

White Paper *on the* **Ethical Dimensions** *of* **Climate Change**



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About Us

History of the Program

The Program on the Ethical Dimensions of Climate Change was launched at the 10th Conference of Parties to the United Nations Framework Convention on Climate Change that was held in early December of 2004 in Buenos Aires, Argentina. The major outcome of this meeting was the Buenos Aires Declaration on the Ethical Dimensions of Climate Change.

The Program on the Ethical Dimensions of Climate Change Seeks to:

- Facilitate express examination of ethical dimensions of climate change particularly for those issues entailed by specific positions taken by governments, businesses, NGOs, organizations, or individuals on climate change policy matters;
- Create better understanding about the ethical dimensions of climate change among policy makers and the general public;
- Assure that people around the world, including those most vulnerable to climate change, participate in any ethical inquiry about responses to climate change;
- Develop an interdisciplinary approach to inquiry about the ethical dimensions of climate change and support publications that examine the ethical dimensions of climate change;
- Make the results of scholarship on the ethical dimensions of climate change available to and accessible to policy makers, scientists, and citizen groups;
- Integrate ethical analysis into the work of other institutions engaged in climate change policy including the Intergovernmental Program on Climate Change and the Conference of the Parties to the United Nations Conference on Climate Change.

Further Information

For more information about the program, including a bibliography on the ethical dimensions of climate change, visit the Web site at <http://rockethics.psu.edu/climate>.



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White Paper on the Ethical Dimensions of Climate Change

I. Preamble

A. Aims

This paper describes the relevant facts, ethical questions, and preliminary ethical analyses that will constitute the initial phase of the Collaborative Program on the Ethical Dimensions of Climate (EDCC).¹ This paper does not seek to deal with these matters exhaustively but rather intends to create a focus for initial inquiry and draw preliminary conclusions about the ethical dimensions of several climate change issues that are possible at this early stage of the work of the EDCC.²

By the use of the word “ethics” in this paper is meant the field of philosophical inquiry that examines concepts and their employment about what is right and wrong, obligatory and non-obligatory, and when responsibility should attach to human actions that cause harm. For this reason, an ethical examination of climate change issues will explore prescriptive assertions about what should be done about climate change rather than focus on descriptions of scientific and economic facts alone, although good ethical analyses of climate change issues must be sensitive to facts that frame any issue. For this reason, this paper identifies the scientific, economic, and social facts associated with each issue about which it draws ethical conclusions.

B. The Buenos Aires Declaration

In December 2004, the Collaborative Program on the Ethical Dimensions of Climate Change adopted the Buenos Aires Declaration on the Human Dimensions of Climate Change at the 10th Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC). (For the complete text of this declaration, see: <http://rockethics.psu.edu/climate/declaration.pdf>.) This document declared that reflection on the ethical dimensions of climate change was urgent because:

- Unless the ethical dimensions are considered, the international community may choose responses that are ethically unsupportable or unjust;

¹ The collaborative program on the Ethical Dimensions of Climate Change (EDCC) is an effort that has grown out of the collaboration of many individuals and organizations. It recognizes that ethics should play a central role in policy decisions that are being made about climate change. The Program met for the first time at COP-10 Buenos Aires and met again at COP-11 Montreal. Program representatives are Donald Brown, ClimateEthics@comcast.net (Director, Pennsylvania Consortium for Interdisciplinary Environmental Policy) and Nancy Tuana, ntuana@psu.edu (Director, Rock Ethics Institute, The Pennsylvania State University). The organizations include the Rock Ethics Institute, Penn State University, EDDC Program Secretariat; Pennsylvania Consortium for Interdisciplinary Environmental Policy; Penn State Institutes of the Environment; Brazilian Forum on Climate Change; Coordination of Post Graduate Programs in Engineering of the Federal University of Rio de Janeiro–The Energy Planning Program; Global Ecological Integrity Group; IUCN Commission on Environmental Law–Ethics Working Group; Centre for Applied Ethics at Cardiff University; Centre For Global Ethics at Birmingham University; Tyndall Centre for Climate Change Research; EcoEquity; Center for Ethics, University of Montana; New Directions: Science, Humanities, Policy; Oxford Climate Policy; IVIG International Virtual Institute on Global Change–Federal University of Rio de Janeiro; Munasinghe Institute for Development; and Sustainability Research Institute, University of Leeds. In addition to these institutions, numerous individuals have contributed to this White Paper. A list of the initial collaborators can be found on the program Web site at <http://rockethics.psu.edu/climate>.

² For a more comprehensive list of references on this topic see: <http://rockethics.psu.edu/climate>.



- Many profound ethical questions are hidden in scientific and economic arguments about various climate change policy proposals;
- An equitable approach to climate change policy is necessary to overcome barriers currently blocking progress in international negotiations;
- An ethically based global consensus on climate change may prevent further disparities between rich and poor, and reduce potential international tension that will arise from climate-caused food and water scarcities and perceived inequitable use of the global atmospheric commons as a carbon sink.

The Buenos Aires Declaration identified a number of specific ethical issues and associated questions concerning climate change about which express ethical reflection is an international imperative. These issues are:

1. Responsibility for Damages: Who is ethically responsible for the consequences of climate change, that is, who is liable for the burdens of:
 - a. preparing for and then responding to climate change (i.e., adaptation) or
 - b. paying for unavoided damages?
2. Atmospheric Targets: What ethical principles should guide the choice of specific climate change policy objectives, including but not limited to, maximum human-induced warming and atmospheric greenhouse gas targets?
3. Allocating GHG Emissions Reductions: What ethical principles should be followed in allocating responsibility among people, organizations, and governments at all levels to prevent ethically intolerable impacts from climate change?
4. Scientific Uncertainty: What is the ethical significance of the need to make climate change decisions in the face of scientific uncertainty?
5. Cost to National Economies: Is the commonly used justification of national cost for delaying or minimizing climate change action ethically justified?
6. Independent Responsibility to Act: Is the commonly used reason for delaying or minimizing climate change action that any nation need not act until others agree on action, ethically justifiable?
7. Potential New Technologies: Is the argument that we should minimize climate change action until new, less-costly technologies may be invented in the future, ethically justifiable?
8. Procedural Fairness: What principles of procedural justice should be followed to assure fair representation in decision making?

These issues were identified in response to actual issues in contention in global climate change negotiations. EDCC seeks to focus on ethical issues either in contention in climate change policy-making or that should be faced to resolve issues in dispute. In this way, EDCC seeks to avoid discussion of abstract ethical issues that have little potential to resolve climate change policy disputes.

Since international climate change negotiations began in the late 1980s, much of the negotiating agenda has focused on duties of developed nations to reduce emissions. For this reason, most of the ethical issues identified by EDCC for analysis at this early stage concern obligations of developed nations to reduce emissions. In the years ahead, as issues on the policy making agenda change, EDCC

will identify other ethical issues relevant to the new negotiating agenda including, but not limited to, issues about duties of developing nations. To do this EDCC will participate in and monitor climate change policy formation in the years ahead.

C. Initial Ethical Principles and Investigative Approach

This paper is written for policy makers and environmental professionals who routinely participate in policy making. More detailed analyses of the ethical questions identified herein will be considered at later stages of this Program including, but not limited to, an international conference on the ethical dimensions of climate change. In this way, EDCC will work to deepen and expand the ethical analyses of issues presented here, or other ethical issues that arise in climate change policy formation in the years ahead. We will briefly identify some overarching ethical principles and basic rules of morality that inform our initial approach.

Given the severity of impact to be expected and given the likelihood that some level of important disruptions in living conditions will occur for great numbers of people due to climate change events, we contend that there is sufficient convergence among ethical principles to make a number of concrete recommendations on how governments should act, or to identify ethical problems with positions taken by certain governments, organizations, or individuals

For issues about which we see substantial disagreement among ethicists, we will identify those competing ethical analyses.

Facts about climate change and fundamental human rights provide the starting point for our ethical analysis. (Sachs, 2005)

A recent article in the respected scientific journal *Nature* (Patz, 2005) concluded that the human-induced warming that the world is now experiencing is already causing 150,000 deaths and 5 million incidents of disease each year from additional malaria and diarrhea, mostly in the poorest nations. Death and disease incidents are likely to soar as warming increases. Irrespectively of the precise numbers of such harmful events, it has become clear that climate change is already compromising rights to life, liberty and personal security. Hence, ethical analysis of climate change policy must examine how policies have an impact on these basic rights.

The rights to life, liberty, and personal security are basic human rights that are the foundation for deriving other widely recognized rights found in international law and practice. These rights, for example, have been the basis for such practical rules as the “no harm principle” and the “precautionary principle.” These rights are recognized in a number of international treaties and decisions in international tribunals, and widely recognized as foundational by many of the world’s religions. These rights are also expressly set out in Article Three of the Universal Declaration of Human Rights³ that expressly provides that:

Everyone has a right to life, liberty, and personal security.

³ Universal Declaration of Human Rights was adopted by the United Nations General Assembly (A/RES/217, December 10, 1948 at Palais de Chaillot, Paris). It contains a list of those human rights that the UN holds should be guaranteed to all people. It was conceived as objectives to be followed by governments; however it does not form part of international law, though it is customary for governments to abide by it. In 1968 United Nations International Conference on Human Rights declared that it constituted an obligation for all members of the international community to follow it. It also served as the basis for two legally-binding UN human rights Covenants, the International Covenant on Civil and Political Rights, and the International Covenant on Economic, Social, and Cultural Rights.



Humans have rights to life, liberty, and personal security that create duties in others to refrain from interference with these basic rights. In this paper we seek to help clarify our duties to prevent the neglect or violation of those rights. Of course, climate change policy making raises additional ethical issues including questions about duties to protect future generations of humans, plants, animals, and ecosystems. Although these issues are considered in sections of this paper, deeper analyses of these ethical questions will be the focus of future work of this Program.

