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Domains of Climate Ethics

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1. Introduction

Literature on climate change is abundant. Beside the scientific, economic, technological, and political literature, there is also a substantial body of ethical analysis of the many moral problems embedded in climate change. The term "climate ethics" (CE) is used for such analyses.

Our aim in this chapter is to present a systematic overview of CE. We distinguish different domains (topics) of CE.[2] A comprehensive CE will be established if well-substantiated positions in each domain can be coherently conjoined. We provide an outline of the main components of such theory.

At its core, CE refers to a triangular structure of how to reduce the negative impacts of climate change by a) *mitigation* (reduction of greenhouse gas emissions), b) *adaptation*, and c) *climate engineering*. Some sections below refer to this structure, but, prior to that, we refer to the ethical profile of climate change, followed by a reflection on climate economics. In addition, we discuss distribution schemes for remaining emissions entitlements. We assume some familiarity with the basics of climate science and with mainstream economics.

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2. The ethical profile of climate change

The basic physical mechanism of a greenhouse-effect is beyond doubt. There are many remaining uncertainties in the details of climate change, but the "big picture" of a warming world, at least partly due to anthropogenic emissions, has been scientifically established.[3] Recent scientific attention focuses on "tipping points" and feed-back mechanisms in the global climate system. All in all, scientific understanding of the global climate system has increased and the models are more trustworthy than 20 years ago.[4]

Anthropogenic climate change is not repugnant in itself. Imagine a world with low CO_2-concentrations that would allow for only an Inuit-like human life in a species-poor borealis-type world. If human cultures and biodiversity could flourish, and if this "cold" world could be warmed by releasing some GHGs, most people would not oppose such a scenario.

Climate change is a moral problem because of its negative impacts on human systems (and on biodiversity) in the short-, medium- and long-run. Not all impacts need, however, to be seen as negative. Negative impacts are those that count as evils (i.e., harms/perils) according to our axiological common sense. In human life, we are facing evils that either are naturally induced (e.g., natural disasters) or that result from the behaviour of other persons. Climate change manifests itself in events that look like natural disasters, but may be anthropogenic. However, hardly any single event, except for sea level rise contributed to by glacial melt, can be attributed to human emissions with certainty.

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[2] The idea to distinguish different domains is taken from Grasso (2007).

[3] Minor mistakes of IPPC which have attracted the media are painful according to IPCC's review standards but do not shatter this overall picture.

[4] So-called "climate skepticism" still presumes to adopt the scientific virtue of being skeptical but, as climate science proceeds, this presumption has become misleading.

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Although only weather events are directly observable, the increase in risks associated with climate change can be measured and liability for such increases can be assessed.[5] What can be predicted with some confidence is a modification in probability, frequency and intensity of events that cause evils for humans. Such disasters are, for instance, floods, droughts, heat waves, forest fires, landslides, spread of diseases, hurricanes, heavy rainfall and inundations, declines in local harvests, desertification, increased water stress in (semi) arid regions, conflicts over scarce resources, political instability, and the like.

The negative (and positive) impacts of climate change will fall upon specific people by chance, but there are some “patterns of likeliness”. If a person lives on the coast of Bangladesh or in Mali, it is more likely that he/she will be affected by flood or drought than a person in the hills of, say, France or Germany. All models indicate that poor people in the global South will have to face most perils. Risks are imposed upon them. Those people might be unaware or ignorant of the problem that is affecting them. Since these people do not contribute much to climate change, they are, intuitively, victimized by the polluters.

