Volume 9 · Issue 3/2009
ISSN 1617-1799

Intergenerational Justice Review

Foundation for the Rights of Future Generations

Issue Topic: Climate Change and Intergenerational Justice

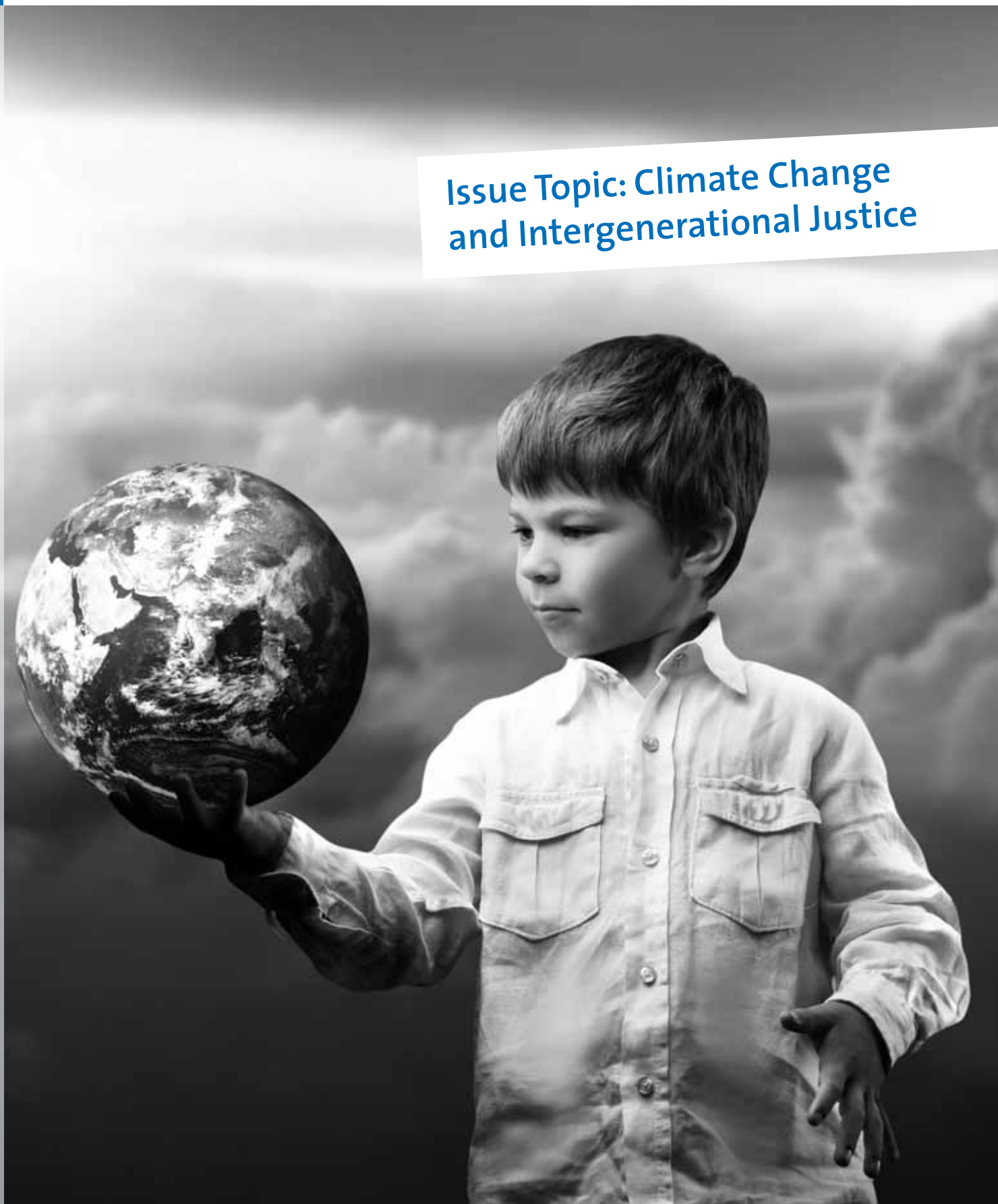


Table of Contents

The reviewers for this issue were as follows (in alphabetical order):

Prof. Dr. Dieter Birnbacher: is a professor of philosophy at the Heinrich-Heine University of Düsseldorf.

Axel Gosseries: is a permanent research fellow, Fund for Scientific Research (FRS-FNRS) and lecturer at the University of Louvain.

Prof. Dr. Andrew Williams: is professor for philosophy at the University of Warwick

Prof. Dr. Bryan Norton: is distinguished professor in the School of Public Policy, Georgia Institute of Technology.

Prof. Dr. Stephen Gardiner: is associate professor in the Department of Philosophy and the Program on Values in Society at the University of Washington, Seattle.

Jürgen Kopfmüller: is a political economist and since 2005 has been the chairman of the Association for Ecological Economy.

Andreas Kraemer: is the director of the Ecologic Institute in Berlin and Chairman of the Ecologic Institute in Washington DC.

Prof. Dr. Max Tilzer: is professor emeritus of aquatic ecology at the University of Konstanz, Germany.

Prof. Dr. Burns Weston: is director of the Climate Legacy Initiative. He has directed the University of Iowa Center for Human Rights until his retirement in 1999.

Prof. Dr. Marcel Wissenburg: is professor of political theory at the Radboud University Nijmegen and Socrates professor of humanist philosophy at Wageningen University, the Netherlands.

Prof. Dr. Dr. Udo Simonis: is professor emeritus at Wissenschaftszentrum Berlin für Sozialforschung.

Dr. Ludvig Beckman: is associate professor in the Department of Political Science, Stockholm University, Sweden.

Prof. Huey Li: is professor of educational philosophy at the University of Akron, Akron, Ohio.

Editorial

Next to the swelling book shelves in the natural sciences, there is a growing library on the ethics of climate policy. This is of small surprise as anthropocentic climate change is one of the greatest problems facing mankind. The impacts of climate change pose a clear threat to the rights and freedoms of many existing and future persons; and they will exacerbate inequalities between rich and poor countries. Dangerous climate change was usefully defined by the UN Framework Convention on Climate Change as a state of affairs where concentrations of CO_2-equivalent (CO_2^e) in the atmosphere trigger climatic impacts sufficiently grave to threaten global food production, prevent sustainable economic development, and prevent ecosystems from adapting naturally. There are essentially four distinct ethical concepts involved:

- Distributive justice: The capacity of the atmosphere to absorb CO_2^e is limited. The acceptable level of emissions is therefore a good to which everybody is entitled a fair share; and this involves everyone being permitted to emit a certain amount of CO_2 into the atmosphere. These 'permissions' are scarce, that is: the demand is higher than the availability. Well-established distributive justice principles can be applied to the problem of allocating the absorptive capacity of the earth's atmosphere in a broadly analogous fashion to the problem of the just division of other scarce resources (food, water, shelter) between households. From an ethical point of view, the logic is the same regardless of whether the item in question is a good or a bad (or a resource or a sink).
- International justice: This is the problem of justice between different countries, regardless of the distribution that exists within those countries. In reality, it is countries and their political leaders, rather than citizens of those countries, that negotiate emissions rights and adaptation costs in the international arena. Pure distributive justice could be applied if there existed a single world government that allocated fairly among its citizens. But the reality is that the international climate arena is divided into quarreling nations enjoying differential bargaining power and often pursuing a narrowly defined set of national interests.
- Intergenerational justice: This is justice between members of different generations, each generation represented by an average individual. The capacity of the atmosphere to serve as a sink for CO_2^e is non-renewable in a human time-scale. How should this unique absorptive function be divided between members of different generations? The logic of intergenerational relations is that, while a delay in mitigation will only necessitate even more drastic emissions cuts in the future, each generation faces the cognitive problem that they can only guess how efficiently, and effectively, subsequent generations will be able to continue to the mitigation effort. Yet, each generation also has the duty not to engage in the wishful thinking that the problem can be left for descendants to solve. An additional argument is that all of the main greenhouse gases remain in the atmosphere for many decades after release. Combined with other inertias integral to the climate system, the bulk of the expected harm to humans from climate change will be felt by future generations.
- Historical justice: Industrialized states bear the brunt of the historical responsibility for climate change but most of the regions suffering from the impacts of global warming are in developing countries. Should the current inhabitants of the major emitter countries compensate the victims of their ancestors' emissions of greenhouse gases? Take for instance the case of Bangladesh and the US. Do present US-citizens owe present Bangladeshies compensation for the wrongdoings of their ancestors?

Historical justice is often grouped together with intergenerational justice, as both seem to have to deal with justice in time. But this seems to be matter of analytical convenience rather than any underlying equivalence. Objections of compensatory (or historical) injustice rest upon the identification of distinct groups of descendants, at least one injured party and at least one causer of the damage; whereas intergenerational justice typically focuses on the way in which inequitable acts or social policies affect the well-being of a typical member of a subsequent generation.

Fulfilling its interdisciplinary approach, IGJR 3/2009 brings together articles from distinct, but overlapping, disciplines including ethics (Lumer), epistemology (Hillerbrand), social contructivism (Rothe) and political science (Oleson et al.). The paper of Christoph Lumer (University of Siena, Italy) establishes a new criterion for our moral duties, dubbed 'progressive norm welfarism', and deduces a principle of 'no harm to developing countries' from it.

Rafaela Hillerbrand (RWTH Aachen, Germany) addresses the question of how epistemic uncertainties are of relevance for practical decision making. It is shown that the precautionary principle fails to adequately deal with uncertainties as they arise in climate modeling.

Following a social constructivist approach, Delf Rothe (Helmut-Schmidt-University, Hamburg, Germany) shows how the interests of the actors in climate conferences have shifted between Rio 1992 and now. As a result, adaptation became more and more widely accepted as a necessary step in international climate politics whereas mitigation strategies lost ground.

Kirsten Oleson, Lauren Hartzell and Michael D. Mastrandrea (Stanford University, USA) explore the advantages of a climate agreement of those key nations responsible for 90 percent of current emissions (instead of a global agreement). The authors give three reasons why these nations should act alone: ability to act; responsibility to act; self-interest in acting.

We hope you will enjoy the articles in our current issue.

Joerg Chet Tremmel
Editor-in-Chief
London School of Economics and Political Science

Edward Page
Guest Editor
University of Warwick

Konrad Ott
Guest Editor
Ernst-Moritz-Arndt-Universität Greifswald

Climate Change, Intergenerational Justice and Development

by Prof. Dr. Christoph Lumer

Abstract: The subject of this paper is distributive justice in relation to financing greenhouse gas abatement. After separating the various questions of distributive justice in climate change (first section) and isolating the financing issue (second section), the paper explores whether any effective moral norms resolving this question already exist. It is argued that such norms still have to be constructed. As a basis for the further discussion, a criterion for moral duties is proposed, progressive norm welfarism, which takes up the constructivist idea (third section). These ethical, intuitive and political considerations finally converge into a proposal for 'no harm to developing countries' (fourth section).

Questions of distributive justice in climate change

Climate change raises several questions of intergenerational, international and intranational justice, in particular: *1. Reduction target:* How much should greenhouse gas (GHG) emissions be reduced? *2. Measure mix:* How much should we rely on emission reduction and how much on adaptation, mitigation and compensation measures? *3. Financing:* Who shall pay how much for these measures?

The importance and urgency of this question has been made evident recently by various developments. In 2006 the rapidly increasing Chinese CO_2 emissions surpassed those of the USA, which for decades were the largest emitter. Since 2005 industrial countries have been emitting less CO_2 than the rest of the world. Whereas GHG emissions in the 1990s increased by 0.9 percent per year, in the first (not yet full) decade of the new millennium (2000-2007) they increased by 3.5 percent per year. While the carbon intensity of economic activities (i.e. the amount of CO_2 released per Euro GDP) had decreased for decades, it increased from 2003 to 2005 – despite the efforts to curb emissions in several Kyoto Protocol signatory countries. The main cause of this trend reversal is the massive increase in energy consumption in China and India, served mainly by – outdated – coal combustion.[1] These also are problems of distributive justice because China and India do not recognize any strong obligation to curb their emissions. They do not accept that they should pay for restrictions on their emissions with strong constraints of their economic development – in particular considering that the much richer First World countries, which are polluting more per capita, did not undergo analogous restrictions when developing at comparable economic levels and are responsible for most of the high increase of atmospheric GHG concentration occurring since the industrial revolution.

> Unless we stop dumping 70 million tons of global warming pollution into the atmosphere every 24 hours, which we are doing right now (...), the continued acceleration of this pollution will destroy the future of human civilization.
> /Al Gore/

Isolating the financing question

Tradable emission certificates are not only an important economic instrument for making GHG attenuation more efficient but also an analytic device to separate – at least partially – the question of reduction targets (question 1) from the question of how to finance this reduction (question 3).[2] The question of reduction targets corresponds to determining the total number of emission certificates, whereas the financing question corresponds to determining certificate distribution. The latter holds because if trade in certificates functions properly, having more certificates is equivalent to possessing a certain amount of capital. The answers to the two questions are only incompletely seperable though because fair answers depend on people's comprehensive well-being under the respective regulations, and, of course, this well-being depends on all the main factors touched on by the two questions: the many direct effects of a more or less warm world (from stifling heat waves to climate casualties e.g. by undernourishment), economic abatement costs and economic development. Whereas the question of reduction targets at first seems to be more an issue of intergenerational justice and the question of financing reduction a matter of international justice, even this holds only partially; since intergenerational and international justice are intertwined for at least two reasons: lenient global reduction targets (intergenerational justice) imply more damage to poorer countries (international justice) because these countries are generally more vulnerable (due to their geographical position their agriculture will suffer more, in addition they have less money for adaptation measures). And strong abatement obligations / fewer certificates for poor countries today (international justice) *ceteris paribus* imply less development and therefore more relative poverty in the future (intergenerational justice). Nonetheless, for reducing complexity and for delimiting the unmanageably high number of possible options, one can roughly fix one of the variables by assuming more or less plausible values for this resulting from other discussions and try to give a justified answer to the other question on this basis.

So, to answer the financing question, we need a rough idea of the reduction target. However, in the literature rather divergent targets have been proposed. One problem that has led to this divergence is the great disparity of advantages and disadvantages accompanying the various options. Simple moral principles do not allow considering and pondering all of them. For that purpose, complex and elaborate models are needed to quantify all the advantages and disadvantages in one common currency. The currency economists use is money; they usually propose rather modest reduction targets. Most ethicists, however, find that money cannot capture the real moral value of things; many of them prefer the currency of well-being or utility instead, which is expected to give more weight to certain damages like death and thus to lead to far more demanding reduction targets. However, welfare calculations with well-being as the general currency are even more complex than monetizing, so adequate calculations are still a desideratum.

I have undertaken such a study, which includes also the application of several ethical standard criteria.[3] On account of the convergence of these criteria, the study's results with regard to the morally best and morally required CO_2 reduction targets may provide a rather strong basis for assuming a reduction target in the present context.

In the study four options were considered, namely a_1: business as usual, a_2: global stabilization of GHG emissions at the 1990 level, a_3: strong (25 percent) GHG emission reduction with respect to 1990 until 2015, a_4: sustainable (60 percent) GHG emission reduction compared to 1990 until 2035. (A 50-70% reduction of emissions is needed to prevent most of the usually projected damages.[4] In 1990 sustainable reduction meant a decrease to about 0.4 t C/capita x year.) Sustainable reduction (a_4) turned out to be morally best or morally required by the vast majority of the moral criteria taken into account.[5] Considering, however, that annual global CO_2 emissions from 1990 (5.85 Gt C/yr) to 2007 (8.1 Gt C/yr) increased by roughly 39 percent (China alone: increase from 0.7 to 1.8 Gt C/yr),[6] the morally best option now seems almost unreachable. Therefore, the following discussion will presuppose that the community of states will ideally only strive for strong reduction until 2030.

Are there effective moral norms for the financing problem? – A case for moral constructivism and progressive norm welfarism

With respect to the interests of future people, GHG abatement may be a moral requirement. However, among present people (and the states representing them), GHG emissions – like many other environmental problems – constitute an n-person prisoner's dilemma: (i) for (almost) everybody, higher GHG concentrations are worse than (ii) the lower concentrations that could be reached by global cooperation in reduction efforts;[7] but (iii) if only few people make strong efforts their situation is even worse than it would be if no efforts were made at all (because the efforts are costly, but the global reduction achieved is only marginal); (iv) finally, free-riding on the vast majority's reduction efforts is the best option from a selfish point of view (the free-rider benefits from the better climate without paying for it). The most obvious and, in this case, probably only solution to the resulting dilemma (i.e. that rationality requires the egoists not to cooperate, i.e. not to abate their emissions, even though mutual cooperation would be better for each individual), is to sign a binding contract for reaching forced mutual cooperation.

However, the strategy of simply relying on a contract is problematic for several reasons, which require at least a moral complement to contractualist proposals. First, a better climate, the aim of cooperation, is a public good (or, more precisely, a common-sink resource). This implies that even those who do not participate in the contract profit from other people's participation in an agreement (the USA have profited in this way from the Kyoto Protocol, free riding on the signatory states' efforts). Therefore, the usual threat in negotiations, i.e. that without mutual agreement and, therefore, in particular without one's own agreement everybody is reduced to the status quo, does not work in this case. Unforced agreement has to be based on reasons beyond the expectations for a better climate, in particular on moral reasons like wanting to be fair or to contribute to a better future. Second, contracts can be made only between living people. However, the biggest advantages of a contract (and disadvantages of a failure) would inure to future persons; and in a fair contract their interests, of course, have to be considered. Because their interests do not coincide with those of present persons and require stronger environmental investments a morally just contract calls for a moral engagement beyond the satisfaction of the present contracting parties' personal interests. Third, even if climate protection were not a public good (so that only those who participate in the contract would profit from improvement measures) the potential damages as well as advantages and disadvantages are distributed so unequally that a merely rational contract (e.g. according to the Nash solution) would be far from just - as is often the case with rational contracts. So it might be a rational, though morally disgusting, result that the most aggrieved have to pay the strongest polluters for reducing their GHG emissions. So a morally just contract again requires a moral engagement beyond the parties' personal interests.

What could motivate such a moral engagement? The strongest kind of prompter would be moral obligations sustained by formal, i.e. legal norms. However, the problem is that such norms do not yet exist; the fair contract to be concluded should constitute exactly such a norm.

A much weaker though still, at least in the long run, strong prompter would be moral obligations sustained by *informal social norms*, i.e. rather generally observed modes of acting whose known non-observation will be punished by informal sanctions implemented by any other moral subjects, where the informal sanctions may range from utterances of disapproval to lynch law. The most obvious candidates for such informally valid moral norms are the no-harm and the polluter-pays principle.

> Global warming causing climate change may be the ultimate issue that unites us all.
> / Louise Burfitt-Dons /

With respect to the no-harm principle, however, it is not obvious what it requires in this case. In an immediate sense, every breath we take harms other people insofar as it (albeit marginally) increases the atmosphere's GHG concentration. Of course, it would be absurd to require not harming other people by not breathing. The problem is that any, even marginal, emission is harmful only on the basis of an already tremendously high level of emissions by other people. So a more sensible interpretation of the no-harm principle is to, first, determine which global level of GHG emissions would be harmless in the sense of being sustainable, then, second, to break this global budget down to the individual level, e.g. in an egalitarian fashion, and, third, to take transgressions of these individual budgets as the harms prohibited by the no-harm principle. The first step leads to a rule similar to the above mentioned sustainable reduction (option a_4), with the important difference of requiring sustainable reduction immediately. The fact that the vast majority does not observe this limit,[8] according to the definition of 'informal norm', already implies that a respective informal moral norm is not socially in force. In addition, immediately reducing all persons' GHG emissions to a sustainable level would cause severe economic damages to other persons as well, which means that the no-harm principle would be violated in any case. And finally, the second step, i.e. to distribute emission rights equally, is not morally evident because this rule considers neither interpersonally different needs and costs nor abilities to pay.

The status of the polluter-pays principle is not much better because it is far from clear what this principle requires in the case of

GHG emissions. It could require payment for damages generated by emissions above the sustainable level – but to whom? To future generations via investing in a kind of fund from which they will be compensated? Again, this is far from being a common practice and thus not an informally holding social norm. And then, would not the best investment be increasing the national capital and since this is something we aim to do anyway, so that the most important change compared to the current practice would not regard us but only our heirs (who would have to use some part of the inherited capital for compensating those who will be damaged across the respective national borders)? A stronger interpretation of the polluter-pays principle demands that we also pay the so-called 'historical debts', i.e. damages caused by excessive emissions in the past. Again disregarding the difficult question of what 'excessive' would imply, it is dubious whether present people can have such historical debts resulting from their ancestors' activities or from their own activities before the harmful effects of GHG emissions became more or less vague common knowledge, i.e. around 1990. And since immediate and radical emission cuts to a sustainable level at that date would have extensively damaged the whole economic system and thus other people, it is dubious whether all post-1990 emissions above that level have generated historical debts (Some further discussion of historical debts will be provided below).

The upshot of this discussion is that there do not seem to be even halfway clear moral norms already informally socially in force. On the other hand, there seems at least to emerge a vague informal social norm to practically recognize one's responsibility as a GHG emitter towards the vulnerable and future people by reducing one's emissions where this is not expensive as well as perhaps also another norm for politicians to make stronger emission reductions legally binding.[9] (The internationally widespread moral disgust about the former US-president George Bush's and his followers' hardliner activities would be part of the sanctioning behavior belonging to this informal social norm.) Although the fact that these norms are becoming socially valid constitutes moral progress, they are only vague and weak[10] informal norms, which - for resolving the problem - demand too little, do not provide much motivation and cannot be establish a guide for stronger legal norms.[11]

An even weaker form of moral obligation that could perhaps enforce moral engagement in the climate question could result from the ontological kind of moral norms endorsed by moral realists (like Brink, McNaughton, Schaber), who think that there are moral norms independent of our subjective attitudes. However, in metaethics the idea of such a moral reality has been strongly criticized for ontological, epistemological and practical reasons.[12] Here is not the place to elaborate these arguments. I can only assume that such a moral reality and its norms probably do not exist.The positive lesson of those criticisms is that moral reality is a man-made construct and that stronger moral norms, which really help to resolve the problems of global warming, have to be socially introduced and enforced, preferably by legal norms.

