



United Nations
Educational, Scientific and
Cultural Organization

Executive Board

Hundred and eighty-second session

182 EX/INF.16
PARIS, 2 September 2009
English & French only

Item 56 of the provisional agenda

REPORT BY THE WORLD COMMISSION ON THE ETHICS OF SCIENTIFIC KNOWLEDGE AND TECHNOLOGY (COMEST) ON THE ETHICAL IMPLICATIONS OF GLOBAL CLIMATE CHANGE

SUMMARY

As a supplement to document 182 EX/56, this information document contains the full text of the report by the World Commission on the Ethics of Scientific Knowledge and Technology (COMEST) on the ethical implications of global climate change. The text presented is an edited version of the draft considered and approved by COMEST at its sixth Ordinary Session, held in Kuala Lumpur (Malaysia) from 16 to 19 June 2009, subject to final revision and drafting on the basis of discussion at the Session.

**Report By The World Commission on the Ethics Of Scientific Knowledge
and Technology (COMEST) on the Ethical Implications of Global Climate Change**

Table of contents

I.	Introduction	1
II.	Uncertainties related to climate change	2
II.a	Uncertainties in the scientific knowledge base	3
	<i>Gaps in climate change observation</i>	<i>3</i>
	<i>Limitations in climate change science</i>	<i>4</i>
II.b	Climate change as a source of ethical ambiguity.....	4
	<i>Threats of global climate change to human well-being</i>	<i>5</i>
	<i>Issues of justice.....</i>	<i>6</i>
	<i>Ethical uncertainties related to the main characteristics of global climate change.....</i>	<i>7</i>
III.	The basis, nature and scope of ethics	9
IV.	Internationally agreed ethical principles relevant to global climate change	11
IV.a	Problems in applying international instruments and principles	12
IV.b.	Drawing on already shared and accepted principles	13
IV.c.	Beyond existing values and principles?.....	14
V.	Core themes for critical ethical dialogue	15
V.a.	The link between foreknowledge and the duty to act on it.....	15
V.b	Applying the precautionary principle as a basis for action in the face of scientific uncertainty	16
V.c.	Determining the place of human rights in an ethics of climate change.....	17
V.d.	Concerns about future generations in an ethics of climate change	18
V.e.	Concerns about discounting	19
V.f.	Obstacles to sharing and differentiating responsibilities	20
VI.	Conclusions	21
II.	References	25

I. INTRODUCTION

1. The claim that global climate change is the defining issue of our era is supported by the *Fourth Assessment Report* of the Intergovernmental Panel on Climate Change (IPCC), published in 2007, which states unequivocally that global climate change engendered by past and present human activities poses a severe threat to human welfare, biodiversity and ecosystem integrity, and possibly to life itself. Climate change is expressed by global warming, i.e. rising average temperatures, but entails much more. Long-term changes in precipitation, high-tide levels, ocean salinity and acidity, wind patterns and extreme weather events, including droughts, heavy precipitation, heat waves and the intensity of tropical cyclones (IPCC 2007a: 7), confront humanity with enormous practical challenges. It will be necessary therefore to build a sound scientific understanding of the mechanisms through which climate change unfolds, and, on the basis of this knowledge, to mitigate its intensity as far as possible, while adapting to its effects.

2. What is increasingly clear is the magnitude of the global climate change threat, which not only calls immediately for action and response, but also necessarily raises questions such as “what is to be done?”, “who is responsible for what?” and “what is the criterion for proper (good) action?”. These questions illuminate the explicit ethical thrust of any serious engagement with climate change. In other words, far-reaching ethical questions can be asked about the continuation of human actions that not only cause climate change, but also contribute to its intensification and acceleration. The ethical stakes surrounding climate change cannot be avoided or reduced. Failure to act could have catastrophic implications, but responses to climate change that are not thought through carefully, with ethical implications in mind, have the potential to devastate entire communities, create new paradigms of inequity and maldistribution, and render even more vulnerable those peoples who have already found themselves uprooted by other man-made political and ideological struggles. Moreover, it is well known that global climate change has the potential to bring about conflict mobilized by the quest for scarce resources. The need for an ethical approach is therefore compelling.

3. The formulation of an ethics of response to climate change will thus have far-reaching implications for the immediate and future well-being of vast numbers of people who are the immediate victims of global climate change, or fall in the vague category of those causing it. However, ethical concerns are in fact rarely made explicit in discussions about climate change, and therefore are not adequately scrutinized or debated. Climate change discussions predominantly take place on a factual and technical level, i.e. they focus on the causes, the impacts and the effects of climate change, or on technical policy issues regarding responses to its challenges. As Ten Have (2006: 11) has pointed out with regard to responses to environmental problems in general, there seems to be a tendency to move directly from concerns about climate change to climate change action, without self-consciously and critically reflecting on the aims, the nature, the extent and the justification of these actions. Thus, the ethics already embedded in concerns about and responses to global climate change are shifted to the background, and effectively taken off the agenda of matters that need to be seriously considered.

4. In light of this, the aim of this report is to make explicit the ethical implications of global climate change. Policies that actively take into account such implications, at international, regional and national levels, are undoubtedly more likely to succeed in developing a sound understanding of climate change with which to mitigate its threat, and to adapt to its effects. The first step in this regard is to articulate clearly the ethical implications and moral basis of possible responses to global climate change. This requires grappling with the extreme complexity of global climate change as a concrete phenomenon unfolding in time and moving beyond conventional conceptual frameworks and decision-making strategies that marginalize the ethical nexus of the problem.

5. However, one cannot fully outline the contours of this ethical nexus without first addressing climate change as a space of uncertainty, which calls for a specific ethics. Section II of this report articulates the various uncertainties that constitute the past, present and future of climate change with particular reference to the relation between epistemology and ethics. In Section III, we then

attempt to elaborate more specifically the basis, nature and scope of ethics with a view to identifying the ethical principles that should inform rational debate about climate change. Section IV is devoted to an overview of the principles that are already available in the international arena to address the ethical issues related to climate change. In Section V, we go on to discuss the core themes that should form an essential part of critical dialogue in the context of developing ethically justifiable responses to the challenges of global climate change. Finally, Section VI summarizes the main argument of this report and draws key conclusions.

II. UNCERTAINTIES RELATED TO CLIMATE CHANGE

6. The ethical implications of global climate change must also seriously take into account the uncertainties embedded in scientific knowledge about climate change and its future implications. Furthermore, the fact that some of these uncertainties are recognized to be irreducible heightens the need to clarify the ethical grounds of response.

7. Climate change is not new. It has indeed, in recorded history, led to the collapse of entire civilizations. However, current processes of climate change are specific in several respects that create challenges above and beyond what is inherent in interactions between human societies and ecosystems.

- Analytical and predictive knowledge is available that enables us to foresee, to mitigate and to adapt to the effects of climate change in a manner that was not possible in earlier times.
- On the basis of that knowledge, it is also possible now to discern a causal link between human action and current processes of climate change, as well as to establish that earlier processes of climate change were predominantly natural phenomena.
- Humanity collectively has greater capacity than ever before to address climate challenges, but at the same time the speed of change may exceed adaptation capability, and some groups may be more vulnerable than in earlier periods.
- The scope and nature of ethical concerns currently acknowledged globally have evolved to include issues wider than only those related to human-human interactions.
- There is a growing realization that human well-being is dependent on ecosystem integrity, biodiversity, and on the existence of a climate system with specific characteristics.
- Our current knowledge of ecosystems and the impacts of our actions on these ecosystems is incomplete, and this generates responsibilities to foresee, to prevent, to mitigate and to adapt to the negative effects of our impacts. However, it is not always clear who has the responsibility to do what.

8. Taken together, these observations point to a double set of uncertainties that, paradoxically, emerge from within a framework of well-established and undisputed knowledge about global climate change. On the one hand, in spite of scientific consensus that global climate change indeed exists, and that it is contributed to by past and present human action, there are a number of scientific uncertainties that make it difficult to form a clear picture of the ethical implications. On the other hand, in spite of a growing consensus that global climate change is seriously affecting the well-being of the whole of humanity living now and in the future, and also that it is affecting some groups more than others, it is unclear what exactly the ethical challenges of global climate change are, and on the basis of which ethical considerations we should take what action to address these challenges.

9. It might be argued that ethical concerns are irrelevant to the menace of global climate change insofar as the environment and the atmosphere can be mastered through the cultivation of

scientific knowledge. However, there are ethical implications inherent in the quest for scientific knowledge above and beyond the uncertainties embedded in science itself.