We note at this early stage of our analysis, that climate change raises a number of particularly challenging ethical issues about how to fairly share the benefits and burdens of climate change policy options. Although these issues will be dealt with in later sections of this paper and program, we note them here to flag their importance and to invite special reflection on these matters. We also note them here because many of the policy tools often employed to solve environmental problems such as cost-benefit analysis usually do not adequately deal with these issues because they often ignore questions of just distribution.

These challenges of distributional fairness arise out of certain facts about climate change including:

- a. Many of those who will be most harmed by climate change have contributed little to causing the problem;
- b. Many of those who emit the most GHGs are least threatened by adverse climate change impacts;
- c. Those that are most vulnerable to climate change harms are often least able to pay for adaptation measures needed to protect them from climate change impacts;
- d. Because there is a need to set an agreed upon global atmospheric target, climate change policy makers will need to face the question of who should bear the burdens of reducing emissions so that an atmospheric GHG target can be achieved through national emissions limitations;
- e. In allocating national emissions reductions targets, policy makers will need to take a position on who has a right to use the biosphere as a global carbon sink and in what amounts;
- f. Emissions levels from human activity vary greatly around the world and therefore the huge emissions reductions that will be needed to prevent dangerous climate change will fall disproportionately on some if equity is not taken seriously;
- g. In responding to the threat of climate change, current generations will affect the interests of future generations.

II. Ethical Issue One: Responsibility for Damages—Who is ethically responsible for the consequences of climate change, that is, who is liable for the burdens of:

- a. preparing for and then responding to climate change (i.e. adaptation) or**
- b. paying for unavoided damages?**

A. Factual Context

a. Relevant Climate Change Science

1. Climate change has been seriously discussed as a threat to human health and the environment for several decades with scientific interest growing rapidly since the late 1970s when measurements of atmospheric GHG levels were determined to be rising in proportion to the use of fossil fuel around the world.

2. Human-induced climate change is now discernable and is already adversely affecting some humans, plants, animals, and ecosystems around the world. However, as some parts of the world are warming faster than others, some of the climate change damages are more discernable in some parts of the world (IPCC, 2001).
3. It is believed that human activities are responsible for warming in the amount slightly less than 1°C although some parts of the world have experienced greater warming than this global average. This warming is attributable to atmospheric GHG levels in greater concentrations than occurred naturally before the beginning of the industrial revolution. Human activities responsible for this elevated warming include mostly GHG emissions and land use changes (IPCC, 2001).
4. The amount of damages caused to humans and ecological systems by human-induced climate change depends on the magnitude of the temperature change. The amount of temperature increase that will be experienced is dependent on the GHG atmospheric levels. The concentration of GHGs in the atmosphere depends on the collective action of GHG emitters around the world as well as changes being made to natural systems that have an affect on carbon storage.
5. About half of GHGs emitted remain in the atmosphere while the other half are being stored in carbon sinks, primarily in terrestrial ecosystems and oceans (IPCC, 2001).
6. Harms already being experienced by some people are of many types including, but are not limited to, death, disease, ecological harm, floods and droughts, rising seas, more intense storms, and increased heat waves. Harms due to human-induced climate change will grow in the years ahead even if it is possible for the international community to stabilize atmospheric GHG concentrations near current levels. Increased warming will continue even if atmospheric GHG levels are held constant because of thermal lags in the global climate system including lags in the oceans (IPCC, 2001).
7. It is very unlikely that atmospheric levels of CO₂ equivalent can be stabilized much below 450 ppm during this century. (Stevens, 1997). This virtually guarantees significant additional warming and associated harms to some people and places around the world. (Baer and Athansiou, 2004).
8. Given point 6 and 7, even if we adopt the most robust adaptation strategies possible, some current and future harms to ecosystems are unavoidable. Other damages could be minimized or avoided if adaptation steps are taken.
9. There remains some scientific uncertainty about timing and magnitude of future climate change impacts; however, this uncertainty has been described as a range of plausible impacts that will be caused by different levels of atmospheric concentrations of atmospheric GHGs by the Intergovernmental Panel on Climate Change (IPCC, 2001).⁴

b. Distribution of Harms and Benefits

10. The developed nations are mostly responsible for the build up of GHGs in the atmosphere to present levels although total emissions and per capita emissions levels vary greatly among nations (Argawal and Nairin 1991; Estrada-Oyeala, 1992; Müller, 2001; Munasinghe, 2002; Muylaert, 2002; Paavola, 2004; Pinguelli-Rosa and Munasinghe, 2002).

⁴ The IPCC was created in 1988 by the World Metrological Association and the United Nations Environment Program to advise nations about the science of climate change. IPCC reports growing levels of confidence about climate change impacts although uncertainties remain.



11. Those who are harmed by human-induced climate change are located in both developing and developed nations and those who benefit from GHG emissions are located in both developing and developed nations (Argawal and Nairin 1991; Estrada-Oyeala, 1992; Müller, 2001; Munasinghe, 2002; Muylaert, 2002; Paavola, 2004; Pinguelli-Rosa and Munasinghe, 2002).
12. The developed countries are most responsible for temperature increases that the Earth has experienced recently, having contributed the greatest percentage to historical increases in GHG emissions. (Miguez, 2002).
13. However, those most vulnerable to climate change damages are often the least responsible for GHG emissions. (IPCC, 2001; Estrada-Oyeala, 1992)
14. Those who could most benefit from adaptation measures are also often least responsible for GHG emissions. This is true both at the national level and at the individual level.
15. Those most vulnerable to climate change are often least able to afford adaptation measures such as dikes, irrigation to compensate for droughts, moving away from flood or storm prone areas, installing HVAC systems and implementing improved public health systems. In addition, poor people can't afford insurance against climate-related damage.
16. There is some uncertainty regarding the economic impacts of undertaking measures to reduce GHG emissions. Models show a range of possible costs, with some reductions being achievable at no cost or cost savings and others at considerable costs. Economic estimates have not usually incorporated benefits to be achieved from innovation. Many large corporations have achieved considerable reductions in GHG emissions while realizing cost savings. With longer lead times, costs can be reduced. Cost estimates in economic models rely deeply on contested assumptions about damage-function, rate of discount, technological progress, and values of a statistical human life.

c. International Negotiations and Agreements

17. International negotiations to set targets and timetables were called for by many scientists in the 1980s. During this time, some governments, organizations, and individuals have resisted pleas from potential victims of climate change to take precautionary action to reduce GHG emissions and thereby mitigate climate change damages. The arguments for this resistance were often based on the contentions that there was scientific uncertainty concerning climate change impacts and that implementation of measures to limit GHG emissions would entail significant costs to national economies (Brown, 2002).
18. International climate change negotiations began in the late 1980s, with some nations and organizations calling for enforceable emissions targets while others resisted making commitments often on the basis of scientific uncertainty and cost to national economies (Brown 2002).
19. Some norms about responsibility for damages from human-induced climate change are well established in a variety of international agreements including the Rio Declaration on Environment and Development, United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol to the UNFCCC, and the Law of the Sea.
20. The Rio Declaration on Environment and Development which states in relevant part:
 - i. States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own

- environmental and developmental policies, and ***the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction*** (UN, 1992b, Principle 2).
- ii. National authorities should endeavor to promote the internalization of environmental costs and the use of economic instruments, **taking into account the approach that the polluter should, in principle, bear the cost of pollution**, with due regard to the public interest and without distorting international trade and investment (UN, 1992b, Principle 16).
 - iii. States shall develop national law regarding liability and compensation for the victims of pollution and other environmental damage. States shall also cooperate in an expeditious and more determined manner to develop further international law regarding liability and compensation for adverse effects of environmental damage caused by activities within their jurisdiction or control to areas beyond their jurisdiction (UN, 1992b, Principle 13).
2. Additional norms relevant to responsibility for damages caused by one nation to another are contained in the United Nations Framework Convention on Climate Change (UNFCCC) including:
- i. *Recalling* also that States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental and developmental policies, and **the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction** (UN, 1992a, Preface).
 - ii. The Parties should protect the climate system for the benefit of present and future generations of humankind, **on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities. Accordingly, the developed country Parties should take the lead in combating climate change and the adverse effects thereof.** (UN, 1992a, Art. 3).
 - iii. The Parties should **take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing such measures**, taking into account that policies and measures to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost (UN, 1992a, Art. 3).
22. There are also norms created by other international accords that were not intended to address the issue of climate change directly, but include issues that will be affected by climate change that could be relevant to responsibility to damages. These agreements, for instance, include the International Law of the Sea, the Convention on Biological Diversity, and the Convention on International Trade on Endangered Species of Flora and Fauna.

B. Ethical Analysis of Issue One

1. Since people around the world have basic rights to be protected from the actions of others that threaten life, health, and security, and given that the effects of climate change will violate these



rights, norms must be agreed upon by the international community to establish responsibility for climate change mitigation, adaptation, and for reparation of damages due to climate change.