So, there are no norms in the deontological sense and hence no obligations in a strict sense apart from legal and socially valid norms. Not all legal and social norms, however, are at once *moral* norms and obligations - think e.g. of racist laws - but only those that can be morally justified, namely as being morally good according to a conception of the morally good. The most widely accepted family of such conceptions is *welfarist,* i.e. it conceives the moral desirability of an object *p* as a function of the individuals' desirabilities / utilities of *p*. One such conception is *utilitarianism*, which equates moral desirability simply with the sum (or the mean) of all the individuals' respective desirabilities of *p*; another conception is *prioritarianism*, which gives greater priority to improving the lot of people worse off, and the greater priority, the worse off these people are; still a further conception is *moderate welfare egalitarianism*, which over and above the sum of individual desirabilities gives higher rankings to more equal distributions; etc. In the following, I presuppose one of these welfarist conceptions of the morally good; but for the present purpose it is not very important to specify which one.[13] If our moral obligations (in the strict sense) do not go beyond what the morally good legal and socially valid norms require, this is far less than what we can morally do. Most utilitarians find that this is insufficient and postulate a moral duty to always do what is morally best (in utilitarian terms). However, this has been criticized as an excessive demand and as moral exploitation; in addition, it again postulates an ontologically obscure obligation. A far more appealing middle course between an illusory excessive demand and the unambitious fulfillment of low obligations is *progressive normativism*. Progressive normativism tries to raise the standards of moral duties at least historically, in the long run. It says, first, that morally responsible people should politically try to enforce the morally best legal and informal norms that are currently realizable, thereby historically improving the stock of social norms, and, second, that everybody is morally bound to such norms. Progressive normativism thus implements the constructivist lessons concerning the reality of moral norms. In the following welfarism will be taken to be the right conception of moral value, and progressive normativism will be presupposed as the right conception of moral norms; their combination may be called *'progressive norm welfarism'*.[14]

A proposal for constructing the financing norm: no harm for developing countries

Progressive norm welfarism is a basic and general criterion for moral evaluation and moral duties (a "primary principle", so to speak). Now we have to look for more concrete and specific precepts, directives or norms (or, somewhat paradoxically, 'secondary principles') to be applied in more specific situations, such as that of the financing problem, and which may be justified by the primary moral principles. The no-harm and the polluter-pays 'principles' are already such more specific precepts; and so are the solutions to be discussed in the following.

According to the discussion in the second section, the financing question can be reduced to the question of how to distribute (the reduced number of) GHG emission certificates. Many proposals regarding this distribution have been discussed. Some of them are rather implausible, so can be discarded quickly. This holds in particular for grandfathering and distribution according to GDP.

> Your grandchildren will likely find it incredible - or even sinful - that you burned up a gallon of gasoline to fetch a pack of cigarettes!
> / Paul MacCready, Jr. /

Grandfathering means to distribute emission certificates proportionally to present emissions so that every nation has to reduce its emissions by the same factor. This principle rewards present emission inefficiency (i.e. inefficient use of the limited sink capacities of

the earth), obstacles or may even prevent development in Third World countries, and it is grossly unfair in terms of all major theories of distributive justice like welfare egalitarianism, prioritarianism, sufficientarianism,[15] welfare leximin[16] or utilitarianism etc.

Distribution according to GDP, which has been proposed by Wirth / Lashoff and Cline as one component of a more comprehensive distribution scheme,[17] is different from grandfathering because GHG emissions are not proportional to GDP, so it rewards emission efficiency to a certain extent. Distribution according to GDP, however, privileges the rich and thus is again unfair, and obstacles the development of poor countries.

Some distribution proposals which merit more discussion are the following:

Certificate egalitarianism, popularized by the Global Commons Institute under the name of 'contraction and convergence', aims at an equal distribution of emission certificates to all persons (convergence) over the medium term, where the sum of the certificates is defined by a global reduction target (contraction). Certificate egalitarianism is a specific precept (dealing only with certificate distribution), which may be justified as an application of the (primary) moral principle 'resource egalitarianism'. Welfare egalitarianism, which is another (primary) moral principle, on the other hand, will not lead to certificate egalitarianism because an equal number of certificates for different people will often lead to different levels of well-being or welfare. Certificate egalitarianism has found many supporters among theoreticians.[18]

Historical responsibility is a precept to be applied in combination with other maxims, e.g. certificate egalitarianism, and requires polluters who in the past have exceeded the justified limit of emissions to pay for the damages generated (historical debts, cf. sect. 3). Usually the respective responsibility is attributed to states, and the historical debt is calculated on an egalitarian basis, i.e. excess emissions are equal to actual emissions minus individual emission budget times population size. Historical excess emissions have been calculated (and their redemptions proposed), e.g. starting from the year 1950[19] or even 1800.[20] The principle of historical responsibilities has found supporters in particular among friends of poor countries.[21]

No harm for developing countries (NHDC) is a distribution directive according to which, on the basis of a tripartition of countries, beyond their own emission reduction the rich (OECD and rich OPEC) countries pay the GHG abatement of poor, developing (and perhaps poor emerging) countries, whereas the middle group of countries only pays their own emission reductions. According to certificate egalitarianism, the emission certificates for rich countries would be far below their present emissions; however even some of the poor countries exceed their egalitarian emission limits so that these countries, with certificate egalitarianism, would have to invest a considerable part of their development capacities into GHG abatement; and that, in a certain sense, constitutes a harm to them. The idea of NHDC is to take these abatement costs of poor countries by assigning them more than the egalitarian share of emission certificates and a lesser share to the rich countries. Shukla e.g. has defended this principle.[22] A model for implementing this idea technically is joint implementation in the way that rich countries provide highly efficient energy technology to poor partner countries. In order to get the biggest polluters into the boat of GHG abating countries now, the definition of 'poor' has to be stipulated so that China (and hence India) counts as poor for some more time still.

From a welfarist point of view – e.g. for utilitarianism, prioritarianism, welfare leximin or moderate welfare egalitarianism – NHDC is clearly morally better than certificate egalitarianism. Though certificate egalitarianism benefits the very poor countries, which may gain from selling certificates not used by them, countries who are somewhat better off have already trespassed the egalitarian limit or would do so soon under unrestricted conditions. Therefore, they have to renounce further development or to invest in more GHG-efficient energy. The idea of NHDC is to make rich countries pay for this investment instead of poor countries (as in certificate egalitarianism), because the resulting welfare loss in rich countries will be lower. The first reason for this is the decreasing marginal utility of income, whereby subtracting one dollar from a poor person's income decreases his utility more than subtracting one dollar from a richer person's income. Because of this reason, already utilitarianism prefers NHDC to an egalitarian distribution of emission certificates. Prioritarianism, moderate welfare egalitarianism and welfare leximin make this preference still stronger because they give more weight to utility changes among people worse off than to the same utility change for people better off (prioritarianism, leximin) or because a welfare transfer from the better off to the worse off is valued positively (welfare egalitarianism). A third reason strengthening this preference still further is the difference in the purchasing power of money, which implies that the same dollar spent on energy efficient high technology bought in the international market results in greater losses in purchasing power for local products in poorer countries than in rich countries.

The preference between the two principles in welfare ethics is evident. Whether this preference shall be translated into a respective contract and legal norm, according to progressive normativism, depends on the question of whether this is the best norm that could be realized; and since the preference question has already been answered, it now depends on the issue of whether NHDC is politically realizable. Now, of course, the vast majority of politicians in rich countries will promptly oppose the implementation of this principle simply because it costs more. However, at second glance, financing highly efficient energy technologies in poorer countries may well turn out to be the only way of reaching the desired global emission reductions because it may be the only way to make these countries participate in a globally concerted abatement effort. Without this kind of financing and technological support, developing countries (in particular China and India), insisting on their 'right' to fast development, will probably continue to base their development on cheap and dirty energy technologies and thus first nullify expensive reduction measures taken in rich countries and then bring the global trend on a waste path - a nightmare scenario. Hence, NHDC probably is even the only effective policy towards curbing radical climate change. And this insight hopefully will also change the behavior of realist politicians.

This argument also helps to resolve an open problem, namely completing NHDC by fixing the upper limit of countries whose GHG abatement shall be financed by rich countries. In principle, the initial arguments in favor of NHDC as against certificate egalitarianism (i.e. lower utility loss if rich countries pay for the reduction than if poor countries do) lead to taking that mean national income that is identical to the global mean (always corrected for purchasing power) as the upper limit of passive abatement subvention. This is against the spirit of

progressive norm welfarism, which inter alia should resolve the problem of excessive moral demand. Progressive norm welfarism blocks this excess by its criterion for implementing new norms, which aims at enforcing the morally best norms that are currently realisable. The combination of optimality and realisability leads to the proper upper limit. The kernel of the initial argument is that the consumption of one Euro in relatively poor countries leads to more utility than the respective consumption in rich countries. Now this argument would lead to promoting development aid for the poorest countries but not to invest the money in improving the welfare in far richer countries such as China. However, there are two additional mechanisms that radically change the utilities. First, many of the impending damages caused by climate change, unlike the damages resulting from global absolute poverty, are threshold phenomena (aridization, melting of icebergs, etc), so that the utility of preventing these thresholds from being exceeded is extraordinarily high. Second, undertaking actions that lead to effective climate agreements, which radically and effectively curb global emissions by including all major emitters, would constitute a leap in utility with respect to the current situation. This leap goes far beyond the utility gained by shifting consumption from rich countries e.g. to China. Such a utility leap does not exist in the field of development aid - unfortunately. Getting China into the boat of such a climate agreement is crucial here and of strategic importance, because China is the strongest emitter, with emissions still rapidly increasing, and because China is one of the richest countries contemplable for receiving subventions - in fact, many westerners think China is far too rich to be eligible for subventions. However, the utility leap results only from accomplishing the effective agreement; subventions beyond what is necessary in order to convince strategically important contract parties lead only to the initially considered shift in consumption with a utility increase, in the case of China, lower than the increase achieved by investing in good development aid for the poorest countries. The NHDC norm that can be proposed on the basis of these reflections is that, the upper eligibility limit for subventions should be somewhat higher than the present mean income in China, e.g. equal to the Chinese mean income expected in ten years (corrected for purchasing power).

These considerations concerning the moral value of subsidizing GHG abatement in relatively poor countries go hand in hand with considerations concerning the current realisability of NHDC. At present most westerners are not particularly magnanimous towards Chinese people, as they are considered responsible for the loss of jobs in richer countries. Though this attitude is neither justified nor fair, the strategic argument just outlined is probably the only one that might convince these westerners to accept the suggested norm - along with their concrete experiences (e.g. of hurricanes) that the bad effects of climate change will also be hitting home.

> Because we don't think about future generations, they will never forget us.
> / Henrik Tikkanen /

Would progressive norm welfarism adopt the principle of historical responsibility and make developed countries pay for their 'historical debts'? No. According to progressive normativism, social norms, in particular the norm of indemnifying damages caused and still more specifically the polluter-pays principle, have the instrumental function of motivating moral behavior. However, this function can only be fulfilled if in the moment of decision the agent knows which action is sanctioned by the respective norm. Until recently (about 1990) no application of the polluter-pays principle to GHG emissions could satisfy this condition because the harmful effects of such emissions were not sufficiently clear.[23] Today, of course, the polluter-pays principle should enter the GHG contracts in the form of a kind of fine for exceeding GHG limits, but not in the form of recognizing historical debts.

These constructive justifications of NHDC without recognition of historical debts shall now be complemented by some intuitionistic arguments. Several pragmatic difficulties count against the principle of recognizing historical debts. Past emissions cannot be quantified exactly, political boundaries and, above all, population sizes have changed considerably. Past GHG emissions were not only useful for the immediate consumer but at least some part was also useful for the whole of later mankind insofar as these emissions were a by-product of technical development that also benefited people in countries with historically fewer emissions. Where it may be sensible that together with our wealth we have inherited also the costs generated by its creation, it is far less clear why we should also inherit mere costs of consumption that had nothing to do with the creation of that wealth. While people on an individual level can reject a heritage it is unclear whether and in what way we can reject a collective heritage; and if this is unclear the application of the heritage idea to the collective level may be unfair. Finally, historical debts will eventually have been paid, so that indemnified countries needing special help will no longer receive these extra gratuities.

Many arguments against every kind of primary egalitarianism (in particular resource or welfare egalitarianism) criticize that the ideal of equality has never been justified positively; its defenders take it as natural or evident; its critics just do not feel this. Egalitarianism is a comparative ethics. Isn't this kind of always making comparisons a repugnant character trait, namely a fruit of envy, which cannot bear that someone else is better off - instead of sharing the other person's pleasure? The most radical consequence of this character trait is levelling down, i.e. preferring that everybody be equally badly off to only some people being well off. Certificate egalitarianism is a special kind of resource egalitarianism. However, the *primary* objects of a just distribution should be primary, intrinsic goods and not mere means like emission certificates because a special distribution pattern of means may lead to a completely different distribution pattern of primary goods.[24] So an egalitarian distribution of emission certificates does not consider the welfare consequences of this distribution, neither does it consider special needs in energy consumption, like heating in high mountain regions or areas near the poles, nor the economic impact on and economic power of countries, in particular the curbing effect on developing countries.

A general problem with certificate egalitarianism is that it is fixated on one special problem. Given the economic needs and aspirations of developing countries, however, it seems to be sure that a solution to the climate problem can only be reached by also addressing the issue of sustainable development.

Certificate egalitarianism is sometimes defended as being favourable to developing countries, and to a certain degree it does, in fact, help the poorest countries. Yet, if that ist considered a moral advantage, a more direct way to express this particular concern for the poor is prioritarianism; and generosity can be better practiced through the various forms of welfarism, which along with progressive normativism have led to the maxim NHDC. According to progressive normativism, what is still more important, however, than these principles and maxims

is the great-hearted motivation itself to reduce one's own GHG emissions and to actively install strict reduction norms in society.

Notes

1. Data from the National Energy Administration of China, however, imply that since 2005 China has diminished the carbon intensity of its economy (GCP 2008).
2. Kverndokk 1995, 130-131; 146
3. Lumer 2002.
4. Mabey et al. 1997, 380.
5. Sustainable reduction was morally optimal according to utilitarian and prioritarian evaluation criteria and morally required by a sustainability criterion, Kantianism and the no-harm criterion (Lumer 2002, 75, 78-80).
6. GCP 2008, Appendix.
7. There may be few winners of global warming, e.g. farmers in the northern USA, southern Canada or some parts of Russia. Of course, these people do not have any rational interest in stopping global warming. However, these small fractions never sum up to a nation's majority.
8. In 2000 the mean GHG emissions of only about 25 of the poorest, mostly African, countries were equal or below the sustainable level of then about 1.5 t CO_2 equivalent/capita (cf. WRI 2009).
9. Lumer 2002, 104.
10. A norm is vague if its content is not completely clear; it is weak if it does not require costly actions.
11. However, on the basis of this weak norm and for reasons of fairness as well as to encourage earlier efforts, it may be right to require from those countries which did not follow this norm that, in a global climate agreement, they be obliged to make good for this omission by stronger efforts or by receiving lower emission permits.
12. Mackie 1977, ch. 1.
13. In a more detailed and precise discussion, it would be necessary to specify the underlying welfare function. In such cases, I endorse a special kind of prioritarianism (Lumer 2006; 2000, ch. 7).
14. The name 'progressive norm welfarism' has been coined in analogy to names like 'ideal rule utilitarianism', where the 'ism' denotes the moral value function (welfarism), the other noun denotes the kind of objects that are central to the theory and that are primarily valued (socially valid norms), and the adjective gives some further specification (here: progressiveness, i.e. that the morally justified socially valid norms shall be historically more and more ambitious).
15. Sufficientarianism is the principle that everybody should dispose of the necessary resources at least at the sufficiency level.
16. Leximin is a social preference order that prefers the one of two states where the respectively worst off is better off; if the worst off persons in both states are equally bad off, leximin prefers the state where the second worst off is better off; etc.
17. Wirth/Lashoff 1990 and Cline 1992.
18. E.g. Athanasiou/Baer 2002, 47 ff.; Ghosh 1993; Grübler/Fujii 1991; Meyer 2001, 56 ff; Ott 2003, 196-197.; Page 2006, 177-179; Paterson 1996; Shue 1993; Welsch 1993.
19. Smith 1993, 37-41.
20. den Elzen et al. 1993; Grübler/Fujii 1991; Grübler/Nakicenovic 1991.
21. Hyder 1992; Smith et al. 1993
22. Shukla 1990.
23. This justification for excluding liability does not hold for subjectively risky behavior, such as pharmaceutical research, because subjective risk can already establish liability. CO_2-emissions, however, were not even subjectively risky before that date. And, of course, that justification does not exclude historical debts generally but historical debts from, according to the present scientific knowledge, allegedly harmless actions.
24. This does not exclude that, for reasons of practicability, theories of justice determine also different secondary distribution patterns for certain means, which are expected to lead to the desired distribution of primary goods. However, even welfare egalitarianism, which determines just distributions in terms of the primary object of welfare, does not imply certificate egalitarianism; only resource egalitarianism does, which again speaks of secondary goods.

References

Athanasiou, Tom / Baer, Paul (2002): Dead Heat. Global Justice and Global Warming. New York: Seven Stories Press.

Banuri, Tariq / Göran-Maler, Karl / Grubb, Michael / Jacobson, Harold / Yamin, Farhana (1996): Equity and Social Considerations. In: IPCC (Intergovernmental Panel on Climate Change): Climate Change 1995. Economic and Social Dimensions of Climate Change. Contribution of Working Group III to the Second Assessment Report of the Intergovernmental Panel on Climate Change. Edited by J. P. Bruce / Hoesung Lee / E. F. Haites. Cambridge: Cambridge University Press, 79-124.

Cline, William R. (1992): The Economics of Global Warming. Washington, D.C.: Institute for International Economics.

Elzen, M. den / Janssen, M. / Rotmans, J. / Swart, R. / Vries, B. de (1993): Allocating Constrained Global Carbon Budgets. In: International Journal of Global Energy Issues. No. 4, 287-301.

GCP (Global Carbon Project) (2008): Carbon Budget and Trends 2007. http://www.globalcarbonproject.org/carbonbudget/07/index.htm. Viewed 26 September 2008

GCP (Global Carbon Project) (2008): Carbon budget 2007. Appendix: Emission figures. http://www.globalcarbonproject.org/global/pdf/Press%20Release%20-%20Emission%20figures.pdf. Viewed 26 September 2008.

Ghosh, Prodipto (1993): Structuring the Equity Issue in Climate Change. In: Achanta, A. N. (ed.): The Climate Change Agenda. An Indian Perspective. New Delhi: Tata Energy Research Institute.

Grübler, Arnulf / Fujii, Yasumasa (1991): Intergenerational and Spatial Equity Issues of Carbon Accounts. In: Energy. No 16, 1397-1416.

Grübler, Arnulf / Nakicenovic, N. (1991): International Burdensharing in Greenhouse Gas Reduction. World Bank, Environmental Policy Division.

Hyder, Tariq O. (1992): Climate Negotiations. The North/South Perspective. In: Mintzer, Irving (ed.): Confronting Climate Change. Risks, Implications and Responses. Cambridge, UK: Cambridge University Press.

Kverndokk, Snorre (1995): Tradeable CO_2 Emission Permits. Initial Distribution as a Justice Problem. In: Environmental Values. No. 4, 129-148.

Lumer, Christoph (2006): Prioritarian Welfare Functions. http://mora.rente.nhh.no/projects/EqualityExchange/ressurser/articles/lumer1.pdf.

Lumer, Christoph (2002): The Greenhouse.

A Welfare Assessment and Some Morals. Lanham, Md.; New York; Oxford: University Press of America.

Lumer, Christoph (2009): Rationaler Altruismus. Eine prudentielle Theorie der Rationalität und des Altruismus. 2nd ed. Paderborn: Mentis.

Mabey, Nick / Hall, Stephen / Smith, Clare / Gupta, Sujata (1997): Argument in the Greenhouse. The International Economics of Controlling Global Warming. London, New York: Routledge.

Mackie, John Leslie (1977): Ethics. Inventing Right and Wrong. Harmondsworth: Penguin.

Meyer, Aubrey (2001): Contraction & Convergence. The Global Solution to Climate Change. Totnes: Green Books.

Ott, Konrad (2003): Ethische Aspekte des Klimawandels. In: Gottschalk-Mazouz, Niels / Mazouz, Nadia (eds.): Nachhaltigkeit und Globaler Wandel. Integrative Forschung zwischen Normativität und Unsicherheit. Frankfurt, New York: Campus. 169-201.

Page, Edward A. (2006): Climate Change, Justice and Future Generations. Cheltenham, UK; Northampton, MA, USA: Edward Elgar.

Paterson, Matthew (1996): International Justice and Global Warming. In: Holden, Barry (ed.): The Ethical Dimensions of Global Change. London: Macmillan. 181-201.

Shue, Henry (1993): Subsistence Emissions and Luxury Emissions. In: Law and Policy. No. 15, 39-59.

Shukla, P. R. (1999): Justice, Equity and Efficiency in Climate Change. A Developing Country Perspective. In: Tóth, F.L. (ed.): Fair Weather. London. 145-159.

Smith, Kirk R. (1993): The Basics of Greenhouse Gas Indices. In: Hayes, Peter / Smith, Kirk (eds.): The Global Greenhouse Regime. Who Pays? Science, Economics and North-South Politics in the Climate Change Convention. London: United Nations University Press; Earthscan. 20-50.

Smith, Kirk R. / Swisher, Joel / Ahuja, Dilip R. (1993): Who Pays (to Solve the Problem and How Much)? In: Hayes, Peter / Smith, Kirk (eds.): The Global Greenhouse Regime. Who Pays? Science, Economics and North-South Politics in the Climate Change Convention. London: United Nations University Press; Earthscan. 70-98.

Welsch, Heinz (1993): A CO_2 Agreement Proposal with Flexible Quotas. In: Energy Policy. No. 21, 748-756.

Wirth, David A. / Lashof, Daniel A. (1990): Beyond Vienna and Montreal. Multilateral Agreements on Greenhouse Gases. In: Ambio. Vol. 19 (6-7/1990,), 305-310.

WRI (World Resources Institute) (2009): Climate Analysis Indicators Tool (CAIT) Version 6.0. http://cait.wri.org/cait.php?page=yearly. Viewed June 6 2009

Submitted:11 June 2009
Accepted: 24 August 2009

Christoph Lumer is professor of moral philosophy at the University of Siena (Italy). His main fields of research are: general and applied ethics (in particular: justice; environmental, future and developmental ethics), theory of action, of rational action, of the good life and of argumentation.

Contact Details:
Università degli Studi di Siena, Dipartimento di Filosofia, Via Roma, 47, I-53100 Siena
E-mail: lumer@unisi.it
Web: www.unisi.it/ricerca/dip/fil_sc_soc/lumer.htm

Epistemic Uncertainties in Climate Predictions. A Challenge for Practical Decision Making

by Prof. Dr. Dr. Rafaela Hillerbrand[1]

Abstract: Most scientists agree that, at least for the time being, unquantified uncertainties are inevitably connected to predictions of climate models. Uncertainties, however, do not justify political inaction. This paper addresses the question of how epistemic uncertainties are of relevance for practical decision making. It is shown how common decision approaches based on the precautionary principle fail to adequately deal with uncertainties as they arise in climate modeling. I argue that with regards to climate change, unquantified uncertainties can neither be ignored in decision making nor be reduced to quantified ones by assigning subjective probabilities. This distinguishes the ethical problems associated with climate change from other problems regarding energy supply and demand like, for example, those associated with nuclear power.

