

# The Argument from Catastrophe in Climate Change – The Need to Go Beyond a (Catastrophic) Precautionary Principle

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## Abstract

The problem of climate change arguably constitutes the greatest challenge to humankind. However, climate ethics has so far been better on the side of the diagnosis rather than of the solution or therapy of that problem. We attempt to show why this is the case and we outline what is needed for helpful ethical contributions to overcoming the climate problem. For this we focus on what may be called the argument from catastrophe in climate ethics, assessing the standard use of a catastrophic precautionary principle by Henry Shue and the non-standard use of the principle by Eugen Pissarskoi. That argument focuses on the single catastrophe of climate change and treats the problem of taking the necessary means to avoid the catastrophe mainly as a motivation problem. What is overlooked is that the solutions are not at hand, that fighting climate change involves intricate normative conflicts of goals, and that potential measures may themselves be riddled with (catastrophic) risks.

**Keywords:** climate ethics, decarbonization, catastrophe, precautionary principle, risks, energy security, economic development

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It is frequently denied that there could be something like a single consistent and overarching precautionary principle ("the precautionary principle").<sup>2</sup> More and more often, however, a certain kind of precautionary principle is advocated for dealing with possible catastrophes („a catastrophic precautionary principle“, CPP).<sup>3</sup> Stephen M. Gardiner claimed in a seminal paper that such a principle, which he dubbed “Rawlsian Core Precautionary Principle” (RCPP), constitutes something like the gist of the precautionary principle.<sup>4</sup> A CPP is prominently and with increased urgency used in climate ethics.<sup>5</sup>

In this paper we are primarily concerned with what might be called *the argument from catastrophe* in climate ethics and insofar also with variants of a CPP which guide the argument. While the use of the argument from catastrophe is understandable and conveys, as we think, a justified sense of increasing urgency, it constitutes, as we would like to show here, an impasse in climate ethics and is not conducive to the aim of mitigating global warming. To put it bluntly: If climate ethics is interested in making meaningful contributions to averting a climate catastrophe it must give up the argument from catastrophe guided by something like the CPP or RCPP.

## 1 Climate Change and the Attraction of a Catastrophic Precautionary Principle

At first sight anthropogenic climate change seems to constitute a paradigm case of a CPP, so much so that climate change seems to call for the development of something like a CPP. For global warming is connected with the realistic possibility of extreme catastrophes like the extinction of humanity or the end of human civilization. At the same time it is uncertain which level of (cumulative) greenhouse gas emissions will lead to which increase of average global temperature and which increase of average global temperature could in turn trigger extreme catastrophes.<sup>6</sup> Under such conditions it seems to be imperative to take without delay the necessary means to avoid the risk of catastrophe if these means can, as it seems to be the case, be taken at relatively low costs.

<sup>2</sup> See e.g. Cass R. Sunstein, *Laws of Fear: Beyond the Precautionary Principle*, New York: Cambridge University Press, 2005, ch.1; Lauren Hartzell-Nichols, *A Climate of Risk: Precautionary Principles, Catastrophes, and Climate Change*, New York: Routledge, 2017. – For an instructive attempt to save something like “the” precautionary principle, see Daniel Steel, *Philosophy and the Precautionary Principle: Science, Evidence, and Environmental Policy*, Cambridge: Cambridge University Press, 2015.

<sup>3</sup> See e.g. Hartzell-Nichols, *op. cit.* ch. 3 and 5; Cass R. Sunstein, *Worst-Case Scenarios*, Cambridge, Mass.: Harvard University Press, 2007; Cass R. Sunstein, *Averting Catastrophe: Decision Theory for COVID-19, Climate Change, and Potential Disasters of All Kinds*, New York: New York University Press, 2021.

<sup>4</sup> Stephen M. Gardiner, “A Core Precautionary Principle,” *Journal of Political Philosophy* 14,1 (2006): 33-60. See also Sunstein’s treatment of Gardiner in Sunstein, *Averting Catastrophe op. cit.* 67-70.

<sup>5</sup> Gardiner *op. cit.* 55f. threats climate change as a “paradigmatic application” of the RCPP, see also Stephen M. Gardiner, *A Perfect Moral Storm: The Ethical Tragedy of Climate Change*, New York: Oxford University Press, 2011, 411-414; Hartzell-Nichols, *op. cit.* (fn. 2). See especially Henry Shue, “Deadly Delays, Saving Opportunities: Creating a More Dangerous World?” in: Stephen M. Gardiner, Simon Caney, Dale Jamieson, Henry Shue (eds.), *Climate Ethics: Essential Readings*. New York: Oxford University Press, 2010, 146-162, reprinted in Henry Shue, *Climate Justice: Vulnerability and Protection*. Oxford: Oxford University Press, 2014, 263-286 (in this article Shue is not directly employing a precautionary principle, but comes close to a CPP); Henry Shue, “Uncertainty as the Reason for Action: Last Opportunity and Future Climate Disaster,” *Global Justice: Theory Practice Rhetoric* 8,2 (2015): 86-103; Henry Shue, “Mitigation gambles: uncertainty, urgency and the last gamble possible,” *Philosophical Transactions of the Royal Society A* 356 (2018): 1-11; Eugen Pissarskoi, “The Controllability Precautionary Principle: Justification of a Climate Policy Goal Under Uncertainty,” in Ravi Kanbur, Henry Shue (eds.), *Climate Justice: Integrating Economics and Philosophy*. Oxford: Oxford University Press, 2019, 188-208.