II.a Uncertainties in the scientific knowledge base

10. Climate change confronts us with a strange paradox. On the one hand, we currently have analytical and predictive knowledge that enables us to foresee, prevent, mitigate and adapt to aspects of climate change, far beyond what was possible in earlier times. On the other hand, we are still confronted with a number of uncertainties in our scientific knowledge base that combine to put constraints on our ability to predict when and where, and with what intensity, the various effects of climate change will emerge. The sources of these uncertainties include:

- incomplete factual data on aspects of climate change (i.e. uncertainties caused by observation gaps);
- limitations in science (i.e. uncertainties embedded in the applicability and predictive capacity of scientific models);
- the boundaries of our conceptual schemes (i.e. uncertainties caused by the nature, assumptions and scope of current theoretical frameworks available to understand global climate change);
- epistemological constraints (i.e. uncertainties caused by the methodologies typically followed by natural science, which commonly exclude the human dimensions of climate change).

11. The sub-sections below give a thumbnail sketch of the first two of these sources with a view to demonstrating that the uncertainties that they give rise to are already, in themselves, ethical challenges.

Gaps in climate change observation

12. All predictions about future climate change trends start with gathering factual data at a certain place over an extended period of time. Currently, the most comprehensive interpretation of climate change data can be found in the assessment reports of the IPCC. Drawing on historical as well as biological, fossil and geological records, it is possible for science to estimate past climate conditions over hundreds of thousands of years. However, in spite of the impressive data set that has been built up, there still are numerous gaps in the observation basis of knowledge about climate change.

13. In its overview of the physical science basis of climate change, the IPCC, for instance, states with reference to polar regions (IPCC 2007a: 902-909) that the large natural variability of the polar climate on inter-annual, decadal and longer time scales is an important source of uncertainty (p. 903). It further states that “understanding of the polar climate system is still incomplete due to its complex atmosphere-land-cryosphere-ocean-ecosystem interactions involving a variety of distinctive feedbacks” (p. 903). While models are constructed to form an understanding of these interactions, the problem is a lack of observations of clouds, precipitation, wind, sea ice and ocean currents against which the models can be assessed. Similar observation gaps hamper understanding of the interactions between land use, ground cover, and ocean temperature in determining rainfall patterns in the Sahel (IPCC 2007a: 866-871). Such observation gaps clearly make simulations of future climate very difficult, and may reduce confidence in projections of climate change trends.

14. Observation gaps of another kind exist with respect to climate data in southern countries and continents. This is evident from the number of studies and databases that informed the Fourth Assessment Report (AR4) of the IPCC. Relative to the abundance of data about climate conditions in the Northern hemisphere, the data about climate conditions in the Southern hemisphere appears

to be thin (IPCC 2007d: 32), partly because of lower proportions of land compared to ocean, and again this can reduce confidence in predictions about climate change trends.

15. From these observations, two important conclusions follow. Firstly, it is of crucial importance for scientists to identify the observation gaps in the scientific basis of their knowledge about climate change, and to actively follow strategies to fill these gaps. Secondly, it is equally important to communicate to policy-makers, as well as the broad public, where the information gaps are and what implications they have for the confidence with which climate change trends can be predicted. Since the public as well as policy-makers are dependent on the information provided to them by scientists to understand and appropriately respond to the risks and threats of climate change, scientists have a clear duty to provide a picture of climate change that is as complete and reliable as possible.

16. Gaps in observing systems thus point to two distinct ethical challenges. First, from the perspective of science ethics, the question is how to optimize scarce resources allocated by science policies to maximize benefits for humankind as a whole. Secondly, given irreducible gaps in observation capacity, an ethical framework consistent with imperfect information needs to be developed.

Limitations in climate change science

17. Besides uncertainties generated by gaps in observation data, scientists also experience uncertainties with regard to their predictive models. While many of these models take into account both natural variability and the contribution of human actions to climate change trends, and while their predictive power has progressed enormously, it is important to avoid unrealistic expectations. For instance, it is not possible to predict exactly how or when a specific region may be affected by specific aspects of climate change. In spite of continuous progress in modelling capacity, some aspects of such uncertainty are likely to be irreducible.

18. Yet climate scientists claim with very high levels of confidence that limitation of average global temperature rises to less than 2°C above pre-industrial levels are likely to stabilize climate change trends and avert catastrophic effects in the future. At the same time, predictive models show that bigger increases in average global temperatures may exceed a “tipping point” that will introduce dangerous and irreversible climate change by the end of this century (Northcott 2007: 21).

19. When it comes to more specific predictions, however, one would be hard pressed to find a climate scientist who would claim absolute certainty. For example: some predictive models envisage a gradual melting of summer Arctic sea ice, leading to a “blue Arctic Ocean” by 2070. Other predictive models, taking into account different observational data, predict a “blue Arctic Ocean” as early as 2030. Even scientists are uncertain about specific events that may occur because of climate change.

20. It follows that the challenge for science is, as already mentioned, not only to identify observational gaps, but also, on the basis of such identification, to continue to improve the predictive models it uses on global and regional scales to interpret observational data and generate simulations of future climate trends. With better models, more accurate simulations can be produced which, in turn, will equip policy-makers and the public to determine better responses to climate change. Given the high stakes involved, science problems are not mere intellectual puzzles but rather crucial challenges on which the future well-being of humankind depends.

II.b Climate change as a source of ethical ambiguity

21. Climate change confronts us with a different set of uncertainties with regard to ethics. We seem to be uncertain about the basis and substance of our obligations to seek knowledge and foresee, to prevent and adapt to climate change. We seem to be uncertain about how to act on the

knowledge that there is a causal link between human action and climate change. And we are unsure how to relate to those vulnerable to climate change, as distinct from those who clearly contribute to climate change. These uncertainties entail ambiguity about the ethical implications of global climate change. A better understanding will emerge when we consider first what we know about the threats that global climate change already poses to the well-being of people living now and in the future, and secondly some of the characteristics particular to global climate change.

Threats of global climate change to human well-being

22. The force of climate change entails not only rising average temperatures on earth, but also long-term changes in precipitation and weather patterns. These trends are already manifested in extreme weather events that include floods in some parts of the world and droughts in other parts, or alternating floods and droughts in the same part of the world, as well as an increase in the intensity and frequency of typhoons, tornadoes and hurricanes. Also directly associated with global climate change are rising sea levels due to two processes: first, water expands as it warms; secondly, melting of polar land ice and glaciers increases the volume of sea water. In addition, the best climate models currently available predict that these changes, in spite of all mitigation efforts, and under the best-case scenarios, will directly affect hundreds of millions of people within the next 100 years. And no one on Earth will escape the effects of climate change. In the absence of vigorous effort in the next 50 years, these effects may indeed set in much sooner, and affect more people than currently expected and planned for.

23. The people most vulnerable to the direct effects of global climate change are those living in areas prone to flooding such as small low-lying islands, large river deltas and certain coastal areas, as well as those living in the Arctic where livelihoods and traditional ways of life are threatened by the summer loss of polar sea ice. Equally vulnerable are those people living in arid or semi-arid regions who are already, or will be, the victims of prolonged droughts – such as are predicted in particular for parts of Africa, South Asia and South America. As the heat waves in Europe in 2003 and in Europe and Asia in 2005 demonstrated, other vulnerable groups are the elderly and children. Elderly people suffer from heat which causes heart and blood pressure problems; children are at serious risk of cold and angina. These effects are worse for the poor, whether urban or rural, who have no means to avoid or adapt to rapid climate changes. A less well-defined group is the possible victims of extreme weather events such as flooding, or storms such as typhoons, tornadoes and hurricanes. Another category of possible victims are those who will be newly exposed to infectious diseases because of shifts in the range of disease vectors due to rising average temperatures.

24. Furthermore, global climate change does and will not affect humans alone, but will also diminish the flourishing and integrity of the biosphere as a whole. This includes a reduction in biodiversity, less resilient ecosystems, and suffering for countless animals, domestic as well as wild. There is a close interaction between the well-being of humans and animals, as clearly illustrated by the effects of ocean acidification on coral reefs, fish, and the livelihoods of people living in tropical coastal regions and islands. People in these areas are heavily dependent on fish for their protein. Coral animals need calcium carbonate to build their shells, but more acidic oceans make this chemically much more difficult. Loss of coral reef, which serves as the nursery and base of the food chain for many fish species, will thus have a direct impact on the lives and livelihoods of many people in these regions.

25. The categories of vulnerability, including a number of well-known issues not discussed in the preceding paragraphs, can thus be recapitulated as follows:

- Threats to the lives of people, animals and plants living on small islands, in large river deltas or in other low-lying areas.

- Threats to the wealth, property, livelihoods, including traditional livelihoods, and food security of people exposed to climate change events such as regular floods, prolonged droughts, frequent storms, the loss of coral reefs, or melting ice.
- Threats to the health of people, animals and plants that become exposed to disease vectors that have shifted in range as a result of changes in climate.
- Threats to cultural heritage, mainly to traditional ways of living, or to architectural masterpieces of various kinds, particularly in the case of sudden irreversible submergence of inhabited land.
- Threats to local, regional and global ecosystems.
- Threats to political and economic stability in States particularly vulnerable to the negative impacts of climate change.
- Threats of possible mass emigration by climate change refugees, particularly in the case of sudden irreversible submergence of inhabited land.
- Possible destabilization of the economy or health status of countries receiving large numbers of refugees.
- Possible threats to the world order and world economy.
- Threats to the dignity of people who become victims of climate change.