Introduction

The uncertainty of climate predictions is discussed intensively within the scientific community – not only among climate sceptics. However, uncertainties are often kept under wraps when scientific findings are communicated to the public.[2] It is not the scientists who are to blame here. Rather the practical debate seems incapable of adequately reflecting uncertainties in modeling predictions. If these uncertainties were communicated, sound scientific research runs the risk of being discredited as unscientific; the public seems to prefer black and white instead of the scientists' shades of grey. Often predictions are taken either as correct and unquestionably reliable or simply as wrong. However, most scientific models are neither true, in the sense that they exactly predict future events, nor simply wrong and useless.[3] It is argued in this paper that in order to incorporate aspects of inter- and intragenerational justice, practical decision making has to carefully consider the shades of grey

that affect the reliability of climate models in practical decision making.[4]

The focus here is not on the question of how much, if any, reduction of greenhouse gases is ethically legitimate,[5] but rather on what kind of decision making criteria should guide our reasoning about this very question. The aim of the paper is twofold: Firstly, I contend that some of the uncertainties that practical decision making has to consider cannot be quantified. Secondly, it is argued that common decision making approaches based on the precautionary principle and expected utility maximisation fail to adequately deal with unquantified uncertainties and therefore are unable to incorporate issues of intergenerational or international justice.

> This is the first age that's ever paid much attention to the future, which is a little ironic since we may not have one.
> / Arthur C. Clarke /

The second section shows that any ethical evaluation of greenhouse gas emissions has to deal with epistemic uncertainties that comprise, but go well beyond, what climatologists refer to as *uncertainty*. Most pressing for practical evaluations is the fact that this auxiliar uncertainty is not quantified. I argue in the third section that discerning quantified and unquantified uncertainties is relevant for practical decision making. The fourth section contends that the precautionary principle is not capable of adequately implementing questions of fairness between different nations or generations. The fifth section sketches briefly why, for the climate debate, expected utility maximization does not provide a more rational decision criteria than the precautionary principle. As an outlook, a way to modify expected utility maximization in view of unquantified uncertainties is adumbrated.

What is uncertain about climate predictions?

Climate change raises serious problems regarding considerations of inter- and intragenerational justice. This paper focuses on the former and restricts itself to the ethical issues associated with climate change insofar as they are related to the distribution of welfare across different generations. Presupposing that our interest in the ethical aspects of climate change arises mainly from considerations of intergenerational justice, we may assume that we value a certain 'state of the climate system' only because of its value for future generations. Then a mere rise in global mean temperature is not morally relevant per se. What actually matters is how changes in mean temperature or other climatic variables influence the living conditions of present and future human beings.[6] Quite often, however, the discussion is cut short and moral conclusions are derived directly from climate-model predictions, which merely determine the state of the climate system. Unless one assigns an absolute value to the climate system, there is, however, no a priori obligation to maintain the climate system in a particular state. This preempting of the moral debate is not only at variance with sound decision making, it also adversely affects the science itself as scientific reasoning is, mostly implicitly, accused of being but a political instrument for the wrong side.[7]

The direct and indirect influences of climate change on the expectancy and quality of human life cannot be determined straightforwardly; hence so-called impact models are used by (welfare) economists. The threefold distinction between a scenario, an earth-scientific, and an economic level introduced in figure 1 helps to clarify where and how epistemic uncertainties arise and how they enter the practical discourse.[8] Only some of the uncertainties in climate modeling (level two) may be quantified in a meaningful way, e.g. in terms of the width of the probability distribution of, say, a change in global mean temperature. These quantifiable uncertainties mainly correspond to unknown parameter ranges, while unquantified uncertainties remain. This is particularly (but not exclusively) because on the first and third level in figure 1 it is not known how adequately the models used represent the relevant causal mechanisms of the modeled system. This uncertainty in the model conceptualization may be due to finite computational power or due to our insufficient understanding of the modeled processes.

Note that in practice, the distribution of the various tasks in determining the effects of anthropogenic greenhouse gas emissions is not as clear-cut as suggested by figure 1, particularly when impact models mix with normative assessment. This is, on the one hand, unavoidable and even necessary: Only a normative evaluation can determine which aspects of human life are worth modeling. Some modeling assumptions, like the discounting rate of non-monetary losses, have to be considered (also) on moral grounds.[9] On the other hand, merging normative and descriptive assessments blurs many (normative) assumptions and makes the evaluation rather opaque.

The immediacy and practical relevance of uncertainties

Why worry about epistemic problems when reasoning about issues of inter- and intragenerational justice? If uncertainty is a serious problem, why not simply wait until climate models and global and long-term economic predictions have overcome their teething troubles? The climate system only reacts very slowly to changes in its parameters, such as changes in carbon dioxide contraction. Hence the atmospheric concentration of persistent greenhouse gases like carbon dioxide can only be stabilized by reducing emissions.[10] The large inertia of the climate system necessitates timely countermeasures. Once particular effects occur, it may well be too late for a systematic response. Note again that this paper deals with a sound discourse about how to react to climate change, not with the issue of correct reduction or

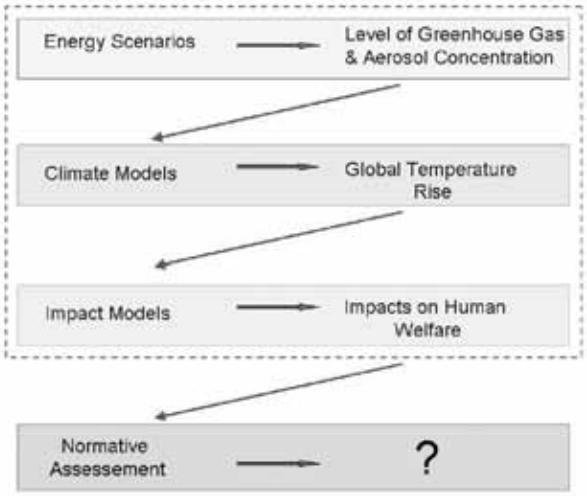


Figure 1: 'Estimating the impacts of greenhouse gas emissions on human wellbeing.' Short straight double arrows correspond to 'yields the output', long oblique thick arrows correspond to 'is input for'. The dotted rectangle indicates the combination of scientific prognoses that, as a whole, serve as the empirical input for a political or moral evaluation on the last line.

mitigation strategies. The practical discourse may or may not come to the conclusion that instead of mitigating now, we should wait and adapt later. However this decision cannot wait for better and less uncertain predictions: it has to be taken now.

A need to address epistemic uncertainties in practical debates can be deduced from three (fairly weak) assumptions: Firstly, practical decision making has to be based on the best (empirical) knowledge available. Secondly, practical problems related to environmental issues can be formulated as scientific problems. Thirdly, science gives us the most reliable understanding of the natural world. I do not want to justify these suppositions, as all three seem to be both weak and rather intuitive. From these epistemic and practical assumptions it follows that we have to consider epistemic uncertainties in practical decision making: The best available information that we have today is our scientific forecasts *plus* information on their reliability. Though the latter may not be expressed or even be able to be expressed in numeric terms, information on the quality of various climate predictions is available.

If, for example, quantified uncertainties that arise from insufficient knowledge on the input parameters were the only uncertainties we had to deal with, common probabilistic decision criteria like utility maximization could be applied in a straightforward way. Unquantified uncertainties, however, that arise from insufficient understanding of the model conceptualization pose a severe problem. Quantitative figures may be misleading, but they can be communicated easily to people outside one's own discipline. This is not the same for errors and shortcomings that are not quantified. Nonetheless, in estimating the reliability of a physical or economic model there always remain unquantified factors that are hard to communicate. For example, the outputs of statistical analysis will always depend on the specific experimental paradigm in use, accepted practices, and the general research experience within the field; these factors cannot be defined explicitly, but must be learned by working in the field. In this way the scientific community establishes a Wittgensteinian language community.[11] Even if scientists in a given field tend to assign 'higher order beliefs' that express their confidence in an underlying theory, the methodology used, the researcher or the group who carried out the work, etc, these higher-order beliefs are only very rarely quantifiable themselves in terms of, say, subjective probabilities.

The precautionary principle and justice as fairness

When outcomes are highly uncertain, it is often suggested that we fall back on the precautionary principle. The phrase *precautionary principle* is fraught with ambiguity, so let us briefly explicate the term and its use within ethical, juridical, and political contexts. The Rio Declaration on Environment and Development, for example, formulates the precautionary principle (rather vaguely) as follows: "Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."[12]

In this weak formulation, the precautionary principle provides no distinct directive for practical decision making. Instead it constitutes a meta-criterion stating that uncertainties in scientific forecasts have to be taken seriously. Strong formulations of the precautionary principle constitute a genuine decision criterion. The following is an example of the *precautionary principle* in a strong formulation: "Where an activity raises threats of harm to the environment or human health, precautionary measures *should be taken* if some cause and effect relationships are not fully established scientifically [my italics]."[13]

Proponents of the precautionary principle like C. Raffensberger and J. Tickner suggest the following core idea behind all formulations of the *precautionary principle*: "In its simplest formulation, the precautionary principle has a dual trigger: If there is a potential for harm from an activity and if there is uncertainty about the magnitude of impacts or causality, then anticipatory action should be taken to avoid harm."[14]

In this paper, I want to understand the precautionary principle as a genuine decision making criterion, that, loosely following Gardiner,[15] interprets the strong formulation as a variant of the minimax rule in decision theory: Minimize the maximally bad outcome. Given certain assumptions about how to quantify harm and wellbeing, this may be reformulated as a maximin rule and reads (for climate change): Maximize wellbeing in those scenarios in which the involved humans are worst off (minimally benefited), regardless of how uncertain these scenarios are. At first glance, a precautionary approach seems well suited to avoiding an ethically unjustifiable discounting of future damage caused by our present greenhouse gas emissions: We cannot exclude with certainty the possibility that the release of greenhouse gases has the potential to cause severe harm to future generations, hence emissions of greenhouse gases ought to be abandoned. A precautionary approach seems adequate when the stakes are high – the living conditions of all future humans may be endangered by severe climatic changes. Furthermore, some economic assessments suggest that reducing anthropogenic greenhouse gas emissions is not very costly.[16] Following Stern,[17] a commitment of only 1 percent of global gross domestic product (GDP) is needed to avoid the major hazards that may arise from climate change. At first blush, this appears very affordable; but if we base our calculation on current GDP value, it amounts to an investment of US $ 450 billion per year. For comparison: the current estimates of the money needed to provide 80 percent of rural populations in Africa with access to water and sanitation by 2015 amounts to US $ 1.3 billion per annum.[18] Clearly, societies (or other organisations) are able to part with only a certain amount of money or other resources for altruistic endeavours, and the mitigation of major changes in future climate is only one such endeavour.[19] Investing in the mitigation of climate-change effects means forgoing other investments which we have a moral obligation to make. One central requirement of the practical debate is a decision about which investment has priority over others. Presupposing an answer to this question from the very beginning of the debate – for example by assuming that climate change is currently humanity's most pressing problem – pre-empts the moral debate, as discussed in section 2. Applying the precautionary principle to global warming as a singular problem thus does not allow us to adequately deal with the valid claims of groups that are adversely affected by natural or societal 'disasters' other than climate change. This approach is clearly incapable of adequately incorporating considerations of inter- or intragenerational justice as it does not address the question of why suffering arising from climate change has priority over suffering caused by other sources. The critique raised here, however, is not a charge

> Our greatest responsibility is to be good ancestors.
> / Jonas Salk /

against the precautionary principle itself; it only disqualifies common applications of the precautionary principle.

Suppose that one can show that – given certain ethical standards, which are not under debate here – the worst-case scenario regarding the effects of climate change is that these effects are worse than any other type of human suffering, present and future. This means that if our (possibly very unrealistic) assumptions are indeed correct, then following the precautionary principle, we have to mitigate climate change at any cost. We are trading the certain suffering of people living presently against a possibly more severe, but yet uncertain suffering of people living in the future. If the worst-case scenario is as uncertain as currently estimated for global warming, and is balanced against certain other scenarios whose bad effects are certain (like the actual suffering of many people in third word countries, for example), it is unreasonable to completely mask all other scenarios and focus on mitigation of the uncertain, but worst outcome.[20] As noted above, the available information on the effects of anthropogenic global warming includes information about the 'likelihood' of the worst-case and other scenarios. This information is not quantified and may not be fully quantifiable at all. However, we do have information that suggests that, while present suffering is certain, future suffering caused by global warming is uncertain. Good arguments for neglecting this information should be given. But to the best of the author's knowledge, no such arguments have been presented tin the literature.

Problems with a precautionary approach as an action guiding principle have been discussed extensively in the literature.[21] This paper only addresses one central issue of importance in any intergenerational ethics, namely how to balance obligations towards future generations against obligations towards people living presently. Even if one argues for the ethical legitimacy of trade-offs between losses and gains experienced by different people one cannot deny that presently living people have a right to safe water and sufficient nutrition. One needs to argue at least that uncertain future losses are worse than current suffering. But a mere precautionary approach to global warming is incapable of simultaneously incorporating considerations of inter- and intragenerational justice.

A modified expected utility approach for a greener future

The precautionary principle is often perceived as the opposite e of maximizing expected utility: Instead of focusing on the worst case scenario, the latter considers all possible outcomes and the associated utilities u_i, weighted by their occurrence probability $\sum_i u_i p$, or, to put it in more technical terms: We are to maximize and sum over all possible scenarios. The extreme scenarios of run-away climate change or very little temperature change, for example, are thus taken into account, as is the scenario in which the temperature change exactly equals the estimated mean value. The latter scenario being the most probable, is given the greatest weight.

Maximizing the expected utility is an adaptation of the utilitarian maxim of the *greatest good for the greatest number* to decisions under uncertainty: It is not the overall utility (or 'good') that is to be maximized, but the expected utility, i.e. the sum of different utilities weighted by their probability of occurrence. The assignment of utilities to possible climate-change effects raises many difficult problems, but I do not want to dwell on these problems here. These problems are not specific to decision making under uncertainty and related problems of welfare-based ethics. Note, in particular, that problems about determining the utility of an event, or deciding what utility actually amounts to, parallel to some extend a problem of the precautionary approach, i.e. to decide as to how to actually determine the worst-case scenario.[22] As this paper's focus is on uncertainties (of expected utility and of the worst-case scenario), the problems associated with measuring human welfare and how to equate it with utilities are not discussed here. For the purposes of this paper it suffices to assume that the impact on human welfare estimated in economic models on level three in figure 1 can be associated with (intersubjective) utilities in a meaningful way.[23]

In order to apply the principle that tells us to maximize expected utility to global warming, all (morally) relevant effects of greenhouse gas emissions have to be assigned some probability p_i. As there are no frequency estimates for most of these effects, one may fall back on a Bayesian account, i.e. via subjective probabilities, the reliability of scientific outcomes is quantified. The distinction between quantified and unquantified uncertainties thus becomes obsolete. That is rather brief, so let us dilate somewhat on the problem here: Our most successful method for tackling uncertainty has been to regiment situations of uncertainty by the use of probabilistic propositions. But unless one is a certain kind of subjectivist about probability, one wishes that one's probabilistic beliefs are constrained by objective facts, so that they approximate to objective variables, whether one takes the latter to be frequencies, propensities, or some other concept.

As argued above and elsewhere,[24] there is no reliable basis for assigning probabilities to the empirical inputs needed for practical assessment. Unquantified uncertainties are of central relevance when we are discussing climate-change issues. This distinguishes the threat of global warming from other ethical problems related to energy supply and demand, such as safety issues of nuclear power plants, or final disposal site, where there is a reliable basis of assigning probabilities. Not only is it impossible to choose meaningful prior probabilities, but due to the large time scales in which the climate system reacts to changes, there is also insufficient data for updating these probabilities. The Bayesian method of assigning subjective probabilities via prior guesses therefore fails in the case of climate change.

Another way to assign subjective probabilities is to use Laplace's principle of insufficient reason: All possible effects are taken as equally probable. This approach, which was employed, for example, by Harsanyi,[25] is at fault for neglecting available empirical information (as is the precautionary approach). There is no logical superiority of Harsanyi's assumption of equiprobability over Rawls' focus on the worst outcome as, per se, there is no logical need to assign subjective probabilities to uncertain decision outcomes on the basis of Harsanyi's equiprobability assumption. We do have information – albeit not fully quantified – about the likelihood of certain effects of climate change. Hence, even when we leave problems associated with assigning meaningful utilities to the impacts of various energy sce-

Today, more than ever befor, life must be characterized by a sense of universal responsibility, not only nation to nation and human to human, but also human to other forms of life.
/ Dalai Lama /

narios aside, climate change cannot be treated by expected utility maximization. This is unfortunate as maximizing expected utility has one clear advantage over a precautionary approach: By incorporating an inter-temporal as well as an international perspective, maximizing expected utility is, by its very nature, able to trade-off the costs and benefits of different people living at different places and times.

The lack of (subjective) probabilities in the sense defined above does not imply, however, that one has to fall back on to non-probabilistic decision criteria such as the precautionary approach. This paper's proposition should not be misunderstood as a kind of reformulation of the precautionary principle in its weak form, i.e. 'Take uncertainties seriously and therefore address also the uncertain outcomes'. If anything, the paper aimed to argue that uncertain effects are not to be (mis)taken as certain ones, which seriously undermines the use of the precautionary principle.

In the literature decision methods are suggested, which parallel expected utility maximization, to cope with the lack of reliable prior probabilities and information about how to update these priors on the basis of the conditional probability calculus.[26] An adequate decision procedure for global warming would assign meaningful utilities to various outcomes in a first step by political decision makers, moral philosophers and others. As to the occurrence of unquantified uncertainties, however, the second step, the actual cost-benefit analysis (understood in a broad sense), should be conducted by experts on the empirical forecasts. Such a blue print can only work when, though philosophical ethics may not aim at a detailed casuistic, it does not shy away from context-variant information on the very decision. The 1970s debate on the 'rationality' of expected utility maximization or maximin, whose main protagonists were Harsanyi and Rawls, was only able to show that answering the question of whether the precautionary principle or expected utility maximization is adequate has to, willy-nilly, implement context-variant features of the decision situation. Note that this paper argues against the precautionary principle only when applied to global warming. The given arguments do not discredit this principle as a decision-making criteria in itself.

Concerning an adequate decision-making approach to global warming, this paper has, so far, turned a blind eye to factors that actually precede the debate on whether the precautionary approach or expected utility measures seem most adequate. So, concluding this paper, let me briefly discuss this problem: Before being able to actually talk about uncertain outcomes of the decision whether to try to reduce greenhouse gases, we have to decide what this decision is actually about – is it about the welfare of future humans?; do we need to discuss the pros and cons of alternative energy supplies that do not emit greenhouse gases as well?, etc. Any analysis of a specific decision must start with some delimitation of the decision itself. It is not always well established how to determine the 'decision horizon'.[27] The scope of the decision, or even which problem the decision is supposed to solve might be unclear. The further in time the consequences of our decisions lie, the more difficult it is to determine the decision horizon. For example, on moral grounds different people are not to be treated in a different way, but we cannot simply be all treated in the same way. Currently, the decision horizon is set by pragmatic considerations, though, particularly in intergenerational ethics, it is of central relevance. As for how to determine the scope of a decision, whether it be about climate change issues or other issues, this should be a topic for the empirical sciences, only insofar as these determine limits to our knowledge. It remains a genuine task for ethics that philosophers should not shy away from, because this task requires dwelling in detail, on the context of the decision-making situation.

Notes:

1. I would like to thank Steve Clarke, Martin Peterson, Andreas Pfennig, Nicholas Shackel, and Hartmut Westermann for helpful discussions on the topic of this paper as well as criticism and comments on earlier versions. I thank Till Spieker for help in finalizing the paper.
2. Compare, for example, the full IPCC report and its summary for policy makers: Solomon et al. 2007.
3. Giere 2004.
4. Though moral uncertainties are indisputably a big concern in an intergenerational ethics, this paper focus on epistemic uncertainties only.
5. Therefore compare, for example, Gardiner 2006a, Hanson/Johannesson 1997, Lumer 2002.
6. Note in this context that the anthropocentric approach pursued in this paper can be extended straightforwardly to incorporate other sentient beings as well.
7. Compare Oreskes 2004 and Pielke 2004 on the heated debate that followed the publication of B. Lomborg's book *The Sceptical Environmentalist* in 2001.
8. Hillerbrand/Ghil 2008.
9. Stern 2007.
10. Solomon et al. 2007.
11. Wittgenstein 2001, 10.
12. UNEP 1992; UNFCC 1998.
13. Apart from the two versions discussed in this paper, various other formulations of the precautionary principle exist: Sandin et al. 2002, O'Riordan/Jordan.
14. Raffensberger/Tickner 1999, 1. 15. Gardiner 2006b.
16. Note that there is considerable disagreement within the economic community on the costs of reducing greenhouse gases,see the response of Weitzmann 2009 and Nordhaus 2008 to Stern 2007.
17. Stern 2007.
18. Martinez Austria/van Hofwegen (eds.) 2006.
19. Note that the assumption of one well-defined decision maker that underlies the debates on climate change and is adopted here is unrealistic.
20. Note that this argumentation needs refinement when the worst-case outcome is a singular event like the end of human life on Earth (c.p. Ord/Hillerbrand/Sandberg 2009). The current empirical knowledge, however, seems to exclude that climate change is of this very nature.
21. Peterson 2006, Clarke 2005, and references therein.
22.The problem of the precautionary approach is somehow easier, as it needs only an ordinal concept of wellbeing, while EUT presupposes a cardinal welfare measure. Cardinal and ordinal measures can only identical when the welfare function already fulfills certain restraints Neuman/Morgenstern 1967.23. How to actually assign meaningful utilities has been discussed extensively in the literature. For an intergenerational ethics it raises rampant problems, see Lumer 2002 for a discussion as to how assign utilities in the context of climate change.
24. Frame et al. 2007.
25. Harsanyi 1975, 1982.
26. For example Shafer 1990.
27. Hansson 1996, 371.

References

Clarke, Steve (2005): Future Technologies, Dystopic Futures and the Precautionary Principle. In: Ethics and Information Technology. Vol. 7, 121–126.

Frame, Dave. J. / Faull, Nicholas E. / Joshi, Manoj M. / Allen, Myles R. (2007): Probabilistic Climate Forecasts and Inductive Problems. In: Philosophical Transactions of the Royal Society. A, doi:10.1098/rsta.2007.2069.

Gardiner, Stephen M. (2006a): A Perfect Moral Storm: Climate change, intergenerational ethics and the problem of moral corruption. In: Environmental Values. Vol 15, 397–413.

Gardiner, Stephen M. (2006b): A Core Precautionary Principle. In: The Journal of Political Philosophy. Vol 14 (1), 33–60.

Giere, Reto (2004): How Models are Used to Represent Reality. In: Philosophy of Science. Vol. 71, 742–752.

Hanson, Sven Ove (1996): Decision-making under Great Uncertainty. In: Philosophy of the Social Sciences. Vol. 26, 369–386.

Hanson, Sven Ove / Johannesson, Mikael (1997): Decision-theoretic Approaches to Global Climate Change. In: Fermann, Gunnar (ed.): International Politics of Climate Change. Stockholm: Scandinavian University Press, 153–178.