2. The Rio Declaration and the United Nations Framework Convention on Climate Change established the following norms about responsibility for climate change:
 - a. Nations have the responsibility to reduce GHG emissions of activities within their jurisdiction;
 - b. Polluters have the responsibility to bear the costs of pollution;
 - c. Nations have the responsibility to reduce their emissions based upon equity to prevent dangerous anthropogenic interference with the climate system;
 - d. The developed nations have the responsibility to take the lead in reducing the threat of climate change;
 - e. Nations may not use scientific uncertainty as an excuse for taking cost-effective action to reduce the threat of climate change (UN, 1992a; UN, 1992b).
3. While the norms established by various international law documents are important and relevant, they are not sufficient in that principles of retributive and distributive justice are relevant to determining responsibility for harm from human-induced climate change. These principles make those responsible for harm in proportion to their contribution to the harm in the absence of morally relevant principles that would allow for other assignments of responsibility.
4. Because harms from climate change are related to past and current emissions levels, the following facts, among others, are relevant to any nation's responsibility for damages to others:
 - a. Magnitude of total national and per capita emissions during period of concern.
 - b. The nation's proportional share of total global emissions that have led to climate change that has or will cause harm.
 - c. Historical contributions of GHG emissions.
5. According to relevant principles of justice, those who claim entitlement to use the atmosphere or other natural systems as a sink for their GHG emissions at levels proportionately greater than others have the burden of demonstrating that their claim for entitlement to unequal levels of emissions is based upon morally relevant criteria.
6. Some nations have used cost to their economy as an excuse for their unwillingness to take action to reduce their emissions; however, cost is not an ethically acceptable excuse for failing to take actions to reduce harmful levels of pollution below the emitting party's fair share of global emissions, particularly when that pollution threatens basic human rights to life, health, and security. (See discussion on cost below, Issue Five). Cost considerations are appropriate in efforts to find cost-effective strategies to reduce harmful levels of emissions
7. Those engaged in inequitable and dangerous behavior concerning GHG emissions cannot use the excuse of lack of certainty about the harm to justify risky behavior. (See discussion on uncertainty below, Issue Four.)
8. According to relevant principles of justice, when multiple parties have contributed to cause harm to others, parties harming others will be responsible in proportion to that proportion of harm that they have inflicted when it is possible to determine the relative contribution of the harming parties. To determine the responsibility of nations for climate change there are two questions that need to be answered.

- a. The first is relatively easy to ascertain. That is, how much did that nation contribute through its emissions or land use changes to the build up of GHG in the atmosphere beyond what would have occurred naturally.
- b. The second question will be more difficult to answer in some cases because damages from climate are sometimes caused by events that may have occurred naturally in part, such as storm damages. That is, for instance, with or without human-induced climate change, floods would occur naturally. Yet as human-induced warming increases, flooding intensity and frequency are likely to increase. For this reason, it will be necessary to determine the contribution from human-activities to climate events such as floods that cause damages in order to assess responsibility for human-induced damages.

Issues to be Developed

1. In addition to the provisions of the UNFCCC, what norms exist in hard and soft international law such as the Law of the Sea, the Convention on biological Diversity, the Convention on International Trade of Endangered Species, the Trail Smelter Case, etc., that might be relevant to responsibility for climate change damages.
2. If nation states have responsibility to reduce GHG emissions, what can be said about the ethical responsibility of other units of government, organizations, and individuals or other non-state actors within those states?
3. How do tort rules inform international responsibility of nations?
4. What ethical principles should be followed in determining tort liability for climate change damages? For instance, in determining tort liability how should considerations of utility be taken into account in relation to rights? Should liability rules consider such matters as spreading the costs among parties? What other public policy concerns should inform the creation of tort liability rules for climate change?
5. What ethical principles should be followed for determining liability within nations given disparities among those who have benefited from past GHG emissions and differences in historical emissions levels among government subdivisions, organizations, and individuals?

III. Ethical Issue Two: Atmospheric Targets — What ethical principles should guide the choice of specific climate change policy objectives, including but not limited to, maximum human-induced warming and atmospheric greenhouse gas targets?

A. Factual Context

See factual paragraphs above:

1. In 1992, under the United Nations Framework Convention on Climate Change (UN 1992a, Art 2), governments agreed to “stabilize GHG concentrations in ***the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.*** Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally



to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.” However, no atmospheric GHG target has been agreed to that gives scientific precision to this commitment.

2. Different levels of atmospheric GHG concentrations will generate different levels and kinds of damages to human health and the environment with some of the poorest people around the world suffering the greatest harm (Argawal, and Nairin 1991; Estrada-Oyeala, 1992; Müller, 2001; Munasinghe, 2002; Muylaert, 2002; Paavola, 2004; Pinguelli-Rosa and Munasinghe, 2002).
3. Any increases in atmospheric concentrations of GHGs will result in additional warming and consequent harm to some people, plants, animals, and ecosystems. The greater the atmospheric level of GHGs, the greater the probability that climate change will cause serious and catastrophic climate change damages to humans and the environment. It is believed by many scientists that additional warming from human-induced climate change should be kept below 2°C to avoid rapid non-linear impacts from climate change; however, catastrophic harm could be triggered by additional warming of less or more than 2°C because this level is uncertain (Athanasios and Baer, 2002).
4. Given current world demand for fossil fuels, the size of global automobile and transportation fleets, and the unavailability of affordable non-polluting technologies, monies already invested in existing technologies, and lead time necessary to replace existing technologies, it is likely to be practically impossible to stabilize atmospheric GHG levels below 450 ppm of CO₂ equivalent (Stevens, 1997).
5. In setting a stabilization target for GHG concentrations, major scientific uncertainties need to be faced including, but not limited to, uncertainties about:
 - a. the amount of warming caused by different levels of GHGs in the atmosphere or “climate sensitivity;”
 - b. the actual amount of GHGs that will be emitted given unknowns about future technology, population, and economic activity;
 - c. the magnitude, type, and geographic spread of adverse impacts that will be generated by different levels of warming;
 - d. the timing of temperature change and other climate change impacts, including the possibility of rapid non-linear changes;
 - e. threshold levels that will cause climate surprises and irreversible and potentially catastrophic impacts if exceeded;
 - f. the ability of people to take anticipatory protective action,
 - g. the resiliency of ecosystems, and;
 - h. the vulnerability of people to certain climate change impacts (IPCC, 2001).
6. To deal with the scientific uncertainty about warming and its impacts, the IPCC has identified a range of possible atmospheric GHG concentrations and associated temperature increases. However, the identification of this range does not preclude the possibility of rapid non-linear changes in the climate system at temperatures in the lower end of the range (IPCC, 2001).
7. Those who will be affected by climate change include not only people currently living but future generations and non-humans. Their interests are particularly at risk from unchecked climate change’s likely destruction of plants and animals, and increases in sea levels, floods, droughts, disease, and intensity of storms.

8. Stabilization of GHGs in the atmosphere to a safe level will require the reduction of global emissions by 60 to 80 percent from current levels and by much larger amounts from business-as-usual projections of global emissions (IPCC, 2001). To make the necessary global reductions, decisions must be made about how much each nation will be responsible for achieving these reductions. (See discussion below on fair allocations, Issue Three.)
9. Changing another nation's climate can seriously affect its interests because the quality of any nation's climate determines, among other things, (1) its potential for growing food, (2) the type of indigenous plants and animals, (3) the need to use energy to protect from extremes of heat and cold, (4) human health threats from natural pathogens, (5) citizen vulnerability to damage from extreme weather events, (6) the number of hours that citizens can work or recreate in the outdoors in comfort, (7) the amount of fresh water available for human uses, (8) the rate of flow in rivers and streams, (9) weather limitations on travel, (10) the damage caused by floods, and (11) the ability to attract tourists (Landes, 1998).
10. Human-induced climate change has already caused damages. Moreover, any additional warming above present levels will cause damages to some people and some places which could be catastrophic to them. (See discussion on responsibility above, Issue One.)
11. Many of the poorest people are highly vulnerable to climate change because: (1) the ecological systems of many of the poorest nations are most at risk from climate change, (2) many of the world's poorest people are the most vulnerable to storms, flooding, and sea level rise, (3) the health of the poorest people is at greatest risk from global warming, particularly from vector borne disease; (4) the food supplies of the poorest people are often at great risk from increases in droughts and heat; and (5) the poorest nations and people have the weakest capacity to adapt to climate change (IPCC, 2001).
12. Most nations who have developed national climate change strategies have not consulted other nations or their citizens who will be most harmed by climate change.
13. Ecosystems around the world are at great risk from climate change including ecosystems that provide life support services to humans, plants, and animals. Among ecosystems that are vulnerable to climate change are marine ecosystems including coral reefs, and terrestrial ecosystems such as forests and grasslands. Since climate change could cause rapid changes in these ecosystems, climate change further threatens humans, plants, and animals by causing massive changes in these ecosystems on which life depends. Moreover, some ecosystems are already stressed by other human activities that could be put at even greater risk by climate change. For instance, global fisheries around the world are already vulnerable to overexploitation of fisheries, some tropical forests are in rapid decline from overexploitation, and ecosystems around the world are vulnerable to increases in nitrogen from human activities. For this reason, climate change threatens many ecosystems around the world already under great stress.

B. Ethical Analysis of Issue Two

1. The issue of a GHG atmospheric stabilization target raises profound ethical questions because the levels of GHGs in the atmosphere will determine what plants, animals, and people survive and what damages will be caused to humans and the environment.
2. The rights that people have to be protected against threats from others to life, health, and security, as well as the UNFCCC commitment made by nations to reduce emissions to levels



that would “prevent dangerous anthropocentric interference with the climate system,” are basic ethical principles that must be considered in setting atmospheric GHG targets.