26. Formulated thus, it is clear that global climate change poses a clear and present threat to the well-being of the community of life on Earth, which includes non-human life, but also the social and cultural dimensions of human existence. However, while it is clear that climate change deserves focused ethical consideration and intervention, vulnerability seems poorly understood. It is not clear how to establish the basis of a systematic analysis of differential vulnerability and an adequate and long-term approach to disaster relief and adaptation.

Issues of justice

27. The very nature of potential vulnerability and the ethical uncertainties that gird appropriate response carry within them a series of larger ethical and political concerns that touch on fundamental rights and the very nature of justice, the good and equity. Four categories may be distinguished in this respect:

- Issues of distributive justice. Some people, groups or States carry an unfair burden in suffering the negative consequences of climate change to the course of which they have made little or no contribution. In addition, those who earlier caused the harm did not know it was one at the time. They may even have thought they were helping future generations by bringing on the fruits of “progress” to the good of all. Here the ethical difficulty lies in determining exactly what is unfair and unjust in the distribution of the negative consequences of climate change; but also in the distribution of the benefits of actions that cause climate change. Given the complexity of these issues, it is an ethical and practical challenge to identify what to do in the face of such distributive injustices.
- Issues of compensatory justice. If people who suffer the consequences of climate change are not those who caused it, can they legitimately claim compensation from those who did cause it? While a general ethical principle exists that those who have caused harm to others should be held accountable for it and even compensate those that have been harmed, it is not exactly clear within the context of global climate change how to determine historical and current responsibility. This is because climate change is the result of the collective action of numerous agents: States, institutions,

businesses and individuals. It is also not clear how to assign causal responsibility if global climate change is attributable not only to the collective action of the present generation, but to the collective action of a series of previous generations going back to the beginning of the industrial era around 1750. But even if these issues could be resolved, another ethical uncertainty in this context has to do with the nature and extent of compensatory justice, who exactly the beneficiaries should be, and how exactly the benefits of compensatory justice should be distributed. Furthermore, response to climate change may in turn create knock-on hypothetical claims, based on compensatory justice. Should countries that may experience loss of revenue due to climate change mitigation policies be entitled to claim compensation, and if so, from whom?

- Issues of procedural justice. Who should participate in which processes of decision-making about measures to prevent, mitigate or adapt to climate change? It is essential to reflect on current patterns of inclusion and exclusion and the mechanisms that produce them. Vulnerable groups (the elderly, the sick, the poor, indigenous peoples) need effective opportunities to participate in decision-making about climate change responses. And here too, local and traditional knowledge must be respected and effectively integrated in deliberations and decision-making, in particular about adaptation policies.
- Issues of human rights. Human rights guaranteed by international instruments are put under threat by global climate change. Hence, the question of the duties correlative with recognized rights necessarily follows. Can States or individuals appeal for instance to the human rights enshrined in the Universal Declaration of Human Rights, and guaranteed by the relevant conventions, to require certain States, institutions or individuals to stop those actions that cause global climate change, or to claim compensation from them if they do not? If yes, the question is how exactly this can be done and through which mechanisms and structures. In more specific terms, we must examine the degree to which global climate change has any implications for the basic right to liberty, which includes a person's right to use his/her property to enhance his/her well-being as he/she sees fit, as well as the right to freely choose one's own way of life.

28. Within the context of global climate change, it is not obvious how to engage these issues related to justice and human rights. They point to some of the most difficult questions that can be asked in ethics, namely how to recognize and respect other persons, in particular when they are vulnerable and do not have the power to make their voices heard in international, regional or national arenas. In the context of decision-making about mitigation of, prevention of, and adaptation to global climate change, it is even more difficult to answer these questions of recognition and respect.

Ethical uncertainties related to the main characteristics of global climate change

29. An overview of the main characteristics of global climate change reveals a number of other uncertainties that make it difficult to develop an ethical discourse about some aspects of climate change, specifically with regards to the entities – nations, States, policy-makers, corporations, and consumers – mostly responsible for activities which have caused climate change, and who should therefore be mostly responsible to take action for its mitigation. These characteristics, which further problematize the various dimensions of justice discussion discussed in the previous section, include (Gardiner 2006):

- the global dispersion of the causes and effects of climate change;
- the fragmentation of agency that makes it difficult to respond to global climate change;

- institutional inadequacy that makes it difficult to respond to global climate change;
- the persistence, non-linearity and time-delayed nature of climate change.

30. Given the issues at stake, it appears difficult to achieve a unity and coordination of responses between States, and among agents within States, to adequately respond to the challenges of global climate change not only because agents are divided by different geographical locations, interests and political agendas, but also because it is not this generation alone that needs to act, but also future generations.

31. The obvious ethical dilemma is that different generations do not share the same time horizon, and thus cannot influence one another reciprocally. The important ethical uncertainty that emerges from this is not so much what we should appeal to when we consider the interests of future generations, since we obviously have to respect the dignity and well-being of future generations as much as we do our own. Rather, the issue is exactly how much can be reasonably and ethically expected of us for the sake of the well-being of future generations, and for exactly how many generations such sacrifices should be made. Since it is very easy for any current generation to make no sacrifices at all for the well-being of future generations, another important ethical uncertainty that arises concerns how we can ensure the action minimally required to put the next generation in a position no worse than ours – insofar as this is physically possible in the face of global climate change trends. Moreover, one should be wary of the cynical response that future generations can take care of their own challenges. A third ethical uncertainty arises when we reflect upon whether the present generation, which has enjoyed the benefits of climate changing actions, has a special obligation to equip and empower the next generation with knowledge, technologies and opportunities that enable it to cope better with the challenges of climate change than we do currently.

32. Another complicating factor in responding to the challenges of climate change identified by Gardiner (2006) is institutional inadequacy. Besides the fact that it is not clear which institutions should take the lead in responding to the challenges of climate change, it is also not clear whether the current institutions that do take the lead (States and international organizations) are geared to respond effectively. Part of the problem seems to be that current structures and strategies for international decision-making are not conducive to international cooperation, collective decision-making and joint action. Even if some States express willingness to set up international platforms to implement bold measures, in the absence of consensus they may have little impact, and even one dissenting nation can prevent any international action from being implemented. One ethical uncertainty is whether there is an unconditional obligation for each agent to take that action regardless of what others say or do.¹ If such a duty exists, and if sufficient agreement on future joint action can be reached, a further uncertainty is how strongly to act and for how long; and what should be done about those “free riders” who could act but do not, while still enjoying the benefits of others’ actions.

33. Gardiner (2006) further points out that climate change constitutes a persistent problem with effects that are non-linear and seriously time-delayed. Climate change experts agree on the fact that CO₂, one of the most important greenhouse gases, stays in the earth’s atmosphere for a very long time, some say for five to 200 years which gives us room for hope, while others claim that a certain proportion of it stays in the atmosphere for thousands of years. Since it is extremely difficult to extract CO₂ from the atmosphere once it is deposited there, constant increases in, or even a steady continuation of, CO₂ emissions will lead to an accumulation that is not easily reversible. According to Gardiner (2006) all climate change effects are at the same time time-delayed. Effects

¹ “Conditionality”, which has an ostensibly ethical form, is an argument that, on grounds of fairness, argues that one has the duty to act if others do also act. Gardiner (2006) links this problem in game theoretical terms to the prisoner’s dilemma, and discusses its implications for decision-making about climate change at length. An alternative theoretical formulation, with similar implications, is the “free rider” problem, which arises when action by some agents necessarily produces benefits for all.

of climate change experienced now have been caused by greenhouse gas emissions of a previous era. Similarly, current CO₂ emissions will only have an effect at some future time.

34. But climate experts also agree that increases in atmospheric CO₂ cause non-linear or threshold effects in the climate system. The climate system can thus suddenly change into another state, which can have unpredictable effects in terms of average temperatures rising at a faster rate than before, more intense droughts and floods, and increased extreme weather events such as typhoons, tornadoes and hurricanes. Put on a time line crossing generations, this means that if nothing is done about climate change by generation A, generation B, following it, does not merely receive a package of problems of the same magnitude that generation A has faced, but a different set of problems that can be of a far greater magnitude than existed before.

35. Taken together, the persistence, the non-linearity and the time-delayed nature of climate change effects point to the disconcerting observation that at the time when humanity starts noticing negative effects, it is only the start of worse, albeit unpredictable effects to come. Formulated in graphic terms: even if humanity was able to shut down all greenhouse gas emissions today, and even if levels of CO₂ in the atmosphere did thus stabilize in the future, the effects of past emissions would still be felt for centuries to come.