Harsanyi, John C. (1999): Can the Maximin Principle Serve as a Basis for Morality? A critique of John Rawls' theory. Reprinted in: Richardson, Henry S. & Weithman, Paul J. (eds.): The Philosophy of John Rawls. A Collection of Essays. Taylor & Francis, 234–246.

Harsanyi, John C. (1982): Morality and the Theory of Rational Behaviour. In: Sen, A. & Williams, B. (eds.): Utilitarianism and beyond. Cambridge: Cambridge University Press.

Hillerbrand, Rafaela / Ghil, Michael (2008): Anthropogenic Climate Change. Scientific uncertainties and moral dilemmas. In: Physica D 237, 2132–2138.

Lomborg, Bjørn (2001): The Sceptical Environmentalist. Measuring the real state of the world. Cambridge: Cambridge University Press.

Lumer, Christoph (2002): The Greenhouse. A welfare assessment and some morals. Lanham, Md., New York, Oxford: University Press of America.

Martinez Austria, Polioptro / van Hofwegen, Paul (2006) (eds.): Synthesis of the 4th World Water Forum, Mexico City.

Neuman, Jon / Morgenstern, Oskar (1967): Theory of Games and Economic Behavior. New York: Wiley.

Nordhaus, William (2008): A Question of Balance. Weighing the options on global warming policies. Yale: Yale University Press.

Oreskes, Naomi. (2004): Science and Public Policy. What's proof got to do with it?. In: Environmental Science & Policy. Vol. 7(5), 369–383.

O'Riordan, Timothy / Jordan, Andrew (1995): The Precautionary Principle in Contemporary Environmental Politics. In: Environmental Values. Vol. 4(3), 191-212.

Ord, Toby / Hillerbrand, Rafaela / Sandberg, Anders (2009): Probing the Improbable. Methodological challenges for risks with low probabilities and high stakes. In: The Journal of Risk Research, forthcoming.

Peterson, Martin (2006): The Precautionary Principle is Incoherent. In: Risk Analysis. Vol 26(3), 595–601.

Pielke, Roger A. Jr. (2004): When Scientists Politicize Science. Making sense of controversy over the sceptical environmentalist. In: Environmental Science & Policy. Vol 7, 405–417.

Raffensberger, Carolyn / Tickner Joel A. (1999): Introduction: to Foresee and Forestall. In: Raffensberger / Tickner (eds.): Protecting Public Health and the Environment: Implementing the Precautionary Principle. Washington: Island Press, 1–11.

Sandin, Per / Peterson, Martin / Hansson, Sven Ove / Ruden Christina / Juthe, Andre (2002): Five Charges Against the Precautionary Principle. In: Journal of Risk Research Vol. 5, 287–299.

Shafer, Glenn (1990): Perspectives on the Theory and Practice of Belief Functions. In: International Journal of Approximate Reasoning. Vol. 41, 323-362.

Solomon, Susan / Qin, Dahe / Manning, Martin / Chen, Zhenlin / Marquis, Melinda / Averyt, Kristen / Tignor, Melinda / Miller, LeRoy. (2007) (eds.): Climate Change 2007: The Physical Science Basis. Contribution of WG I to the 4th Assessment Report of the IPCC. Cambridge, New York: Cambridge University Press.

Stern, Nicholas (2007): The Economics of Climate Change. In: The Stern Review. Cambridge: Cambridge University Press.

United Nations Framework Convention on Climate Change (1998): Kyoto Protocol to the United Nations Framework on Climate Change. http://unfccc.intresourcedocscon vkpkpeng.pdf.

United Nations Environment Program (1992): Rio Declaration on Environment and Development. http://unep.orgDocuments.MultilingualDefault.asp?DocumentID=78&ArticleID=1163

Weitzman, Martin L. (2009): On Modeling and Interpreting the Economics of Catastrophic Climate Change. In: Review of Economics and Statistics. Vol 1(1), 1–19.

Wingspread Statement (1998): The precautionary principle. 586. http://www.psrast.orgprecaut.htm. Viewed February 19.

Wittgenstein, Ludwig (2001): Philosophical Investigations. Oxford: Blackwell Publishers.

Submitted: 8 May 2009
Accepted after revisions: 23 August 2009

Rafaela Hillerbrand studied physics and philosophy in Erlangen, Münster, Liverpool and Nice and holds a doctorate in both fields. Her research interests lie in the area of philosophy of science and philosophy of technology. Before she took up her current position as head of the research program 'Ethics for Energy Technology' at the Human & Technology Center, RWTH Aachen University, she worked as a research fellow at the University of Oxford.

Contact details: RWTH Aachen, HumTec Gebäude 6070, Theaterplatz 14, D-52056 Aachen
Email: rafaela.hillerbrand@rwth-aachen.de

Just Adaptation? How the Diffusion of Norms in the Global Climate Regime Affects International Climate Politics

by Delf Rothe, M.A.

Abstract: Politics in the international climate regime is a balancing act between intra- and intergenerational justice, as it has to account for both the needs of developing countries and those of future generations. Following a constructivist approach, this paper argues that international climate politics are heavily dependent upon the way climate change and the appropriate behavior required to prevent it are constructed collectively. The article shows how the diffusion of norms and changing images of climate change have shifted the interests of the actors under the UN Framework Convention on Climate Change. As a result, adaptation became more and more widely accepted as a necessary step in international climate politics in advancing the strategy of climate change avoidance. This also represents a shift from a focus on intergenerational justice as the main normative goal of the convention, to a broader aim of sustainable development that comprises both inter- and intragenerational justice.

Introduction

For mankind, adaptation to changing climatic conditions is nothing new. At any given point in history, people have been forced to adapt to changing climatic conditions. In the face of anthropogenic climate change however, adaptation takes on a new ethical as well as political significance. As scientific modeling has developed which allows the prediction of future climatic developments, adaptation can be undertaken anticipatorily – and hence alongside mitigation may be a complementary strategy to promote intergenerational justice in the face of climate change. Yet, because most of the regions suffering from the impacts of global warming lie in developing countries, but it is the industrialized states that bear the main responsibility for the origins of these changes, adaptation is also an issue of international politics and international justice. Thus adaptation is seen today as "a necessary strategy at all scales to complement climate change mitigation efforts."[1]

This development is mirrored in the political development of the UN Framework Convention on Climate Change (UNFCCC). Until 2001 adaptation did not play any significant role in the convention. It was rather seen as a hindrance of climate policy and stood contrary to the sustainability norms that were constitutive of the regime. The preservation of natural systems for future generations was the main goal of the convention as it was formulated at the UN Conference on Environment and Development (UNCED). On the contrary, the promotion of adaptation measures was seen as a form of resignation and a turn away from a policy of preserving the present state of the ecosystems. Yet from 2001 on, beginning with the seventh Conference of the Parties (COP) in Marrakesh, adaptation played a major part at every annual UN climate summit.

From a conventional or rationalist perspective in International Relations this development of the climate regime is puzzling. If we were to assume the purely utility-maximizing behavior of states as the main actors in international climate politics, we would not be able to explain why they should voluntarily engage in adaptation projects that do not in large part benefit them. Yet by taking a social constructivist perspective, we can show that the growing role of adaptation was the result of a learning process in the climate regime that shifted the collective perceptions and norms in the climate change discourse. Thus, a narrative of climate change focused on the physical and ecological that was dominant at the time of the creation of the regime, was gradually replaced by a narrative that stressed the regionally specific social implications of climate change. On an ethical level this represents the shift from intergenerational justice to international justice as the main normative paradigm in international climate politics.

The challenge of constructivism in international relations theory

Constructivist approaches in the field of International Relations (IR) developed as a critique of the dominant theories in IR – Realism and Liberalism.[2] Although there are many different versions of constructivism, all share the same basic idea: the social construction of reality. While the existence of an objective reality is not put into question, it is assumed that humans are not able to perceive that reality directly. Rather, objects in the 'real world' gain their meaning through the process of human interaction and communication. Thus, the interests of political actors cannot be regarded as fixed and given, but depend on the actors self-image, the collectively shared views of the problem or issue at stake (causal ideas) and conceptions of appropriate behavior (behavioral norms).[3] Actors therefore are seen as *homini sociologici* rather than as *homo oeconomici*. In certain situations they do not act in a way that maximizes their personal gains, but rather in the way they think is appropriate for the respective situation.[4]

Applied to international climate politics this means that neither do the material characteristics of global climate change determine politics in the climate regime, nor do the interests of the actors in the regime exist independently of the ideas and norms of the dominant climate discourses. Rather, it is a particular construction – or narrative – of climate change that decides which policies are chosen. Furthermore, the conduct of actors in the climate regime depends heavily on their notions of themselves (e.g. as climate political pioneers or as a victim of climate change). Norms in climate politics, as derived from ethical principles like inter- and intragenerational justice do not simply exist; they are invented and promoted in ethical discourses by influential actors like the Intergovernmental Panel on Climate Change (IPCC) or the World Commission on Environment and Development (WCED).

Inter- versus intragenerational justice

In postulating a shift from inter- to intragenerational justice, this work will first clarify the meaning of those concepts as well as their relation to each other. The concept of intergenerational justice refers to the obligation of the present generation to enable the members of successive generations to satisfy their basic needs in the same way, or in some better way, than themselves.[5] Intergenerational justice in this respect does not only

mean the preservation of natural resources but refers to all resources (material and ideal) that may promote human well-being. When it comes to the political realization of intergenerational justice, there is one central problem: the short-term orientation of the democratic process. Future members of society do not have any voice in the system, and are thus not represented by present decision-makers.

Intragenerational justice on the contrary, refers to the social inequality within national societies or between different states at a global level (international- or north-south-justice). While in the case of intergenerational justice a certain generation is conceptualized as a single average individual, in the case of intragenerational justice the differences between the different living conditions within a generation are highlighted. Contrary to intergenerational justice, conflicting goals in intragenerational justice can be resolved through direct negotiations or judicial proceedings. Moreover, it is possible to directly increase intragenerational justice through distributive measures which may also have positive effects on intergenerational justice, if the future benefit of the disadvantaged outweighs the predictable deficit of the advantaged, i.e. the net-effect in the future is positive.[6]

A climate change response must have at its heart a redistribution of wealth and resources.
/ Emma Brindal /

Ethical implications of mitigation and adaptation

Unmitigated anthropogenic climate change poses a threat to intergenerational justice directly and indirectly. Firstly, it threatens to destroy significant amounts of the earth's natural capital (a clean atmosphere, ecosystems, biodiversity etc.). Secondly, there will be impacts such as extreme weather events that threaten human-security and well-being of future generations. Yet, while the direct effects of climate change will hit future generations as a whole, impacts on human-security will remain unequally distributed between future peoples in the industrialized world and the developing countries.

When it comes to alternatives to deal with these problems politically, there are two general strategies: mitigation and adaptation. Whereas the former means an abatement or prevention of dangerous climate change through the reduction of CO_2-emissions, the latter refers to the anticipatory and planned modification of human practices to accommodate climate changes. From a purely intergenerational point of view, mitigation can be regarded as the normatively superior strategy as it guarantees both natural preservation (and is thus compatible with a strict notion of ecological sustainability) and the chances of future generations as a whole to satisfy their basic needs.[7] Adaptation policies on the contrary also have the potential to increase intergenerational justice, when they have a positive net-effect in the future. Yet this potential is rather limited, as the ecological losses caused by climate change will have to be accepted in most cases. Moreover, as most adaptation has to be undertaken locally, it will not benefit future generations in their entireties.

By adopting the perspective of intragenerational justice when analyzing international politics however, we get a slightly different picture. This position was especially adopted by developing countries in the 1990s, leading to a general skepticism among developing countries regarding climate politics. At the global level, mitigation policies are potentially inconsistent with notions of international justice. This is because industrialized and developing countries have thus far made unequal contributions to the global amount of greenhouse-gas emissions. This led for example to the implementation of the 'polluter pays principle' in the first round of the Kyoto Protocol, and the search for a fair allocation mechanism for the next round (post 2012).[8]

International adaptation policies, on the contrary, are normatively rooted in a discourse of international justice. As the industrialized states bear the main responsibility for climate change, but developing countries will exorbitantly suffer from its impacts, a normative imperative can be derived for the north to finance necessary adaptation projects in the south.[9] Following this argumentation, advanced for example by developmental NGOs, financing adaptation is an appropriate measure to guarantee a sustainable development of vulnerable countries in the face of what is, to some extent, unavoidable climate change.

International climate politics between mitigation and adaptation

The years following the creation of the international climate regime at the UNCED in 1992 were characterized by intense negotiations over an international agreement on mandatory emission reduction targets (the Kyoto process). Due to the opposing positions of European Community (EC) member states, climate skeptics like the USA or Japan, and the developing countries, the negotiations proved to be very difficult. While there had been some agreement on an absolute reduction target for industrialized countries at the 1997 COP-3 meeting in Kyoto, it was ultimately not until 2000 during the second part of the COP-6 meeting in Bonn that the agreement was concluded.[10]

In the beginning of the Kyoto process the issue of adaption played a minor role, but this changed with the seventh COP conference in Marrakesh, in 2001.[11] The *Marrakesh Accords* initialized an international program to support the developing countries with adaptation measures. For this purpose, three funds for the financing of projects in the south were established. Less developed countries were engaged through *National Adaptation Strategies* (NAPAs) under the

Conference	Year	Results/Agreements
COP1 Berlin	1995	• Berlin Mandate initiates negotiations on global emission reduction agreement (Kyoto process)
COP3 Kyoto	1997	• Formulation of the Kyoto Protocol → Agreement on absolute emission reduction targets (mitigation), → Flexible Instruments (emission trading and clean development mechanism).
COP6 The Hague/Bonn	2000	• Bonn Agreements → Design of the flexible instruments.
COP7 Marrakesch	2001	• Marrakesh Accords → Creation of the adaptation, least developed countries and special climate change funds.
COP10 Buenos Aires	2004	• Buenos Aires working program → Production and distribution of scientific knowledge, → Training of decision-makers and adaptation planners, → Development of pilot projects and best practice examples, → Technology transfer,
COP12 Nairobi	2006	• 5 years working program → Adaptation research, improvement of climate prediction models, → Development of adaptation-technologies.
COP13 Bali	2007	• Agreement on the Bali-Roadmap → Initialization of a two-year negotiation process of a follow up agreement of the Kyoto-protocol.

Table 1: Important steps in international climate governance

UNFCCC. Alongside the funding of adaption projects the UNFCCC also focused on the development and distribution of scientific knowledge, providing the most vulnerable regions and countries with the means to improve their adaptation efforts. Moreover, best practice projects should serve as guidelines for policy-makers in vulnerable regions and countries. To this end the UNFCCC adopted the Buenos Aires Working Program on Adaptation and Response Measures in 2004 and the Nairobi Work Programme on Impacts, Vulnerability and Adaptation to Climate Change in 2006.[12]

Cognitive change as social learning

When we look into the reasons for the growing importance of adaptation, one could simply point to the fact that scientific certainty about future climate change has risen. This could have brought decision-makers to the insight that they would be better off if they look after themselves and thus prevent work on adaptation. Yet from a social constructivist point of view this is clearly only half of the story, as it does not account for the political process that led to more exact scientific insights. The UNFCCC itself is the necessary condition for this learning process through interaction. The invention and dispersion of new understandings of climate change was made possible through the stable framework of international climate negotiations.

Three mechanisms can be identified that were influential in this development. First, the annual meetings of the member-states guaranteed continuous interaction.[13] Second, the Intergovernmental Panel on Climate Change (IPCC) was integrated into the climate regime as a major scientific body. This enabled a steady exchange between climate scientists and diplomats.[14] Third, the members of the convention obliged themselves to regularly report about their activities in the field of climate politics (so called national communications).[15] All of this guaranteed an environment in which new understandings could evolve (and through the publications of the IPCC most fundamentally) and become collectively accepted through intensive interaction.

Climate change as a global and ecological problem

When the climate regime was born in 1992, there was already an internationally established and accepted discourse or narrative about climate change that could be called a *global-physical climate narrative*. This discourse was the result of an ongoing international scientific interaction at a variety of conferences held under the auspices of the UN and the World Meteorological Organization (WMO). The discourse thus comprised the collective ideas about climate change that had been accepted by the vast majority of the scientific community at that time. Through the publication of the first assessment-report of the IPCC in 1990, this narrative had already been dispersed in the political arena of the UNFCCC.

In this dominant discourse climate change was depicted as a global problem: causes of climate change were identified with the sum of total global emissions, and the impacts were perceived as global in scale (e.g. sea level rise).[16] Furthermore it was clear that the scientific facts about the exact development and future impacts of climate change remained uncertain.[17] Nonetheless, the insight that climate change was the result of greenhouse-gas emissions can be regarded as having been collectively accepted in the dominant climate discourse.[18] Climate change was generally framed in terms of the natural sciences, which suppressed other, more socially orientated, interpretations. In terms of societal impact this meant that climate change was primarily perceived as an environmental problem, and to a lesser extent a social or economic one.[19]

Global-physical narrative	Understanding of adaptation
• Climate change is a global problem. • Climate change is a result of human action and caused by the greenhouse-effect. • Future development and impacts are unsure. • Climate change is a physical phenomenon. Global warming is fundamentally a threat to the environment.	→ • Adaptation is a local problem. • Regional impacts are unpredictable → adaptation is hard to plan. • The capacity to adapt is an inherent feature of ecosystems. • Adaptation hinders mitigation.

Table 2: Elements of a global-physical narrative.

The general conception of climate change had some serious implications for the collective ideas about adaptation to climate change. As climate change was primarily regarded as a problem for the future environment, the duty of policymakers was to avert it. In this context, adaptation was not seen as a desirable option in climate politics but rather as capitulation.[20] While climate change was seen as a global problem, the problem of adaptation was perceived to be a local one, as the impacts of global warming vary greatly from place to place. It was considered doubtful to predict impacts at a local level so that anticipatory adaptation appeared irrational.[21] The construction of the accepted conception of climate change in physical terms led to the collective belief that adaptive capacity is an intrinsic feature of regional ecosystems, rather than a function of socio-economic conditions that could be politically modified. Finally, and following from this, adaptation was widely interpreted as being part of the expected costs of global warming.[22]

> Don't blow it –
> good planets are hard to find.
> / Unknown /

Climate change as a regional and social problem

From 2001 onwards, there were a number of considerable changes in the discourse on climate change in the UNFCCC. Probably the most important change was the growing evidence of the occurrence of climate change.[23] Furthermore, the spatial perception of global warming seems to have changed. The main reason for this was the development of new regional climate models that are far more precise and allow for accurate predictions at a regional level. This led to the realization that the perception of climate change as a global problem does not adequately account for its local impacts.[24] Moreover, the focus is no longer on the effects of global warming upon certain ecosystems but on the vulnerability of certain regions and communities. This leads us to another shift in the perception of climate change: it is not illustrated in purely physical terms anymore, instead it is portrayed – at least with respect to its impacts – in its socio-economic context.[25]

The changes in the collective perception of climate change also alter the image of adaptation in the context of international climate politics. The problem of climate change now appears to be a secure scientific fact. More exact regional climate models show that the least developed parts of the world, who have contributed the least to the greenhouse effect, will likely suffer the most from its effects. This has also led to the collective perception of contemporary weather ex-

tremes as being the first significant visible consequences of climate change. Through this development the discourse of climate politics engages with the discourse of development politics and/or sustainable development. Adaptation and mitigation are no longer perceived as excluding each other, but as complementary strands of an international climate political strategy.[26]

Regional-social narrative	Understanding of adaptation
• Causes of climate change are global but the impacts are regionally specific. • Human made climate change is a reality, the consequences will be grave and the developing countries will be the hardest hit. • Climate change has to be seen in its socio-economic context. • Climate change poses a threat to the environment and to vulnerable communities.	• Adaptation is a local, regional, national and international problem. • Climate change leads to regional specific impacts that can already be felt. • Adaptive capacity is determined by geographic, biological, social and economic factors. • Adaptation und mitigation are complementary approaches. • Adaptation is a necessary political option.

Table 3: Elements of a regional-social climate discourse.

The evolution of norms in international climate politics

When the UNFCCC was initialized three dominant climate political norms in the international arena had already been established. The first norm resulted from years of ongoing international scientific cooperation and from a collective interpretation of climate change as a global problem. It can be formulated as follows: the problem of climate change should be solved by the international community in a cooperative manner.[27] The two other predominant climate norms derived from an international discourse on sustainability initiated by the Club of Rome in the 1970s, and politically enforced by the Report of the WCED in 1987.[28]

The first of these norms translates the implications of an intergenerational ethics into a behavioral norm for climate politics, arguing that efforts to mitigate climate change should be undertaken in spite of definite scientific facts (i.e. precautionary principle).[29] As global warming poses a threat for the well-being of future generations, insufficient scientific certainty must not be allowed to result in political inactivity. The second sustainability-norm reflects, in contrast to the first, a concept of international justice: because industrialized countries bear the largest share of responsibility for climate change, they should take the lead in climate politics (i.e. the polluter pays principle).[30] The WCED can be regarded as the initiator of these two sustainability norms in the climate regime, as it as it was the one organization with the authority and legitimacy necessary to successfully promote these norms internationally. With the formulation of the UNFCCC treaty these three climate norms were collectively accepted and were made international law.[31]

The growing importance of adaptation was not the result of a displacement of these climate norms by newly established ones. Rather, the concrete meaning of the norms described above changed and was extended against the background of the changing climate discourse. In the cognitive context of 1992, the primary normative imperative in climate politics was to abandon or avert climate change.[32] This can logically be derived as follows. Global warming poses a threat to the environment and to future generations, thus, climate change should be averted. In order to do so, global emissions should be reduced in absence of absolute certainty, and that due to their historical debt industrialized countries should take the lead in doing so. In other words, this logic means that according to a global-physical narrative, a strict concept of ecological sustainability leads to the normative superiority of mitigation over adaptation.

However, the more the cognitive context in climate politics has shifted towards a regional-social narrative, the more the normative judgment of adaptation changed. This can also be explained logically, as follows. Climate change poses a threat to existing and future generations especially in poor countries. The industrialized countries are responsible for the main part of climate change. Therefore, developing countries should be supported by developed nations in their efforts at adaptation to climate change, and adaptation should be undertaken in an anticipatory fashion. On an ethical level, this development reveals a normative shift away from a rather strict conception of sustainability, to a more socially oriented conception in which international justice is advanced, and increasingly serves as a driving factor in climate politics. To guarantee sustainable development, it is no longer seen as sufficient to free developing countries from obligations in the climate regime. Instead, they must actively be supported.