3. The GHG atmospheric target raises profound questions of distributive justice because climate change impacts will not be distributed equally, because nations and peoples have different responsibilities for current levels of GHGs in the atmosphere, and because nations and peoples are differentially vulnerable to climate change impacts. For this reason, nations who are willing to tolerate some climate change damages to their nation cannot ignore damages that will be imposed upon others without their consent.
4. The GHG atmospheric target raises important questions of procedural justice because no country or person has the right to put other nations or persons at grave risk without their consent. Procedural justice demands the participation of victims in decision making about what risks cannot be accepted, what risks are acceptable, and under what conditions risks will be accepted. (See discussion below on fair participation, Issue Eight.)
5. Those who are most vulnerable to climate change have contributed little to elevated levels of GHGs in the atmosphere. Therefore, those vulnerable people who will be harmed by climate change policies or by their absence have rights to participate in the development of policies that establish atmospheric targets for GHGs.
6. Given that all people have a right be protected from threats to their life, safety, and security caused by others, and that existing levels of GHG emissions threaten these rights, the UNFCCC commitment to reduce GHG emissions to levels that will avoid dangerous anthropocentric interference with the climate system should be interpreted to require stabilization levels at the lowest possible levels.
7. So long as atmospheric GHG levels threaten basic human rights, the Collaborative Program on the Ethical Dimensions of Climate Change cannot find any respected ethical system that would justify allowing atmospheric levels of GHGs to rise thereby additionally jeopardizing human rights. In other words, various ethical systems converge in the conclusion that atmospheric levels of GHGs should be stabilized at the lowest possible levels above existing atmospheric GHG concentrations (Ott et. al. 2004).
8. Nations implementing atmospheric targets for GHGs are ethically obligated to consider the interests of non-represented future generations and non-humans.
9. The issues of scientific uncertainty in setting a GHG atmospheric target raise important ethical issues that include both substantive questions about who should bear the burden of proof with regard to uncertainties and what levels of risk are acceptable, as well as questions of procedural justice such as whether victims that may be put at risk have exercised free informed consent to participate in decisions that will impose risk on them, or whether even such consent would legitimize actions by others that threaten their life, health, and security. (See discussion below on scientific uncertainty, Issue Four.)

Issues to be Developed

1. The choice of lower or higher GHG atmospheric targets has great ethical significance particularly in light of differential impacts on the most vulnerable people. As alternative GHG atmospheric targets are proposed, ethicists need to identify the ethical significance of each alternative.

IV. Ethical Issue Three: Allocating Global Emissions among Nations — What ethical principles should govern the allocation of responsibility among people, organizations, and governments at all levels to prevent ethically intolerable impacts from climate change?

A. Factual Context

See factual paragraphs above.

1. To reduce ethically intolerable impacts from climate change it will be necessary to limit total global GHG emissions. (See Issue Two.)
2. To stabilize atmospheric GHGs at acceptable levels, the world needs to reduce existing emissions significantly. To achieve an atmospheric target, nations will need to reduce their GHG emissions in such a way that total emissions from all nations do not cause atmospheric emissions to exceed acceptable levels.
3. The later the international community agrees on acceptable GHGs atmospheric targets, the more difficult it will be to achieve lower atmospheric GHG concentrations.
4. Nations have made widely different contributions to global GHG atmospheric concentrations in terms of total tons of emissions, per capita emissions levels, and when GHG were emitted (Argawal and Nairin 1991; Estrada-Oyeala, 1992; Müller, 2001; Munasinghe, 2002; Muylaert, 2002; Paavola, 2004; Pinguelli-Rosa and Munasinghe, 2002; Müller 2002).
5. Because GHGs in the atmosphere are well mixed from all sources, it makes little difference to atmospheric GHG concentrations where emissions are released.
6. Some GHGs emitted into the atmosphere are stored in oceans, forests, soils, and plants. Often these carbon sinks are not in the jurisdiction of nations who are responsible for GHG emissions, nor have the nations in which such sinks are located given permission to emitting nations to use their natural resources as carbon sinks.
7. In the absence of funding for new technologies, many poorer nations will need to emit more GHGs than their current level in order to meet basic human needs for food, shelter, and security (Shue, 1994, 1999). Other nations' current level of emissions far exceeds those needed to meet basic human needs.
8. The UNFCCC contains some normative guidance on how emissions' allocations should be made among nations. The UNFCCC provides that: "The Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities. Accordingly, the developed country Parties should take the lead in combating climate change and the adverse effects thereof" (UN 1992a, Art. 3).
9. There are large differences in historical and current consumption patterns within both developed and developing nations as well as between sub-national governments, organizations, and individuals.



10. Despite a failure of the global community to reduce GHG emissions to levels that will prevent climate-change caused damages to human health, the environment, plants, animals, and ecosystems, some nations, sub-national levels of government, organizations, businesses, educational institutions, and individuals have taken significant steps to reduce GHG emissions. These steps have often included voluntary reductions not required by law or regulation (Environmental Finance, 2004).
11. Under the Kyoto Protocol, certain developed nations have agreed to GHG reduction targets to reduce emissions levels from the baseline year of 1990. Yet, responsibility for human-caused climate change that has been experienced thus far should also include attention to historical levels of GHG emissions earlier than 1990 (Miguez 2002; Muylaert and Pinguelli Rosa, 2002).
12. Under the UNFCCC several nations have made specific proposals on criteria to define what principles constitute “equitable” reductions. The IPCC has grouped them as:
 - a. *Ad hoc proposals*, including (1) proposals that divide total global emissions into equal shares between developed and developing nations, and; (2) proposals that proportion GHG allocation to a nation’s GDP.
 - b. *Equal per capita proposals* suggested by many developing nations have it that national allocations should be based upon the idea that all human beings should be entitled to an equal share of the atmospheric commons.
 - c. *Status quo proposals* forwarded by several developed nations suggest that current emissions should be recognized as entitlements. For example, the United States has only been willing to negotiate emissions reductions from current levels. The justification presented for the position is that those who have first used natural resources have a right to continue to use it at levels that are based upon past use.
 - d. *Mixed proposals* have suggested allocation rules combining equal per capita considerations, equal percentage cuts, status quo, and historical responsibility (Brown 2002; Rose, 1998; Müller 2001; Müller 2002).
13. In addition to these proposals for equitable allocations, others have identified a number of other principles arguably needed to make equitable allocations of GHG emissions among nations. These include:
 - a. *Polluter Pays and Proportionality Principles*. These principles would base allocations upon each nation’s historical contribution to damages caused by climate change.
 - b. *Satisfaction of Basic Needs*. This principle urges that the poorest nations should be first in line to receive allocations needed to meet the basic needs of their citizens, so that it is possible for them to fully participate in the world.
 - c. *Comparable Burdens Principle*. This Principle would suggest allocations where each nation share the effort of reducing emissions to safe levels equally, for example, by allocating an equal percentage of its GDP to GHG reduction.
 - d. *Ability to Pay Principle*. This principle would make the richer nations more responsible than the poorer nations because of their greater ability to pay to reduce emissions.
 - e. *Rawlsian Principle of Justice*. This principle suggests that allocations should be determined such that follow the presumption on just allocations contained in the theories of John Rawls that in no case should the poorest nations be made worse off by any allocation scheme. Furthermore, some argue that it argues that just allocation schemes should give maximum rights to use the atmosphere to the poorest, least advantaged people. (Brown, 2002; Rose, 1998).

B. Ethical Analysis of Issue Three

1. Not all proposals by nations to define “equity” under UNFCCC, Title 3 are entitled to equal respect as a matter of ethics and justice.
2. Those who advocate that GHG emissions allocations should be based upon status quo emissions levels suggest that some nations should be given a right in the continued use of the atmosphere as a sink on the basis of their prior use. However, there are serious ethical problems with this view, including the following:
 - a. Unlike some natural resources such as water, the global atmosphere has never been recognized as a subject of private property rights. Rather, it has been viewed as a global commons available for use by all people,
 - b. Those who may be harmed by levels of GHGs in the atmosphere have never consented to the appropriation of the atmosphere as GHG sink, and
 - c. The idea of recognizing property rights in natural resources that have gained higher value through labor is not applicable to the atmosphere because this line of thinking is based on assumptions that:
 - i. there will be sufficient quantities of the natural resource left over for others for their use, which is not true of the atmospheric GHG sinks,
 - ii. the persons claiming property rights to natural resources have increased its value through their labor, however in the case of atmospheric sinks they have rather diminished the value of the atmosphere,
 - iii. international law prohibits the use of resources in one country in such a way that it will harm people in other countries, and
 - iv. the nations of the world have already agreed that they must reduce the use of atmospheric sinks on the basis of “equity.”
3. To adequately address issues of equity in allocating GHG targets among nations involves issues of distributive justice. Traditional distributive justice demands that benefits and burdens of public policy be distributed according to concepts of equality, modified only by morally relevant considerations of, for example, need or merit.
4. Distributive justice puts the burden on those who want to be treated differently from others to show that the basis for being treated differently is based on morally relevant criteria. For this reason, as a matter of distributive justice, those who propose a formula for defining equity that is not based upon giving all people equal rights to use the atmosphere have the burden of proving that differences in treatment that they demand are based on merit, deservedness, or other morally relevant criteria.
5. One distinction that distributive justice would acknowledge as a relevant basis for treating nations differently in GHG emissions allocations is differences in responsibility for causing the existing problem. Therefore, the “polluter-pays” principle is consistent with principles of distributive justice because polluters deserve to have greater responsibilities for the problems they cause.
6. Another distinction that distributive justice would acknowledge as a relevant basis for treating nations differently in GHG emissions allocations is differences in needs and capacities. Developing countries where the citizens cannot meet their basic needs deserve to have smaller responsibilities than other countries.
7. An equal per capita allocation would be consistent with principles of justice because: (a) it treats all individuals as equals and therefore is consistent with most theories of distributive



justice, (b) it would implement the ethical maxim that all people should have equal rights to use global commons, (c) it would implement the widely accepted “polluter-pays” principle, and (d) it would recognize the need of developing countries to increase their emissions to meet the basic needs of their citizen.