Climate change is a paradigm case for intergenerational responsibility since, once induced, it will continue for centuries (e.g., with the melting of ice shields in Greenland and Antarctica). The ethical literature on responsibility towards posterity can be applied to the case of climate change. Parfit's “future individual paradox” does not refute the widespread conviction that there is some moral responsibility *vis-à-vis* future generations.[6] Such responsibility implies, minimally, that it is mandatory to bequeath overall environmental conditions that are not inimical to a decent life for all humans. Such decency can be conceived according to the capability-approach of Nussbaum and Sen. This

[5] Allen, 2003
[6] Ott, 2004. The famous future-individual paradox was outlined in Parfit (1983).

implies the *prima facie* obligation not to change the global climate by *GHG emission*s in a way that dignity, decency and the safety of human life is impaired or threatened. This highly unspecific formulation must be specified as CE proceeds through its different domains. The moral profile of climate change can be conceived as:

- Negative external effects in conjunction with market failure (economics).
- Increase in pain, suffering, sorrow which affects the overall welfare function for worse (welfare based ethics).
- Imposing risks on other people without informed prior consent given by them (ethics of risk).
- Impairing rights of contemporary and future persons (right based morality).
- Unfair victimization of other people (ethics of justice).

Rights-based morality, ethics of risk, and ethics of justice are close allies. Under these approaches, it seems plausible to conceive of climate change as a case of *victimization*. Victimization is one type of injury against other people. The facets of such victimization are as manifold as the types of evils that are associated with climate change. If one adopts the principle that it is more important to avoid harms than to bring about benefits, the attitude against victimization can be taken by utilitarianism, especially negative utilitarianism. For both Kantian and utilitarian ethicists, it seems hard to accept increases in the standard of living of wealthy persons that impose severe risks on poor people.[7] Utilitarian ethicists, such as Broome[8], and welfare-ethicists such as Lumer[9], come to results on mitigation policies that differ significantly from those of

[7] Shue, 1992.
[8] Broome, 1992.
[9] Lumer, 2002.

economists who calculate the economic optimal (efficient) climate policy (see below). This indicates that neoclassical economics is not simply applied utilitarian welfare ethics, but is, in fact, a very different approach.

3. Ethical Suppositions in Climate Economics

Neo-classical economists are not willing to avoid climate change "at any cost". If energy input by fossil fuels increases production of commodities, but has *GHG emission*s as unwelcome side-effects, and if the consumption of commodities fulfils preferences while the side-effects create negative external effects, the *GHG emission*s should be curbed to the extent only to which these external effects outweigh the utilities being created by consumption.[10] Indeed, standard economic approaches rely on the idea of maximizing net present value. The paradigmatic calculation is Nordhaus's "classical" DICE-model.[11] Tol continues this efficiency approach (EA) in which he downplays the moral problems of climate change.[12] However, the application of EA to global, unique, and long-term problems such as climate change has raised skepticism even among economists.

Meanwhile, it is widely accepted that EA is not neutral with respect to ethics. First of all, it must be understood clearly that in all models, costs are opportunity-costs, not payments.[13] Furthermore, there are many ethical assumptions in EA-models. Such assumptions are:

- the rate of discount
- the curving of the damage function
- aggregation of impacts in a single welfare function

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[10] Cf. Schröder, 2002.
[11] Nordhaus, 1994.
[12] Tol, 2008.
[13] Most costs are decreases or delays in growth rates of GDP. Given the magnitude of global GDP, even small declines in growth rates amount to huge costs in $-numbers.

- the marginal value of future consumption units
- the assumed value of a statistical life
- technological innovation as either exogenous or endogenous to climate change
- monetary value of environmental change and loss of biodiversity
- shift in transaction costs, control costs, and search costs.

Economic calculations are highly sensitive to these assumptions. It makes a difference whether the damage function is shaped in a linear fashion or whether it allows for non-linearity. A linear damage-function models climate change as rather smooth and without unpleasant surprises. Modelling the monetary value of a statistical life may downplay the death of poor humans. The many cultural amenities of a stable natural environment are also downplayed in most economic models. The costs of strong mitigation increase if technological innovation in carbon-free energy supply systems is modelled as exogenous. Costs decrease if innovations are modelled as endogenous (which is more likely).

