nuclear power, but could not sell its generation in an open market. In competitive markets around the world, nuclear power has been found to be an economic liability, and nuclear plants are now being sold at just a fraction of their book value. The dream of nuclear energy being "too cheap to meter" has had to face the reality of other energy sources being "too cheap [for nuclear power] to matter."

In the wake of its Northern economic failure, the nuclear power industry now seeks to reverse its fortunes by promoting the technology in developing countries under the guise of offering a climate-friendly source of electricity. While the nuclear industry may desire to sell nuclear reactors to some developing countries with reduced price tags due to carbon credits, this does not mean that electricity generated by nuclear energy will be economically competitive. According to recent studies, for example, even in several leading developing countries that have already some level of needed infrastructure, nuclear power has proved to be its most expensive electricity supply option (see Table 1).

Table 1
Projected Generation Costs of Conventional Electricity Technologies by Selected Developing Countries

(unit: 1999 US cents/kWh)

	Korea	Argentina	Brazil	Russia	China
Nuclear	5.0	6.4	5.4	4.9	6.1
Coal	4.7	6.0	4.5	5.8	4.3
Gas	4.9	3.3	3.4	4.1	3.7

Sources: International Energy Agency, 1998, *Projected Costs of Generating Electricity*; Pew Center on Global Climate Change, 2000, *Electric Power Options in Argentina*; Battelle Memorial Institute, 1998, *China's Electric Power Options*.

Despite these problems and the dubious claims of advocates regarding CO_2, there is a real possibility that it will not be included as a CDM option. If allowed, nuclear CDM will offer large amounts of carbon credit in single transactions, whereas genuinely climate-friendly and ecologically benign options, such as energy conservation and renewable energy, would typically require numerous transactions to realize the same level of credits. As a result, CDM resources will be skewed towards more industrialized developing countries that have the necessary infrastructure and conditions for nuclear development, leaving many other developing countries short of resources to develop less technology-intensive energy options. Such a pattern, of course, will widen the already existing gap in global resource distribution. Moreover, developing countries that accept nuclear power as a way of attracting Northern investment will inherit among the most toxic and long-lived wastes invented by humankind, bear the risk of nuclear reactor accidents, and become technologically dependent on the North for the operation of their national energy systems.

Supporters of nuclear CDM argue that developing countries should be able to choose the technology, and that excluding its choice violates the sovereign rights of these countries. But including the nuclear option in CDM will erode global democracy. In the view of pro-nuclear groups, global democracy is best achieved by allowing states to negotiate freely for their national interests. What they ignore, however, are conflicts between states and civil societies, where the very contest for democracy exists. Of fundamental importance in this debate is the type of state powers that nuclear industries require for their development. The history of the technology's rise attests to the fact that nuclear power can operate only when the public participation in policy-making is restricted. Precisely because of the dangers involved, nuclear power requires authoritarian systems of social control in order to ensure the security of nuclear facilities, its fuel supply and waste stream (Byrne and Hoffman, 1988 and 1996). Active involvement of civil society in policy making is antithetical to these needs, and it is why no nation-state in 45 years has permitted local governance of the technology on any matters ranging from siting approval to issuing of operating licenses.

It is difficult to imagine how a technology with the risks and security implications that accompany the use of nuclear power could avoid producing domestic social injustice. From the mining of uranium to the siting and operation of nuclear power plants, to the disposal of nuclear wastes, there are inherent questions of how to allocate risks and dangers among citizens. To date, one of the most effective means of deciding these risks is to allow those who may be harmed to have a significant role in weighing alternatives. However, with civil society uniformly denied the power to render such decisions, social justice would appear to be an inherent result of nuclear power development. These are myriad of studies in the US—home to the largest number of operating nuclear reactors—that document patterns of environmental injustice in the development and use of this technology (see, e.g., Gilles, 1996; Byrne et al, 1992; and Churchill and LaDuke, 1986).