<sup>6</sup> See, e.g., Klaus Steigleder, “Climate Risks, Climate Economics, and the Tasks of Climate-Related Risk Ethics,” *Journal of Human Rights* 15 (2016), 251-271.

The necessary means consist in bringing down the global emissions of greenhouse gases mainly by transforming the global fossil fuel-based energy systems to systems with net-zero emissions of carbon dioxide.

A CPP says, in one form or another, that under conditions of uncertainty a (realistically) possible catastrophe must not be risked if the catastrophe can be avoided at relatively low costs.<sup>7</sup> This seems plausible enough. And it seems to allow for the argument from catastrophe in climate ethics, which has several attractions.

First, one can point out or underscore that the risks of global warming are commonly underrated or not sufficiently taken into account and stress that global warming is one of the most important, if not the most important, problems of our times.<sup>8</sup>

Second, the uncertainties connected with the possible consequences of different levels of an increase in average global warming suggest a special and increasing urgency to take the required measures. Any further delay risks to bring us closer to catastrophes. The catastrophes can probably still be avoided, but one has to act now.<sup>9</sup> This sense of increasing urgency is connected with an obvious frustration and exasperation on the part of the climate ethicists. Thirty years since the Rio Conference in 1992 have passed mostly unused. Instead of at least reducing the global emissions of greenhouse gases, the emissions heavily increased.

Third, using a CPP in the argument from catastrophe seems to allow for a sort of welcome shortcut. For if the assumption is that the necessary means for limiting global warming involve relatively low costs, complex and complicated normative considerations can be avoided. It is perhaps one of the main attractions of the use of a precautionary principle that it seems to allow to avoid or quickly pass the muddy waters of risk ethics. It offers guidance for the, if you want, relatively riskless cases of avoiding catastrophes. If on the other hand not only climate change, but also the measures to fight global warming involve considerable costs and risks for different people and groups, then a differentiated evaluation and weighing of the involved risks cannot be avoided.<sup>10</sup>

This would be unwelcomed because risk ethics is still an underdeveloped field of normative ethics.<sup>11</sup> This is obvious for rights-based risk ethics, which has a problematic tendency to prohibit all risk impositions and therefore to be overly strict in its treatment of risks.<sup>12</sup> However, it should

<sup>7</sup> See the careful and insightful development of a CPP by Hartzell-Nichols, *A Climate of Risk* (fn.2), esp. chapters 3 and 5, who develops the framework set-up in Shue, “Deadly Delays” (fn.5).

<sup>8</sup> For an impressive argument that climate change constitutes the most important problem of our time, see Henry Shue, *Basic Rights: Subsistence, Affluence, and U.S. Foreign Policy*, 40th Anniversary Edition, Princeton: Princeton University Press, 2020, ch. 8 (“Basic Rights and Climate Change”). See also Henry Shue, *The Pivotal Generation: Why We Have a Moral Responsibility to Slow Climate Change Right Now*, Princeton: Princeton University Press, 2021.

<sup>9</sup> Shue, *The Pivotal Generation op. cit.*

<sup>10</sup> We will take *risk* as a generic term here signifying the possibility of harm, whether this can be measured by probabilities or not. Thus, risk comprises both “risk” in the technical sense where probability numbers can be given and “uncertainty” where this is not the case. Given that, except for certain special contexts, exact or reliable probability numbers cannot be given in many if not most cases, risk, as used here, will mainly involve uncertainty. - See Sunstein’s treatment of uncertainty in *Averting Catastrophe, op. cit.* (fn. 3), ch. 5. See also John Kay, Mervin King, *Radical Uncertainty: Decision-Making Beyond the Numbers*, New York, London: W.W. Norton, 2020.

<sup>11</sup> See Madeleine Hayenhjelm, Jonathan Wolff, “The Moral Problem of Risk Impositions: A Survey of the Literature,” *European Journal of Philosophy* 20 (2012). S1: E26-E51; Sven Ove Hansson, *The Ethics of Risk: Ethical Analysis in an Uncertain World*. London: Palgrave Macmillan, 2013; Sven Ove Hansson, “Risk,” in: *The Stanford Encyclopedia of Philosophy*, ed. Edward N. Zalta, Fall 2018 edition.