8. Equity and justice demand that policy makers examine whether those who are harmed by public policy decisions on allocations of burdens and benefits are being treated fairly. For this reason, all people who would be affected by GHG allocation schemes have a right to fair representation in decision making about GHG allocations.
9. The UNFCCC has established the norm that nations should reduce their emissions on the basis of “equity.” This should be considered a minimum normative requirement, to be interpreted in the context of other ethical and justice considerations relevant to distributing benefits and burdens.
10. Allocating GHG targets among nations is a classic problem of distributive justice. Traditional distributive justice demands that benefits and burdens of public policy be distributed according to concepts of equality, modified only by morally relevant considerations of, for example, need or merit.
11. Philosopher John Rawls has suggested that the principles of justice that should be followed in allocating society’s burdens and benefits are those that would be agreed upon by rational self-interested persons behind a “veil of ignorance” about their positions in the society. In this light, policy makers would adopt GHG reduction allocation schemes that give maximum rights to use the atmosphere to the poorest, least-advantaged people (Rawls, 1999).
12. Efficient solutions may not be just solutions. Proposals for defining equity on the basis of efficiency alone are inconsistent with principles of distributive justice. This is so because, among other reasons, equity is ignored in welfare maximization formulae which do not include compensation to losers. Allocation schemes based upon welfare maximization criteria alone or cost to national economies alone raise several additional ethical problems. (See discussion of Issue Five below on cost.)
13. As the amount of human-caused temperature increases that has been experienced thus far is linked to the historical levels of GHG emissions earlier than 1990, the 1990 baseline level adopted in the Kyoto Protocol as a matter of equity is not necessarily determinative of the point in time at which responsibility for reducing GHG emissions is triggered. In fact, the level of historical emissions of GHG from countries is a relevant fact that could be considered in determining responsibility for GHG emissions along with other ethically relevant considerations.
14. Although most developing countries have contributed comparatively small amounts to elevated levels of GHGs in the atmosphere attributable to human activities, any developing nation which exceeds its fair share of total global GHG emissions that interfere with the rights of other people to life, health, and security of others needs to take action to maintain emissions levels below its fair share of safe global emissions. In addition, there is an ethical imperative that each developing nation make every effort to support sustainable development practices. Developed nations have a similar imperative to move to sustainable practices to ensure that they are satisfying basic needs and enhancing the quality of life within their nations without compromising the quality of life of future generations. It should be noted, however, this obligation of developing nations to reduce emissions should not be construed as a limitation on any developing nation’s rights to make morally relevant arguments about what constitutes their nations fair share of global emissions.

15. Since there are large differences among parties in both developing and developed nations in historical and current consumption patterns, there may be a need for nations to allocate responsibility for GHG emissions among sub-national governments, organizations, and individuals based upon morally relevant principles of justice and equity.
16. Although nations are responsible for reducing GHG emissions under the UNFCCC, sub-national governments, businesses, organizations, individuals are also responsible for reducing GHG emissions to levels that constitute their fair share of just national emissions. Although nations may allocate emissions reductions burdens within each nation based upon equity to assure that national emissions targets are not exceeded, given that sub-national governments, businesses, organizations, and individuals can voluntarily reduce GHG emissions to levels below their fair share and since such reductions would reduce the threats coming from global emissions, all sub-national governments, businesses, organizations, and individuals should be encouraged to reduce GHG emissions to the lowest levels practical notwithstanding that these emission levels would be lower than their fair share of total national emissions. In this regard, ability to make reductions is an ethically relevant consideration for determining reduction responsibility.

Issues to be Developed

1. Research is needed on the ethical issues that are entailed by the fact that the atmosphere is generally considered to be “global commons” resources. Does, for instance, the use of public commons resources entail equal access of all citizens to the use of that resource, the use of the “polluter-pays” principle, limitations on property rights, etc.? Does the fact that the atmosphere is a global commons limit private property claims including market based trading in the commons resources? The normative significance and moral implications of “global commons” merit further discussion.
2. Should the “public trust” doctrine be applied to the atmosphere? If so what normative significance in regard to allocation of rights to use the atmosphere as a carbon sink are entailed by the public trust doctrine.
3. What, if any, use of “efficiency” or “welfare maximization” goals are appropriate considerations that could be integrated in any allocation scheme after basic rights considerations are fulfilled?
4. How could a fair and equitable global system of emission trading evolve over time?

V. Ethical Issue Four: The Use of Scientific Uncertainty in Policy Making — What is the ethical significance of the need to make climate change decisions in the face of scientific uncertainty?

A. Factual Context

1. Governments, corporations, and individuals have often used scientific uncertainty about climate change impacts as justification for lack of action on climate change. In making these arguments, some proponents seek to avoid costly responses that may not be necessary if climate change predictions turn out to be erroneous.



2. In 1988, with support from nations around the world, the World Health Organization and the United Nations Environment Program created the IPCC. The IPCC's mission is to review the peer-reviewed science on climate change and make recommendations on climate change science to governments. More specifically, the IPCC is expected to assess for the international community the scientific, technical, and socio-economic information relevant for the understanding of the risk to and solutions for human-induced climate change. The IPCC has issued three major reports on climate change science in 1990, 1997, and 2002 (IPCC, 1990, 1995, 2001).
3. Beginning with its first report in 1990, IPCC has urged countries are to take immediate actions to reduce the risks of climate change despite scientific uncertainties about timing and magnitude of climate change impacts (IPCC, 1990).
4. In 1990, at the world Conference of Climate Change in Geneva, over 700 scientists from around the world reviewed the first IPCC report. Following this review, these scientists issued a *Scientist's Declaration* in which they said: "A clear scientific consensus has emerged under the leadership of IPCC on estimates of the range of warming that can be expected in the 21st Century" (IPCC, 1990).
5. The IPCC's Second Assessment Report was issued in 1995. In this report, the IPCC, as it had before, exhaustively summarized the state of the scientific knowledge on human-induced climate change, made specific predictions about the risk of climate change, and discussed mitigation options (IPCC, 1995).
6. One of the many conclusions contained in the IPCC's second assessment report was that a "balance of the evidence showed a discernable human influence on climate." In other words, not only had IPCC found that climate change was a substantial and real threat, a conclusion IPCC reached in its first report in 1990, by 1995 it had concluded that the balance of the evidence attributed some actual climate change to human activities despite great natural variability in the climate system. That is, human caused changes to the climate system were already observable by 1995 by the balance of the evidence (IPCC, 1995).
7. In February of 2001, the IPCC's third assessment report was released. This third assessment report, like others released in 1990 and 1995, made specific predictions about how human actions would change the global climate and how climate change would affect human health and the environment. The third assessment confirmed and expanded upon previous IPCC reports and concluded that there was additional evidence that human-induced climate change had already become noticeable around the world (IPCC, 2001).
8. In each of its reports, the IPCC identified increasing levels of scientific confidence in the connection between human activities and observable climate change while making predictions with increasing levels of certainty on the magnitude and timing of climate change impacts. Nevertheless, some scientific uncertainty about the timing and magnitude of climate change impacts remained.
9. In recent years, major scientific institutions, whose members' expertise bears directly on climate change science, have issued statements in support of the IPCC. For example, the National Academy of Sciences report, *Climate Change Science: An Analysis of Some Key Questions*, concluded that the IPCC assessments are a fair and accurate summary of scientific thinking. Other scientific organizations with expertise on climate issues also support the IPCC conclusions. For instance, The American Meteorological Society, the American Geophysical Union, and the American Association for the Advancement of Science all have issued

statements that are consistent with IPCC conclusions that humans are modifying the climate system (Oreskes, 2005).

10. In addition, observations that have been made both directly and through a range of reliable techniques for indirect measurements clearly establish that the earth's temperature is changing in ways that are consistent with the IPCC predictions.
11. For these reasons, the international scientific community has developed a consensus position that human-induced warming is already causing some damage to some places and people around the world. However, uncertainties remain about magnitude and timing of future warming and associated impacts.
12. Significant scientific uncertainties exist in attempting to predict future global warming impacts that will be created by different levels of atmospheric GHG concentrations, an issue that must be faced in determining atmospheric GHG stabilization targets (Lemons, 1996).
13. To deal with remaining uncertainties about remaining climate change impacts, the IPCC has established likely ranges of temperature changes and impacts. Even if the temperatures and impacts that are experienced turn out to be at the lower end of the range of the IPCC predictions, some people and some ecosystems will be harmed by climate change. Yet some people may benefit from climate change due to longer growing seasons, some arid and semi arid zones becoming wetter, and increased growth in some plants because of higher levels of CO₂, for example (IPCC, 2001).
14. IPCC's predictions about climate change impacts are made by IPCC in reliance on a number of climate models. These models assume that the climate system will react in mathematically describable patterns so that temperatures and associated impacts respond in proportion to atmospheric GHG concentrations which are slowly rising in response to increases in GHG emissions. Yet, the IPCC acknowledges that there are a number of plausible more rapid non-linear responses of the climate system that are not fully represented in the models that could lead to potentially catastrophic impacts at least for some places in the world. These plausible non-linear responses of the climate system are generally referred to as "climate surprises." If some of these climate surprises occur, then climate change would be much larger and more rapid than those described in the IPCC's predictions. Climate surprises of concern include: (a) abrupt changes in ocean circulation patterns; (b) large releases of methane from melting permafrost, (c) large sudden increases in sea level caused by the breakup of polar ice, and, (d) non-linear responses of the earth's carbon cycle.
15. The longer the world waits to take significant action to reduce GHG emissions, the harder it will be to stabilize greenhouse gases in the atmosphere at levels that prevent dangerous interference with the climate system.
16. If governments wait until all uncertainties about climate change impacts are resolved and the consensus view of climate change science turns out to be correct, it is likely to be too late to prevent potentially catastrophic damages from human-induced climate change.
17. Even if it were possible to stabilize GHG atmospheric concentrations at current levels, because of temperature lags in the global climate system, the earth will continue to heat up causing additional climate change damages in the years and decades ahead.