Another important variable is the discount rate. Stern, choosing a far lower rate than Nordhaus, argues for immediate and strong mitigation measures.[14] However, both approaches rely on debateable assumptions.[15]

The debate on the ethical assumptions within EA motivates many (prudent) economists to adopt an alternative approach, called the *Standard Price Approach* (SPA). This approach starts from a standard set by some legitimate authority (democratic politics, fair negotiation, discourse-based). The primary task of economics is to calculate how this standard can be reached by minimizing costs. In SPA, the role of economics is less a master of rational

[14] Stern, 2007.
[15] Hampicke, 2011. See also the contributions in Hampicke/Ott (2003).

choice than a servant to political objectives.[16] SPA, however, does not answer the question of how to determine such a standard with respect to atmospheric greenhouse gas concentrations. To this question we now turn.

4. Stabilization level of atmospheric greenhouse gas concentrations

Article 2 of the United Nations Framework Convention on Climate Change (UNFCCC) defines the ultimate objective of this convention, and of all related protocols, to stabilize atmospheric greenhouse gas concentration at a level that prevents dangerous anthropogenic interference with the climate system. Very often, a “tolerable window” approach has been specified with reference to a modest increase in global mean temperature (GMT). Very popular is the so-called "2°-target"proposed by the Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen (WBGU).[17] This target claims that GMT should not increase more than 2°C compared to pre-industrial GMT. It has been argued that the sum of evils associated with a higher increase in GMT might become too high. Some scientists, as James Hansen, argue that a 2°C increase in GMT is still too risky since the ice shields of Greenland and Antarctica might melt down slowly but steadily (over centuries) at such a GMT. Thus, the 2°C target is ambitious from a political perspective, but from a strictly risk-averse position, it might still be too risky.

Some years ago, a study on behalf of the German Environmental Protection Agency[18] outlined an ethical argument in favour of very low GHG stabilization levels. The study compared CE approaches that argue from within

[16] At least with respect to environmental problems SPA has several advantages over EA since it is hard to see how the “efficient” pollution of air, rivers, and marine systems or the “efficient” number of species on planet Earth might be calculated.

[17] WBGU, 2009.

[18] Ott et al., 2004.

different ethical theories. Almost all approaches, except ethical contractarianism, came to the conclusion that there is a moral commitment to curb global GHG emissions in order to reach the lowest possible GHG stabilization levels. This agreement encompassed variants of utilitarianism, welfare-based consequentialism, deontological approaches, Rawlsian approaches, Aristotelian prudential approaches, physiocentric approaches, and, of course, Jonas' ethics of responsibility. Thus, one can argue with some confidence that despite all controversies, most current ethical theories demand the stabilization of GHG at the lowest feasible level. This is, indeed, a remarkable convergence of different theories that should not be ignored by politicians. Clearly, the clause "as low as possible" requires interpretation and specification.

In any case, taking the 2°C target seriously requires that GHG concentrations remain far below 560 CO_2-equivalent. Given all the carbon on planet Earth, especially coal resources, given economic growth, and given roughly 9.2 billion humans in 2050, it will be very difficult to reduce GHG emissions to the extent needed. All in all, we propose to adopt a prudent and cautious, but not completely unrealistic stabilization level of 450 ppmv CO_2-equivalent. Given current GHG concentrations (430 ppmv CO_2-eq) and an increase of 1.5-1.9 CO_2 ppmv each year, this target would mean that the net intake of GHG into the atmosphere must be stopped within two decades. Global emissions must peak in 2025, and then continuously decline as steeply as possible. This target requires deep cuts in emissions in the North but, meanwhile, it requires cuts in countries like China, too.[19] There might be some overshot above this limit, but it is better to face overshot *as such* than to adapt objectives to emission realities step by step.

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[19] For a discussion of the duties of individual persons to reduce GHG emissions see Baatz (2012).

5. Distribution schemes for remaining emission entitlements

Any stabilization target raises the problem of how to distribute the remaining sink capacities (or carbon budget) fairly. There are many schemes of how the carbon budget under the given target structure should be distributed.[20] Since emission entitlements are only one good among many, it might be tempting to embed the problem at stake into a more comprehensive theory of distributive justice. But, because such a theory will be essentially contested, it seems more viable to isolate emission entitlements as one specific good, the distribution of which is to be determined irrespective of how other goods are distributed in a globalized world. Thus, we set aside all problems of background distribution.