<sup>12</sup> For the difficulties of rights-based risk ethics and for an attempt to establish the basic criteria of rights-based risk ethics, see Klaus Steigleder, “Climate Risks, Climate Economics, and the Tasks of Climate-Related Risk Ethics,” *Journal of Human Rights* 15 (2016), 251-271; Klaus Steigleder, “On the Criteria of the Rightful Imposition of Otherwise Impermissible Risks,” *Ethical Perspectives* 25 (2018), 471-495.

be evident that utilitarian risk ethics for its part also faces serious problems.<sup>13</sup> For one can only work with expectation values if one has reliable probability numbers and if one can sensibly apply them to certain values. It must be clarified which possible damage would be so high that one should avoid discounting it by (low) probabilities and what principles should guide decisions under uncertainty. Finally, there are the perennial questions concerning the pros and cons of cumulative treatments of overall, intra- and intergenerational, welfare. Be that as it may, the criteria of the evaluation of risks will certainly be disputed.

A precautionary principle promises to offer a relatively uncomplicated and uncontroversial treatment of important risks. Alas, taking recourse to a precautionary principle reflects an underestimation of the challenges of combatting climate change and it involves a problematic simplification of the tasks of climate ethics. Climate ethics cannot avoid risk ethics. In order to show this, in the following, to simplify matters, we will concentrate on one exemplary case of the precautionary principle's standard use in climate ethics, namely Henry Shue's article *Mitigation Gamble*, and we will contrast the approach with a perplexing non-standard use, namely Eugen Pissarskoi's *Controllability Precautionary Principle*.<sup>14</sup>

## 2 Henry Shue's Standard Use of a Precautionary Principle in Climate Ethics

In his article "Mitigation gambles: uncertainty, urgency and the last gamble possible", Henry Shue tries to transpose John Rawls's justification of maximin as the required decision criterion in the original position to the justification of a precautionary principle. To do so was first proposed in 2006 in the already mentioned article by Stephen Gardiner.<sup>15</sup> Shue, in his earliest attempt to employ an argument in which one may recognize a precautionary principle did not follow Gardiner in this.<sup>16</sup> Possibly in view of Pissarskoi's argument that a Rawlsian Core Precautionary Principle (RCPP) has certain advantages over Shue's (earlier) version,<sup>17</sup> Shue modified his position in *Mitigation Gambles*.<sup>18</sup> Be that as it may, the decision situation Rawls is concerned with has some features which do not allow for its transposition to a complex problem like climate change and which do not allow for the use of a precautionary principle, or so we will argue.<sup>19</sup>

Let us start with a short look at Rawls's argument. The gist of Rawls's argument in *A Theory of Justice*<sup>20</sup> is to construe, with the help of a set of moral considerations each of which is presumed to be plausible and relatively weak, a decision situation in which a rational decision guarantees a

<sup>13</sup> For an overview of the „Difficulties of Moral Theories“ of dealing with risks see Hansson, *The Ethics of Risk*, *op. cit.* (fn. 11), ch.2. Hansson treats utilitarianism at pp. 23-28.

<sup>14</sup> Shue, "Mitigation Gambles," *op. cit.* (fn. 5); Pissarskoi, "The Controllability Precautionary Principle," *op. cit.* (fn. 5).

<sup>15</sup> Stephen M. Gardiner, "A Core Precautionary Principle," *Journal of Political Philosophy* 14,1 (2006): 33-60.

<sup>16</sup> Henry Shue, "Deadly Delays, Saving Opportunities: Creating a More Dangerous World?," in: Stephen M. Gardiner, Simon Caney, Dale Jamieson, Henry Shue (eds.), *Climate Ethics: Essential Readings*. New York: Oxford University Press, 2010, 146-162, reprinted in Henry Shue, *Climate Justice: Vulnerability and Protection*. Oxford: Oxford University Press, 2014, 263-286.

<sup>17</sup> Pissarskoi, *op. cit.* 192f.

<sup>18</sup> See his short recapitulation of Rawls's argument in Shue "Mitigation gambles", 2.

<sup>19</sup> To avoid misunderstanding, in the end the important point is not that Rawls's setting cannot be transposed but that the choice *exemplified* by the decision situation Rawls is concerned with, namely a choice between an option with potentially catastrophic outcomes and an option with relatively minor costs, cannot sensibly be applied to the options concerning climate change.

<sup>20</sup> John Rawls, *A Theory of Justice*, Cambridge, MA: Harvard University Press, 1971, revised edition 1999.

morally justified result, namely the choice of his principles constituting a just society over an alternative principle of utilitarianism. Rawls is well aware that maximin, which compares the potentially worst outcomes of the available alternatives and then chooses the option with the least bad outcome, is often, if not mostly, not a rational decision rule. However, he argues that the decision situation in question is such that the use of maximin is rational or rationally required here.<sup>21</sup> For the decision is (1.) between two well-defined alternatives A and B. (2.) In both cases one does not know what will be one's position and background conditions in the society. It is a situation of (almost) complete ignorance on whether one will end up being in the worst position or not. Therefore, it is not possible to say anything about the probabilities of such an outcome. (3.) Being in the worst position in alternative A would still be an acceptable situation for oneself, while being in the worst position in alternative B will be intolerable or catastrophic. (4.) One must stick to the possible consequences of one's decision. The decision is not revisable. Under such conditions, the only rational decision, Rawls claims, is to choose alternative A.