The effort by the previous Taiwan government to export nuclear waste to North Korea exemplifies the possibilities for international injustice inherent in nuclear power. The indigenous population of Orchid Island, an island government by Taiwan, revealed to the world the serious health impacts caused by the operation of a nuclear waste facility there and rejected further burial of Taiwan's nuclear wastes on their island. In response, the Taiwan government secretly negotiated with North Korea to accept their nuclear wastes. While this effort was stalled by international protests (at least for now), it clearly illustrates a likely pattern for addressing the waste problems—putting the poorest of the poor at environmental risk to serve the growth aims of other countries and allow the wealthiest nations to evade obligations to alter their own production and consumption appetites.

Ecological risks loom even more broadly. When the lid blew off the Chernobyl No. 4 plant, a dozen nations were subjected to radioactive fallout across an area the size of Western Europe. Expansion of the nuclear power regime means, as its own advocates agree (see, e.g., Weinberg, 1972 and 1985), that the probability of significant accidents will increase. The catastrophe-scale potential of nuclear accidents for ecosystems elevates the rising probability of accidents to a serious concern for those seeking to address climate change. With greater use of nuclear power raising the prospect of ecological disasters, there can be little logic in proposing to avert one ecological crisis by propelling another into our future.

Even without accidents, greater use of nuclear power *also* amplifies ecological risk. Upon decommissioning, all nuclear plants become radioactive waste sites that must be dismantled and sequestered from human or biological contact for 2,000-25,000 years (Byrne and Hoffman, 1996). Thus, nuclear CDM will shift to future generations a range of ecological risks even in the implausible scenario of accident-free operation of these plants.

In sum, ecological injustice is a necessary accompaniment of widened use of nuclear power. Third world countries will become the dumping ground for a failed technology that nearly all western societies long ago rejected. Nuclear CDM would serve to shift the burden of climate justice from those who caused the problem to those who are at greatest risk. It will breed a predatory pattern of social exploitation in which developing countries take on the risks of nuclear accidents to allow Annex I states to avoid changes in domestic production and consumption. At the same time, developing countries may be enticed to prey upon their poorest members by negotiating nuclear waste-for-cash swaps, such as Taiwan has sought to do with North Korea. In all of these transactions, an operational commitment to ecological justice is stunningly absent.

Indeed, it would appear that nuclear industry is the *only* thing that nuclear CDM can save. Expanded use of this technology cannot correct climate injustice; instead it will prolong and fortify the current political economy based on overexploitation of nature, globally inequality, a state-corporate alliance that disempowers civil society, and catastrophe-scale ecological risks. To avert global warming, a new political economy is needed in which people can live in balance with nature, guided by democratic and ecological principles of justice. Nuclear power has no future along such a new path.

Living in the Greenhouse: Sustainability and Equity

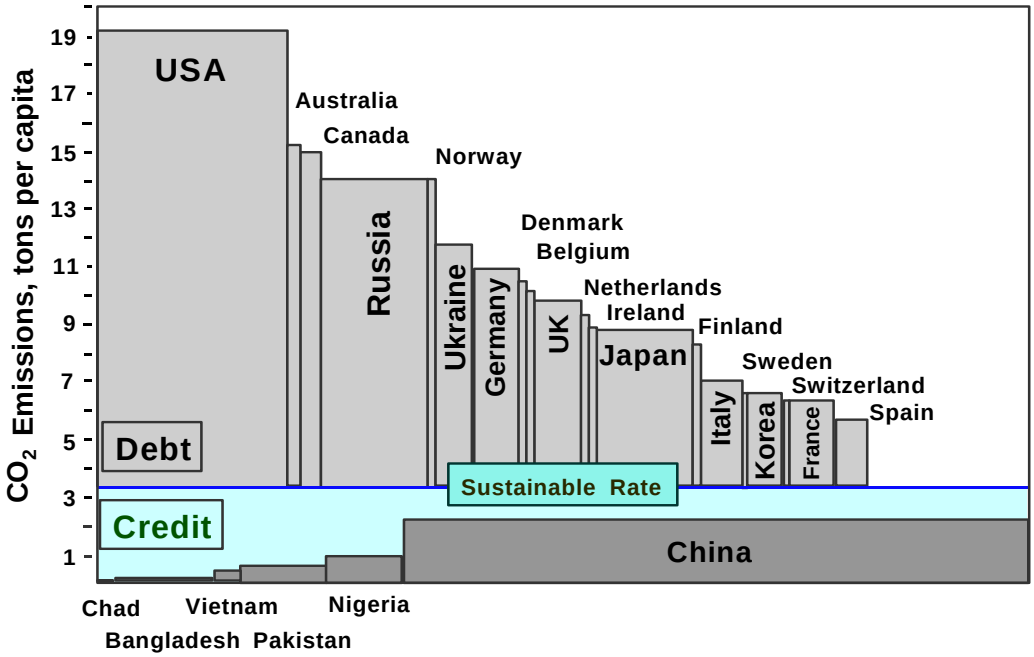
From the extensive efforts to substitute profit and efficiency for ecological justice in writing the implementation rules of the FCCC, one might think that the problem lies in operationalizing a just response to climate change. Such a supposition is false. There have been repeated efforts by many organizations—ranging from the Center for Science and Environment (India) to the Alliance of Small Island States, the Global Commons Institute (UK) and the World Wildlife Fund (US)—to offer practical strategies and standards to promote climate justice. Since 1998, CEEP has elaborated one approach to operationalizing both sustainability and equity in setting a global emission target (Byrne et al, 1998). A GHG reduction target for the year 2050 is set by CEEP at the level indicated by the IPCC for climate stability.[3] The resulting volume of allowable emissions is then divided by the 1990 world population to establish a per capita allowance of greenhouse gas emissions of approximately 3.3 tons of carbon dioxide equivalent per capita per year. This proposal abides by the democratic principle that no human being is