18. It is unlikely that atmospheric levels of carbon dioxide equivalent can be stabilized much below 450 ppm during this century and thus significant additional warming is virtually guaranteed in this century (Baer and Athanasiou, 2005).
19. Damages already being experienced by some people are of many types including, but are not limited to, death, disease, and ecological harm from floods and droughts, vector borne disease, rising seas, storms, and increased heat waves.
20. As stated previously, some of the poorest people around the world are most vulnerable to climate change impacts. (See discussion above on responsibility, Issue One.)
21. In regard to scientific uncertainty about climate change, nations of the UNFCCC agreed to follow the “precautionary principle,” a guide to acting in the face of scientific uncertainty, which has been adopted in other treaties to deal with uncertain but risky behavior. (Brown, 2003) As we have seen, article 3 of the UNFCCC states in relevant part:

The Parties should take precautionary measures to anticipate, prevent, or minimize the causes of climate change and mitigate its adverse effects. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing such measures, taking into account that policies and measures to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost (UN, 1992a, Art. 3).

B. Ethical Analysis of Issue Four

1. Decision making in the face of scientific uncertainty about climate change raises important ethical questions. This is so because even if science could accurately describe levels of risk, ethical questions about the acceptability of this risk arise. That is, from a scientific conclusion that a climate change creates a particular threat or risk, one cannot deduce whether that threat is acceptable without first deciding on certain criteria for acceptability. The criteria of acceptability must be understood as an ethical rather than a scientific question. For instance, although science may conclude that certain levels of GHGs in the atmosphere create a risk that the West Antarctic ice sheet may melt and increase sea levels by many meters, science cannot say whether this additional risk is acceptable. Science is designed to identify and describes facts and cannot, by itself, generate prescriptive guidance. The scientific understanding of the nature of the threat, of course, is not irrelevant to the ethical question of whether the risk is ethically acceptable, but science alone cannot tell society what it should do about various threats.
2. Decision makers cannot avoid ethical questions when faced with uncertain impacts of human activities including who *should* bear the burden of proof about harm. To ignore risks is to decide to expose human health and the environment to a legitimate threat, that is, a decision not to act on a serious environmental risk has consequences. Furthermore, science alone also cannot determine the quantity of proof that should trigger preventative actions. For this reason, climate change decisions in the face of scientific uncertainty about impacts must be understood to raise a mixture of ethical and scientific questions.
3. All ethical systems concur that those who engage in risky behavior are not exonerated simply because there was uncertainty involved in determining whether or not their behavior would actually cause damage. There are many laws that implement this well-established norm. For instance, for a defendant to be convicted of reckless driving or reckless endangerment,

a prosecutor simply has to prove that the defendant acted in a way that he or she should have known to be risky. Many types of risky behavior are criminal because societies believe dangerous behavior is irresponsible and should not be condoned. Furthermore, the ethical duty to avoid risky behavior is proportional to the magnitude of the potential harm, particularly to those who have not consented to being placed at risk.

4. Therefore, as a matter of ethics, a relevant question in the face of scientific uncertainty about harmful consequences of human behavior is whether there is a reasonable basis for concluding that serious harm to others could result from the behavior. In the case of climate change, scientists have understood the potential of human activities to change the climate for at least thirty years and have known that these changes could harm humans, plants, animals, and ecosystems. In addition, for the last twenty years, the threat of human induced climate change to human health and the environment has been widely discussed in the scientific literature. For more than a decade, the IPCC, after evaluating the peer-reviewed science on climate change, has been telling the world that great harm from global warming is likely. For this reason, climate change causing actions constitute risky behavior that is ethically unsupportable.
5. For this reason, nations cannot deny that their release of GHGs creates a risk to human health and the environment around the world, even if one disagrees with the specific predictions of the timing and magnitude of global warming impacts now being made by mainstream science. Therefore, nations emitting significant amounts of GHGs have been engaged in risky behavior and this risky behavior has ethical significance even if there is uncertainty about actual consequences.
6. Because by the end of the 1980s there was widespread understanding in the scientific community of the threat posed by rising concentrations of atmospheric GHGs, there was at least by then a clear ethical duty to act unless potential victims of climate change or their representatives gave free informed consent to accept the risk.
7. All major ethical systems would strongly condemn behavior that poses serious risks to the things that humans hold to be of most value, i.e., life, health, family, the ability to make a living, community, and the natural environment. Despite scientific uncertainty about the timing and magnitude of climate change threats, there is general scientific consensus that human caused changes to the climate system are occurring and that they put peoples and environments at serious risk. Because of the high levels of potential harm to peoples and environments, the duty to refrain from activities that result in climate change is extraordinarily strong. Therefore, using scientific uncertainty as an excuse for continuing increasing global atmospheric levels of GHGs is ethically intolerable.
8. For the above reasons, there is ethical consensus that the argument that a nation need not reduce its GHG emissions because of scientific uncertainty about consequences of timing and magnitude does not withstand minimum ethical scrutiny because of:
 - a. The enormous adverse potential impacts on human life, liberty, and personal security, as well as on and the environment from human induced climate change.
 - b. The disproportionate effects on the poorest people of the world.
 - c. The real potential for potentially catastrophic climate surprises much greater than impacts often predicted that rely on assumptions of smooth, linear responses to climate change.
 - d. The fact that much of the science of the climate change problem has never been or is not now in dispute even if one acknowledges uncertainty about timing or magnitude of climate change impacts.
 - e. The fact that climate change damage is probably already being experienced by some people.



- f. The strong likelihood that serious and irreversible damage will be experienced before all scientific uncertainties can be eliminated.
 - g. The fact that the longer nations wait to take action, the more difficult it will be to stabilize GHGs at levels which don't create serious damage to humans, plants, animals, and ecosystems.
 - h. The fact that nations agreed in the UNFCCC not to use scientific uncertainty as an excuse for inaction on climate change when they agreed to the precautionary principle.
 - i. The fact that those most vulnerable to climate change impacts have not consented to the risk imposed by climate change.
9. Because nations have consented to be bound by the precautionary principle in relation to climate change science, the failure to apply the precautionary principle in developing climate change policies also violates the ethical norm that a nation should keep its promises.
10. Nations have a duty to consider all plausible adverse climate change impacts in setting policy including low probability high consequence impacts. In determining whether low probability, high consequence impacts are acceptable, nations need to provide opportunity for those most vulnerable to climate change to participate in this decision (Brown, 2003).
11. As remaining scientific uncertainties about climate change are largely about timing and magnitude of climate change impacts rather than about whether human activities are changing the climate system, these scientific uncertainties cannot be ethically justified to limit obligations to reduce GHG emissions that are already harming some people and places and creating additional threats for millions of people around the world who have not consented to be put at risk.

Issues to be Developed

1. Because there is a need to apportion liability for unavoidable climate change damages (see Issue One above), given that scientific confidence about adverse impacts from climate change has increased over time, future work on the ethical dimensions of climate change scientific uncertainty should examine when the science of climate change had become certain enough to create duties to act. Several options for assigning responsibility for climate change exist. They include once climate change was first recognized to be a threat by the scientific community in the 1930s, when the scientific community began to measure the rise of GHGs in the atmosphere in the late 1950s, when the first models started to predict serious warming in the late 1970s, when many nations began to call for serious emissions reductions in the middle 1980s, when the first IPCC report concluded that climate change science was a real threat in 1990, etc. Although it may not be possible to draw clear lines around these events, arguments about normative responsibility at various times could be developed.
2. In the law, there is a notion that "willful ignorance" of a state of affairs can not be used as justification for continuing harmful behavior. There is a need to develop the ethical basis for this position and determine how it applies to climate change.
3. In some cases in the face of uncertainty, it is prudent to act incrementally. Are incremental approaches to climate change ethically justified and if so what ethical problems and considerations about incremental approaches are there?

VI. Ethical Issue Five: Cost to National Economies — Is the commonly used justification of cost to a national economy for delaying or minimizing actions to reduce the threat of climate change ethically justified?

A. Factual context

1. Some nations have resisted calls to reduce GHG emissions using two arguments that involve costs to the nation. The first is that costs to the national economy of reducing emissions through programs that would achieve targeted emissions reductions are excessive. The second is that cost-benefit analysis (CBA) does not justify programs to reduce GHG emissions (Brown, 2002).
2. Some nations have justified non-action on climate change on the basis of cost to their national economies alone. In using cost as an excuse in this way, nations have ignored potential harms to other nations from climate change.
3. Nations refusing to commit to GHG reductions based upon cost usually have not considered their duty to reduce emissions as matter of justice.
4. Some nations have used CBAs as a prescriptive tool for determining acceptable approaches to national global warming policy and on that basis limited commitments to reduce emissions (Brown, 2002).
5. The use of CBA as a tool to evaluate climate change policy options can lead to ignoring obligations to reduce GHG emissions if the results of the CBA are used prescriptively to the exclusion of other considerations.
6. The use of CBA as a tool to evaluate climate change policy options often include calculations that aggregate costs and benefits while ignoring how costs and benefits are distributed among those who will be affected by climate change policies.
7. CBA calculations to determine the value of environmental and social benefits derived from climate change policy options often assume that value of benefits can be determined on the basis of “willingness-to-pay” measurements determined in market transactions or other shadow-market measurements that attempt to estimate what people would pay for things for which there is not adequate market-price evidence.
8. CBA of climate change policy options often attempt to consider the time-value of money in making quantitative assessment of benefits by applying discount rates to future benefits. Proponents of discounting in CBA urge that the value of future environmental benefits be determined in the same way that that the market applies value to future events, that is by understanding the present value of future benefits. When such discounting occurs, benefits from climate change policy options that will accrue far in the future are given little present value. Such an approach makes current investors’ interests, not future generations’ welfare, the focus of concern (Banuri et al., 1996).
9. CBA calculations about climate change policy options usually must confront considerable scientific uncertainty about such issues as how much temperature change and associated impacts on human health and the environment will be caused by different levels of GHGs in the atmosphere. Often CBAs have dealt with this uncertainty by assuming mid-level predictions of likely impacts while ignoring plausible higher and lower levels of impacts. In addition, CBAs prepared for use in climate change policy analyses sometimes have assumed that climate will



respond to increased GHGs in a smooth, mostly linear, fashion. Yet many scientists believe that the climate may respond rapidly to GHG forcing with potentially catastrophic consequences.