If one assumes, first, that the atmosphere has the status of a *global common good*, and if one, second, adopts the Rawlsian intuition on justice that all goods should be distributed equally unless an unequal distribution benefits all, egalitarian schemes deserve special attention. Recently, we have argued in favour of an egalitarian *per-capita* approach in more detail.[21] The argument claims that it is fair to shift the burden of proof to those who favour unequal distribution schemes for global common pool goods. Reasons in favour of an unequal distribution might be that some people deserve more entitlements from a moral point of view, or that unequal schemes are beneficial to all consumers in the global village. There are only a few articles that defend this position.[22] Another reason is special needs.

The most plausible claim with respect to special needs might be the claim for heating in winter in the North which might be seen as more basic than the

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[20] Grandfathering, basic needs, Rawlsian difference principles, proportionality, per-capita schemes.

[21] Ott, 2010a.

"luxury need" for cooling in the tropical zones. As a matter of fact, income levels can explain the differences in emission profiles better than natural factors.[23] If so, heating needs can be addressed by technological innovations and social policies in rich Northern countries and should not open Pandora's box of a global debate on special needs. In such a debate, there will be claims for special needs in many countries, such as special needs to visit friends and relatives in large countries with a high mobility (as in the US). An egalitarian scheme is well-advised not to address special needs.

An egalitarian scheme under the target-structure given in the previous section would mean that each person is given a carbon budget of roughly 1.8-2.0 tons of CO_2 a year.[24] If the global carbon budget is allocated to national states according to their populations, this implies emission reductions of 80% (Germany) or even 90% (US). There are different proposals of how to deal with such budgets .The budget might be auctioned or distributed directly to individuals. In most proposals, the budgets can be traded freely on carbon markets. If properly implemented, such an egalitarian scheme has the welcome effect that persons with low emissions (India, Africa) will benefit because they can sell their entitlements. In any case, the political integrity of such schemes must be secured against misuse.[25]

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[22] The most inspiring criticism of egalitarianism is to be found in Caney (2009). Caney's idea is to embed *GHG emission*s in a holistic scheme of goods, capacities, and sources of anthropogenic forcing. This holistic approach adds complexity to an already complex matter.
[23] Neumayer, 2002.
[24] This approach should be based on a benchmark to avoid incentives for pro-natalistic population policies.
[25] Our proposal would result in something akin to Contraction and Convergence (Meyer, 1999). Due to the space available we omitted a critical discussion of a rivaling concept, the Greenhouse Development Rights Framework (Bear et al., 2008; but see Kraus/Ott, 2009). However, C&C is plausible only when combined with a robust scheme of financing adaptation in developing countries. In this way it is also possible to account for the historical dimension of climate change (in detail see Baatz, 2012).

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6. Adaptation opportunities

Humans are practical beings with large capacities for problem-solving. They are settlers on a global scale who can cope with a great variety of environmental conditions. These capacities can be used for adaptation. Adaptation strategies may include buildings like dikes, behavioural patterns like *siesta*, protective strategies against forest fires, improved water supply systems in arid regions, different crops in agriculture, and the like.[26] Adaptation has a broad spectrum across different dimensions of societal life.

Rich countries can utilize scientific knowledge, financial capital, political administration, and infrastructure in order to implement adaptation strategies on their own. Given only modest climate change and proper adaptation strategies, the prospects for the temperate zones are not completely bleak. The situation is different in Southern countries were many institutional preconditions for effective adaptation are lacking.

The emergent adaptation discourse suggests that there can be no such thing as a global master plan on how to adapt. Adaptation is literally "concrete" because internal and external resources, cultural lifestyles, and patterns of environmental practices must be rearranged within adaptation strategies. Details are beyond the competencies of ethicists.