Polluters, non-polluters and victims in the climate regime

Including adaptation as a part of global climate governance however, is not simply the result of altruistic behavior on the part of the industrialized countries within the normative context described above. Rather, the process through which these cognitive changes took place went hand in hand with the alteration of some of the actors' identities, and thus their very interests. Most important in this respect was the development of a collective identity among the most vulnerable countries. At the beginning of international climate negotiations, most of the developing countries saw themselves as not being truly involved in questions of climate change. From the point of view of international justice, they did not feel responsible for the fate of future generations. This resulted from the fact that there were two distinct role models in international climate politics, the *polluters* (the industrialized countries) and the *non-polluters* (the developing countries).[33] There was only a small group of small island states (AOSIS) that understood themselves to be threatened by global warming. Through the process of interaction in the ongoing climate regime negotiations, this constellation of roles began to change. First, the changing climate discourse led to the insight on the part of many developing countries that their socio-economic and/or geographic situation made them particularly vulnerable. Second, developing nations began to take the communicative signals of the *polluters* in the climate negotiations into account. Although the latter had obliged themselves to prevent climate change, they either expressed their unwillingness publicly (as in the case of the 'climate skeptics') or they failed to reach their reduction targets (like some states of the European Union).[34]

> Every human has a fundamental right to an environment of quality that permits a life of dignity and well-being.
> / United Nations Conference on the Human Environment /

As a result, the developing countries began to share a notion of a common fate in facing the threats of climate change: they did not see themselves as non-*polluters* anymore, but

rather as *victims*. The changing collective identity of the developing countries thereby led to the alteration of their very interests. From their self-image as *victims*, they drew power for arguments in favor of compensation and support in the process of adaptation. Their collective identity serves as a fastener, allowing them to develop a common position in the negotiations and thereby add authority to their accounts. Thus, the growing presence of adaptation issues in the UNFCCC can be explained by more explicit claims for compensation by developing countries.[35]

Thus, under a global-physical climate discourse the perspective of intergenerational justice was normatively forwarded in the international climate regime by some of the industrialized countries (the EC member-states). In that context, the developing countries had no incentive to participate in international climate politics and relied on arguments of international justice to justify this. Yet, from the same standpoint, under a regional-social climate discourse, they actively developed claims in international climate governance. Whereas under a global-physical discourse the sufferers (future generations) were anonymous and had no direct voice in the negotiation process, the sufferers under a regional-social perspective are actively engaged in the negotiations.

Shame on us if 100 or 200 years from now our grandchildren and great-grandchildren are living on a planet that has been irreparably damaged by global warming, and they ask, "How could those who came before us, who saw this coming, have let this happen?"
/ Joe Lieberman /

Conclusion

This article has shown that the growing importance of adaptation as an international climate political strategy can be explained by a learning process which has taken place within the climate regulation regime. Scientific and political interaction led to the shift from a global-physical to a regional-social narrative on climate change. We have further seen that the political implications of ethical principles such as inter- and intragenerational justice depend heavily on the discursive context of the political issue-area. Under a global-physical narrative, the intergenerational implications of climate justice were forwarded within the climate regime, while international justice was mainly invoked by developing countries to contest their own participation in a global mitigation scheme. A regional-social discourse however, has led to a more prominent and active role for international justice arguments in climate politics, allowing them to become a driving factor in the push for a combined political strategy of mitigation and adaptation. A social constructivist analysis of this transition shows that the interests of actors in the climate regime are not independent of their surrounding beliefs and the context that influences their very identities. The self-image of developing countries changed as they began to realize that they will have to bear most of the negative consequences of climate change. And unlike future generations, developing countries have a voice in contemporary climate negotiations. This may open a window of opportunity in upcoming negotiations to integrate such countries into global mitigation schemes.

The UN climate summit (COP-15) in Copenhagen this December is going to be a critical moment in developing such a plan. There, an agreement on the institutional design of a second commitment period to the Kyoto Protocol shall be reached. With respect to intergenerational justice, it will be decisive to reach a binding agreement on global emission reductions that sticks to a maximum limited average temperature rise of 2°C, and will be accepted by the highest possible number of high-emission states.

To reach this goal however, the emerging countries and some of the larger developing countries must participate. The broadened agenda of international climate governance, with adaptation and technology transfer as part of a climate strategy sensitive to international justice, can help to manage this challenge. It raises the possibility of package deals that compensate participating developing and emerging countries with technology partnerships, fund adaptation and offer knowledge transfers, all of which together could enable disadvantaged countries to develop their economies in a sustainable manner.

Notes:

1. IPCC 2001: 8.
2. Wendt 1992: 129-130.
3. Ulbert 2005: 13.
4. March/Olson 1984.
5. Tremmel 2003: 34-35.
6. Tremmel 2003: 43-45.
7. Paavola 2008: 653.
8. Page 2008: 557.
9. Adger et al. 2006.
10. Bodansky 2001: 36.
11. UNFCCC 2001.
12. UNFCCC 2004: 1 pp.; UNFCCC 2006: 3-4.
13. Schröder 2001: 24.
14. Jamieson 2001: 291; Kjellén 2007: 211;
15. UNFCCC 1992: Art. 17-18.
16. IPCC 1990a: 2, 22-23; IPCC 1990c: xxvi.
17. IPCC 1990a: 17-18, 21; Oels 2003: 9.
18. IPCC 1990a: 6 pp.
19. Payne 2001: 46; IPCC 1990a: 6 pp.; IPCC 1990b: 3.
20. Schipper 2006: 84; Brunner 2001: 19.
21. IPCC 1990a: 2; IPCC 1990b: 2.
22. IPCC 1990b: 10 pp.; IPCC 1990c: xliv
23. IPCC 2001: 137, 222
24. IPCC 2001: 65 p., 243-244.
25. IPCC 2001: 224.
26. IPCC 2001: 141, 222, 225-227;
27. Oels 2003: 7-8; Jasanoff 2001: 329.
28. WCED 1987; Jasanoff 2001: 331.
29. Jasanoff 2001: 331-332.
30. Jamieson 2001: 298.
31. UNFCCC 1992: Art. 3, Art. 4. (p.5-6).
32. Cohen et al. 1998: 348.
33. Paterson 1996: 133.
34. Depledge 2006: 3; Depledge 2006: 15.
35. Kjellén 2007: 212.

References

Adger, Neil W. / Paavoli, Jouni / Huq, Saleemul / Mace, M.J. (eds.) (2006): Fairness in Adaptation to Climate Change. Cambridge: MIT.

Bodansky, Daniel (2001): The History of the Global Climate Change Regime. In: Lutterbacher, Urs / Sprinz, Detlef F. (eds.): International Relations and Global Climate Change. Cambridge/London: MIT Press, 23-40.

Brunner, Ronald D. (2001): Science and the Climate Change Regime. In:
Policy Sciences. Vol. 34 (1/2001), 1-33.

Cohen, Stewart / Demeritt, David / Robinson, John / Rothman, Dale (1998): Climate Change and Sustainable Development: To-

wards Dialogue. In: Global Environmental Change. Vol. 8 (4/1998), 341-371.

Depledge, Joanna (2006): The Opposite of Learning. Ossification in the Climate Change Regime. In: Global Environmental Politics. Vol. 6 (1/2006), 1-22.

IPCC, Intergovernmental Panel on Climate Change (2001): Climate Change 2001. SynthesisReport. Cambridge: Cambridge University Press.

IPCC, Intergovernmental Panel on Climate Change (1990a): Scientific Assessment of Climate Change. Cambridge: Cambridge University Press.

IPCC, Intergovernmental Panel on Climate Change (1990b): Climate Change. The IPCC Impacts Assessment. Canberra: Australian Government Publishing Service.

Jamieson, Dale (2001): Climate Change and Global Environmental Justice. In: Miller, Clark A. / Edwards, Paul N. (eds.): Changing the Atmosphere. Expert Knowledge and Environmental Governance. Cambridge/ London: MIT Press, 247-286.

Jasanoff, Sheila (2001): Image and Imagination. The Formation of Global Environmental Consciousness. In: Miller, Clark A./ Edwards, Paul N. (eds.): Changing the Atmosphere: Expert Knowledge and Environmental Governance. Cambridge/London: MIT Press, 309-337.

Kjellén, Bo (2007): The New Diplomacy for Sustainable Development and Negotiations on Climate Change. In: Environmental Policy and Law. Vol. 37 (2-3/2007), 207-222.

March, James / Olsen, Johan (1998): The Institutional Dynamics of International Political Orders. In: International Organization. Nr. 52, 943-969.

Oels, Angela (2003): The Power of Discourse in Global Climate Policy. Paper presented at the 44th Annual Convention of the International Studies Association ''The Construction and Cumulation of Knowledge'', Portland, 25th February – 1st March 2003.

Paavola, Jouni (2008): Science and Social Justice in the Governance of Adaptation to Climate Change. In: Environmental Politics. Vol. 17 (4/2008), 644-659.

Page, Edward A. (2008): Distributing the Burdens of Climate Change. In: Environmental Politics. Vol. 17 (4/2008), 556-575.

Paterson, Matthew (1996): Global Warming and Global Politics. London/New York: Routledge.

Payne, Rodger A. (2001): Persuasion, Frames and Norm Construction. In: European Journal of International Relations. Vol. 7 (1/2001), 37-61.

Schipper, E. / Lisa F. (2006): Conceptual History of Adaptation in the UNFCCC Process. In: Reciel. Vol. 15 (1/2006), 82-92.

Schröder, Heike (2001): Negotiating the Kyoto Protocol. An Analysis of Negotiation Dynamics in International Negotiations. Münster: LIT.

Tremmel, Jörg (2003): Generationengerechtigkeit – Versuch einer Definition. In: Stiftung für die Rechte zukünftiger Generationen (ed.): Handbuch Generationengerechtigkeit. Munich: Ökom Verlag, 27-80.

Ulbert, Cornelia (2005): Konstruktivistische Analysen der internationalen Politik: Theoretische Ansätze und methodische Herangehensweisen. In: Ulbert, Cornelia / Weller, Christoph (eds.): Konstruktivistische Analysen der internationalen Politik. Wiesbaden: VS-Verlag, 9-34.

UNFCCC (1992): Rahmeneinkommen der Vereinten Nationen über Klimaänderungen. http://unfccc.int/resource/docs/convkp/conv ger.pdf (19.08.2009).

UNFCCC (2001): The Marrakesh Accords & The Marrakesh Declaration. http:// unfccc.int/cop7/documents/accords_draft.pdf (19.08.2009).

UNFCCC (2004): Buenos Aires Programme of Work on Adaptation and Response Measures. http://unfccc.int/files/ meetings/cop_10/adopted_decisions/application /pdf/01_cp_l_16.pdf (19.08.2009).

UNFCCC (2006): The Nairobi Work Programme on Impacts, Vulnerability and Adaptation to Climate Change. http://unfccc.int/files/meetings/cop_12/application/pdf/ sbsta_26.pdf (19.08.2009).

WCED, World Commission on Environment and Development (1987): Our Common Future. Oxford: Oxford University Press.

Wendt, Alexander (1992): Anarchy is What States Make of it. In: International Organization. Vol. 46 (2/1992), 391-425.

Submitted: 1 April 2009
Accepted: 1 August 2009

Delf Rothe works at the Institute for International Policy of the Helmut-Schmidt-University in Hamburg. He specializes in the fields of international climate policy, postmodern theory and theories of international relations.
Contact details: Helmut-Schmidt-University, University of the Bundeswehr, Institute for International Policy, Holstenhofweg 85, D-22043 Hamburg

Email: drothe@hsu-hh.de

The Baker's Dozen: Key Nations Can and Should Act Together to Prevent Further Dangerous Climate Change[1]

by Dr. Kirsten Oleson;[2] Dr. Lauren Hartzell;[3] Dr. Michael D. Mastrandrea[4]

Abstract: Most international responses to climate change assume we need a 'global' solution. Game theory and political science both support limiting the negotiating parties to enable a more rapid and aggressive response. Given that 90 percent of emissions come from 12 percent of nations, we argue if a 'Baker's Dozen' of nations bands together, they can make great strides in combating climate change. With aggressive measures, their action would be sufficient to greatly reduce the likelihood of additional dangerous climate change, defined as widespread and irreversible change. We give three reasons why these nations should act: ability to act; responsibility to act; self-interest in acting.

Introduction

The projected impact of severe climate change, the urgency of cutting greenhouse gas emissions, and the current political environment offer a unique moment for reconsidering policy options for curbing global climate change. Most international responses to climate change assume we need a 'global' solution, in which most if not all of the world's nations participate in an emission reduction agreement. But the majority of the world's emissions derive from a handful of nations, so we may be able to achieve sufficient reductions by involving fewer nations. Limiting the negotiating parties may enable a more rapid and aggressive response. This paper asks the question: can and should a sub-group of nations act together to avoid further dangerous climate change? We conclude yes on both counts. This approach is not new – we base it on lessons from political science and game theory. Our paper seeks to establish that this approach also has scientific and moral justification. We first argue that if a sub-group of key nations bands together, they can make great strides in combating climate change; with aggressive measures, their action would be sufficient to greatly reduce the likelihood of additional dangerous climate change as we define it. Our second major argument addresses why these key nations should take immediate action; we give three reasons. First, the subgroup is able to significantly decrease the likelihood of dangerous climate changes and the participation of certain nations is critical. Second, all key nations bear responsibility for acting because of their historical or projected future emissions. Third, it is in the interest of these nations to act to mitigate dangerous climate change.

> Ignoring climate change will be the most costly of all possible choices, for us and our children.
> / Peter Ewins /

Lessons from game theory and political science

Insights from game theory and political science make the case that a core group of nations may be more effective in reaching quick and ambitious agreements than working to achieve a global consensus. The major insight from these literatures is that any agreement has to be in the best interest of each of the parties. If a country feels like the cost of accession to the agreement outweigh the associated benefits (or benefits from defection outweigh the costs), then the agreement will not form or endure, because countries will defect, cheat, or refuse to take part. The following four overlapping lessons derive from game theory and political science literatures and can be used to analyse international agreements.[5]

(1) Game theory shows that a large group negotiation will lead to consensus matching the aspiration of the least ambitious party. This is supported by political science: as the number of interests in a negotiation increase, the harder it is to find a combination of measures that will make each nation better off. If we need to meet ambitious targets, we would do better to limit the number of negotiating parties.

(2) When many parties are involved in an agreement, there is little cost to defection and little benefit of accession for any individual actor. This means all nations will have a strong incentive to free ride, and their defection (or accession) will have little effect on other parties. Any agreement will therefore never be in equilibrium, parties will defect, and the environmental effect will be minimal.

(3) A more likely long-term, self-enforcing, and adaptable global solution will arise when multiple, variable-sized coalitions each determine their own appropriate aspirations and national actions to meet the set goals. The likelihood of accession and self-enforcement of national actions will be much higher under this model.[6] The more inflexible the policy targets, the less likely a multiparty solution will form or endure because nations will not be able to implement national measures aligned with their interests and, moreover, their national institutional capacities.

(4) Some nations will need to pay other nations to keep them as parties. Given the political debate of global climate change, no agreement will include lesser-developed nations unless more-developed nations (who, not coincidentally, have higher historical emissions) agree to pay them. Game theory, too, establishes the importance of side payments from rich nations to keep poorer nations as parties to agreements.[7]

These extensive literatures provide one very important lesson: a global agreement on climate change is very unlikely, and what will result will be inadequate and unstable. We are more likely to see coalitions and parallel agreements where some countries do more and all parties take a bottom-up approach reflecting their national incentives and institutional capabilities.

Empirical evidence also speaks to the utility of side agreements in international environmental policy. The decade between the establishment of the climate change framework convention and the ratification of the implementing protocol, and the US's refusal to ratify the protocol, are evidence of the difficulty of coordinating diverse national interests.[8] The Montreal Protocol, one of the most successful international environmental agreements,[9] started with just 28 nations. Recent policy discussions, for example at the G20 or the L20, have focused on developing an international climate change policy based on initial agreements by a select group of nations. However these discussions have occurred under the shadow of on-going international climate negotiations and there

is significant evidence that agreeing to side-deals prior to wider negotiations could lead to worse environmental outcomes when these deals are not contingent on later action by other negotiating parties.[10] We cannot say how these discussions would have ended had there been no concurrent global negotiation process.[11]

Urgency of and thresholds for required action

Dangerous climate change is a normative concept describing a situation where the impacts of climate change have exceeded a level society has deemed to be acceptable; it is a value judgment informed by our scientific understanding of projected climate change impacts. No specific definition of 'dangerous anthropogenic interference' was delineated in the United Nations Framework Convention on Climate Change, in part because what constitutes 'dangerous' can differ based on differing worldviews, values, geographic location, or abilities to adapt. We assess what is dangerous through the lens of human welfare, which we consider to be normatively valuable and worth protecting, now and into the future. Since human welfare relies on services provided by the earth, the loss of essential services without the possibility of replacement, restoration, or substitution constitutes a dangerous impact.

Given the goal of avoiding further dangerous climate change, scholars have worked on defining the interrelated physical metrics of an acceptable temperature rise, determining what the associated atmospheric stabilisation level would be, and then estimating what annual emissions pathway or cumulative emissions budget would enable us to keep to that stabilisation target. These studies converge on some targets for allowable temperature change, stabilisation concentration, and emissions levels. We note that these targets are still uncertain and fraught with value judgments, especially with regard to the embedded assumptions about acceptable levels of risk. To produce a policy-relevant cumulative emissions budget, we specify (a) an acceptable temperature rise, and (b) a long-term atmospheric carbon dioxide stabilisation level and the short-term overshoot of the stabilisation target.

We set our target stabilisation temperature at 1 degree Celsius above 2000 levels. Our target translates to ~1.6 degrees above pre-industrial temperatures, slightly below the 2-degree EU policy target and roughly equivalent to the 1.5-degree limit proposed by the Alliance of Small Island States.[12] We follow other studies drawing on the IPCC's "Reasons for Concern" as a way to define what temperature change could be considered "dangerous" if sustained over the long-term[13] They represent the developers' best approximation regarding the magnitude of risk in each category we can expect at different temperature levels. For our purposes, we consider running a "severe risk" within these Reasons for Concern as an appropriate threshold for dangerous because, as we will show, this would trigger impacts that threaten the irreversible loss of services important to many people's welfare.

A recent update of the temperature change that would induce severe risk in each Reason for Concern gives a range of 1 – 2.5 degrees warming above 2000.[14] Within that range, where we should set the threshold depends on value judgments about the relative importance of each Reason for Concern. Setting a threshold at 1 degree above 2000 would avoid running a severe risk for all. Even at this level, we will face a litany of impacts and a greater than 1-degree rise could result in far worse consequences due to non-linearities in the climate system and the surprises they could bring.

With a 1-degree above 2000 rise in global average temperature, we will likely experience significant, widespread impacts and associated risks to unique and threatened ecosystems, including more frequent and extensive coral bleaching and increased vulnerability of Arctic and small island communities. We will also experience increased intensities in extreme weather events, such as cyclones, heat waves, droughts, and floods, which will in turn cause more deaths, injuries, and damage to property. People living in poor, low-lying, low-latitude areas will run the highest risk, but people in rich nations are not immune to vulnerabilities (as evidenced, for example, by deaths from the heat waves in Europe in 2003).

Perhaps most salient to our argument, with a 1-degree rise, we will run a moderately significant risk of large-scale discontinuities in the climate system, including such impacts as partial or full deglaciation of the Greenland and West Antarctic Ice Sheets. If this melting were to occur, sea levels could rise many meters and life-sustaining ocean currents could be disrupted.[15] A large portion of the earth's freshwater has, for many, many years been trapped in these ice sheets.[16] These reservoirs of ice serve multiple physical functions including the storage of water and reflection of sunlight. A number of large-scale impacts would result from the loss of these ice sheets. Their complete melting could cause a sea level rise of up to 12 meters, while partial melting, predicted to occur over centuries, could cause a sea level rise of up to 6 meters. This rise would permanently flood many coastal and low-lying areas, including New Orleans, the Netherlands, Bangladesh, and most low-lying, small island nations. This would affect any nation with a coast, which depends upon coastal infrastructure (such as ports in nearby nations or trading partners), or which cannot adapt to rising sea levels. Secondly, the influx of freshwater could change global ocean circulation. Climate change-induced melting of ice will affect ocean currents by causing an influx of less dense freshwater. Similarly, stratification of the ocean's water will be fortified by warming of surface water, preventing mixing. The ocean is one of the planet's most important carbon sinks. Ocean circulation regulates the contact of deep ocean water with the atmosphere, governing carbon uptake by the ocean. An alteration of this carbon exchange will decrease the amount of carbon dioxide taken out of the atmosphere by the ocean. The third widespread impact caused by the partial loss of the ice sheets is loss of snow/ice cover. Loss of snow/ice cover causes a positive feedback by reducing the Earth's reflectivity, therefore causing more of the sun's heat to be absorbed. This feedback will accelerate climate change.

> The issue of climate change is one that we ignore at our own peril.
> / Barack Obama /

Distressingly, warming estimated as 'in the pipeline' is already slightly over this 1-degree target.[17] In other words, this amount of warming will likely occur even if we could freeze atmospheric concentration of carbon dioxide at today's level of 385 ppm CO_2 because of inertia in the climate system (compare with pre-industrial levels of about 280 ppm). Based on Solomon et al, Meinshausen el al. and Hansen et al., we set our long-term stabilisation target at no more than current concentrations.[18]

The immense inertias in both the climate and social systems require us to exceed the long-term target by a certain amount for a certain amount of time while policy measures take effect and past emissions embedded in the climate system run their

course.[19] The lower and shorter the overshoot, the smaller the probability of widespread, irreversible change.[20] In our scenario, the overshoot peaks at ~427 ppm CO_2 in 2050, and declines thereafter, achieving stabilisation back at 385 ppm CO_2 around 2150.[21]

Given the limits we have determined about temperatures and the associated stabilisation overshoot scenario, we are now prepared to set an appropriate level of total global emissions between the years 2000 – 2050; a value we will refer to as *cumulative emissions*. Numerous studies have estimated the cumulative emissions we can generate over the remainder of the first half of this century. To meet the stabilisation level we have chosen, the cumulative global emissions budget for carbon dioxide emissions from fossil fuel consumption over the period 2000 – 2050 is around 290 gigatons carbon (GtC)[22]

Our proposal: A side agreement

Our proposal is for a sub-group of nations to make a side agreement and thereby greatly decrease the likelihood of further dangerous climate change. This section makes the scientific case for our approach. As relatively few nations are responsible for the vast majority of global emissions, international agreements to reduce those emissions significantly do not require the involvement of all nations. As Figure 1 illustrates, we gain a significant amount of leverage from surprisingly few nations, with 90 percent of emissions coming from 12 percent of nations.[23] The figure shows the cumulative emissions of countries ranked by their national annual emissions in 2004.

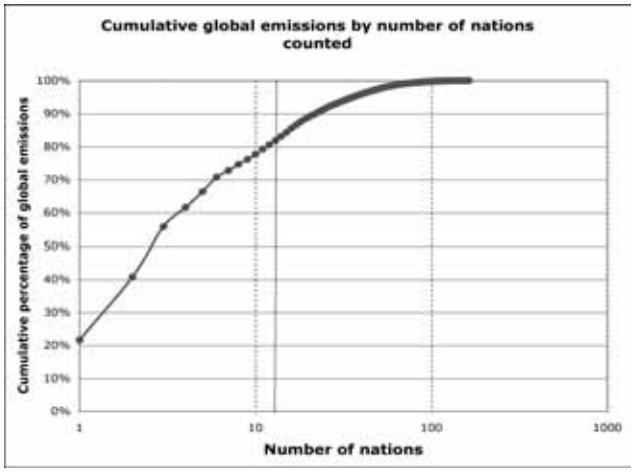


Figure 1: Cumulative global emissions by number of nations counted. Vertical line delineates the top thirteen global emitters, a group we refer to as the 'Baker's Dozen'. Note that the x-axis is presented on a log scale.