Shue tries to transpose these conditions to what he considers the basic decision of climate policy, namely the choice between a (highly) ambitious mitigation policy and an unambitious mitigation policy. A mitigation policy is (highly) ambitious if it attempts to achieve “net zero” or, as one might also say, almost completely decarbonized and greenhouse gas free global energy systems, agriculture, and land use sooner rather than later. A (highly) ambitious mitigation policy (A) attempts to avoid catastrophic climate change for future people. By contrast, a less ambitious or unambitious mitigation policy (B) risks catastrophic climate change, i.e. the end of civilization and humanity, for future people. These are the decision alternatives (1.) A and B.<sup>22</sup> (2.) According to the available knowledge there is the realistic possibility that the outcome of B may be catastrophic. At the same time, it is a situation of ignorance of how probable it is that delays of achieving “net zero” will lead to catastrophic outcomes. (3.) A can be realized in such a way that the consequences of choosing A are acceptable for the affected people. (4.) Choosing B risks irreversible consequences. “A gamble on less ambitious mitigation might be the last gamble possible.”<sup>23</sup> “It is unacceptable to avoid temporary disruption at the cost of forcing future generations to risk irretrievable slides into anarchy.”<sup>24</sup> Under such conditions a catastrophe must not be risked (RCPP) and, thus, it is morally imperative to choose A, i.e. a (highly) ambitious mitigation policy.<sup>25</sup>

Shue is, of course, aware that his argument transforms the situation of a rational decision into a situation of a moral decision and that the relevant conditions are partly modified by such a transformation.<sup>26</sup> Those affected by decision A (the people living today or the current generations) are here different from those affected by decision B (the future generations). However, he sees a parallel regarding the cogency of the rational requirements and moral requirements. Under relevant conditions of uncertainty or ignorance it is as *morally* compelling not to risk catastrophic consequences for future people if this can be avoided by resolute measures with acceptable costs for the people living today as it is *rationally* compelling to avoid catastrophic consequences for oneself if

<sup>21</sup> Ibid. 132-136, see esp. 134f. See also the more extensive discussion in John Rawls, *Justice as Fairness: A Restatement*, ed. Erin Kelly, Cambridge, MA: Harvard University Press, 2001, 96-103.

<sup>22</sup> Shue is aware that in the context of mitigation the choices A and B cannot be “two fixed alternatives”. “Mitigation involves degrees (...).” See Shue, “Mitigation Gambles”, 3.

<sup>23</sup> Ibid. 6

<sup>24</sup> Ibid.

<sup>25</sup> Ibid. 3 together with the subchapter on “Seriousness”, pp. 4-6.

<sup>26</sup> Ibid. p. 3.



an alternative is available the worst consequences of which are acceptable. Shue argues that not choosing ambitious mitigation will amount to exploiting future generations and to wrongfully instrumentalizing future people for illegitimate gains of those living today.<sup>27</sup>

However, the most important difference between the choice Rawls is concerned with and the fundamental choice of current climate policy is that Rawls's decision situation is part of a thought experiment and climate policy pertains to real life conditions. In the thought experiment, while the presumed background conditions must be plausible, the decisive aspects of the decision situation can be well-defined. Thus, there is a well-defined (representative) decision-maker or a group of decision makers facing the exactly same decision situation (which is why the group can in principle be reduced to one decision maker). There is a well-defined decision alternative and the given uncertainty or ignorance is explicitly constructed, which is therefore a defining characteristic of the decision situation.

None of this holds in real life situations in general and for the intricate decision problems concerning adequate climate policies in particular. Regarding climate change mitigation, first, there is no well-defined subject of decision making. The people living today, the current generations, are a multitude in many different situations and many of them live in dire straits. The "rich countries" and "we", the people living in the rich countries are more limited in number and less diverse, but still do not form a single collective actor. Therefore, "we" are faced with many different decision problems. Consider only the problems of the elected representatives of a rich democratic state who may face massive opposition against certain climate policies and who face decisive risks that certain strategies will turn out to be counterproductive because they will bring a different government into power which will not combat climate change at all. Or consider the problems a nation state is faced with, namely that its ambitious climate policies will be ineffective because they will not lead to the necessary global changes or will have the effect that polluting industries will shift their production to other countries with less ambitious climate policies.<sup>28</sup>

Second, the decision alternatives concerning different climate policies are ill-defined. What would and what should an ambitious mitigation policy amount to? The aim is to achieve "net zero"-emissions on a global level in short time. This includes functioning decarbonized global energy systems and mostly emission-free global agriculture. Let us focus here only on functioning decarbonized global energy systems. Our claim is that contrary to what many climate ethicists seem to assume,<sup>29</sup> one does neither know in sufficient detail what a functioning decarbonized global energy system would look like<sup>30</sup> nor how to achieve it in due time. We will confine ourselves here to only a few points.

The decarbonization needs are not confined to the current electricity production but must comprise all aspects of the energy system, i.e. also traffic, including heavy haulage, shipping and aviation,

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<sup>27</sup> Ibid.