It is very likely that there will be adaptation funding for Southern countries under the UNFCCC regime. The extent of payments coming from Northern countries will need to be negotiated. Some calculations indicate that even 100 billion $ per year would not be sufficient. This $-number does not include costs for the provision and resettlement of climate refugees.[27] It is very likely that there will never be enough money in the fund. Since adaptation funding is done under the condition of scarcity of resources, applications for

[26] A conceptual framework on adaptation strategies is given by Smit et al. (2000).
[27] See overview in Biermann/Boas, 2008.

such funding must be governed and controlled by fixed criteria. In order not to fall prey to strategic behaviour, financing adaptation has to be done with sobriety and prudence.

By intuition, the most vulnerable and marginalized groups should be the first beneficiaries of adaptation funding. Grasso proposes the following vulnerability-based decision-rule for spending: the lower the overall level of human security, the more adaptation funds are due.[28] It can not be denied that vulnerability and human security are important criteria for funding priorities. But, if these criteria remain out of balance with other criteria, there is an incentive to present oneself as poor, helpless, ignorant, devoid of capabilities and initiative, and so on. If such an outcome is to be avoided, the criterion of vulnerability should not be the only one.

Many poor people do not live in misery, but use their indigenous knowledge to reproduce a decent livelihood. Why not allocate a substantial portion of adaptation funding to communities that have sustained a non-miserable livelihood for generations and might continue to do so even under climate change impacts? Most experts would agree that adaptation must be something other than an intensification of emergency aid. Adaptation funding should reward and stimulate activities by which adaptation is linked to other objectives of sustainable development. It should pay special attention to the conservation and restoration of natural capital.[29] Activities that combine local adaptation, biodiversity conservation, ecosystem restoration, and carbon storage should be most encouraged. Adaptation funding should give priority to “eco-carbon” activities.

[28] Grasso, 2007.
[29] Cf. Ott/Döring, 2008.

7. Climate engineering

In his most recent publications, Teller proposes solar radiation management as a technical measure against climate change.[30] According to Teller, a doubling of CO_2-concentrations could be compensated by a decrease of roughly 2-3 % of solar radiation reaching the surface of planet Earth. Solar Radiation Management (SRM) is one type of climate engineering, defined as deliberate human interference with the global carbon cycle or composition of the atmosphere. Carbon Dioxide Removal (CDR) is another type of climate engineering. CDR has much overlap with "eco-carbon" adaptation strategies and is often close to nature conservation and restoration. The effects of CDR are promising, but rather slow to materialise.

The profile of SRM is different. Ignoring the SRM-option of placing some thousand reflexive discs in outer space on economic grounds (costs of some trillion $), attention falls upon one specific SRM-option: *continuous release of large amounts of sulphate aerosols into the stratosphere*. This option seems attractive to many scientifically credible scholars, especially those in the US.[31] SRM has already become a tempting "superpower"-option. The more popular message is often quite simple: If there is a quick, cost-efficient, effective technological solution (like SRM) to the problem of climate change by which a decline in economic growth and a change in consumerist lifestyle can be avoided, the US should not hesitate to embrace such a solution.[32] In case of emergency, even unilateral action by technological advanced national states might be the *ultima ratio*.

[30] Teller et al., 2002.

[31] Blackstone/Long, 2009; Keith et al., 2010. Many think tanks that supported climate skepticism some years ago quickly shifted toward SRM-enthusiasm.

[32] Sometimes it is added that the problem of global cooperation in mitigation GHG can be easily turned into a technological joint effort problem.

Together with Betz, we have mapped arguments both pro and con SRM.[33] The contra-side of this map of arguments is quite crowded. There are arguments using the concept of hubris used by Jonas: Engineering planet Earth might be an instance of such hubris. Since injecting sulfate aerosols into the stratosphere will affect weather patterns all around the world, it can be questioned on the grounds of distributive justice, among others.[34]

With respect to the political economy of SRM, it might be argued that SRM should be seen as a protective measure in favour of outdated US industries with their high-emission profiles against the global diffusion of smart “green” industries with comparatively low *GHG emission*s. SRM fits frightening well within the profile of the most questionable variant of capitalism and its military-industrial complex. Launching SRM as an economic-political project will discourage investments in carbon-poor economics. Moreover, there are risk-based ethical concerns against sulphate-based SRM.