36. It is uncertain whether humanity is ready to make the hard choices required to mitigate greenhouse gas emissions and to adapt to the effects of climate change. Is humanity really able to visualize and imagine the challenges that it faces? And are the ethical guidelines currently available in the international sphere adequate to help us make these decisions? In the sections that follow, a framework for a rational debate about these and related questions will be outlined. A first step in this direction will be an overview of the *basis, the nature, and the scope of ethics* in general. Then the ethical principles and guidelines will be discussed that already have substantive support in the international community, and have been captured in a number of normative documents, including binding international law. Nonetheless, the challenge of establishing an ethical approach to uncertainty has yet to be fully confronted. In other words, in the absence of full knowledge, it should be known that one is still obliged not only to think and think about acting, but to act as well.

III. THE BASIS, NATURE AND SCOPE OF ETHICS

37. Besides a special narrow notion of ethics as a part of philosophy, which provides a theoretical explanation and interpretation of morality, in a broad sense ethics, is commonly understood as knowledge of the fundamental values of human existence. Generally speaking, values are general apprehensions about the importance of objects (material or ideal, physical or spiritual) according to certain criteria. There are different kinds of values. For example, *instrumental values* mark objects that are important for their usefulness in gaining other values. The extreme opposite of instrumental values are *intrinsic values*, which identify the importance of objects for their own sake. Environmentalists, developing a *non-anthropocentric* approach towards nature, animals, biosystems or ecosystems, argue that these objects are valuable regardless of their usefulness to humans. The idea of intrinsic values has been proposed by philosophers, sometimes under the name of metaphysical values to identify essential qualities of objects constitutive of their being. *Ethical values* form the basis of decision-making and action in accordance with an ideal accepted in a given moral system. They are expressed in the notions of good and evil, right and wrong, just and unjust, what deserves respect or not, etc.

38. In comparison with merely desirable things, situational, pragmatic, and prudential preferences, political convictions or instrumental values, ethical values differ by their *universalizable* character. Thus, decision-making and action on the basis of ethical values are matters not of arbitrary choice, but rather of following precepts that are of such importance that they are deemed to be binding on all rational human beings. In comparison with aesthetic values, or judgments of taste, ethical values are distinguished by their *prescriptive* character. What makes ethical values different from all kinds of practical values is their overriding character: they articulate

an imperative or a “must” that cannot be escaped by anyone who subscribes to them. Conversely, if the imperative or “must do” that follows from an ethical value is denied, then that value and its importance itself are denied. Such a denial, however, is also not a matter of arbitrary choice. Following from the universalizable character of ethical values, when an ethical value and the imperatives following from it are denied, society has a legitimate expectation that the dissenter provide a sound, *rational justification* for doing so, and if such a justification cannot be provided, may place some kind of sanction on the dissenter.

39. Ethical values are implemented into practice (individual or group behaviour, corporate or public policies) through principles and rules, which together with values constitute an important part of ethics.

40. Among fundamental ethical values are:

- *the good* of individuals and communities;
- *solidarity* and *unity* between individuals and within communities;
- *virtues* (or character traits that typically enable rational agents to promote the good of individuals and communities, or solidarity and unity between individuals and within communities); and
- *excellence* in the good, solidarity and virtues expressed in *moral ideals*.

41. Such values are promoted through ethical principles such as:

- Do not cause harm;
- Contribute to the good of others;
- Be non-violent and just;
- Be tolerant and respect the dignity of others.

42. A further characteristic of the ethical domain is that it primarily deals with *human agency*, that is human action (including decision-making) and its effects. As such, the basis of the ethical domain is constituted by the ability of humans to choose freely and rationally between different value-laden options, and the expected consequences following from these choices. Accordingly, the ethical domain is circumscribed not only by the value choices made by humans, but also by the critical weighing of the expected consequences of their choices.

43. In this context, again, the ability to *choose freely* between value-laden options again does not imply arbitrary choice. It rather entails freedom from coercion, i.e. freedom from external pressures that actually deny rational agents their ability to exercise their own judgement. Indeed, the ethical domain entails the freedom independently to form one’s own assessments on rational grounds alone with reference to the dictates and requirements of ethical values. From this, it follows that the ethical domain allows for different interpretations of ethical values, but at the same time, when differences occur in this regard, it also lays down an imperative for those who differ to engage in a *rational debate* about their differences.

44. The importance of this rational debate is underlined by the fact that all ethical analyses, and the critical reflection associated with them, are conducted in the *context of uncertainty*. The moral agent can never claim to have complete knowledge about a situation or about all consequences of all possible actions in that situation. Within such a context of uncertainty, no action and no decision is self-evident; on the contrary, from an ethical point of view, *every* action and *every* decision made in the face of uncertainty ultimately requires a sound justification. Rational ethical debate and critical ethical reflection can help to explicate and clarify the value basis of actions and decisions,

and to deepen insight into their expected consequences. It has already been noted that since there are numerous uncertainties with regard to global climate change, an ethical approach to global climate change will have to deal explicitly with the complicating factor of uncertainty.

45. Having made these general observations about the basis, nature and scope of ethics, it is important to turn to the question whether it is at all *possible* to take ethical action in response to the challenges of global climate change. Part of the problem is that climate change can mistakenly be placed outside the realm of serious ethical consideration on the grounds that it entails an inevitable natural process that is unfolding in time, in which no human intervention can make any difference. As such, this argument goes, climate change falls outside the ambit of human agency. However, even if the contribution of humanity to climate change is denied, adaptation to the effects clearly falls within the sphere of human agency, and thus will require an ethical approach. Thus, global climate change falls squarely within the domain of human agency: appropriate responses to its challenges entail serious decisions in terms of the values and principles discussed above.

IV. INTERNATIONALLY AGREED ETHICAL PRINCIPLES RELEVANT TO GLOBAL CLIMATE CHANGE

46. There are a number of international documents of diverse legal status that could be used to articulate the already existing international consensus on the ethical values that should inform our responses to global climate change. These documents include:

- The Universal Declaration of Human Rights (UDHR), 1948, along with related covenants;
- The United Nations Framework Convention on Climate Change, 1992;
- The United Nations Convention on Biological Diversity, 1992;
- The UNESCO Declaration on the Responsibilities of the Present Generations Towards Future Generations, 1997;
- The Kyoto Protocol, 1997;
- The Earth Charter, 2000;
- The Johannesburg Declaration on Sustainable Development, 2002;
- The Universal Declaration on Bioethics and Human Rights (UDBHR), 2005.

47. Against the background of the earlier discussion, it is important to note that each one of these documents is based on certain values and principles for which there already exists universal support in the international arena. Accordingly, these values and principles could be explored with a view to determining their relevance and applicability to addressing ethical issues related to global climate change. It can be expected that the values and principles in these international documents may not be fully relevant or fully adequate to address the ethical issues related to climate change. Therefore, it will be expedient to identify where the gaps in these documents lie, and to aim future work on the ethics of climate change at filling these gaps.

48. Among these international documents, the following principles are expressed that are highly relevant to responding to the ethical challenges of climate change:

- The right to life, liberty and personal security;
- The right to a standard of living adequate for the health and well-being of people, including food, clothing, housing and medical care;

- A social and international order in which the rights and freedoms set forth in the UDHR can be fully realized;
- The universal right to share the benefits of scientific progress (which may imply a correlative duty to sharing scientific capacity, resources and/or data).

IV.a Problems in applying international instruments and principles

49. In the absence of enforcement mechanisms, such rights may not strictly speaking be binding. However, the UDHR placed a duty on “every individual and every organ of society by progressive measures, national and international, to secure the universal and effective recognition and observance both among the peoples of Member States themselves and among the peoples of territories under their jurisdiction of these rights”. What is more, Article 28 specifies: “Everyone is entitled to a social and international order in which the rights and freedoms set forth in this Declaration can be fully realized.” This puts a binding obligation on the signatories to work towards such an order including one concerning environmental threats to human rights.

50. In the preamble of the UDBHR, the General Conference declared: “Resolving that it is necessary and timely for the international community to state universal principles that will provide a foundation for humanity’s response to the ever-increasing dilemmas and controversies that science and technology present for humankind and for the environment”, and specifically noted a number of international documents, including the United Nations Convention on Biological Diversity and the Declaration on the Responsibilities of the Present Generations Towards Future Generations. In other words a number of principles and ethical norms from those documents, which have been internationally accepted, were further endorsed in the specific context of bioethics. Among the aims of the UDBHR particularly relevant to the ethics of global climate change are the following:

- to safeguard and promote the interests of the present and future generations;
- to underline the importance of biodiversity and its conservation as a common concern of humankind.