<sup>28</sup> For the importance of the effectivity of climate policies see the dissertation by Friederike Henke, *Die Rolle Deutschlands im Kontext der Energiewende. Eine ethische Untersuchung normativer Zielkonflikte unter besonderer Berücksichtigung des Braunkohleausstiegs* (Germany's Role in the Energy Transition: An Ethical Examination of Normative Conflicts of Goals with Particular Focus on Lignite Phase-Out), Wiesbaden: Springer VS, 2022.

<sup>29</sup> Cf., e.g., Shue, *The Pivotal Generation* (fn.8), 61-76.

<sup>30</sup> Concerning existing proposals, one should ask whether they fulfill (or whether one would bet that they fulfill) all of the three requirements ("functioning", "truly decarbonized", "global"). It is probably not exaggerated that most of the proposals do not fulfill any of the requirements.

heating and cooling, and industrial production and processes.<sup>31</sup> One must realize how ingrained fossil fuels are into the functioning of modern societies and modern economies (regarding the extent, the amount and the varieties of uses). The production of materials like ammonia, plastics, steel and cement currently contributes 31% of the annual greenhouse gas emissions, more than the emissions from electricity production (27%).<sup>32</sup> As Vaclav Smil points out ammonia, plastics, steel and cement constitute the material “pillars of modern civilization”.<sup>33</sup> Artificial fertilizers based on ammonia, currently produced with the help of natural gas,<sup>34</sup> make it possible to feed large parts of the world (more than 7 billion people).<sup>35</sup> The amounts of steel and cement produced are simply enormous. “Annual production of iron ore – led by Australia, Brazil, and China – is now about 2.5 billion tons, (...).”<sup>36</sup> “(...) in just two years – 2018 and 2019 – China produced nearly as much cement (about 4.4 billion tons) as did the United States during the entire 20th century (4.56 billion tons).”<sup>37</sup> There are huge energy needs to produce steel and cement. Besides the production of cement (the very decomposition reaction which leads to the conversion of calcium carbonate into calcium oxide) is itself connected with the production of carbon dioxide ( $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$ ). Plastics, which are produced out of and with the energy of fossil fuels, are ubiquitous. The cumulative production of about “50 different kinds of plastics” amounted to “about 370 million tons by 2019”.<sup>38</sup> Think only of the importance of plastics during the Corona Pandemics as it is used, e.g., in the diverse protective materials, the syringes for the vaccinations, and the different tubes needed in intensive care.

We point to this to convey an impression of how enormous the needed energy transition will be, how difficult and protracted it will be to supplant the use of fossil fuels on almost any level of modern society<sup>39</sup> – and how many risks will be involved here. A multitude of technical solutions is needed which is to a considerable extent not yet existent or available. For many proposed solutions, e.g. biofuels, synthetic fuels, carbon capture and storage, battery driven electric cars, it is not clear how decarbonized they really are. Thus, there are real possibilities to get things wrong here, to bring one’s economy down and to impoverish people and to endanger existing energy security.

A further challenge constitutes the problem with which fuels and engines one must plan today in view of the expected needs. Take aviation as an example. With what estimation of the future extent of civil aviation should and must one plan today? It is far from clear whether one should plan with the pre-corona growth rates (3.9 percent/year),<sup>40</sup> i.e. with a multiplication of pre-corona civil aviation in 2050, or with even more growth accounting for economic development, or with

<sup>31</sup> This is rightly stressed e.g. by Bill Gates, *How to Avoid a Climate Disaster: The Solutions We Have and the Breakthroughs We Need*, London: Allan Lane, 2021.

<sup>32</sup> Gates, *How to Avoid a Climate Disaster*, 55.

<sup>33</sup> Vaclav Smil, *How the World Really Works: A Scientist’s Guide to Our Past, Present and Future*, London: Viking, 2022, Ch. 3 (“Understanding Our Material World: The Four Pillars of Modern Civilization”).

<sup>34</sup> The hydrogen is mostly taken from natural gas.

<sup>35</sup> While in 1950 two thirds of a population of 2,5 billion people were undernourished, in 2019 “only” 8.9% of 7.7 billion people were undernourished. As Smil points out this is due to many further direct and indirect uses of fossil fuels in agriculture besides the production and use of artificial fertilizers. Smil pointedly states that a large part of the current population is “eating fossil fuels”. See Smil, *How the World Really Works*, Ch. 2 (“Understanding Food Production: Eating Fossil Fuels”), see also Ch. 3, 79-84 (“Ammonia, the gas that feeds the world”).

<sup>36</sup> Smil, *How the World Really Works*, 92.

<sup>37</sup> Smil, *How the World Really Works*, 98.

<sup>38</sup> Smil, *How the World Really Works*, 86 and 87.

<sup>39</sup> Smil, *Energy transitions: Global and National Perspectives*, Santa Barbara: Praeger, 2017.

<sup>40</sup> ATAG, Air Transportation Action Group, *Aviation: Benefits Beyond Borders*, Geneva 2018.

less growth in view of a potential moral need to restrict touristic flights.<sup>41</sup> Even if the moral need of such a restriction can be shown, should one plan on the assumption that what is morally necessary will indeed be implemented or followed in time? Dependent on the projected extent of future aviation one must decide today which decarbonization strategies are realistic or to be pursued. For instance, if one expects a multiplication of the pre-corona civil air flights in 2050, one should not plan with using biofuels even if they are derived from marine microalgae. For there will probably not be enough space for the ponds needed to grow the required quantity of algae.