10. Because of differences in methodological assumptions, CBAs made by different parties on the same policy options often differ widely in their conclusions about the magnitude of costs and benefits.
11. Methodological assumptions embedded in CBA calculations of climate change policy options are usually not discussed with potential victims of climate change. Many assumptions are value-laden and must be addressed by ethical reflection.
12. In determining the cost of emission reduction strategies, CBAs sometimes rely on known techniques or technologies for reducing GHG emissions whose costs and effectiveness are relatively easy to estimate such as specific emissions reductions technologies, costs of carbon credits, or taxation approaches that will create incentives to reduce GHG emissions. Although reliance on these techniques or technologies facilitate estimation of costs because of the relative ease of cost estimation, the reliance of these known technologies and techniques may lead to ignoring emissions reductions strategies whose cost and efficacy may be difficult to measure but could provide equivalent emissions reductions at significantly lower costs. For instance, often omitted in CBA of climate change strategies are energy demand side reductions strategies that have often produced significant emissions reductions while saving money.
13. CBAs usually require that all values of climate change policy benefits be translated into dollars so that they may be compared with costs. Such techniques lead to determining value in monetary terms for all things including the value of human life and the loss of an island civilization or species. Yet those who will be harmed by human-induced climate change are rarely consulted about whether all values should be reduced to values expressed in market transactions or the methods for determining the monetary value of those things that can be harmed by climate change.
14. CBA originally was developed as a technique to compare alternative building projects whose costs and benefits would be experienced usually in a time span of no more than fifteen to twenty-five years and whose benefits were relatively easy to quantify because only direct costs and benefits of the project were considered. However, determining the benefits of global warming programs is a much trickier problem because of its technical complexity, the type of things that may be damaged by global warming, and the time in which the damage may occur. Determining the value of climate change impacts is particularly difficult because of the large time spans for which climate damages may be experienced and the great scientific uncertainties that must be faced in identifying the harms that will be caused by climate change.
15. The fact that there are different people who experience the costs and benefits of climate change policies is usually ignored in discounting procedures employed in CBAs.

B. Ethical Analysis of Issue Five

1. If nations justify their refusal to take action to reduce GHG emissions on the basis of cost to them alone, their position is ethically unsupportable because no person or nation has a right either to harm others as a means to achieve their economic health or to endanger others' life, health, or security.

2. The use of cost as a basis for determining the limits of national responsibility to reduce GHG emissions (to be distinguished from the use of cost to determine the least costly methods to achieve a specific goal) is ethically problematic because responsibility for reducing emissions should be derived from rights theories, principles of distributive justice, not on cost to the polluter. Cost can be a useful tool of analysis to determine the cost-effectiveness of policy options and ability-to-pay can be a relevant consideration in determining equitable levels of responsibility, but cost cannot be the sole basis for determining responsibility for GHG emissions as a matter of distributive justice. Although choosing policy options on the basis of maximizing net present economic welfare has been widely used by some governments as justification for government policy, such an approach is ethically problematic when it leads to depriving others of life, liberty, and security without their consent.
3. A nation's use of CBA as a prescriptive justification for its unwillingness to reduce GHG emission to levels consistent with just allocations is ethically problematic. This is so because such an approach undermines duties that nations have to refrain from causing harm to others and the rights that all people have to life, liberty, and security.
4. Since principles of justice would give all people equal rights to use the atmosphere in absence of morally relevant criteria that would entitle people to different levels of use, those who advocate that use of cost as a basis for determining responsibility for GHG reductions bear the burden of identifying morally relevant criteria that justify the use of cost of reductions as a basis for determining responsibility.
5. CBAs that aggregate costs and benefits in analyses of climate change policies fail to satisfy principles of justice that require a just sharing of harms and benefits among people who will be affected by climate change policy.
6. To use "willingness-to-pay" as the exclusive measure of value of the benefits of climate change policy in CBAs can result in the focus on one type of value at the expense of other approaches to value. For instance, as some value systems recognize inherent value in the life of some living beings, an approach that only recognizes the market value of beings transforms inherent value into instrumental value, the very thing prohibited by some value systems. Putting a market price on something that should be protected because of ethical duty can undermine the duty.
7. Since people have rights to be protected from harm to their life, health, and security, the use of "willingness-to-pay" as the measure of the value of life, health, and security of others who have not consented to this valuation undermines duties to do no harm to others without their free, informed consent.
8. Failure to clearly identify all methodological assumptions in CBAs in determining costs and benefits, in selecting which reduction strategies will be considered in cost calculations, and in determining which adverse climate change impacts will be considered in benefit calculations given scientific uncertainty about impacts, violates principles of free informed consent that are required to assure fair participation in climate change decision making. (See discussion below on fair decision making, Issue Eight)
9. The determination of the value of benefits from climate change policy options by assuming only mid-level range potential impacts when more serious harms are plausible is ethically problematic if it leads to actions that are not sufficient to avoid great harm to life, health, and security of others that have not consented to failure to consider all potential harms to them.



10. Because discounting benefits in CBA assumes only contemporary investor-individuals' interests count in determining worth, discounting techniques in CBA can violate interests of future generations to have a global climate system that has not been degraded by human activities. Since nations agreed in the adopting the UNFCCC to protect the interests of future generations, discounting benefits and harms in CBAs can violate the duty of nations to keep promises made in treaties.
11. Cost and benefit calculations in CBAs that are used to justify policy responses to climate change that have not been consented to by victims of climate change raises serious problems of procedural justice.

Issues to be Developed

1. Additional ethical analysis is needed of specific CBAs that are being used as prescriptive guidance of climate change policies.
2. Additional ethical analysis is needed to see if "efficiency" or "welfare maximization" objectives can be integrated into national policies on GHG emissions that also are based upon other ethically justifiable criteria for determining policies.
3. Ethical analysis is needed to determine what extent is "ability to pay" for GHG reductions a relevant criterion for establishing responsibility for GHG emissions.

VII. Ethical Issue Six: Independent Responsibility to Act — Is the commonly used justification for delaying or minimizing climate change action that any government need not act until all others agree on action ethically justified?

A. Factual Context

1. Some have argued that nations have no responsibility to reduce their GHG emissions until other nations agree to reduce their emissions.
2. Some developing nations argue that they have not made major contributions to the climate change problem and should not be expected to take action until developed countries have reduced their emissions.
3. Some countries likely to be heavily impacted by climate change say action must be taken now to limit GHG emissions.
4. Some impacts of climate change are already happening, particularly in the Arctic region.
5. Climate change will benefit some populations and areas of the world and harm others and is likely to change the current patterns of wealth and well-being in the world.
6. Actions taken to slow climate change will benefit some populations and areas of the world and harm others and are likely to change the current distribution of wealth and well-being in the world (IPCC, 2001).

7. Nations differ in levels of GHG emissions, whether measured by total emissions, per capita emissions, or emission per unit of GDP.
8. Developed nations are responsible for the majority of past and current greenhouse emissions.
9. Developing countries will soon surpass developed nations in total GHG emissions, but per capita emissions in developed countries are likely to exceed per capita emissions in developing countries for the foreseeable future.
10. Under the UNFCCC, the developed nations agreed that they would reduce GHG emissions on the basis of equity to prevent dangerous anthropogenic interference with the climate system. The developed nations also agreed that they would “take the lead in combating climate change and the adverse effects thereof” (UN, 1992a, Art. 3).
11. Under the UNFCCC, Annex 1 Parties agreed to “adopt national policies and take corresponding measures on the mitigation of climate change, by limiting its anthropogenic emissions of greenhouse gases and protecting and enhancing its greenhouse gas sinks and reservoirs” (UN, 1992a, Art. 3(2) (a)). The policies and measures to be adopted are not specified (UN, 1992a, Art. 3).
12. The UNFCCC does not provide specific time or amount commitments for emissions reductions, but does say that they should be done “with the aim of returning individually or jointly to their 1990 levels these anthropogenic emissions of carbon dioxide and other greenhouse gases not controlled by the Montreal Protocol” (UN 1992 a, Art. 3(2)(b)).
13. The UNFCCC acknowledges that nations have “common but differentiated responsibilities” (UN, 1992a).

B. Ethical Analysis of Issue Six

1. Because there is a level of global emissions below which adverse climate change impacts will not exceed tolerable levels, the duty to refrain from emitting harmful GHGs is triggered when governments exceed their fair share of these total global emissions. Those nations who refuse to reduce GHG emissions have the burden of showing that their current emissions are below that nation’s just share of global emissions.
2. Although some developing nations can make a presentable argument that they could increase GHG emissions without exceeding their just share of global emissions, some of the developed nations cannot make this argument because they have already exceeded their just share of global emissions needed to stabilize atmospheric concentrations at safe levels.
3. The duty to cease activities that harm others is not diminished if others who are contributing to the harm fail to cease their harmful behavior. This is so because no nation or person has a right to continue destructive behavior on the basis that others who are contributing to the damage have not ceased their destructive behavior.
4. Violating a provision of an international agreement such as the UNFCCC is considered a wrongful act under international law, and is therefore an unethical action for all consenting nations. Since Parties to the UNFCCC agreed that Annex I countries would take the lead in combating climate change and modifying future trends, Annex I countries should undertake



policies and measures to limit their emissions regardless of actions taken by non-Annex I country Parties.