51. If we consider the impact global climate change is predicted to have on the living standards, health, livelihood and even the life of populations who will be most vulnerable to it, a good case can be made for a very strong moral duty, if not a legal obligation, for all States that have subscribed to the UDHR and the UDBHR to put in place measures that will protect the human rights which the international community has accepted. This argument is being forcefully put forward by Pacific Islanders whose islands, whose neighbours’ islands, are likely to disappear under rising sea levels.

52. There are two quite different problems in this regard:

- How to get all States to cooperate in effectively limiting future greenhouse gas emissions so as to slow down, halt or even reverse global climate change. This is an urgent problem for the period extending beyond the quantitative commitments of the Kyoto Protocol, which in end in 2012.
- How to cope with the damage that is already happening and that is expected to increase before any measures to limit emissions can have a perceptible effect.

53. While a global, mandatory regime to limit emissions is logically the first step that needs to be put in place, it may be that international aid to flood, drought and storm victims is politically easier to organize, since conditionality – i.e. the “wait and see” and “we won’t till all the others do” reasons for refusing to agree to binding global emission limits – cannot be used as an excuse for refusing humanitarian aid when disasters strike. It may be that the increasing cost of such international aid, if climate change damage becomes more widespread and serious, will break down present-day

political resistance to a comprehensive international regime for emissions limitation based on economic considerations.

54. The particular problem whether future emissions allocations should be based on a per capita basis, as the so-called “contraction and convergence”² proposal suggests, or on a country basis, might be seen in a different light if humanitarian aid were internationally organized on a basis of each country’s ability to pay. The greater duty of rich countries to contribute to such aid might be politically easier to accept than more stringent emission limits imposed on “more polluting” and “past polluting” countries than LDCs (least developed countries), which would also cost “richer” countries more.

55. An even greater impetus to accepting mandatory emissions limits might arise in reluctant countries if the international community agreed that there was a legal obligation to accept climate change refugees in proportion to a country’s ability to support them. The prospect of having to accept thousands of immigrants from climate-change devastated countries might make the economic loss from reduced emissions more politically palatable. This is of course not an ethical consideration, but a matter of *Realpolitik*.

56. Meanwhile the UNFCCC and the Kyoto Protocol, as well as the Earth Charter, have articulated a number of principles and values that appear to be generally accepted, even if implementation is not. The Kyoto Protocol, which came into effect in February 2005, is an international and legally binding agreement to reduce greenhouse gas emissions for the period 2008-2012. It sets binding targets for 37 industrialized countries and the European Community under the principle of “common but differentiated responsibilities”. However, these countries can meet their targets by three market-based mechanisms: emission trading, clean development mechanisms, and joint implementation, which have caused a certain amount of criticism and political controversy. The Kyoto Protocol has been ratified by 182 parties as of 2008 and it could therefore be assumed that the principles and values set out in the UNFCCC and the Kyoto Protocol have been widely accepted.

IV.b Drawing on already shared and accepted principles

57. There exist a number of already shared and accepted principles in the international arena that could also be drawn upon to provide elements of a value basis for an ethics of climate change. For reasons explained below, no detailed definitions of each one of them (of which numerous examples are available) will be provided here, nor will examples of specific applications to climate change. The list of potentially relevant principles includes:

- the precautionary principle;
- the principle of common but differentiated responsibilities;
- the principle of safeguarding and promoting the interests of the present and future generations;
- the principle of protecting human rights;
- the principle of equitable access to medical, scientific and technological developments as well as the greatest possible flow and the rapid sharing of knowledge concerning those developments and the sharing of benefits, with particular attention to the needs of developing countries;
- sustainability.

² Contraction and Convergence (C&C) is the science-based, global climate policy framework proposed to the United Nations since 1990 by the Global Commons Institute (GCI). See <http://www.gci.org.uk/briefings/ICE.pdf>.

IV.c Beyond existing values and principles?

58. There could be merit in questioning whether an ethical approach to climate change merely entails applying existing principles to a new problem. There seem to be adequate grounds to suggest re-thinking the meaning and application of the ethical principles that we commonly use to make moral decisions. Lack of imagination and sensitivity to issues could be a part of these grounds. Another ground can be found in the challenge that global climate change poses to the very possibility of ethical decision-making.

59. As suggested in Section III, ethics presupposes human agency (or autonomy), i.e. the ability to act on foreknowledge about the effects of one's choices. This presupposes a rational subject with the ability to consider options in the light of fairly well-defined cause and effect relationships, as well as the freedom to choose between different options.

60. These presuppositions of ethics are clearly challenged by climate change, in the context of which agency seems to be diffused; causes and effects seem to be dispersed and non-linear; while freedom and autonomy seem to be undermined by the fact that everyone's fate is determined by the choices that a multitude of others make. Projected to future generations, this problem deepens, since climate change starkly underlines that the well-being of future generations, human as well as non-human, is dependent on the choices that past generations have made.

61. Climate change thus seems to challenge deeply, and even to destabilize the fundamental concepts and presuppositions we conventionally draw upon in ethical decision-making. A word of caution is appropriate at this point, however, because the profound challenge that climate change poses to our fundamental ethical concepts can create a sense of despair and resignation, and this can undermine our will to take international action in response to the problem cluster that climate change constitutes. Instead, a more moderate response can be proposed, entailing an acknowledgement that the task cannot be reduced to merely picking an ethical framework and a few fundamental principles and then applying them to a new problem. The task seems rather to lie at a deeper level, consisting of rethinking the manner in which we formulate and respond to problems and issues and in which we draw upon the conventional values and principles of ethics.

62. As such, climate change provides us with an opportunity to rethink:

- issues of responsibility and accountability;
- human dignity – including the dignity of indigenous peoples (living, for example in the Arctic region, small islands, or in arid or semi-arid regions);
- national interests and identity;
- international cooperation and decision-making;
- current views of minorities;
- current views of resilience and vulnerability;
- how to handle differences of opinions in the international arena;
- the ownership of scientific knowledge and the sharing of scientific data.

63. With this in mind, it can further be observed that the ethical challenge of climate change does not fundamentally lie in clashes between incompatible frameworks, but rather in creating an opportunity to establish a productive dialogue between States and other relevant agents from which a new consensus may emerge about the issues listed immediately above. In the next section, examples of six core themes that should form part of this dialogue are highlighted – with a view not to settling the issues, but rather to foregrounding their importance and to indicating why

each of them deserves serious discussion in the context of developing ethically justifiable responses to the challenges of global climate change.

V. CORE THEMES FOR CRITICAL ETHICAL DIALOGUE

64. No one has a final answer to the crisis of climate change. Every agent who confronts it is faced with ethical dilemmas concerning the nature of collective action, decision-making, and of course uncertainty. However, by actively exploring the core themes and central questions that constitute the climate change debate, we can potentially move closer to a rational dialogue which may lead the way to finding adequate, practical, humane, and ethical responses to the challenges of climate change.

65. Among these core themes, one finds the link between foreknowledge and the duty to act upon it, the place of human rights in an ethics of climate change, and the role that the precautionary principle can play in addressing the risks and uncertainties that an ethics of climate change aspires to respond to. Concerns about future generations should also be added to this list, as well as the effect on future generations of discounting in decision-making about present options. The larger theme of collective and shared responsibility, and the many strategies that are commonly used to avoid and/or defer action on climate change, should also be foregrounded in these dialogues.

V.a The link between foreknowledge and the duty to act on it

66. In ethics generally, the worth of actions and policies depends not only upon the values and principles they realize, but also upon their effects. An agent should thus foresee the possible effects of his/her actions with a view to ensuring that they produce the best results. Foreknowledge is therefore a particular brand of knowledge concerning the impact of collective human action on the global climate system which also pays close attention to the unwanted repercussions of specific actions on this system. Broadly speaking, three principal duties are readily recognized in various forms:

- the duty to actively pursue knowledge of the impact of human action on the global climate system, as well as the impact of climate change on human activities, in particular those of people most vulnerable to climate change;
- the duty to share that knowledge when it is available;
- the duty to act appropriately and in a timely fashion when that knowledge is available.

67. However, the identification of these duties immediately raises the question who should ultimately take responsibility for generating knowledge, what kind of experts and which institutions should be involved, and through what processes. Moreover, even if such knowledge is adequately generated, the issue of its mass dissemination remains problematic.

68. A standard method for engaging these questions is to take a critical view of the current organization of science in the world, and to ask whether the typical research activities taking place, and the structures through which research is promoted, funded, published, and further disseminated, are optimally geared to enable humankind to understand, prevent, mitigate or adapt to climate change.

69. Yet the aforementioned discourse must go even farther and ask whether the questions that guide climate scientists themselves in their research adequately reflect the needs of those most vulnerable to the effects of climate change. In other words, climate science must find a means of making itself accessible and relevant to those who have immediate and short-term knowledge needs and are imminently threatened by climate change. A concrete example may illustrate this. Are polar scientists studying the formation, structure, movement, breaking up and melting of Arctic ice responsive to the knowledge needs of indigenous peoples living in the Arctic who experience in

their daily lives that the ice on which they depend is disappearing from underneath their feet and sense that they may not only lose their traditional livelihoods, but the very place in which they and their ancestors have lived for centuries? Are these polar scientists open and responsive to the contributions that these indigenous peoples can make to their scientific research, and are they geared to engage with indigenous people with a view both to learning from them and to sharing their scientific knowledge with them in a mutually beneficial way?