When reading Shue one gets the impression that the (continued) use of fossil fuels is simply bad. The fuels are primitive, lead to greenhouse gas emissions and pollution with particulate matter which kills millions each year. Agriculture is captured by petty agribusiness and destroys the environment. Industrialization seems to have been mostly harmful.<sup>42</sup> We do not want to ignore or deny the many downsides of industrialization and fossil fuel driven economic development. However, one must also not ignore the many upsides like ending regular starvation crises for many people, the creation of wealth which contributes to the protection of the basic rights of people and the creation of conditions which allow people to lead more healthy, longer, and fulfilling lives. The challenge is to overcome the downside without losing the many and often vital achievements connected with the upside.

Shue is well aware – and through his writing has importantly contributed to the general understanding – that climate policies can harm the poor, for instance by making the only energy sources available to them more and prohibitively expensive.<sup>43</sup> And he rightly urges that fighting global warming must not impede economic development and overcoming energy poverty. However, he sees no real conflict between a viable decarbonization strategy and viable economic development. He seems to assume that if only “we” want, “we” can achieve decarbonization with economic development and without energy poverty.<sup>44</sup>

Contrary to these assumptions we fear that decarbonization with economic development will be even more difficult to achieve than the decarbonization of the existing energy system alone. There is a real conflict between climate change mitigation and economic development. Thus, one must weigh the extent of limiting global warming in order to guard against the looming climate

<sup>41</sup> Cf. Philip Cafaro, “Beyond business as usual: alternative wedges to avoid catastrophic climate change and create sustainable societies,” in: Denis G. Arnold (ed), *The Ethics of Global Climate Change*, New York: Cambridge University Press, 2011, 192-215, 202f.; for a more detailed discussion see Anna Luisa Lippold, *Climate Change and Individual Moral Duties: A Plea for the Promotion of the Collective Solution*. Münster: Mentis, 2020, 115-126.

<sup>42</sup> Shue, „Mitigation gamble“, 2: “(...) and leave behind the era of fossil fuels, the extraction and transport of which pollutes land, water and air, and the combustion of which pollutes the air in multiple ways and, specifically through the release of CO<sub>2</sub>, undermines the climate to which humans and other living things have adapted.” Shue, *The Pivotal Generation*: “It is urgent for humans to get a grip on what we in aggregate are doing to the planet on which we live by blindly continuing the combustion of fossil fuels (and the destruction of natural ecosystems by industrial agribusiness) (...)” (p. 6) “While the current climate change is anthropogenic – driven by society’s failure to mobilize against the primitive and dirty energy sources of coal, oil, and gas – (...)” (p. 24) “No nation has shouldered anywhere near the full consequences thereby created for human health and environmental stability across the world generally. Those problems include lethal air pollution, especially the particulate matter from burning coal that present from the beginning of the Industrial Revolution in the grimy pioneering Welsh and English factory towns; ocean, river, and groundwater pollution from perennial oil spills; perpetual methane leaks from extraction and transport of gas; and worst of all, CO<sub>2</sub> emissions (...)” (p. 32) “This contention is grounded in the unilateral national causal contributions to global harms and the other global costs from the processes of national industrialization, including the industrialization of agriculture by agribusinesses.” (p. 33)

<sup>43</sup> See, e.g., Shue, *Climate Justice* (fn.5), see esp. 396-401 (“IV. The Other Half of the Story: Not Exacerbating Poverty”).

<sup>44</sup> Shue, *The Pivotal Generation* (fn.8), 63: “It simply has to be made possible by acts of determination and will that unseat incumbent politicians blocking action.”



catastrophe and the catastrophes of persisting energy poverty and lack of economic development. This is a further reason why the CPP is not applicable to fighting climate change. We cannot avoid weighing the (potentially catastrophic) risks.

Shue makes certain assumptions which are widespread among climate ethicists. He assumes that there is a huge potential of massive reductions of the carbon dioxide emissions of the current high emitters which can be achieved in relatively short time and therefore must be achieved in short time. A problem is that this is neither quantified concerning the amount of the emissions saved and the time needed to achieve this. If the reductions are to be achieved by emission caps or carbon taxation,<sup>45</sup> the question arises how encompassing and effective such regimes will be and how quickly they will be established. Besides, Shue seems to neglect the question of by how much the developing countries may increase their carbon dioxide emissions if the rich countries, either by not fulfilling their obligations or by not being able to do what they are supposed to do or both, do not reduce their emissions in the required extent and time.

More importantly, like many climate ethicists, Shue seems to be convinced that at least in principle the means that poor countries need so they can develop without using fossil fuels are already available. They can leap-frog directly to the renewables, mostly wind and solar. It is the obligation of the rich countries to help them with the necessary technology transfer.<sup>46</sup> This presupposes the problematic (and we would say false) claim that the means to decarbonize to the required extent are in principle available. According to this claim, the real problem is that the means are not produced, employed and distributed as needed.