[3] The IPCC (1990 and 1996) has commented at length on the uncertainties involved in measuring precisely the global carbon sink. But its 60% reduction target for greenhouse gas releases is widely accepted as a reasonable benchmark for defining a climate-stable circumstance in which little additional anthropogenic forcing of climate change would be evident. Thus, the IPCC reduction target provides a practical basis for measuring the global carbon sink for a sustainability-minded climate policy.

entitled to greater access to our atmospheric commons. It embodies the ecological principle that the human community has an obligation to conduct its activities within the regenerative capacities of the lifeworld (Shiva, 1994).

This rate can be used to establish the environmental 'debt' or 'credit' position of each country with respect to climate change by simply multiplying it by a nation's population. While it does not fully reflect the cumulative effects of emissions from different societies,[4] this approach furnishes a useable portrait of national responsibility for the climate change problem. Annex I nations are shown to be responsible for overusing the atmosphere as a sink, and national and independent forecasts suggest that these nations can be expected to continue to be environmental debtors well into the 21st century. A climate-sensitive response from this bloc would mean lowering domestic emissions from, for example, the nearly 20 tons of carbon dioxide equivalent per person in the U.S. to a 3.3 ton sustainable and equitable emission rate by 2050.

Figure 4: CO_2 Emissions per Capita for Selected Countries



Note: Width of a block represents a country's proportion of world population in 1990.

Source: Data from World Resource Institute et al. 1998. *World Resources 1998-99* (and earlier volumes). NY: Oxford University Press.

To borrow the 50 years anticipated in CEEP's strategy to retire the debt, Annex I members would make payments to an international fund for use by Southern countries in their efforts to build sustainable development paths of their own, while the North rehabilitates its currently unsustainable tendencies. Payment rates would be set at the cost of avoiding a ton of

[4] Measuring historical emissions is a difficult matter.

carbon dioxide emissions through, for example, the adoption of higher efficiency technologies and lowering resource consumption overall. This should provide the business community with ample incentives—which they have felt were lacking until now in climate policy—to address the problem. For those countries that are able to offer reductions below the 3.3 ton rate, trades to other Annex I members may be appropriate. But at no time could implementation strategies offer the wealthy states an opportunity to evade social and ecological responsibility. CEEP estimates that annual contributions by Annex I nations to this 'Green Fund' would average $9.0 billion initially and, over 50 years, would collect $100-120 billion (Byrne et al, 1998).