70. Science policies also bear on these issues. A concern is the degree to which scientists from different parts of the world, from differing nationalities, and from different religions are prepared to cooperate fully with one another, to exchange findings, and to work jointly towards worldwide dissemination. But the possibility of such cooperation is also dependent on the activities of national governments and international scientific organizations and the depth of their desire to make resources available and to develop science policies that enable climate change scientists to form the networks required to build an adequate scientific knowledge base on climate change for the present and the future. National governments and the international scientific community also have a responsibility to train future generations of climate scientists who will be equipped to deal with ever-changing and contingent climate complexities while being simultaneously aware of the interaction between the natural, social, cultural, political, economical and ethical dimensions of global climate change.

V.b Applying the precautionary principle as a basis for action in the face of scientific uncertainty

71. As already mentioned, scientific uncertainty has vast implications for policy-making at both the regional and national level. While one may reasonably expect, for instance, national governments and regional institutions to allocate scarce resources to mitigate greenhouse gas emissions and make provision for adaptation strategies, there is no certainty whether mitigation at a local level will have any effect on global climate change or aid States in adapting to untenable scenarios.

72. One paradigmatic means of grappling with these dilemmas is found in the *precautionary principle* which, formulated in ordinary language, states that action to prevent serious harm to humans or the environment should not be postponed until rigorous scientific proof is established about the causes and effects of that harm. A more comprehensive working definition of the principle was prepared by COMEST in 2005, where it is further stipulated that scientific uncertainty in the context of risk and potential danger does not establish grounds for inaction, but rather for action, including the active pursuit of further knowledge about potential risks and dangers. In other words, as COMEST suggested,

When human activities may lead to morally unacceptable harm that is scientifically plausible but uncertain, actions shall be taken to avoid or diminish that harm. Morally unacceptable harm refers to harm to humans or the environment that is:

threatening to human life or health, or

serious and effectively irreversible, or

inequitable to present or future generations, or

imposed without adequate consideration of the human rights of those affected.

The judgement of plausibility should be grounded in scientific analysis. Analysis should be ongoing so that chosen actions are subject to review. Uncertainty may apply to, but need not be limited to, causality or the bounds of the possible harm. Actions are interventions that are undertaken before harm occurs that seek to avoid or diminish the harm. Actions should be chosen that are proportional to the seriousness of the

potential harm, with consideration of their positive and negative consequences, and with an assessment of the moral implications of both action and inaction. The choice of action should be the result of a participatory process. (COMEST 2005:14)

73. What is already unequivocally known about global climate change is that it poses a ethically unacceptable harm which is uncertain only in terms of magnitude and timing. Hence, from the perspective of the precautionary principle, humanity cannot use uncertainty as grounds for inaction with regard to global climate change. On the contrary, it is precisely because of uncertainty that it is imperative to study climate change in a focused and rigorous manner in order to resolve any uncertainties which can be resolved, while also forming a better understanding of how ethically unacceptable threats will materialize. Yet, simultaneously it will also be necessary to study which peoples and regions find themselves the most vulnerable to these risks, what the nature of such vulnerabilities are, and whether such people possess the necessary tools to help them adapt to climate change. In short, climate change also demands that we develop measures not only to reduce vulnerability, but also to enable the vulnerable to adapt to threatening environmental conditions.

74. The precautionary principle is therefore not a mere philosophical axiom, but also a doctrine, which must be understood at local, national, and regional governmental levels. It asks governing bodies to strive to put into place structures and procedures that are, on one hand, resilient and, on the other hand, sensitive to the vulnerabilities of people and the environment. Such structures and procedures must be able, furthermore, to cope with any over- or underestimations of the risks in question. To speak of a “resilient” structure is to make appeal to policy’s ability to withstand shocks, to learn from experience, and to move towards greater self-organization. As such, the precautionary principle implies an active, system-wide, collective response through which scientists, policy-makers, businesses, NGOs, and the public work together in innovative networks to mobilize scientific and non-scientific knowledge to develop new technologies and organizational forms capable of facing climate change risks. The challenge in this context is to develop such resilient structures which must, moreover, be capable of adapting to a multiplicity of cases while exhibiting steadfastness, patience, modesty and determination. Nonetheless, the precautionary principle should be understood to offer a foundation for the creation of such resilient structures and therefore merits serious and ongoing discussion and debate.

V.c Determining the place of human rights in an ethics of climate change

75. The question of human rights has already been introduced in this report, but we must return to it and outline, in a more systematic matter, its relationship to climate change against the backdrop of the international system. In other words, the geopolitical stakes of climate change are also foregrounded not only in the potential measures that States and international organization may need to take to respond adequately to climate change, but also in how such measures may or may not justify the weakening of human rights guaranteed by the UDHR. Conversely, there are also the political and legal ramifications of a vulnerable population appealing to the UDHR in an attempt to prevent various external actions or non-actions that impinge on its livelihood through exacerbating climate change effects. Following from this is the larger ethical and juridical problem of just compensation, blame, responsibility and reparation. However, the largest and most pressing of human rights issues in the context of climate change will undoubtedly be the inevitable invocation of the UDHR and other applicable conventions by displaced populations and climate change refugees who will be seeking asylum in other countries which may through various legal manoeuvres succeed in being inhospitable.

76. A larger issue here is the very capacity for human rights discourse to address climate change adequately. Arguably, it is individual human and public *interests* rather than *rights* that should be given the priority in ethical climate change discourse. Thus human rights language should not be given a blanket priority in decision-making about responses to climate change insofar as circumstances can arise where the immediate needs of victims of extreme weather or climate events, or of those most vulnerable to climate change trends, are more urgent than the question of

rights. To determine when circumstances like these have indeed arisen is clearly an issue that cannot be settled in the abstract, but rather requires a thorough case-by-case analysis.

V.d Concerns about future generations in an ethics of climate change

77. It goes without saying that concerns about global climate change entail concerns about impacts on future generations, including distant future generations. We speak here not only of our children and their children, but of the generations who will be increasingly menaced by climate change effects. Scientifically speaking, some climate change models predict a rise in average temperatures and sea levels that may continue over a thousand years posing the larger question of sustainability. In the widely accepted definition of the Brundtland Report of 1987, sustainable development is defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (World Commission on Environment and Development, 1987).

78. Ethical concern about future generations is sparked by the awareness of the ability of present generations to harm future generations, by leaving them with less resources or opportunities than their predecessors had enjoyed and therefore with more burdens and risks to face. In addition, the present generation is always in a position to close down and delimit options that the future generation otherwise would have had. It is obviously unacceptable to put a future generation in a position to have to make tragic choices that it otherwise would not have had to face. It is equally unacceptable to suppose that generations to come “work it out for themselves”. The present generation, for instance, can compromise the position of a next generation to such an extent that, in order to save itself, it may inflict even more harm on a succeeding generation, resulting in what can only be called “generational mal-distribution” or “durations of inequity”. In the language of moral philosophy, the present generation thus enjoys unwarranted “moral luck”.

79. The troublesome condition of the present generation with regard to any distant future generation is that it always already finds itself in a unilateral position: it is always in a position to act with impunity, since there is no basis for reciprocity from those future generations. Reciprocity, however, is a central presupposition of the well-established deontological, utilitarian and contractual frameworks for moral decision-making. The conditions for the Golden Rule, which states in its negative form that we should not do to others as we do not wish them to do to us, thus seem to be impossible to satisfy over an indefinitely extended time horizon. Reciprocity in any concrete sense is hence ruled out in advance.

80. The language of harm and rights or needs poses similar problems when attempting to conceptualize our moral relation with future generations. A future generation that does not overlap with ours cannot hold us accountable and claim compensation from us, nor exercise any rights with reference to us, simply because when they do so, we will not exist any more. To some extent, they may also have different higher-level needs than we do, although their basic subsistence needs may be the same as ours.

81. However, instead of thinking about an infinite number of future generations with all the theoretical difficulties that this entails (cf. Parfit, 1983, 1985, 1987), we should, as a starting point, consider that a child born in 2009 may, if the present increase in life expectancy continues, be alive well into 2100 (when some of the catastrophic predicted effects of climate change have already taken effect), having by then had his or her own children and grandchildren. For these three future generations, the theoretical problems of reciprocity may not fully apply in practice.