Compared to fossil fuels the renewables like wind and photovoltaic have the huge disadvantage of being riddled with the problems of intermittency, volatility and low energy and power densities. While the problem of intermittency is at least theoretically acknowledged, it is far from solved. The problems and connected risks of changing a grid of stable input sources to volatile inputs are possibly underestimated, but the problems connected with low energy densities and especially with low power densities seem to be largely ignored in climate politics and climate ethics.

Energy density means the energy content of an energy source per mass (J/kg) or volume (J/m<sup>3</sup>), while power density means power (J/s or W) per space, i.e. W/m<sup>2</sup>.<sup>47</sup> Due to their low energy densities wind and photovoltaics have huge material and space needs.<sup>48</sup> These translate into huge organizational requirements concerning their large-scale employment. While it is relatively easy to fulfill the electricity needs of a megacity in a developing country with coal-fired power plants, it would constitute a considerable challenge, to say the least, to do the same with wind and photovoltaics.<sup>49</sup> It was not least the energy density and power density of fossil fuels which made economic development and industrialization possible. Economic development (on modern scales) driven by

<sup>45</sup> Cf. Shue, "Mitigation Gamble", 8f. and Shue, *The Pivotal Generation*, 64-66.

<sup>46</sup> See Shue, "Mitigation Gambles", 8-10 and Shue, *The Pivotal Generation*, esp. ch. 3.

<sup>47</sup> On the concept and importance of power density, see Vaclav Smil, *Power Density: A Key to Understanding Energy Sources and Uses*, Cambridge/Mass.: MIT Press, 2015; see also Gates, *How to avoid a Climate Disaster*, op. cit. (fn. 31), 58f.

<sup>48</sup> Gates (ibid., p. 59) notes that the power generated per square meter (W/m<sup>2</sup>) is 500-10,000 for fossil fuels, 5-20 for solar and 1-2 for wind.

<sup>49</sup> There is often considerable potential in the build-up and use of hydroelectricity in poor countries but this is often fiercely opposed and successfully prevented or delayed by environmental groups or activists based in rich countries. See John Briscoe, Invited opinion interview: "Two decades at the center of water policy" *Water Policy* 13 (2011), 147-160; Michael Shellenberger, *Apocalypse Never: Why Environmental Alarmism Hurts Us All*. New York: Harper, 2020, 226-229.

renewable energy sources is unproven and possibly not realistic.<sup>50</sup> Corresponding plans will involve huge risks for the affected countries.

In this context it is of the utmost importance to realistically estimate the future energy needs of poor countries. It is criticized, with good reason to our estimation, that the projections of renewables-only scenarios of decarbonized global energy systems count on meager economic development or unrealistic reductions in global energy intensities.<sup>51</sup>

There seems to be a problematic tendency in climate ethics to assume that the rich countries can massively contribute to limiting global warming by transferring necessary technologies and resources to the poor countries. Leaving aside the already mentioned fact that there is still a massive lack in the development of the technologies needed to successfully fight climate change, the envisaged transfer strategies contrast with the experience of largely ineffective and often, if not mostly, outright counterproductive foreign development politics and development aid.<sup>52</sup> While there is no need to deny the existence of occasional examples of successful foreign aid apart from emergency relief<sup>53</sup> nothing justifies any expectation that the rich countries will suddenly be able to support the poor countries effectively on the grand scale envisaged by many climate ethicists and some circles of climate politics. If the problem of global poverty could be solved by money transfers the problem would probably have been solved already.

Thus, there are potentially relevant normative conflicts of goals connected with ambitious mitigation. The simple alternative between a path with acceptable consequences for all affected and a potentially catastrophic path for future generations does not hold. As already argued, there is no such thing as a clearly defined path of combating climate change, but many urgent, but unresolved tasks and connected policies involving many risks for many people. Especially the billions of poor will be threatened in their basic rights if their energy needs are underestimated and decarbonization strategies are pursued which do not allow for sufficient economic development.

Now a problem of the CPP or RCPP is that the catastrophe the principle is focusing on, in our case continuing greenhouse gas induced global warming, is characterized as so pressing that almost no delay is permitted. However, such a delay may be exactly required in order to avoid competitive possible catastrophes which the proponent of a precautionary principle denies.

In this connection the extent of the involved ignorance becomes relevant. In the Rawlsian setting the extent of the relevant ignorance is expressly construed. By contrast, in real life situations the extent of the existing ignorance is an open question, has to be determined, and is not necessarily fixed. Thus, it is not evident that the picture painted by Shue is correct or should form the basis

<sup>50</sup> See, e.g., Arthur A. van Benthem, “Energy Leapfrogging,” *Journal of the Association of Environmental and Resource Economists* 2,1 (2015), 93-132; Shellenberger, *Apocalypse Never*, *op. cit.*, 226-229 (to whom we owe the reference to van Benthem’s article); Smil, *How the World Really Works*, *op. cit.* (fn. 33).