Model

We have two criteria for an eventual side agreement. First, it must be able to get global emissions within limits to meet our cumulative emissions budget. Second, the called-for measures must be within reasonable bounds of technical feasibility. For the reasons explained above, we limit the number of actors in the agreement. For our model, we selected the minimum number of nations required by ranking countries by their current annual emissions; we discuss this a bit later.

A number of possible scenarios of national-level action emerge to cut emissions of carbon dioxide from fossil fuel consumption. The question is which option can keep us below our defined 290 GtC cap. We model scenarios varying five parameters: (i) countries involved, (ii) required annual emissions reductions, (iii) necessary annual sequestration, (iv) the year in which emissions peak, and (v) the year in which sequestration begins. We set a number of conditions: (a) emissions reductions cannot exceed 5 percent a year, (b) sequestration potential cannot exceed n*5 percent of 2000 emissions levels, where n is the number of years after sequestration started (so the first year, a nation sequesters the equivalent of 5 percent of its 2000 emissions, the second year 10 percent, the third year 15 percent, and so on until 2050), and (c) wealthier nations have to start reducing emissions and sequestering earlier than developing nations. While the bounds for emissions and sequestration are aggressive, they fall within the range deemed reasonable by climate scholars and industry analysts.[24]

These scenarios are based on a simple model of national carbon dioxide emissions from fossil fuel consumption, cement manufacturing, and gas flaring using data on past emissions by countries.[25] We separated countries into two development categories where most developed are countries considered high income per the World Development Indicators, and least developed are all others.[26] We grouped the 27 European Union countries and considered them as one entity; and we removed Iran from the sub-group. We calculated the emissions growth rate over the period 2002–2004 to extrapolate emissions in 2005–2009. Our model disaggregates required emissions cuts by country, given a future date after which emissions must decline (called the peak year) and a future date at which sequestration must begin (called the sequestration year). Emissions decline at a constant annual rate after the peak year until the nation's emissions reach zero. Every year after the sequestration year, a nation's sequestration ca- pacity increases a set percentage of its year 2000 emissions. We assume emissions from nations not within the Baker's Dozen would continue to grow at the global average historical rate of over 3 percent a year.[27]

With these assumptions, we find a group of only thirteen nations is necessary to stay below the cap and keep reductions and sequestration within reasonable bounds (represented by the vertical line in Figure 1). While these nations must abide by strictures, emissions from the rest of the world can continue growing at historical rates. This group, which we refer to as the Baker's Dozen – the US, the EU-27, China, Japan, Russia, India, Canada, South Korea, South Africa, Mexico, Indonesia, Australia, and Brazil – must agree to aggressive annual reductions (5 percent) starting in 2012 for developed nations and 2015 for developing nations. As shown in Table 1, to meet the cumulative emissions cap of 290 GtC, these reductions need to be coupled with aggressive sequestration (5 percent of 2000 level emissions, growing at an additional 5 percent each year thereafter) starting in 2015 for developed nations and 2030 for developing nations. Reducing emissions could be achieved by, for instance, improving energy efficiency or switching to low-carbon fuel sources. Carbon sequestration involves removing carbon already emitted from the atmosphere in order to achieve a negative rate of emission growth; examples include carbon capture and storage and reforestation.

In this scenario, the thirteen nations must sequester 132 Gt C by 2050; which seems to be within the bounds of estimated global potential.[28] By 2050, these nations would be sequestering 8 Gt C per year. Studies seem optimistic that research and development will reduce costs of carbon sequestration technologies and these, combined with efficiency, better agricultural and forestry practices, and fuel switches, can bring us within the required bounds,[29] although others are more skeptical.[30]

Annual Emissions Reductions	Sequestration Capacity Annual Increase (as percentage of 2000 emissions, increases linearly on annual basis) 0%	0.50%	1%	2%	5%	10%
0%	617	603	590	564	484	351
1%	557	544	531	504	425	292
3%	491	477	464	438	358	225
5%	418	405	392	365	285	153
10%	347	333	320	294	214	81
20%	299	286	273	246	167	34

Table 1: Cumulative global emissions by 2050 with thirteen minimal nations in agreement. Values in white fall below the cumulative emissions cap of 290 Gt C required to avoid further dangerous climate change. The grey box indicates sequestration and emission reductions within reasonable bounds of technical feasibility.

Why key nations should (and must) act to prevent DCC

Having established that key nations can act to make significant gains in averting dangerous climate change, we identify three separate reasons why they should act.

Preventing further dangerous climate change requires the action of essential nations

The nations in the Baker's Dozen have it in their power to effectively prevent further dangerous changes. Significant action has to be taken now if we are to effectively combat dangerous climate change. Pumping ever more greenhouse gases into the atmosphere locks in further warming and all its associated impacts. The current growth in global emissions is increasing the likelihood of irreversible, dangerous changes and decreasing the likelihood we will be able to adapt. We believe the physical and moral necessity of preventing the worst outcomes of dangerous climate change is so urgent it should trump other considerations normally embedded in climate agreements, if (and only if) those considerations are stumbling blocks for immediate action. Arguments from other areas of policy making substantiate the justification for prioritising action when a crisis threatens.[31]

The Baker's Dozen are among the most able to act to prevent dangerous climate change. The rich, highest-emitting nations have money to invest, e.g., in the research and development of clean technologies, and they have consumption habits that can be altered to reduce per capita emissions, e.g., eating less meat and instigating energy efficiency standards; while the highest emitting developing nations have the most potential for changing their development paths to less carbon-intensive ones, e.g., by adopting carbon-free energy technologies developed in the richer nations or adopting efficiency codes for buildings.

Some nations within the Baker's Dozen are essential parties because without them, no agreement will prevent dangerous climate change. Because the currency we need to reduce is cumulative emissions from 2000-2050, the most important actors are those who are – or who will be – the largest emitters over that period. By paring down the subgroup to a minimal thirteen, our model shows we cannot avoid further dangerous climate change without significant action by all these players. If we expand the number of nations slightly, however, for example adding in the next 7 top emitters (Iran, Saudi Arabia, Ukraine, Taiwan, Thailand, Turkey, and Kazakhstan), the only nations with the power to cause a failure if one were to defect are China, the US, and the EU-27. China is always an essential player; without action from China, the rest of the world will have a difficult time staying under the cap even if they enact significant cuts and sequestration efforts.

The thirteen nations included in our model are a rough approximation of what a subgroup might look like. We find thirteen parties are minimally necessary to achieve the cap and meet our conditions regarding emissions cuts and sequestration. We are interested in establishing the minimal number of parties because a smaller group has advantages, as we have already discussed. The exact membership of a sub-group is not prescribed by our approach – we could come up with a different list and defend it both empirically and normatively, for example by substituting one country for one or more with similar emissions. Nonetheless, we believe the Baker's Dozen is a sub-group with bite: with just thirteen nations, we capture 83 percent of global emissions; to get just 9 percent more would require doubling the number of negotiating parties. Further, these nations are particularly able to act and, as we discuss next, bear disproportionate responsibility.

Responsibility supports necessity of action by key nations

We believe responsibility for preventing the crossing of the dangerous threshold lies with those most responsible for contributing to the problem and those who will contribute to the problem if they do not significantly rein in their emissions. The wealthier nations bear the greatest historical responsibility for increasing the atmospheric concentrations of greenhouse gases, which is why mitigating dangerous climate change is such a pressing issue in the first place. Moreover, their greater wealth is due in large part to these emissions. They therefore have more responsibility for taking action. The less developed nations in the Baker's Dozen accrue responsibility to act as well because of their projected future emissions. They are projected to have significant emissions growth if they develop on a business-as-usual, carbon-intensive pathway. As a result of their economic development, these nations' emissions are growing at rates far higher than developed nations. Indeed, in 2008, China surpassed the US in terms of absolute emissions (though per capita is still far lower).

> Given the nature and magnitude of the challenge, national action alone is insufficient. No nation can address this challenge on its own. No region can insulate itself from these climate changes. That is why we need to confront climate change within a global framework.
> / Ban-Ki Moon /

Concerns about equity go hand-in-hand with historical responsibility. Negotiations are often bogged down by concerns that developing nations will be condemned to lower levels of economic development if they are required to curb their emissions. Equity and fairness considerations, it seems, suggest less developed nations should have the same rights and abilities to develop that wealthier countries had, especially since their emissions have to be reduced because of the emissions (and associated development) of richer nations. We have shown, however, if key developing nations continue on emissions-intensive development paths, dangerous climate change will ensue; their involvement in an agreement is crucial.

The seeming contradiction between moral and pragmatic arguments regarding developing nations' emissions pathways can at least in part be reconciled by an agreement among the Baker's Dozen with differential responsibilities for less and more developed

parties. Our proposal includes differential responsibilities for action based on a nation's level of development and corresponding contributions to climate change. For example, our approach allows developing nations to have more time to begin cuts; developed nations will make side-payments to less developed nations to keep them as parties to the agreement; and the parties involved can negotiate future reevaluations to assess if developing countries, despite legitimate efforts to cut emissions, are falling behind economically, in which case developed nations should have to cut more.

It is in the self-interest of key nations to act

To protect their national interests, the nations in the Baker's Dozen should act to prevent dangerous climate change. As we have presented above, dangerous climate change will cause widespread negative impacts around the world. The nations in the Baker's Dozen will only bear a fraction of the global damages from climate change, but as increasing evidence suggests the costs could be enormous and, if severe climate change occurs, it could be socially destabilising on a global scale.[32] While the key nations will likely not suffer the worst impacts of dangerous climate change relative to all nations when measured as percentage of GDP, percentage of population affected, or severity of impacts, they will nonetheless experience significant negative impacts. Dangerous climate change is a global threat and the extent of the national-level projected impacts can be interpreted as threats to national security. As such it is in every nation's self-interest to act to prevent it. The self-interest argument is also one about moral duties. These countries have a duty to protect their own citizens.

It may seem unfair to focus on just a few nations – whether the Baker's Dozen or another sub-group – when all nations arguably have a duty to act to prevent further dangerous climate change. We believe that the duty to act also involves entering into the most promising negotiations with other countries seeking to fulfill their duties. This implies that nations may be morally obligated to enter into side agreements if these are the most promising way to advance serious climate change solutions. Further, the nature of the problem we are facing – its severity and its urgency – means that we have little time to worry about only 'doing our fair share'. Some nations are going to have to do more than others in order to prevent further dangerous climate change. In part, the duty of those who act is reinforced by the fact that other nations are not acting – the fact that some nations are not taking action makes the problem all the more urgent and dire, and reinforces the moral obligation of those nations that can and will act.

Moreover, if we focus on just the nations in the Baker's Dozen, it is apparent that ignoring the rest of the world raises less of a concern than it might seem to. It is unclear exactly what fairness dictates in mitigating climate change (decades of climate debate speak to this), but the rest of the world's historical and current emissions are so small compared to the Baker's Dozen that leaving them out is not all that far from 'fair'. Of course, over time, the countries included in the sub-group would have to be adapted as new large emitters emerge, but nothing within our approach prohibits this and we see room for multiple coalitions forming à la the Baker's Dozen.

> Climate change is such a huge issue that it requires strong, concerted, consistent and enduring action by governments.
> / Peter Garrett /

Conclusion

While a side agreement would require significant and urgent reductions in emissions from its signers, we conclude that it is possible to avoid further dangerous climate change if a sub-group of thirteen nations – minimally the US, EU-27, Japan, China, India, Russia, Canada, South Korea, South Africa, Mexico, Indonesia, Australia, and Brazil – take immediate action. This action would involve deep and rapid cuts in emissions in the short-term and large-scale carbon sequestration in the medium-term. A side deal circumvents the collective action problem plaguing global climate negotiations and, as both game theory and political science teach us, may enable more rapid and aggressive agreements.

The normative case for the approach is built on the principle that every nation has a duty to act, but we are in such a dire situation that pursuing second-best solutions is appropriate. Key moral concerns that have dominated climate discussions should come secondary to achieving action; but we show that some can be integrated with an eventual side deal policy and can remain the aim of long-term climate change policy. Moral concerns, and particularly concerns about justice, can "muddy the picture and threaten to interfere with efforts to negotiate an effective climate change regime in the future,"[33] but they need not conflict with pragmatic approaches. We believe that finding ways in which pragmatic concerns and moral considerations align can strengthen the case for effective climate policies.

We urge the current global climate change negotiating forum – culminating in Copenhagen in December 2009 – to be a venue which facilitates side deals. We fear a sole focus of achieving a global consensus on binding targets will not achieve the level and speed of reductions needed, nor result in long-term buy-in by key nations. While imperfect, we believe our approach could be a way to break out of the collective action stalemate and prevent widespread, irreversible impacts.

Notes:

1. We gratefully acknowledge funding from a Stanford University Woods Institute Environmental Venture Project and the Climate Decision Making Center (created through a cooperative agreement between the National Science Foundation (SES-0345798) and Carnegie Mellon University), as well as modelling support and extensive editing from Tom Oliver, and helpful comments from David Victor, Zofia Stemplowska, Steve Schneider, Kenneth Arrow, Debra Satz, Joshua Cohen, the participants of the June 2008 AEPA/ISEE and the June 2009 Stanford Environmental Norms conferences, and three anonymous reviewers.

2. Stanford Institute for Economic Policy Research.

3. Department of Philosophy, University of Washington, Seattle.

4. Intergovernmental Panel on Climate Change and Woods Institute for the Environment, Stanford University.

5. A thorough review of the literature is provided in Aldy and Stavins 2007.

6. Victor 2006.

7. Barrett 2001.

8. Sands 2003.

9. Barrett 2006.

10. Hoel 1989.

11. We consider the Bush-era side deal negotiations as an intentional derailment from effective climate policy negotiation, rather than an example of the type of coalition building we are discussing.

12. Solomon et al. 2007; Rogelj et al. 2009.

13. Smith et al. 2009.
14. Smith et al. 2009. Note the baseline in Smith is 1990; we do not adjust for the ~0.15 degree warming between 1990-2000 because it is swamped by the range's uncertainty.
15. Parry et al. 2007.
16. The West Antarctic Ice Sheet is 11,000 years old, while the Greenland Ice Sheet is over 110,000 years old.
17. See Solomon et al. 2007 / Hansen et al. 2008 for discussion of the uncertainty in this estimate.
18. Solomon et al. 2007 / Meinshausen el al. 2006 / Hansen et al. 2008
19. Luers et al. 2007; Parry et al. 2007; Meinshausen et al. 2006.
20. See Solomon et al. 2009.
21. Luers et al. 2007. We derive this budget by converting Luers' cumulative emissions budget of 1,690 Gt CO2eq to ~460 Gt C, and then adjust the resulting cap to ~290 Gt C to reflect the portion of the radiative flux coming from carbon dioxide (about 63 percent): Raupach et al. 2007.
22. Note in this paper, we focus on carbon dioxide emissions from fossil fuel consumption to make the analysis clearer.
23. The EU-27 are considered one 'nation' in this paper.
24. Meinshausen et al. 2006; Den Elzen/ Meinshausen 2006; Pachauri/Reisinger 2007.
25. World Resources Institute 2007.
26. World Bank 2009.
27. Raupach et al. 2007.
28. Metz et al. 2007; Metz/Van Vuuren 2006; Metz et al. 2005; Electric Power Research Institute 2007.
29. Hansen et al. 2008; Metz/Van Vuuren 2006.
30. Rai et al. 2009.
31. Posner/Vermeule 2003; Sunstein 2009.
32. Pachauri/Reisinger 2007; Stern 2007.
33. Posner/Sunstein 2007: 20.

References:

Aldy, Joseph E. / Stavins, Robert N. (2007): Architectures for Agreement. Addressing Global Climate Change in the Post-Kyoto World. Cambridge, UK: Cambridge University Press.

Barrett, Scott (2001): International Cooperation for Sale. In: European Economic Review. Vol. 45 (10/2001), 1835-1850.

Barrett, Scott (2006): Environment and Statecraft. The Strategy of Environmental Treaty-Making. In: Journal of International Relations and Development. No. 9, 103-6.

Den Elzen, Michel / Meinshausen, Malte (2006): Multi-Gas Emission Pathways for Meeting the EU 2 Degree C Climate Target. In: Schnellnhuber, Hans Joachim. / Cramer, Wolfgang P. / Nakicenovic, Nebojsa / Wigley, Tom / Yohe, Gary (eds.): Avoiding Dangerous Climate Change. Cambridge, UK: Cambridge University Press.

Electric Power Research Institute (2007): The Power to Reduce CO_2 Emissions. Palo Alto.

Hansen, James / Sato, Makiko / Kharecha, Pushker / Beerling, David / Berner, Robert / Masson-Delmotte, Valerie / Pagani, Mark / Raymo, Maureen / Royer, Dana / Zachos, James (2008): Target Atmospheric CO_2. Where Should Humanity Aim? In: The Open Atmospheric Science Journal. No. 2, 217-31.

Hoel, Michael (1989): Global Environmental Problems: The Effects of Unilateral Actions Taken by One Country: Bedriftsøkonomisk Institutt.

Luers, Amy / Mastrandrea, Michael / Hayhoe, Katherine/ Frumhoff, Peter (2007): How to Avoid Dangerous Climate Change. A Target for US Emissions Reductions. San Francisco, CA: Union for Concerned Scientists.

Meinshausen, Malte / Hare, Bill / Wigley, Tom / Van Vuuren, Detlef / Den Elzen, Michael / Swart, Rob (2006): Multi-Gas Emissions Pathways to Meet Climate Targets. In: Climatic Change. Vol. 75 (1/2006), 151-94.

Metz, Bert / Davidson, Ogunlade R. / Coninck, Helen D. / Loos, Manuela / Meyer, Leo (eds.) (2005): IPCC Special Report on Carbon Dioxide Capture and Storage. Cambridge, UK and New York, USA: Cambridge University Press.

Metz, Bert / Davidson, Ogunlade R. / Coninck, Helen D. / Loos, Manuela / Meyer, Leo (eds.) (2007): Climate Change 2007: Mitigation of Climate Change. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK: Cambridge University Press.

Metz, Bert / Van Vuuren, Detlef P. (2006): How, and at What Costs, Can Low-Level Stabilisation Be Achieved? An Overview. In: Schnellnhuber, Hans. Joachim. / Cramer, Wolfgang P. / Nakicenovic, Nebojsa / Wigley, Tom / Yohe, Gary (eds.): Avoiding Dangerous Climate Change. Cambridge, UK: Cambridge University Press.

Pachauri, Rajenda K. / Reisinger, Andy (2007): Climate Change 2007. Synthesis Report: Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Geneva: IPCC.

Parry, Martin L. / Canziani, Osvaldo F. / Palutikof, Jean P. / Linden, Paul V D. / Hanson, Clair E. (eds.) (2007): Climate Change 2007. Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK: Cambridge University Press.

Posner, Eric A. / Sunstein, Cass R. (2007): Climate Change Justice. In: University of Chicago Law & Economics, Olin Working Paper No. 354 University of Chicago, Public Law Working Paper No. 177.

Posner, Eric A. / Vermeule, Adrian (2003): Accommodating Emergencies. In: University of Chicago, Public Law Working Paper.

Rai, Varun / Victor, David / Thurber, Mark (2009): Carbon Capture and Storage at Scale. Lessons from the Growth of Analogous Energy Technologies. In: Program on Energy and Sustainable Development: Stanford University.

Raupach, Michael R. / Marland, Gregg / Ciais, Philippe / Le Quéré, Corinne / Canadell, Josep G. / Klepper, Gernot / Field, Christopher B. (2007): Global and Regional Drivers of Accelerating CO_2 Emissions. In: Proceedings of the National Academy of Sciences. Vol. 104 (24/2007).

Rogelj, Joeri / Hare, Bill / Nabel, Julia / Macey, Kirsten / Schaeffer, Michiel / Markmann, Kathleen / Meinshausen, Malte (2009): Halfway to Copenhagen, No Way to 2 [Deg]C. In: Nature Reports (doi: 10.1038/climate.2009.57).

Sands, Philippe (2003): Principles of Inter-

national Environmental Law. Second Edition. Cambridge, UK: Cambridge University Press.

Smith, Joel B. / Schneider, Stephen H. / Oppenheimer, Michael / Yohe, Gary W. / Hare, William / Mastrandrea, Michael D. / Patwardhan, Anand / Burton, Ian / Corfee-Morlot, Jan / Magadza, Chris H D. (2009): Assessing Dangerous Climate Change through an Update of the Intergovernmental Panel on Climate Change (IPCC) "Reasons for Concern". In: Proceedings of the National Academy of Sciences. Vol: 106 (11/2009), 4133.

Solomon, Susan / Plattner, Gian-Kasper / Knutti, Reto / Friedlingstein, Pierre (2009): Irreversible Climate Change Due to Carbon Dioxide Emissions. Proceedings of the National Academy of Sciences. Vol. 106 (6/2009), 1704-9.

Solomon, Susan / Qin, Dahe / Manning, Martin / Alley, Richard B. / Berntsen, Terje / Bindoff, Nathaniel L. / Chen, Zhenlin / Chithaisong, Amnat / Gregory, Jonathan M. / Hegerl, Gabriele C. (2007): Climate Change 2007. The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK: Cambridge University Press.

Stern, Nicholas (2007): The Economics of Climate Change. The Stern Review. Cambridge University Press.

Sunstein, Cass R. (2009): Minimalism at War. Supreme Court Review.

Victor, David G. (2006): Toward Effective International Cooperation on Climate Change. Numbers, Interests and Institutions. In: Global Environmental Politics. Vol. 6 (3/2006), 90-103.

World Bank (2009): World Development Indicators.World Bank.

World Resources Institute (2007): Earth Trends. World Resources Institute.

Submitted: 19 March 2009
Accepted after revisions: 10 August 2009

Kirsten Oleson is a Post-Doctoral Research Fellow with the Stanford Institute for Economic Policy Research. Lauren Hartzell is a post-doctoral research associate in the Program on values in Society and the Program on Environment, University of Washington, Seattle.
Michael Mastrandrea is a consulting assistant professor at the Woods Institute for the Environment, Stanford University.