Once fully deployed, SRM could not be easily stopped if it is not combined with stringent mitigation. SRM, however, once tested in large field tests and fully deployed, may realize itself as *a replacement* of mitigation efforts. In this case, there would be a future world with unmitigated high GHG concentrations in the lower atmosphere and a sulphate-based shield against solar radiation in the upper atmosphere. Both kinds of human interferences with the atmosphere must be kept in some balance over a long period of time.[35] If it turns out that SRM has substantial negative side-effects and, thus, should be stopped, future generations may be trapped in a dilemmatic situation. One lemma would be stopping SRM. If so, there would be sudden and rapid climate change (some °C in few decades). The second lemma would be to continue SRM. It seems

[33] Ott, 2010b; Betz/Cancean, 2011.
[34] Cf. Svoboda et al., 2011.
[35] Matthews/Caldeira, 2007.

highly repugnant to impose such a risk upon future generations without adequate justification.[36] One should consider in advance how such a dilemmatic situation might be avoided. The old criterion of reversibility[37] requires a robust and viable exit-strategy for SRM. Without such a strategy, SRM should be rejected. It has often been said that SRM should be *supplementary* to mitigation, adaptation and CDR. In reality, however, SRM, once tested in large field tests and fully deployed may come to *replace* mitigation efforts.

All arguments considered, CDR should be researched and tested in the field, while SRM might be researched theoretically by experiments and modelling. There should be a ban on large field test for, at least, the next 20 or, better, 30 years. Meanwhile, the risks and threats of SRM can become a useful “stick behind the door” that might motivate national states to co-operate on a proper global mitigation and adaptation regime. SRM will again become prominent on the agenda if the prediction that all global climate policies are bound to fail should materialise.

8. Conclusions

It is mandatory that CE should provide some reasonable ethical orientation. Without a common moral grounding, climate negotiations will fall prey to the predicament of becoming a mere “muddling through”, governed by strategic and tactical cleverness of the thousands of stakeholders and negotiators gathering each year at the COP/MOP conferences. Thus, let us summarize some preliminary results of our “topical” reasoning:

- Ethical profiling: impacts seen as evils, objections against imposing risks and victimization, intergenerational responsibility.

[36] Cf. Gardiner, 2010.
[37] Birnbacher, 1988.

- Standard-Price-Approach in climate economics, discarding "efficiency" approaches.
- Ultimate stabilization objective at "2°C ↔ 450 ppmv CO_2-equivalents".
- Long-term egalitarian distribution at 1.8-2 tons/person/year in conjunction with emissions trading.
- Mandatory attitude for Northern countries to assist adaptation strategies in the global South in conjunction with sustainability "eco-carbon" criteria for funding.
- Research on CDR options, ban (or moratorium) on SRM.

The triangular tensions among mitigation-, adaptation-, and climate-engineering-strategies should not be seen as a portfolio. Within this triangular affair, mitigation deserves priority because mitigation is a precondition for adaptation, and for CDR being successfully performed.

Mitigation on a global scale is not utopian any longer. Despite their continuing to rise (GHG emissions added 1.9 ppmv CO_2 to the atmosphere in the year 2010), substantial change is in the making. Public awareness has increased worldwide. Renewable energies already are going to be established globally. The diffusion of existing carbon-poor technologies can be accelerated by political strategies and economic incentives. GHG emissions have been decoupled from GDP growth in advanced industrial societies.[38] There is scientific knowledge, plenty of capital for carbon-low investments, established technologies waiting to be mainstreamed, and global civil society is becoming more aware. Interestingly enough, the major achievements of modern societies (science, technology, capital, public reasoning) are available for problem-

[38] The German Environmental Advisory Board has outlined scenarios under which Germany could, with modest costs, reach a safe supply system for electricity that runs without nuclear power plants and without conventional coal in the 2030ies (cf. Sachverständigenrat für Umweltfragen, 2011).

solving. If the course of action proposed here could be agreed upon and become a safely paved and reliable pathway, the speed of taking steps may be increased substantially.

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