5. Actions that harm another state may be regarded as wrongful under international law, even in the absence of a violation of a specific agreement such as the UNFCCC. Greenhouse gases are affecting global climate, and the adverse impacts of climate change are felt by nations far from the sources of the emissions. High emitting nations have a legal and ethical responsibility to reduce emissions that harm others. This duty applies regardless of efforts undertaken by other nations.

Issues to be Developed

1. As we saw in Issue Three, there is a need to look at the ethical basis for allocations of GHG emissions, that is, what is each nation's just share of total global emissions.
2. Research is needed about existing norms that can be deduced from legal principles contained in hard and soft law beyond the UNFCCC from such sources as the Trail Smelter Arbitration case (1941) and other principles of international law.

VIII. Ethical Issue Seven: Potential New Technologies — Is the commonly used justification for delaying or minimizing climate change action until less costly technologies are invented ethically justified?

A. Factual context

1. Some parties assert emissions reduction activities should be delayed until new less costly technologies are invented and become available in the future.
2. This argument has been made by parties even though their current emissions levels are above their just share of total global emissions.
3. The justification for waiting for less costly technologies appears to be based upon the assumptions that: (a) existing technologies are too costly and their adaptation will harm their economies (see discussion on costs in Issue Five); (b) new technologies that can achieve needed reductions will be available at lower costs in the future; (c) waiting for these new technologies does not create serious harm; and (d) there are no unintended risks and consequences related to the new technologies. Moreover, it is falsely assumed that market incentives are sufficient to trigger new technologies.

B. Ethical Analysis of Issue Seven

1. The assumption that no serious harm will be caused by delaying emission reductions until new, less costly technologies are available is problematic. Past and present GHG emissions are already causing serious harm to people, plants, animals, and ecosystems. Given this, parties have a duty to take the necessary steps to reduce damage caused by past and current emissions, including emission reductions for those parties whose emissions are above their just share of global emissions. Furthermore, if parties delay making reductions to levels of GHG emissions that constitute their just share of global emissions, these parties should be held responsible for harm caused by their

delay. (See discussion of Issue One above.) It should be noted that costs due to reparations for damage caused by such delays could cost more than the current costs of reducing emissions.

2. The assumption that current emission reduction technologies are unaffordable is questionable. A combination of lifestyle changes (public vs. individual transportation, local vs. imported food consumption) and readily available and affordable renewable energy technologies can significantly reduce GHG emissions. Renewable energy technology has been used in different forms for thousands of years and is readily available. Alternative transportation systems and vehicles are also available. Human settlement patterns and energy conservation processes that reduce GHG emissions are also being applied globally. Promising possibilities are emerging all over the world and should not be underestimated. Since humanity has the knowledge, the financial facilities, and technology to reduce GHG emissions, it is likely misleading and unethical to take a position that no or hardly any such options exist.
3. Even if there were true that no immediate harm from existing levels of GHG emissions, it is ethically problematic to appeal to the possibility that less costly technologies might be available in the future as a basis for refusing to reduce emissions now below one's fair share of global emissions as long as current emissions trajectories indicate that the world will soon exceed very dangerous GHG atmospheric concentrations. In making the claim that new less costly technologies will eventually exist to solve the problem of climate change, parties are speculating that these technologies will in fact be developed in time to avoid additional damages. Given that these less costly technologies may not appear or be developed in a timely enough fashion to avoid additional damage, and that methods for reducing GHG emissions are now technologically available, it is ethically irresponsible troublesome to fail to do what one can to reduce the threat of harm on the basis of speculation. Those who wish to wait to take steps to prevent harmful consequences from current behavior have the burden of proof in demonstrating the feasibility of the premise that these new technologies will be available in time to avoid serious damages.

IX. Ethical Issue Eight: Procedural Fairness — What Principles of Procedural Justice Should be Followed to Assure Fair Representation in Climate Change Decision Making

A. Factual Context

1. Procedural justice requires that decisions are made and implemented according to fair processes. Procedural justice requires at a minimum: a) that like cases are treated alike and any distinctions be ethically justified; b) that the decision making and implementation treat people fairly and impartially; c) that those directly affected by the decisions have a voice and representation in the process; and d) that there be transparency in the decision making process (Shrader-Frechette, 2002). Since decisions about emission controls must be negotiated in an international context, procedural justice is crucial in developing international agreements and policies.
2. National climate change responses and strategies affect people far beyond the borders of the nations making such decisions, yet in developing national strategies nations rarely, if ever, consult with residents of other countries who are vulnerable to climate change. (Paavola, 2005)
3. Because climate change decisions must be made in the face of considerable scientific uncertainty about climate change impacts, nations in developing national climate change strategies must make assumptions about global impacts from a range of plausible impacts. Nations who base



national strategy on the assumption that impacts of climate change will be on the lower end of the range of plausible impacts will adversely affect the interests of those vulnerable to climate change impacts if climate change impacts turn out to be greater than those at the lower end of the range of plausible impacts.

4. Some groups within nations are more vulnerable to climate change than others. For instance, people living close to rising oceans or those vulnerable to droughts and floods are likely to be particularly vulnerable to climate change. Yet, many of those most vulnerable to climate change do not understand the implications of climate change policy options nor have they been consulted in developing policies on climate change.
5. Global strategies to reduce the threat of harms caused by climate change are negotiated by nations who are theoretically representing their citizens' interests in Conference of the Parties under the United Nations Framework Convention on Climate Change. These negotiations often consider complex scientific and economic issues that may not be equally well understood by all those who are involved in the negotiations.
6. Scientists and professionals from developed countries comprise the majority of the analysts working with major international climate change institutions, including the Intergovernmental Panel on Climate Change, and most of the scientific literature on climate change is written in English (Miguez, 2002).

B. Ethical Analysis of Issue Eight

1. Given basic human rights to life, health, and security, those who might be harmed by climate change policy options have a right to free informed consent to being exposed to climate change risks (Shrader-Frechette, 2002). In order to give free, informed consent about climate change policy options, persons must:
 - a. not be forced to consent,
 - b. be in possession of all relevant information, and,
 - c. understand policy options.
2. As scientists that identify climate change impacts including those writing on behalf of IPCC do not always identify all plausible climate change impacts, including low probability impacts, those who may be victims of climate change may have their rights to participate in decisions that create risks to them and be informed of all plausible risks if they are going exercise informed consent.
3. Nations who formulate climate change policies have a duty to make climate policy options understandable to all those who will be affected by their policies and to seek their participation in decision making that will lead to continuing risks to others' life, health, and security.
4. Nations have a duty to disclose all assumptions and uncertainties entailed by climate change policy options to those who will be affected by climate change policy so that they have an opportunity to exercise free informed consent to policies that could harm them.
5. Nations need to provide expertise to those who will be affected by climate change options that they are considering to explain climate change science and economics so that those affected by climate change can make informed decisions.

6. Nations formulating climate policy based upon cost-benefit analysis must disaggregate harms and benefits of climate change policy so that subgroups will understand how they will be affected.
7. In international negotiations, all nations have a right to competent expertise to inform decision makers on complex scientific and economic issues. For this reason, developed nations should provide funds to support technical experts to assist those nations who do not possess such expertise.
8. No nation may consider the implications of climate change policy to itself alone in developing national climate change policy. To do so would violate the rights of those who are harmed to life, health, and security. For this reason, when developing national climate change policies, nations must consult with and consider the interests of persons who may be harmed that live outside their jurisdictions.

Issues to be Developed

1. Commonly used procedures for resolving public policy disputes require careful study to determine if they ensure or enable procedural fairness. In the case of climate change, various procedures have been recommended to resolve certain issues. (See Ott, 2004) These include: lotteries, auctions, opinion polling, bargaining, negotiation, and civil law rules for determining liability. Careful attention to ethical analyses of these procedures (see, for example, Shue 1994, 1999) is needed. For each of these procedures, the types of decisions to which they are ethically best suited should be determined. For example:
 - a. Lotteries can be adequate in resolving hard dilemmas that do not allow for any prioritization of claims on the basis of rights or other moral considerations.
 - b. Auctions are sometimes recommended as means to sell GHG emission entitlements. Although auctions could be ethically superior to other procedures for allocating emissions, ethical issues arise when auctioning interferes with other ethical concerns such as egalitarian allocation schemes. Thus, auctions could be ethically problematic procedures for allocation of rights.

These examples demonstrate the importance of careful, situated, and nuanced ethical analyses of the various procedures frequently recommended for climate change decision making.

2. Future work on procedural fairness in climate change negotiations should develop the full implications and interpretations of a Rawlsian approach to procedural justice for climate change policy-making. In particular, Rawls' distinctions between "perfect," "imperfect," and "pure" procedural fairness should be considered. The Rawlsian attention to negotiating from the position of those worst-off should be considered as another type of procedure that ethical negotiations might employ.
3. Research is needed to determine how individuals or groups within nations may be most fairly represented in international negotiations? In answering this question, discourse ethics is an important resource to be considered in any ethical analysis since basic requirements of procedural fairness in participatory processes is the subject of discourse ethics. Theories of discourse ethics conclude that fair participatory procedures must be characterized by: openness of result, equal position of all parties, neutrality of the facilitator, and a right to present culturally bounded perspectives on the problem at stake (e.g. lifestyles resting on cheap energy) and an equal chance for all party to question and challenge such perspectives. Discourse ethics may also be helpful examining other procedures, such as bargaining.



4. To participate competently in climate change negotiations requires technical expertise and the expenditure of funds that are often beyond the capacity of many poorer countries. Research is needed on how to create decision making procedures that assure fair participation or representation of those who will be affected by climate change but who have limited resources.
5. Research is needed on how to best assure that the interests of future generations are adequately represented in negotiations in climate change negotiations.

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