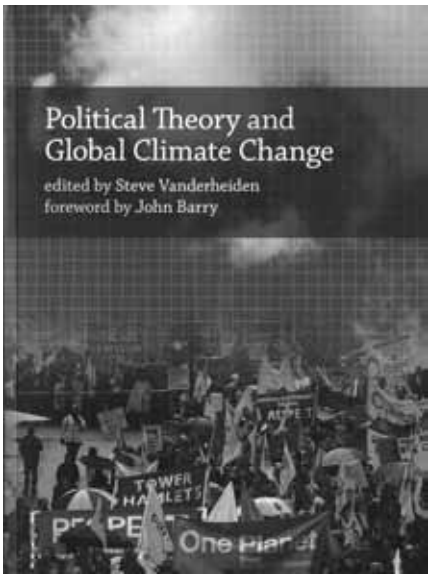
Contact details: Dr. Kirsten Oleson, Stanford Institute for Economic Policy Research, Landau Economics Building, Stanford University, Stanford CA 94305

Email: koleson@stanford.edu

Steve Vanderheiden (ed.): Political Theory and Global Climate Change

Reviewed by Patrick Wegner

Climate change has witnessed a rapid rise in public awareness within the last years and months. The *Fourth Assessment Report* of the *Intergovernmental Panel on Climate Change* (IPCC) in 2007 marked a breakthrough in this development as the true magnitude and the possibly devastating consequences of climate change were scientifically underlined in public. This led to a short-lived flurry of activities and declarations to mitigate global climate change by politicians around the globe. Most of the promises and declarations made were soon curbed or forgotten in the face of the emerging global financial and economic crisis. One of the few lasting positives regarding the upcoming negotiations for a post-Kyoto agreement in Copenhagen are the change of the US climate policy after the election of President Obama and first signals hinting at Chinas willingness to talk about a definite date for a peak of their emissions. If the Copenhagen meeting does not



render decisive results, future generations will most likely pay the price for this lack of action, making climate change a key issue of intergenerational justice.
Fortunately for future generations it seems that the science sector is living up to its role of broaching relevant issues without following public attention cycles, and has not abandoned the topic. Nevertheless, the rising number of publications makes it increasingly difficult to decide which publications are relevant and path breaking for the debate.
The anthology *Political Theory and Global Climate Change*, edited by Steve Vanderheiden of the University of Colorado at Boulder, is one of those publications potentially offering useful insights by approaching the topic from a new angle. It does so by applying green political theory to global climate change.
Composed of eight English articles, the anthology aims to offer interdisciplinary and innovative approaches to the normative questions arising when dealing with global climate change and its consequences. The philosophy behind the book is that, in order to comprehend the nature of global climate

change, we should not only approach it from a natural science perspective, but also from a political angle. This includes questioning our social and political concepts, norms and ideals that are part of the problem and rethinking them as a part of the solution.

The anthology is divided into two parts. Part I on *Justice, Ethics and Global Climate Change* deals with distributive justice concerns, while Part II on *Climate Change, Nature, and Society* highlights the realities of particular concerns stemming from global climate change.

The first part emphasizes the highly relevant questions of justice in the reduction of greenhouse gas (GHG) emissions that will be necessary to mitigate the worst consequences of global climate change. Arguments by the US and other Western governments demanding a "fair share" of the burdens by major developing countries meet claims by India and China. These countries claim that, due to the fact that the developed countries were able to fuel their growth without considerations of GHG emissions in the past decades, any strict caps would hamper their economic growth. Focusing on this central question of international justice, the first part of the book is the more consistent one. It is also the part with the most relevance in the scope of intergenerational justice since most articles address the need for a just solution between the generations in order to come to an overall just solution of burden sharing between generations, nations and individuals.

The first article by Leigh Raymond (Purdue University) assesses different approaches for a morally and politically fair allocation of the earth's atmospheric capacities. He states that a treaty on the reduction of GHG emissions will only be successful if it is perceived as fair by the signatories. He introduces the principles of equal burdens, equal efficiency, equal rights and equal subsistence rights as potential concepts for a treaty. The equal burdens approach is based on the right of nations to their current level of emission shares based on Humean (possession) and Lockean (prior use) views. As a consequence reductions from the current output are treated equally without considering historical outputs or the current share of the global output. The equal efficiency notion states that there should be a benchmark for acceptable emission rates per unit of economic production. The equal rights and equal subsistence rights approaches put forward that each person has a right for a certain per capita emission, possibly taking into account historic emissions. This solution would entail the most radical cuts for the developed nations. Equal subsistence rights refine this argument by distinguishing between luxury and subsistence emission, the latter being necessary for maintaining a basic standard of living. By assessing past agreements on the common use of the open sea, the Antarctic and outer space, Raymond shows that ideas of possession have been dominant in the past. Nevertheless, he detects a tendency to accept ideas of common human heritage and arguments of economic need and efficiency which could lead the way towards new solutions to the allocation dilemma of climate change mitigation.

Raymond puts the current allocation problems into perspective and allows for a better evaluation of the current discussion by analysing past approaches to the allocation of global commons. The article contrasts current theoretical models with past practices and is a good example of how a well-balanced mixture of political theory and practical analysis can lead to valuable results.

Stephen Gardiner's (University of Washington) article uses the concept of the perfect storm to explain problems we encounter when trying to find just approaches to climate change mitigation. The storms Gardiner analyses are the global storm, meaning the global dispersion of causes and effects of climate change, the intergenerational storm, meaning that climate change is a lagged phenomenon unfolding its full consequences on future generations, and the theoretical storm, meaning that there is no adequate theory to grasp the whole dimension of climate change. The theoretical storm results form the inability to deal with long-term problems like intergenerational equity, contingent persons and scientific uncertainty. These storms overlap and hamper mankind's ability to cope with the problem of global climate change, forming thus the perfect moral storm. Gardiner then includes the problem of moral corruption to explain how doubts, distractions, complacency and hypocrisy in the political debate add to the global moral storm and obstruct problem-solving.

Even though Gardiner's model of a perfect moral storm helps to understand the difficulties we are having in searching for a way to cope with climate change, the model appears somewhat fabricated. This is due to the fact that the global and intergenerational storms are convincing models, but the theoretical storm is off point with its close link to the problems of moral corruption preventing us from getting a clear picture of the overall situation. Furthermore the 'missing theory' / 'moral corruption' problem has to be seen as a cause and a result of the global and intergenerational storms which leads to a lack in precision of the theoretical framework.

The third contribution, written by editor Steve Vanderheiden (University of Colorado at Boulder), analyses the possibilities of an effective solution to the allocation problem that also meets our ideas of fairness. He recurs to the equal subsistence rights perspective in search for such a solution. According to Vanderheiden, the right to develop, the right to stable climate, the right to a share of atmospheric capacities, and the right to survival emissions are environmental rights that should be implemented in international public law. He deducts the right to development of disadvantaged societies, which might be contested due to its extensive range, convincingly from notions of justice, stating that the "natural lottery of birth" (p. 62) should not continue to dictate the life prospects of people.

A fair approach to climate change mitigation should respect these rights, and can become effective through radical cuts of luxury emissions in industrialised nations which are based on weaker rights. Vanderheiden does not comment on the (probably low) feasibility of his ideas in the scope of the current international power balance. This does not weigh too heavy though, since the author delivers a concept that envisions solutions beyond the restrictions of today that are direly needed in order to cope with an unprecedented challenge. Considering the shifting power balance in favour of developing nations in the wake of the financial crisis and the new US climate policy, developments are playing out in favour of Vanderheiden's concept.

Martin Adamian's (California State University) article provides a comprehensive overview on the way international environmental law is being formed, and addresses the problems of international power balance missing in Chapter 3. He describes the Kyoto Protocol and the UN Framework Convention on Climate Change (UNFCCC) as fledglings of a new system of environmental law. At the same time, he depicts the limitations of contemporary international law to deal with the problems of climate change. One

of his key objections is that fair solutions can only be reached if the process of reaching the rules is fair in matters of equal contributions of the persons concerned. Since international law is made by states in an international power balance, this is not ensured. Even worse is that the interests of individuals and sub-national groups are thereby ignored. The fact that international law needs to be implemented by states and cannot be enforced adds up to the problem and leads Adamian to the conclusion that a global people's sovereignty is needed in international law to cope fairly and effectively with the problem. Adamian delivers a concise analysis of the problems of contemporary international law. Nevertheless, it could have gone further by including a discussion of possible developments of international law. This could have included a discussion on the possibilities to ensure global participation by the world's people through NGOs, or an assessment of the possibility of granting the people a second mandate, in addition to their mandate for national governments, to a body on a global level.

The second part of the book leaves the mainly philosophical area of political theory in order to bring the theory into the reality of the situation. This case- and topic-oriented approach makes the second part of the book less salient, leading to a higher fluctuation of the quality of the included articles. Nevertheless, this section offers innovative insights into tangible climate change issues and proves that political theorising can go beyond the figurative ivory tower. Unfortunately, some articles fail to deliver a convincing composition of theoretical elements and the realities of climate change. In these cases the added value of applying a theory to certain problems remains vague and the approach appears to be laboured.

The fifth article by Amy Lauren Lovecraft (University of Alaska Fairbanks) uses the concept of social-ecological systems (SESs) to point out that human societies are closely interlinked with their environment. She then provides a case study on the wildfire disturbance regime of the boreal forests and the vanishing of seasonal ice in the arctic region based on the SES concept.

The robustness of these SESs is decisive for the future of mankind in a particular environment. Damages to the environmental system have repercussions on the society, and whether it can recover from the damages sustained, despite parts of the environmental system collapsing forever, depends on the robustness of the combined SES. The way people define their relation to the environment in these SES, under the influence of political struggles and environmental governance, is defined as environmentality.

The subsequent case studies on the wildfire regime of the boreal forests in Alaska and the reaction to diminishing coastal sea ice illustrate how SESs, in their attempt to reach a robust equilibrium, struggle for a balance

between society and environment. This struggle is a constant trade-off between the interests of a society, potentially damaging the environment, and environmental protection, potentially constraining a society. The results of these trade-offs remain uncertain and it is key to develop institutions that have the capacity to cope with these uncertainties in order to ensure the wellbeing of mankind.

The article delivers a comprehensive assessment of the problems human societies are facing when defining their relation to an environment under stress from global climate change. Its main accomplishment is uncovering the close links our society still has to local environments. We tend to forget how much we depend on the particular environment we are living in. Lovecraft highlights that we are the ones who are defining our relation to our environment and that we should be more aware of the trade-offs we are committing ourselves to in environmental politics. Sadly, this core message is blurred by an overtly complicated theoretical part that could have been written much more concisely without losing depth.

Timothy Luke (Virginia State University) points out in his article that global warming, global dimming (the decrease of solar radiation reaching earth) and global cooling are socially constructed. They are by-products of an unsustainable economy that alters the environment to a degree that Luke defines it as "urbanatura", a second creation shaped by humans. This urbanatura is a constructed world ecology/economy that is disorganised and uncontrolled and thus growing at an unsustainable pace, producing damaging by-effects that are excluded in capitalist logic and keep causing a potentially destructive change in global climate. Due to this disorganisation the effects of anthropogenic climate change cannot be addressed effectively. Social critique on a global level does not go far enough to counteract this disorganisation. Luke goes as far in his analysis as to ask whether the *International Panel on Climate Change* is only masking the negative outcomes of urbanatura by maintaining some environmental viability (pp. 141-143). This dilemma calls, according to Luke, for a renegotiation of all social relations to cope with the changes caused by urbanatura.

Timothy Luke's contribution describes strikingly how anthropogenic climate change is socially generated through an unsustainable social concept created by mankind, with its very logic denying us the possibility to cope with the consequences of our doing. It is a theoretically based description of the dilemma which mankind currently faces in dealing with anthropogenic climate change, nothing more and nothing less. As such the article remains somewhat vague amongst the other articles in part II which directly target specific realities of climate change.

George Gonzales' (University of Miami) article on urban sprawl in the US is one of the strongest of this anthology. The author uses Marx's conception that natural resources have no intrinsic value to explain how urban sprawl in the US was encouraged politically in order to lead the US economy out of the Great Depression in the 30s. According to Marx, value is only created through social labour. Money is only made with the control over raw materials, not with the resources themselves. Since resources like oil and timber have no intrinsic value they could be spent in great amounts in order to encourage urban sprawl in the US and thereby spark the demand on the US market. Consumers were encouraged to build their own houses in the suburbs through low oil and timber prices, an easy credit policy and the promotion of settlements the periphery of the cities in US development plans. Since major US cities have become increasingly sprawled, the demand for cars has soared, creating a dependence on the automobile. This process was accompanied by a huge upsurge in the demand for consumer durables. Gonzales shows how this process was actively furthered by politicians and economic elites, who were pursuing supply side politics on the oil market. He also shows that government induced urban sprawl in the US is one of the main reasons for the over-proportional increase in oil consumption of the US and thus one of the causes for global climate change.

In the context of today's financial and economic crisis Gonzales article reveals a disturbing timeliness. The logic behind supporting ecologically and economically unsustainable developments to stimulate short-term economic growth is now backfiring on us twofold. One can read Gonzales' article as a description of how the way to anthropogenic climate change and the US real estate crisis was paved in the 30s. This raises the uncomfortable question of for how long we have been building our social foundations on sand.

The last article by Peter Cannavò (Hamilton College) analyses the dilemma that arises when we have to decide whether to abandon our homes that have become unsustainable due to global climate change. Using the example of hurricane-struck New Orleans he describes a problem that many regions in the world will soon face due to rising sea levels and extreme weather conditions: can we save our homes in potentially unsustainable regions in the face of climate change effects? Cannavò disagrees with the economists arguing that it would be cheaper to just move away from unsustainable places instead of investing in flood control or the stop of sea level rise. The author counters this argument by saying that the idea of home cannot be treated as a commodity because it has a high importance for our daily routines and our social and individual development. He proves his point convincingly with the example of New Orleans that was hit by the hurricane Katrina in 2005. New Orleans is both a culturally unique city due to its rich cultural heritage as well as a highly unsustainable city. New Orleans was built in the wetlands of the mouth of the Mississippi and is both under sea level as well as under the level of the Mississippi. Many scientists doubt that the whole city can be saved in the long run from hurricanes and the rising sea level. At the same time the plans for a deconstruction of the largely "black" neighbourhoods in the low altitudes of the city threaten the character of New Orleans. Cannavò shows how the mainly African American inhabitants of these neighbourhoods have been struck exceptionally hard by hurricane Katrina. As a result the inhabitants of entire neighbourhoods are spread throughout the US after they lost their homes. He also describes the psychological damages the inhabitants suffered from the destructions the storm caused and the desperation of the inhabitants returning to destroyed neighbourhoods with an unclear future.

Describing the tragic fate of New Orleans and its inhabitants, Cannavò convincingly argues that we cannot limit ourselves to adaption to climate change by leaving unsustainable homes behind because the social costs are just too high. He proposes a mixture of adaptation and stronger efforts in climate change mitigation in order to minimise the dilemma of home vs. sustainability. Due to the lagged effects of anthropogenic climate change the chances of avoiding these dilemmas are relatively slim and we unfortunately have to prepare ourselves to discuss the dilemma presented by the author on a more regular basis in the fu-

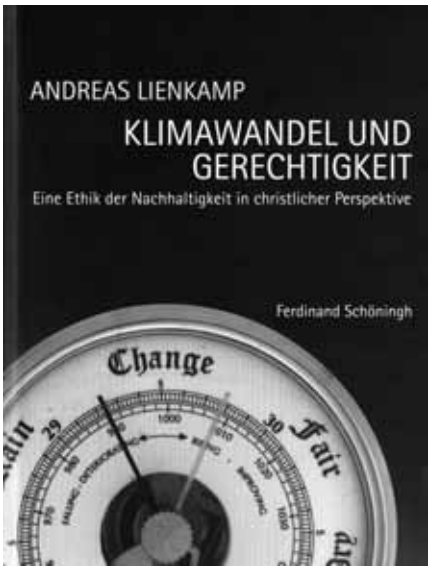
ture. In this context his approach of calculating the social worth of home will prove important in reaching the right decisions.
All things considered, the anthology *Political Theory and Global Climate Change* does live up to its aim to deliver new insights into the problems stemming from global climate change. A negative aspect is that it cannot always fully bridge the gap between political theory and the realities on the ground. Nevertheless, it does broach some of the most relevant problems mankind will face when trying to mitigate global climate change and its consequences. The issues addressed are not always new, but the anthology's approach of green political theory usually offers new perspectives in dealing with known issues. Some articles like Luke's contribution on urbanatura and Gonzalez' analysis of urban sprawl challenge our traditional perspectives of social realities by unmasking the self-destructive side effects of our way of life that we still tend to block out in fear of too much change and that sometimes blinds us by its short-term benefits. Considering the ambitious aims of the anthology, namely to offer new insights into problems of climate change through an interdisciplinary approach while marrying theoretical thinking with considerations of on the ground problems, the articles are a respectable first step and offer a multitude of starting points for further research. Thus the anthology is, despite its negligible weaknesses, definitely an inspiring lecture in the truest sense of the word.

Steve Vanderheiden (ed.): Political Theory and Global Climate change. Cambridge, MA: MIT Press. 280 pages. ISBN: 0262720523. Price: £15.15.

Andreas Lienkamp: Klimawandel und Gerechtigkeit. Eine Ethik der Nachhaltigkeit in christlicher Perspektive

Reviewed by Jörg Tremmel and Patrick Wegner

In his postdoctoral lecture *Climate Change and Justice. Sustainability Ethics from a Christian Perspective* (only available in German), the theologian and specialist in Christian social ethics Andreas Lienkamp tackles a crucial topic of our time. The already abundant catalogue of economic and political literature on climate change is hereby complemented by an important ethical work. Lienkamp's approach allows for religious positions to be at times interpreted in such an undogmatic way that the book can even be read by philosophers critical of theology to their real benefit.
Lienkamp identifies the handling of climate change consequences as the key question from an ethical point of view. Justice plays a prominent role both in the search for climate change mitigation possibilities as well as in negotiations on intergenerational and international burden-sharing in adaptation. Lienkamp uses the term 'Ethik der Nachhaltigkeit' (sustainability ethics) to discuss these questions from a Christian perspective. On the one hand, the term is well chosen since it is wide enough to include all aspects of climate change and its consequences. On the other hand, the definitions surrounding the concept of sutainability are notoriously blurred – a problem that Lienkamp prefers to circumnavigate rather than to solve.
Lienkamp looks at the ethics of sustainability from a Christian perspective but fortunately



refrains from conceptionalizing ethics of sustainability as a purely Christian concept. Solutions to climate change problems cannot be found from a solely Christian point of view since other religions and cultures have to be won over for a truly global solution. Lienkamp's definition of sustainable ethics from a Christian *perspective* could be interpreted as an invitation for dialogue and could even initiate an intercultural debate without appropriating the topic. In the same context of dialogue Lienkamp stands up for deeper cooperation of the scientific disciplines on climate change. He explicitly defines his approach as interdisciplinary and discursive while still claiming the right to question results of other disciplines from an ethical point of view.
Lienkamp's genuinely Christian perspective draws mainly from the theology of creation which the Christian religion also shares with Judaism and Islam. Lienkamp underlines that human beings are part of the creation according to the theology of creation, and thus have a responsibility towards it (p. 25). The fact that mankind increasingly defines itself as ruler of creation, instead of as a part of it, is a main reason for the low popularity of the concept of ethics.
Lienkamp's analysis is based on the papal encyclical *Pacem in Terris* of John XXIII and the book *Laymen in the Apostolate* by the Belgian bishop, cardinal and founder of the *International Young Christian Workers*, Joseph Cardijn. In his encyclical, John XXIII emphasised the importance of the 'signs of the times' for gaining insight in theology. He defined the signs of the times as harbinger of great challenges or positive historical developments which the church and believers should detect in order to act accordingly. Lienkamp interprets climate change as such a sign of the times and consults the methodology in three steps 'Seeing – Judging – Acting' developed by Joseph Cardijn for an analysis of climate change. He structures the rest of his book according to these three steps: chapter 2 analyses the causes, the con-

sequences and the status quo of climate change (to see); chapter 3 describes the normative construction that Lienkamp consults in his judgement (to judge) and chapter 4 delivers advice on effective measures of mitigation and adaptation inspired by ethics of sustainability from a Christian perspective (to act).

The author has to be credited for his ability to introduce all relevant scientific facts in a short and concise way, through documenting the most applicable statistics and figures. As a theologian he manages to describe the most relevant factors of climate change and their interdependence in a more accessible way than many climate scientists. Considering the consequences of climate change (like rising temperatures and sea levels) he endorses the findings of the reports of the *Intergovernmental Panel on Climate Change* (IPCC), which are seen as conservative estimations by some (p. 50). He justifies this with the remark that even conservative estimations are sufficient to document the need to act according to ethical considerations. In a similarly unagitated way Lienkamp also solves the problem of the public dispute be-tween sceptics and supporters of the thesis of anthropogenic climate change. With a hint towards the scientific weight of the IPCC calculation, resulting in a 95-100 percent probability of climate change being anthropogenic as opposed to natural (p. 81), Lienkamp clarifies the real weight of the sceptic arguments without immerging into the polemic debate with climate change sceptics.

In accordance to the scientific literature, Lienkamp names three man-made phenomena as the main causes for on-going climate change: the ever growing output of greenhouse gases, the advancing deforestation destroying one of the most important natural CO_2 reservoirs, as well as the rising population figures and the need for food, energy and resources that grows with them. He lists heat, extreme weather phenomena, a loss of biodiversity, malnutrition, water shortage as well as conflicts resulting from this shortage as consequences of climate change. The so-called 'tipping-elements' in the climate system are of special relevance for the potential consequences of climate change, and Lienkamp mentions them at the end of the second chapter (p. 153). The deglaciation of frozen land masses or certain changes in the Asian monsoon system can reach a point at which they ‚tip over'. This means that these developments can further accelerate climate change or lead to catastrophic and irreversible consequences for mankind. In the media, the potential ebbing of the Gulf Stream due to the inflow of sweet water from melting glaciers around the North Pole is often cited as a potential tipping element that could lead to a new ice age in Europe. Lienkamp is using the irreversible character of the tipping element phenomena as an appeal for a principle of precaution in climate change matters (p. 135; 330-337).

In the third chapter Lienkamp derives the responsibility of mankind for God's creation as a whole from the bible and genesis. He argues for a modern interpretation of the bible according to the 'relecture' stipulated by Pope John Paul II in this context. His core arguments are that man has a responsibility for creation as an image and deputy of God on earth which results in his task to further the immanent the 'good' of creation (p. 216). Lienkamp states in this context that all humans, including future individuals have to be seen as equal in this effort. Lienkamp opposes the old interpretation of the bible, which was supported by the church for centuries that God told men to conquer earth and multiply by quoting several other passages of the bible. He reasons that the reign of men on earth is connected with a God-given responsibility and the mission to populate the planet can only be interpreted in the scope of an ecologically sustainable growth. Interestingly, Lienkamp interprets the Sabbath as a rest period which mankind should respect in regular intervals in order to facilitate the regeneration of natural resources and a readjustment of the economic system. Against the background of the current financial and economic crisis this seems to be a very topical and thought-provoking impulse!

One result of the 'relecture' of the bible is the perspective that man is not creation's crowning glory but a part of it. From this thought Lienkamp derives the rights of the nature. He proves the increasing acceptance of these rights with references to the German constitution (Art 20a) and the Lisbon-Treaty of the EU (Art 13).