This approach comes under the general heading of 'contraction and convergence.' Essentially, such approaches envisage a global system in which developed nations lower their emissions to a specific level, while developing nations are allowed to increase their emissions to that same level, over a specified period. Population growth is incorporated into this per capita approach, otherwise it can be argued that growing nations would enjoy an advantage over those with stable populations. Setting the population level under the scheme to an agreed reference year (1990) for all nations means that each country has a fixed emission allotment. After 1990, any national population increases will work to the disadvantage of a nation, as this would decrease its effective per capita allowance. With such a reference year system, the per capita approach ensures long-run equity.

Critical to the effectiveness of any global system is protecting against nations lowering their emissions simply by shifting key high-emission industries to another country. Industry relocation from the developed to the developing world has been underway for many years. Until recently, identical relocation was prompted by such factors as the search for cheap labor and lower environmental standards, but now the intention to shift greenhouse gas emissions may also become an influential factor. Clearly, the emerging international system must control national activity to reduce emissions in this manner, a problem known in climate change policy jargon as 'leakage.' This problem does not occur in the scheme advocated here, because emissions are calculated at the 1990 level, so that subsequent trades cannot alter the emissions baseline.

Such an exercise of environmental and social justice, rather than pecuniary interest, is instructive on several counts. First, it promises to actually reduce carbon dioxide emissions, not an inconsiderable achievement given the track record of the negotiations to date. Moreover, the outlined strategy offers a realistic hope that the risk of human-induced climate change might be removed by the middle of the next century, again no small triumph when compared to current policy directions. Third, it addresses the need for global democracy that the existing international climate change regime has effectively precluded because of its preference for profit and efficiency. Finally, such a strategy promises to take seriously the need for an ecologically just path to sustainability. Indeed, evaluated against the existing strategy being negotiated through the COP process, the principal failure of the approach is only that it will not make money for those who fail to cut carbon dioxide emissions.

Conclusion

The Annex I bloc may manage to capture the atmospheric commons as though it was a line of products available for sale. Indeed, UN-organized negotiations may effect an enclosure

of a global commons under the management of Annex I shopkeepers. In this event, literally the air and weather—undeniably elements of the *lifeworld* of all species—will be commandeered by a handful of countries and companies. Their aim will be essentially to exploit the highest-profit options and cutting global emissions will have no direct relevance. Of course, any success in making money off the atmosphere will be in the old-fashioned, imperial way: they will claim as theirs something they don't own and sell it back to the rest of us at a sizable markup. The majority of the world's human population and all of its non-human species are regrettably money-poor and, thus, their only participation is likely to be looking through the shop window.

In the end, though, the commodification of the atmosphere will merely reproduce the same self-contradictory nature-society regime that has characterized the modern era. It will strip away communal rights of access and create new inequalities where none previously existed. An oxymoron of 'scarce atmosphere' will result with no abatement of the crisis. To actually avert global warming, an international regime founded on entirely different principles will be needed. The one advocated here—a national obligation to limit greenhouse gas emissions on the democratic principle of equal access to the atmospheric commons—rests on principles of social and ecological justice. It would lead to industrialized nations substantially cutting their greenhouse gas emissions and bearing the costs themselves to achieve such cuts (rather than transferring the burden to poor countries, as contemplated in the Kyoto Protocol). Southern nations would have greater flexibility than industrialized countries in their economic choices related to greenhouse gas emissions, but eventually would also have to observe the same upper limit.

All serious alternatives begin with the rejection of commodification in favor of principles of global justice as the foundation of nature-society relations. Scientific, political and economic discourses need to recognize this and begin the process of *recovering* their understanding of nature and society as commons regimes. Such a task cannot be deferred to future generations, but needs to be placed at the forefront of efforts to build a post-growth political economy that actually cuts greenhouse gas emissions, calls off the experiment to design climate, and seeks a genuinely sustainable and equitable relation among societies and between humanity and nature as a whole.

Ecological justice may not offer us neatly resolved approaches in all respects, but the principle can provide substantial guidance in finding a genuinely global consensus on climate change response strategy. To date, the wealthy states and corporations have devised a system to their liking. No one seriously suggests that the interest of future generations should be made into market value or that we should trade in the welfare of the living—so what can be the justification for making the atmosphere and the future climate into a commodity? One thing is certain—not only does the current approach deny ecological justice, it also has the simultaneous disadvantage of not working to reduce GHG emissions or stabilize climate.

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