82. It may also be legitimately objected that concerns about future impact in the relatively short time frame of 100 years may not make any real difference to the longer term or catastrophic effects of climate change. However, this shorter time frame makes it possible for us to think of future people in terms of interests, needs, and harms that we can imagine without difficulty and realistically respond to. Furthermore, it enables us to think of them as bearers of rights and as agents who can make claims that we can support, negotiate, and even plan for in the present. With

this approach, we then effectively place ourselves in a position of “reciprocating in advance”, which also means opening ourselves up towards the future with a projection of an anticipated responsible action. We may, of course, be proved wrong about what actually unfolds in the future. But this does not result in a call for passivity. On the contrary, even if eventually proven wrong, the present generation has a clear duty to ensure, in the light of what it knows about future climate change, that its current policies are as robust as is reasonably possible and that they, at least, provide a point of departure for future generations in their own quest to diminish the impact of climate change.

83. As such, consideration of future generations is an essential element of the total ethical response to climate change. It illuminates wider concerns and quandaries than those that afflict the present generation alone, and it moderates the claims we tend to make about our own current “solutions”. The scientific knowledge produced by generations to come will undoubtedly reveal our “grand insights” to be at best only partially valid, and at worst totally misguided. However, this is not a cause for despair and resignation, but rather a call to be sensitive to new insights, to learn from other perspectives, and even to discard our own cherished views if other arguments turn out to be more convincing, accurate, and insightful than ours.

V.e Concerns about discounting

84. In decision analysis, the usual technical expression of concern for the welfare of our future selves or of future generations is “discounting”, whereby the present weight of future values decays exponentially over time at a constant discount rate. While discounting is a mechanical procedure once the discount rate has been chosen, the choice of the rate raises significant ethical questions.

85. As COMEST (2005) has emphasized in its work on the precautionary principle, the effect of discounting at significantly positive rates is to render present decision-making indifferent to very long-term consequences. A cost of US \$1 in 2100 has a present value of 0.1 cent if discounted at 8%, 1 cent if discounted at 5%, and only 17 cents if discounted at 2%, a rate much lower than typically considered in social decision-making on issues such as climate change. What this means is not simply that future costs and benefits have comparatively little weight in the economic balance, but furthermore that, for any discount rate greater than about 4%, it is unreasonable to seek to determine them with any precision. It is this principle of indifference, built into the use of high positive discount rates, which clashes with a basic requirement of intergenerational equity.

86. With respect to the long-range consequences of climate change, it is therefore ethically imperative to consider with care how to weigh future costs and benefits and to devote serious attention to assessing them. The issue here is not to reject discounting – after all a discount rate of 0 is still a discount rate – but rather to interpret it in ethical terms. First, what does a discount rate *mean*? Secondly, which *rate* makes ethical sense?

87. In economic terms, the discount rate corresponds to the *opportunity cost of capital*. Intuitively, it captures the notion of a “rate of return” that connects the past to the future by measuring, effectively, the capacity of a future balance sheet to cope with costs when they occur. Extension to *social* decision-making implies the notion of a “social rate of return” expressing the change over time of the total economic, social, human and natural capital stock of a society. Technically and ethically, the discount rate used for calculations about climate change mitigation or adaptation policies thus constitutes an assessment about the capacity of future decision-makers to cope with their problems, including, of course, the ones we bequeath to them.

88. Any assumption about the social rate of return over long periods is open to question, not just because of the uncertainties inherent in the dynamic of global climate change, but also because present decision-makers need to remain open to the possibility that future decision-makers may value components of the capital stock very differently. Intergenerational equity, as emphasized in the COMEST report on the precautionary principle, cannot be limited to our concern for the future in our terms, but also engages our sensitivity to what future generations themselves may care

about. It is the unavailability of precise knowledge in this respect that dictates prudence about acting on the basis of discounted income streams, however precise and sophisticated their content may be.

89. No abstract ethical procedure can provide a definite answer to the question what discount rate should be adopted for calculations to inform decisions about global climate change. On the other hand, some fairly precise negative statements can easily be justified. Certain kinds of discount rate, including some commonly used in public debate, are manifestly inappropriate.

90. First, any discount rate higher than assumed future average GDP growth is clearly overstated. The *highest* plausible social discount rates therefore probably fall in the range of 3 to 5%. Secondly, GDP growth is a proxy for aggregate capital change, not a measure of it. It is well known that, in some respects, standard measures of GDP *underestimate* growth by failing to account fully for technical change. It is equally well known that, by failing to account for destruction of natural capital and other non-market effects, such measures *overestimate* growth. How these opposite effects balance out is controversial. Given the possibility that climate change might cause unprecedented loss of natural capital, it at least deserves consideration whether a reasonable long-range social discount rate should not be lower than a consensus estimate of average future GDP growth, over and above the effect of climate change on growth as conventionally measured by GDP. Anything else would simply transfer the risk of climate change entirely to future generations.

91. Indeed, even the possibility of a *negative* social discount rate should not be rejected out of hand. Before sticking to a range of positive values, one should minimally be convinced that future generations will be at least as well equipped as we are to deal with climate change, taking account of the possibly irreversible consequences of our present choices and of the possibly different values with which they may approach them.

V.f Obstacles to sharing and differentiating responsibilities

92. Among the other core themes that require serious discussion in an ethical approach to climate change are the obstacles that hinder the possibility of realizing the principle of “common but differentiated responsibilities”. This principle, stated in the UNFCCC, is clearly articulated in the Kyoto Protocol, and acknowledges that the actual ability to take action to address the knowledge, mitigation, and adaptation challenges of global climate change varies from country to country, and from region to region. Within countries, there are similar differences between parts of the population that can take action in the face of climate change challenges, and those who cannot.

93. From an ethical point of view, it is a well-established principle that those who have the ability to prevent or alleviate harm suffered by others, and are in a position to do so without sacrificing a greater value than what is rescued, have a clear duty to act. For example: it would not be reasonable to expect someone who cannot swim to rescue a child drowning in the heavy swells of a rough sea. However, we would find it ethically reprehensible if a well-trained lifeguard, who knows how to brave such conditions and has the equipment to do so, refused to come to the rescue of the child and merely stood by as the child drowns. He would have to provide very good reasons before we would take his inaction as ethically acceptable. We would find it equally reprehensible if the lifeguard did not act on the grounds that (a) he was waiting for better equipment to arrive, (b) he would compromise his economic position by being late for his night job, (c) he would not take action unless someone else assisted him, or (d) he was awaiting specific instructions to intervene.

94. This example also draws attention to three of the arguments that are often offered as justification for inaction by those agents who are able to act on the challenges of global climate change, but choose not to do so. One is the argument that such action may cause damage to national economies. Another is the argument that we have to wait for new technologies to mature. And the third, displaying the classic structure of the free rider problem is the conditionality

argument which dictates that “I will not act alone. I will only act in concert with others, and for that matter, only if we all act together”. Whether the fourth hypothetical argument by the lifeguard has any bearing on responses to global climate change is an open question.

95. It is not necessary to explain these arguments in detail, except to point out that they reverberate in debates concerning the challenges of global climate change, and form the grounds on which ethically justifiable options are thought through and questions of agency, obligation, will, and responsibility configured. However, if these arguments merely serve as excuses for scientific, moral, and political inaction, they must be held suspect and critically examined as arguments potentially masking unstated interests.

VI. CONCLUSIONS

96. The first conclusion of this report, which is less obvious than it may seem, is that global climate change itself – not simply its possible impacts – constitutes an ethical challenge. The second, also not self-evident, is that there is no simple basis for an ethical response to the challenges of global climate change. Nonetheless, ethics, as properly understood, is a constitutive part of all reasonably justifiable responses to the challenges of global climate change.

97. While acknowledging that there are a wide range of ethical issues related to the effects of climate change and that each requires a specific response, there is also widespread international consensus that climate change requires a collective response from everyone that contributes to causing it. As expressed in the documents of the IPCC and in the deliberations of the Conference of the Parties to the UNFCCC, the most concise means of articulating this general ethical challenge is to state that:

- Climate change through global warming is caused, or at least contributed to, by human activity;
- Climate change has already caused harm to human and non-human populations alike, and this harm is likely to increase as climate change intensifies – as it is expected to do for some time still;
- Since climate change is caused by global warming (rising average temperatures of the sea and the earth’s atmosphere), and since global warming is in its turn caused by emissions of greenhouse gases (including carbon dioxide and methane), it is generally accepted that climate change can be arrested, mitigated, and even reversed if optimal levels of additional anthropogenic greenhouse gas emissions can be established and enforced;
- Since past emissions of greenhouse gas emissions have already brought about unavoidable climate change effects, international action should also focus on adaptation to long term climate change trends, as well as immediate disaster aid in response to extreme weather events caused by climate change.