To sum it up, Lienkamp denies an anthropocentric point of view in favour of a holistic, anthroporelational argument (p. 227). Herein he refers to the grace of charity, which he interprets as encompassing nature in the sense of a 'reverence for life', a term coined by Albert Schweitzer (p. 248). He also refers to the virtue of justice, which urges us to a responsible handling of the

creation. He sees the principles of precaution and polluter-pays as practical guides for a just approach to mitigation and adaptation. Lienkamp decidedly refutes the interpretation of climate change as a misfortune and labels it an injustice. He also addresses the question of intergenerational justice in this contect. Given the focus of the journal this section was of special interest to the reviewers. Lienkamp tries to draw on the bible to anchor his account of intergenerational justice. In the bible, however, the obligations of children towards their parents used to be emphasised, and not the other way around. The Fourth Commandment, "honour thy father and mother", is repeated more often in the Old Testament than any other commandment. Lienkamp interprets this commandment as an obligation that extends the scope of the family and encompasses respecting the creation in its entirety (p. 276) but this is surely not a literal reading of the bible.

On a trial basis, Lienkamp then applies Rawls 'veil of ignorance' to the intergenerational context but finds it very difficult, refering to the difficulties that Rawls himself encountered ("it submits any ethical theory to severe if not impossible tests"). Without a real application of the 'veil', Lienkamp endorses a preventive principle (p. 277) which is partly in line with the results of more elaborate applications of the 'veil'. Then, Lienkamp continues by operationalizing intergenerational justice by the three parameters 'diversity', 'quality' and 'access' (quoting Edith Brown-Weiss). Afterwards, Lienkamp mentions how 'intergenerational justice' is defined in the German National Strategy for Sustainability. While some of Lienkamp's results are shared by the reviewers, the arguments he offers to sustain his results fall short of his own deliberations, and his ethical theory is composed a bit too haphazardly. But even if Lienkamp does not deliver a precise ethical definition of intergenerational justice he offers some new aspects from an theological point of view.

People that are religiously 'nonmusical', as Lienkamp calls them following Habermas, will perhaps have problems to accept the core interpretation of Lienkamp's book since it relies strongly on the bible and thus on God's will and mandate. The Christian perspective of the book probably appeals to Muslims and Jews as well as it comes close to a monotheistic approach. But it might be less accessible to atheists or agnostics. According to Lienkamp, there can be many justifications (religious, ethical, economic) for mankind's obligation to save the climate. While the lines of reasoning may vary, the results of these deliberations converge and press us to start acting. But this is doubtful as the conservation of nature as the economic basis for mankind would not encompass all species. The consequences of the intrinsic and the instrumental approach to nature protection are not identical.

In the fourth chapter *(acting)* Lienkamp delivers a complete and well-arranged overview of measures that are discussed with regard to climate change. True to his moral argument he stresses the primacy of measures for mitigation. From energy transition to reforestation, financial incentives and CO_2-certificate trading systems he explains a lot of widely-discussed measures. But beyond that he also mentions far-reaching measures that are discussed much too rarely or too shallowly in politics, like ensuring an adequate ecological education starting at school age. Among these measures Lienkamp's preoccupation with a potential 'third parliamentary chamber' in the political system sticks out. This chamber is meant to represent the interests of the future generations during the legislative procedure in trust as some sort of Future Council. The introduction of such a chamber with real veto-powers against laws endangering the rights of future generations would be an important instrument to combat the short-sightedness of democratic systems that concentrate too much on the cycle of election periods.

All in all, this is a well-researched and accurately written book. One point of criticism is that Lienkamp was not able to deliver on his promise to consistently treat the issue from an interdisciplinary point of view. Even though chapters 3 and 4 regularly mention legal sources and arguments one notices the lack of inspiration from political or social sciences. This is especially true for chapter 4, in which political science theories could have contributed significantly in judging the feasibility of these measures.

The book ends with a general call to take action. Here, Lienkamp resorts to the anecdote, used in science and media so widely that it has already become clichéd, that the Chinese word for 'crisis' is composed of the words 'opportunity' and 'danger'. This is meant to serve as a reminder to decision makers that bold measures are to be taken in the face of great problems.

As a conclusion one can say that the book delivers a well formulated and justified account of the ethics of sustainability which could rise to the challenges of climate change. The Christian perspective of the book is always there, but never so intrusive as to block an ethical approach to the topic. The modern reinterpretations of biblical passages are also conclusive for non-religious persons and offers highly interesting perspectives and approaches. Almost in passing Lienkamp also delivers a remarkably complete, clear and well written overview of the state of knowledge on climate change and possible counter-measures. The book is an inspiring lecture that can be recommended to anyone interested in climate change.

Andreas Lienkamp (2009): Klimawandel und Gerechtigkeit. Eine Ethik der Nachhaltigkeit in christlicher Perspektive. Munich: Schöningh. 534 pages. ISBN: 978350676 6755. Price: 58 €.

Harald Welzer: Klimakriege. Wofür im 21. Jahrhundert getötet wird

Reviewed by Adrian Schell

Harald Welzer presents his book called *Climate Wars. What is Worth Killing for in the 21st Century* (only available in German) on the consequences of climate change, the content of which differs from most literature in this area. Welzer examines and describes the potential for social conflict, which arises from climate change as well as the resulting after-effects including natural disasters, resources shortages and migration flows.

Welzer approaches the topics of climate change and violence in several stages. He writes about the holocaust, the genocide during Rwanda's civil war and the crisis in Darfur. In parts, the author does not manage to explicitly clarify the coherence between the respective chapters and the title of the book. For example, he dedicates a detailed chapter to terrorism (Red Army Faction, Al-Qaeda, etc.), just to end it by asserting that there was merely an indirect connection between terrorism and climate change. Some chapters include facts which were already discussed extensively in preceding sections of the book. During these sections the reading pleasure is limited, because it is not obvious how the reader should gain additional knowledge from these parts. More careful editing of content would not have done any harm to the book.

Despite those few weak points, Welzer's book is worth reading. He depicts clearly in which way climate change causes and accelerates the decay of statehood in wide swaths of the Third World leading to the emergence of force based economies. All players involved in conflicts in force-based economies have a common interest in ensuring such disputes continue since they are set to profit from it and thus foster their persistence. According to Welzer, civil war, originally a state of emergency, will become normality in many developing countries. As an example, Welzer mentions the crisis in Darfur which he regards as a forerunner to future conflicts, conditioned by climate change. The consequences of climate change, such as aridity, flooding and desertification, result in the agricultural sectors

of many regions being unable to sustain the local population. Hence, taking part in the force-based economy appears as a rational option to those farmers who originally lived of subsistence agriculture.

The players in force-based economies in the Southern hemisphere act, as far as they do so in reaction to the consequences of climate change, under circumstances which were set by the industrial nations of the North. The causes of climate change and the resulting after-effects were triggered by industrial nations. Welzer clearly points to fact that those actors who caused climate change will not - or at least not in the beginning – be among those who will be affected by the negative outcomes of climate change. In contrast, those whose living conditions are worst affected are much less responsible for climate change and unlike those who caused it lack the means to adapt to the aftermaths. Therefore it is little surprising, that there are flows of migration from South to North that will gain momentum in the future, because those regions, affected by the consequences of climate change, are not capable of providing sufficient means for survival. The North, which initially would even profit from moderate global warming, will consequently become the destination of choice for climate change refugees from the South. In addition, Welzer portrays the already existing counteractive measures of the European Union and the USA, which aim at detaining climate refugees before they reach their territory, e.g. by enlisting the assistance of 'third states' like Morocco and Lybia, without really being interested in the means they resort to in order to dam up the flow of migration.

The end of the book is comprised of two chapters. In one, Welzer depicts an optimistic scenario of prospective development in which the outcomes of climate change can be mitigated by a process of social rethinking in the North. In the other, Welzer delineates the pessimistic version in which the after-effects are not mitigated effectively because industrial nations are not able to develop a new cultural and economic model in the short time left. Should this version come true, even the decay of societies or the downfall of mankind becomes imaginable. While reading the final chapter it becomes clear that Welzer regards the pessimistic version as more realistic (its headline is *Optimism is a lack of information*) and probably only added the optimistic version as a glimmer of hope. The lack of conviction, which can be observed while reading the optimistic variant, makes this final chapter a less worthwhile read as one notices that Welzer is not really invested in this version.

To conclude, reading the book is quite worthwhile because it deals with the social consequences of climate change in a well-informed and intensive in-depth manner by dramatically highlighting the social aftermaths of global warming.

Harald Welzer (2008): Klimakriege. Wofür im 21. Jahrhundert getötet wird.
Frankfurt am Main: S. Fisher. 300 pages.
ISBN: 3100894332. Price: 19.90 €.

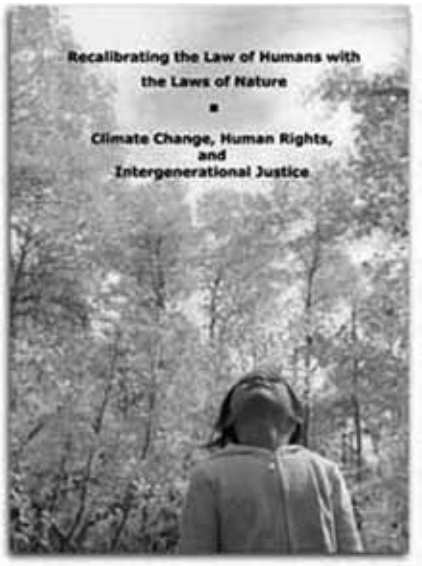
Recalibrating the Law of Humans with the Laws of Nature: Climate Change, Human Rights, and Intergenerational Justice

by Burns H. Weston
Director and Senior Researcher, Climate Legacy Initiative
Visiting Distinguished Professor of International Law and Policy, Vermont Law School
Bessie Dutton Murray Distinguished Professor of Law Emeritus and Senior Scholar, Center for Human Rights, The University of Iowa

and Tracy Bach
Associate Director and Senior Research Fellow, Climate Legacy Initiative
Professor of Law, Vermont Law School

The Climate Legacy Initiative (CLI) is a joint project of Vermont Law School's Environmental Law Center and The University of Iowa's Center for Human Rights (UICHR). Launched in Spring 2007 to research and analyze how current law (national and international, indigenous and foreign) conceptualizes and codifies the ethical rights and duties that exist between present and future generations ecologically, it was triggered by climate change – which the UN's Intergovernmental Panel on Climate Change (IPCC) and other leading environmental scientists have persuasively demonstrated to be, in modern times, the consequence largely of human activity, generating carbon buildups in the atmosphere that now threaten life on Earth as we know it. In this setting, building on work by Professor Edith Brown Weiss [In Fairness to Future Generations (1989)], it has sought to answer intriguing and generally unexplored legal questions: Is it possible for US law, the law of other countries, indigenous peoples' law, and/or international law to define the rights of future generations to a clean, healthy, and sustainable environment? Likewise, can law impose a duty on current generations to pass on a climate legacy of this sort?

In Spring 2009, the CLI gave birth to a 108-page Policy Paper, complete with 624 pages of Background Papers (Appendix A) and Recommendations (Appendix B), documenting this research and more. Titled



Recalibrating the Law of Humans with the Laws of Nature: Climate Change, Human Rights, and Intergenerational Justice, it makes the scholarly case that ecological protections for future generations and concomitant present-day obligations relative to them are supported by plausible and persuasive theories of social justice (particularly when the theories are grounded on the value of respect, the core value of human rights). It finds, too, a broad consensus that this obligation must take the form of (a) preserving diversity of natural and cultural resource options comparable to those enjoyed by previous generations; (b) maintaining the quality of the planet so that it is passed on in no worse condition than when received, and repairing it where necessary to meet this duty; and (c) providing members of current generations equitable access to the legacy of past generations and conserving this access for future generations. Additionally, it identifies and evaluates existing laws that support and codify the obligation to leave an ecologically livable world to future generations.

On final analysis, however, the Policy Paper finds these expressions of intergenerational concern to be, overall, much too limited in scope and practice to meet the challenge of presently ominous and potentially catastrophic climate change.

In this spirit, the Policy Paper calls for a general paradigm shift in legal thought and action relative to the environment. It argues for new legal norms, institutions, and procedures that give to the ecological rights and interests of present and future generations at least equal standing with the essentially market-driven norms and practices that rule worldwide today but which were crafted during and for a bygone 19th century Industrial Revolution and its priorities and interests. "Present and impending climate change," it observes, "brings us face to face with stark, discomfiting images of a non-future. […] Business-as-usual now appears as an irreversible experiment with the only atmosphere humans have."

The CLI Policy Paper therefore concludes that, to meet the climate change challenge, our world needs a heavy dose of intellectual and moral daring committed to ensuring "an ecological legacy […] that will benefit our children, grandchildren, great-grandchildren, and other future generations. [...]" To this end, it calls for the litigation of select cases and the reinterpretation of existing laws sensitive to the preciousness of all life on Earth. Also, in a manner intended to stimulate – not foreclose – dialogue and innovation, the Policy Paper urges progress on sixteen legal initiatives "that leave a legacy of ecological justice for future generations" defined by the ideal of a clean, healthy, and sustainable global environment for all. Among them are the following:

- the adoption of state and national constitutional amendments and statutes establishing the rights of present and future generations to clean, healthy, and sustainable environments;

- the enactment of state environmental protection acts (SEPAs) to complement and strengthen, and a national environmental legacy act (NELA) to supplement, already existing but weak national environmental protection laws, the US National Environmental Protection Act (NEPA) in particular;

• the adoption of cap-and-trade regulations for allocations to energy efficiency;

• the creation of sky trusts and other environmental stakeholder trusts to sustain and safeguard common ecological assets;

• the expansion of the public trust doctrine beyond its current limited application to safeguard the entire environment for present and future generations;

• the establishment of legal guardians for future generations, with provision for their training and certification;

• the adoption of UN resolutions aimed at protecting the ecological rights and interests of present and future generations, including a call for the establishment of the atmosphere as a global commons protected by precautionary principles and strong enforcement powers; and

• the fine tuning of international trade rules to the ecological needs and interests of future generations.

"It is impossible to think," the CLI Policy Paper asserts, "that creative responses to the climate change challenge can be successful without innovative as well as effective legal and policy action."

Call for Papers for Intergenerational Justice Review

"Intergenerational Justice and the Scourge of War"

We are looking for articles in English for the upcoming issue 1/2010 of the IGJR with the topic *"Intergenerational Justice and the Scourge of War"*.

The Charter of the United Nations signed in San Francisco on 26 June 1945 starts with the words *'We the peoples of the United Nations determined to save succeeding generations from the scourge of war, which twice in our lifetime has brought untold sorrow to mankind […]'*. The Charter was obviously formulated and signed under the impression of the recently ended Second World War, which was the single event with the sharpest decrease of human welfare in history. The priorities have since shifted during an era of unprecedented peace in the OECD world and on a global scale. But even though as many as 192 states have signed the UN Charter, starting with an expression of determination to rid the world of the scourge of war, conflicts still ravage large parts of the world, particularly in Africa, the Middle East and Central Asia. According to findings of the AKUF (Working Group on the Causes of Wars) in Hamburg, Germany, the number of conflicts has even steadily risen since the end of the Second World War, while inner state conflicts increasingly dominate the statistics.

The persistence of the institution of 'war' might be the greatest threat of all to future generations. Its negative consequences for the future of societies are obvious. Apart from the people dying, traumatised soldiers and victims pass down the psychological damages they suffered in war times to the future generations as parents. Additionally new forms of inner state conflicts have a much longer duration in comparison to classic interstate wars and leave the economies, state structures and societies of the states they ravaged in ruins for decades to come. Thus modern inner state conflicts are more likely to affect future generations than classical wars with clearly defined warring parties that usually end with a truce or a peace treaty.

Evidently, the problem the 'scourge of war' poses to mankind is far from being solved. In this context it is remarkable that studies on intergenerational justice have so far neglected the topic, especially considering that the UN Charter specifically pointed out 'succeeding generations' as the beneficiaries of its determination to rid the world of wars. The upcoming issue 1/2010 of the Intergenerational Justice Review addresses this issue, with the aim to establish the groundwork for a comprehensive discussion of peace policies in the scope of intergenerational justice. The issue aims to clarify the relation between the rights of present and future generations for a peaceful life, the role of humanitarian interventions based on Chapter VII of the UN Charter and interventions in general. This includes interventions for conflict management, peacebuilding, peace enforcement, peacekeeping, state and nation building.

Weapons of mass destruction pose an exceptional danger to the future of mankind. Therefore the ban and demolition of nuclear arms as well as the elimination of chemical and biological weapon are important elements of the topic.

Deadline for the submission of full articles is 1 November 2009.

"Possibilities and limits of party cooperation in democracies"

The editors are seeking articles in English for an upcoming issue in 2010 of the IGJR with the topic *"Possibilities and limits of party cooperation in democracies"*.

Every democratic system requires the competition of political parties and parliament factions, and to a certain degree it is part of the democratic role play to maintain such competition. Nevertheless, in a democratic system it is important to aim for as much competition as needed and as much cooperation as possible, in order to achieve the majorities for necessary decisions. Democracy is always a struggle to balance between cooperation and competition. Across the globe there are many different approaches to finding this balance; the British Majority system, the concordance system in Switzerland, the coalition system in Germany and the Presidential democracies of France and the USA. All can be said to have their advantages, but do any of these systems ensure that not only the current needs are addressed in order to please voters and win votes, but

that long term interests are implemented? Do any of these systems practice sustainable politics?

Take for example the complicated decision making in the political system of Germany, a system that requires the consensus of many actors often recompensing blockades. The non-appearance of costly reforms, for example in climate protection, are examples which illustrate that measures often oriented to the future can and are being blocked by single parties. In this case future generations in particular are disadvantaged by the absence of functional collaboration of parties.

Deadline for the submission of abstracts is 1 November 2009.
Deadline for the submission of full articles is 1 December 2009.

FRFG at the COP15 United Nations Climate Change Conference Copenhagen 2009
The FRFG has received a provisional admission for the UN Climate Change Conference in Copenhagen in December. The Foundation will attend the talks with two observers in order to ensure that we can gather first hand information for our research on climate change issues. The Foundation will also advocate the importance of generational justice in climate change mitigation and adaptation at the conference and at various side events.

Grantham Research Institute on Climate Change and the Environment
Since April 2009, Joerg Chet Tremmel is a Visiting Research Fellow at the London School of Economics and Political Science (LSE). Although he works in the Centre for Philosophy of Natural and Social Science, he also follows closely climate research activities that take place at LSE. The "Grantham Research Institute on Climate Change and the Environment" is the new home to climate-change and environment research at LSE.[1] The Institute is chaired by Lord Stern of Brentford, author of the 2006 Stern Review,[2] and brings together international expertise on economics, finance, geography, the environment, international development and political economy to establish a world-leading centre for policy-relevant research and training in climate change and the environment.
The Institute has been funded by philanthropists Jeremy and Hannelore Grantham, through their Grantham Foundation for the Protection of the Environment. It works closely with the Grantham Institute for Climate Change at Imperial College London, established last year also with funding from the Grantham Foundation. A common advisory board oversees the work of both Institutes.

Upcoming event:
Public lecture: 'Climate Change: Are We Heading for a New Cold War?' Thursday 1 October 2009, 6.30-8pm, Old Theatre, Old Building, LSE. Speaker: Professor Graciela Chichilnisky. There is an historic standoff between China and the US on the issue of global warming. Neither wants to limit emissions unless the other does so first. In Copenhagen (December 2009) the nations of the world will decide whether to resolve the Global Warming problem extending Kyoto after 2012 – or to start a new Cold War of escalating emissions – the outcome of which may determine the fate of humankind. Professor Graciela Chichilnisky suggests two modest improvements to the Kyoto Protocol that could resolve the impasse and literally save the day. These unique proposals have received positive attention in China and in the US. But will they be adopted in Copenhagen?
Graciela is Director of Columbia Consortium for Risk Management and Professor of Economics and Statistics at Columbia University. This event celebrates her newest book *Saving Kyoto.*
-
1) http://www.lse.ac.uk/collections/granthamInstitute/Default.htm
2) http://www.hm-treasury.gov.uk/sternreview_index.htm

Imprint

Publisher: Foundation for the Rights of Future Generations (Stiftung für die Rechte zukünftiger Generationen)
Editor-in-Chief: Jörg Chet Tremmel
Guest Editors: Konrad Ott, Edward Page
Editorial staff: Patrick Wegner, Hannah Taylor-Kensell, Karsten Gödderz, Dan Sylvain, Kristof Müller, Alessy Beaver
Layout: Angela Schmidt, OblaDesign
Print: LokayDruck, Königsberger Str. 3, 64354 Reinheim (www.lokay.de)

Editorial office address:
Foundation for the Rights of Future Generations, (Stiftung für die Rechte zukünftiger Generationen)
Postfach 5115, 61422 Oberursel
Germany
Telephone: +49(0)6171-982367,
fax: +49(0)6171-952566
Email: editors@igjr.org
Website: www.intergenerationaljustice.org

The peer reviewed journal *Intergenerational Justice Review* aims to improve our understanding of intergenerational justice and sustainable development through pure and applied ethical research. Quarterly published in English and German, the IGJR (ISSN 1617-1799) seeks articles representing the state of the art in philosophy, politics and law of intergenerational relations. It is an open access journal that is published on a professional level with an extensive international readership. The editorial board comprises over 50 international experts from ten countries, and representing eight disciplines. The IGJR is not only read by the scientific community but also by members of parliaments, decision makers from the economy and persons with a general interest in intergenerational justice. The internet version is free of charge, the printed version has an annual subscription cost of 25 Euros which has to be paid in advance. The cancellation period is three months until the end of the year. For subscription, see last page.

Youth for Europe sponsors our two EVS (European Voluntary Service) editorial staff members: Hannah Taylor-Kensell and Dan Sylvain. We would like to thank them for supporting this project.

JUGEND für Europa
Deutsche Agentur für das
EU-Programm JUGEND IN AKTION

Subscription Form
Fax-No. +49 6171 952566

Foundation for the Rights of Future Generations
Postfach 5115
61422 Oberursel

FRFG, Postfach 5115, 61422 Oberursel, PVSt., DPAG, Entgelt bezahlt, D 54906

Last Name _____ First Name _____

Street _____ Town/Postcode _____

Phone _____ Fax _____

E-mail _____ Date of Birth _____

Membership in other organisations, parties, NGOs etc. _____

Occupation (details voluntary) _____

I am particularly interested in the following (tick all that are applicable):

- ☐ Philosophical Theories of Intergenerational Justice
- ☐ Institutionalization of Intergenerational Justice
- ☐ Ecological Policy
- ☐ Pension Policy
- ☐ Finance Policy
- ☐ Labour Market Policy
- ☐ Youth Policy
- ☐ Education Policy

Subscription of IGJR costs 25 Euro/Dollar p.a.

SRzG
Account no. 803 9555 800 · GLS Bank eg (BLZ 430 609 67) IBAN: DE64430609678039555800 · BIC: GENODEM1GLS
More information: editors@igjr.org
or http://www.intergenerationaljustice.org/ > Friends of FRFG

Thank you for your support!