98. From this consensual perspective, a duty appears to rest on individual, corporate, national and international agents to ensure that they do not (further) contribute to causing climate change, but rather contribute towards reversing it. More specifically, this means taking measures, on the one hand, to *mitigate* greenhouse gas emissions and, on the other hand, to put measures in place that will facilitate effective *adaptation* to those effects of climate change which cannot be mitigated, and will continue to be felt until such time that the measures to reverse climate change take effect. Following from this, there appears also to be a duty for everyone who can contribute to mitigation and adaptation to assist those who have become or will become victims of climate change but cannot help themselves. And any talk of “duty” is of course ethical talk.

99. While, from an ethical point of view, mitigation and adaptation are equally important tasks, it is crucial to note that the international community has hitherto focused mostly on mitigation, giving adaptation a secondary status. However, taking into account the long time spans required for mitigation measures to take effect, and given that many of the processes contributing to climate change are both persistent and irreversible, the question arises whether the international community should not increase the priority given to adaptation measures while continuing with its efforts regarding mitigation.

100. Formulated thus, this general response to climate change seems to be justified and reasonable, and therefore not easily dismissed or rejected. The trouble, however, is that this consensus is challenged from various angles from both outside and within.

101. From within the general consensus on what should be done about climate change, there seems to be disagreement on, *inter alia*, the following issues:

- The rise in the average temperature of the Earth that can be allowed before a tipping point is reached after which catastrophic climate change will be irreversible. Some argue that we have a margin of 2°C above the average temperature of the pre-industrial era, others argue that the margin is 4°, while others point out that even a 2° C rise in average temperatures will have catastrophic effects for populations living on small islands, large river deltas, or other low-lying areas.
- The time frames within which we have to reverse the general trend of rising average temperatures. Some set 2050 as the target date, while others argue for a longer or shorter time frame.
- The ceiling that should be set for greenhouse gas emissions. On the one hand, some propose that acceptable levels of emissions will require a return to the levels of 1990, while others propose a return to emission levels of 2000. On the other hand, some propose that current emission levels can be doubled with no serious detrimental effects, while others still argue that no ceiling should be set because market forces will ensure optimal levels of emissions at the best possible trade-off between costs and benefits to society.
- The question whether the solution is to be found in neutralizing current levels of greenhouse gas emissions by offsets, such as tree planting, or by replacing old with new technologies, or by doing both. Some argue that a state of zero emissions can be reached by neutralizing or offsetting emissions through biological and technological means; while others argue that a state of negative emissions can be provided when more offsets are put in place than are required to neutralize emissions.
- The question whether the solution is to be found in lowering current levels of greenhouse gas emissions, or finding more efficient levels by sequestering emissions. Some argue that we need a drastic change of lifestyle and character to ensure lower levels of emissions, while others say that we can continue with our current consumerist lifestyles if we can find ways to prevent, for example, carbon dioxide emissions reaching the atmosphere.

102. From without, the general consensus sketched above is challenged on the basis of:

- Skepticism about the causes of climate change, in particular the claim that current climate change is not human-induced. This implies that nothing *should* be done about climate change, because nothing *can* be done about climate change. It should be left to take its natural course, and the most humans can hope for are effective measures to adapt to its effects.

- Skepticism about the effectiveness of fighting climate change by reducing CO₂ emissions. While accepting that climate change is caused by human activities, the argument in this regard is that most of the measures taken to cut current levels of CO₂ emissions will have little if any effect, and that the finances required to achieve these cuts could be used more effectively to address other world problems like eradicating poverty, or fighting epidemic diseases such as malaria (see the arguments of Lomborg, 1998, 2004, 2008). While this challenge is important as a reminder that resources should be used efficiently, even when it comes to addressing the causes and effects of global climate change, it can be questioned on the basis of its extremely narrow methodology of financial cost-benefit analysis in which there is no place for other than monetary values. Against the background of the discussion of the precautionary principle above, it is also highly questionable to channel money away from mitigation and adaptation measures if it is scientifically plausible that global climate change might, in due course, produce morally unacceptable harm.

103. While these challenges from both inside and outside the ethical consensus sketched above may seem damaging, a closer look reveals that these differences of opinion do not deny that global climate change poses a serious ethical problem, and that action should be taken to do something about it. As such, these differences of opinion relate to the question what action should be taken, and how it should be executed. As to the question how these differences should be settled, the considerations discussed in this report suggest that a process of rational dialogue with reference to ethical values be initiated to identify a framework in which decision-making and action can take place in a relatively coherent fashion.

104. Within the context of this report, it has been suggested, and can now be explicitly stated, that there is no simple basis for ethical action in the face of the challenges of global climate change. This directly follows from the complexity of global climate change as a phenomenon unfolding in time. It also follows from the fact that different actions are required by different agents in different contexts to respond appropriately, humanely and ethically to the challenges of climate change. For instance:

- The disaster managers of a State or a region, who have to engage in contingency planning to address the challenge of people suffering from extremely intense storms, may choose a language based on the value of *immediate need* (or preventing harm) to respond to the challenge;
- A Minister of Science who has to decide which research programmes should be funded may, on the basis of the *medium-term needs* of the country's poorer population to adapt to rising sea levels flooding a large river delta, choose to support research that focuses on mass migration patterns and alternative settlement needs;
- A scientist (for example a geo-hydrologist) who has to determine which questions should inform research design, may perhaps consider a wide array of options, and eventually choose those questions that serve the *information* needs of a population that is struggling to find adequate groundwater for its livestock;
- A Pacific island population which has to abandon its land and find alternative land to settle on permanently could be expected to appeal to the ethical values of *immediate need*, *solidarity* with fellow human beings, and *special obligations* stemming from having contributed in the past to the *causes* of climate change;
- A botanist studying a certain plant on the highlands of central Africa, stumbling inadvertently on a population of malaria mosquitoes where they never could have existed before because of rising average temperatures, may choose in spite of disciplinary boundaries to inform local, national and international health organizations

about this, with reference to the *duty to act on the basis of foreknowledge*, as well as the *duty to share knowledge* about matters that can detrimentally affect others.

105. These examples illustrate how an ethical approach to climate change is not a field of investigation separate from and supplementary to the phenomenon itself and the actions taken in response to it. Ethics in relation to climate change is not an intellectual luxury, but rather part and parcel of every bit of knowledge gathered about climate change trends, their causes and effects, and every single decision and action based on that knowledge with a view to mitigation or adaptation to particular effects.

106. Ethics is thus not something added on top of other issues related to climate change, but rather a constitutive part of all of the reasonably justifiable responses to the challenges of climate change. Therefore, it can be stated unequivocally that climate change cannot be dealt with adequately and properly if the ethical dimensions discussed in this report are not highlighted, well understood, and taken into account in decisions about responses. The purpose of this report was therefore not to make climate change a (new) theme of ethics, but rather to make ethics a core and necessary element of any debate about climate change and its challenges.

II. REFERENCES

COMEST, 2005. *The Precautionary Principle*. Paris: UNESCO.

Gardiner, S.M., 2006. A Perfect Moral Storm: Climate Change, Intergenerational Ethics and the Problem of Corruption. Revised draft of a paper delivered to a workshop on *Values in Nature* at Princeton University. (Available at: <http://faculty.washington.edu/smgard/GardinerStorm06.pdf>)

IPCC, 2007a *Climate Change 2007: The Physical Science Basis. Summary for Policymakers*.

IPCC, 2007b *Climate Change 2007: Impacts, Adaptation and Vulnerability. Summary for Policymakers*.

IPCC, 2007c *Climate Change 2007: Mitigation of Climate Change. Summary for Policymakers*.

IPCC, 2007d *Climate Change 2007: Synthesis Report*.

IPCC, 2007d Guidance Notes for Lead Authors of the IPCC Fourth Assessment Report on Addressing Uncertainties. First published by the IPCC in 2005.

Lomborg, B., 1998. *The Skeptical Environmentalist. Measuring the Real State of the World*. Cambridge: Cambridge University Press.

Lomborg, B. (ed.), 2004. *Global Crises, Global Solutions*. Cambridge: Cambridge University Press.

Lomborg, B., 2008. Cool it. *The Skeptical Environmentalist's Guide to Global Warming*. New York: Vintage Books.

Northcott, M.S., 2007. *A Moral Climate. The Ethics of Global Warming*. Maryknoll, NY: Orbis Books.

Parfit, D., 1983. Energy policy and the further future: the identity problem. In Douglas MacLean & Peter G. Brown (eds), *Energy and the Future*, Totowa, NJ: Rowman and Littlefield: 166-179.

Parfit, D., 1985. *Reasons and Persons*. Oxford: Oxford University Press.

Parfit, D., 1997. *Equality and priority*. *Ratio*, 10: 202-221.

Ten Have, H.A.M.J. (ed.), 2006. *Environmental Ethics and International Policy*. Paris: UNESCO Publishing.

World Commission on Environment and Development, 1987. *Our Common Future*, Report of the World Commission on Environment and Development. Published as Annex to United Nations General Assembly document A/42/427: *Development and International Co-operation: Environment*. August 2, 1987.