<sup>51</sup> See, e.g. Peter J. Loftus; Armond M. Cohen; Jane C. S. Long; Jesse D. Jenkins, “A critical review of global decarbonization scenarios: what do they tell us about feasibility?” *WIREs Climate Change* 6 (2015): 93-112; Ben P. Heard, Barry W. Brook, Tom M.L. Wigley, Corey J.A. Bradshaw, “Burden of proof: A comprehensive review of the feasibility of 100% renewable-electricity systems,” *Renewable and Sustainable Energy Reviews* 76 (2017): 1122-1133; Shellenberger, *Apocalypse Never* (fn.49), 222-249, 274-279; Smil, *How the World Really Works*, *op. cit.* (fn.23).

<sup>52</sup> See e.g. William Easterly, *The Elusive Quest for Growth: Economists’ Adventures and Misadventures in the Tropics*, Cambridge, MA: MIT Press, 2002; William Easterly, *The White Man’s Burden: Why the West’s Efforts to Aid the Rest Have Done So Much Ill and So Little Good*, New York: Penguin Press, 2006; Dambisa Moyo, *Dead Aid: Why Aid Makes Things Worse and How There is Another Way for Africa*, London: Penguin Books, 2009; Daron Acemoglu, James A. Robinson, *Why Nations Fail: The Origins of Power, Prosperity and Poverty*, London: Profile Books, 2012. For an optimistic view see Jeffrey D. Sachs, *The End of Poverty: Economic Possibilities for Our Time*, New York: Penguin Books, 2005.

<sup>53</sup> See, e.g., Abhijit V. Banerjee, Esther Duflo, *Poor Economics. A Radical Rethinking of the Way to Fight Global Poverty*, New York: Public Affairs, 2011.

for climate politics, namely that truly catastrophic events can be triggered at any point of global warming, that any increase in global warming makes the triggering of the events more likely and that there is complete ignorance concerning the probabilities of the triggering of the events. Therefore, any (considerable) delay of achieving “net zero” risks the end of human civilization or the end of humanity.

It is one thing to be ignorant about the exact degree of global warming that will trigger a certain event (or the onset of an irreversible development). It is quite another thing to have justified assumptions about whether certain events will be, say, improbable or not very probable under certain conditions. This is so because one can have a basic understanding of what conditions must likely be fulfilled for triggering certain far-reaching events and of how far the conditions are already fulfilled. Whether a possible catastrophic event of a relatively low probability may be risked is an open question. The answer will, *inter alia*, depend on which other possible negative events the catastrophic events must be traded off against and on how catastrophic the event will be. If the melting of the East Antarctic Ice Sheet is a matter of several hundreds of years, there will possibly remain time to react on the slowly unfolding consequences, especially if economic development was the reason to incur the risk and successful development led to a massive increase in the adaptive competences of the affected people. If a sea level increase of several meters during this century is a realistic possibility this might be a different matter.<sup>54</sup> Our claim is that intricate risk ethical considerations and tasks are involved here which must supplant the broad brush of a catastrophic precautionary principle.

Besides, one must take seriously that no single actor or unified group of actors is involved who could be directly normatively addressed. Instead, one must reckon with a multitude of actors and groups of actors who are confronted with different kinds of risk. They are also dealing with different justified right claims and their possible violations (e.g., secure energy supply and economic development by the use of fossil fuels or limiting the consequences of global warming by decarbonized energy systems). Take for example what one may call the mitigation-adaptation-dilemma of poor countries. From the viewpoint of the government of a poor country which is interested in the well-being of its people and not in enriching itself or building up its power base it is far from certain how extensive, effective, and speedy the mitigation measures taken by rich countries will be and with what amount of global warming the poor country will have to deal. In view of this, the perhaps safest adaptation strategy will be extensive economic development in the time-proven ways, i.e. increases in agricultural productivity, built-up of basic infrastructure and industrialization.<sup>55</sup> The simplest and probably cheapest way to fulfill the corresponding energy needs will be the use of (perhaps domestic) coal. From the perspective of an individual poor country such a perspective is not only rational but also, in view of the needs of the people of the country, a responsible one. However, pursued as a general strategy it would have catastrophic consequences. Thus, one must be aware that it is implausible that there could be an effective climate policy which does not have room for ample economic development. Possibly such development will have the justified consequence of acquiescing in a higher increase of the average global temperature. Shue

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<sup>54</sup> For the recent re-evaluation of the so-called “tipping points”, see Seaver Wang, “There is No Climate Tipping Point: How the ‘tipping points’ metaphor infiltrated environmental discussions – and how it set us back,” *Breakthrough Journal* No. 19 (2023); Seaver Wang, Adrianna Foster, Elizabeth A. Lenz et al., “Mechanisms and Impacts on Earth System Tipping Elements,” *Review of Geophysics* 63 (2023) e2021RG000757.

<sup>55</sup> We take this from John Briscoe, see fn. 49.

calls the “goal of not exceeding a 2°C rise” “unambitious”.<sup>56</sup> In our opinion, it is highly ambitious, probably completely unrealistic, and possibly even normatively dubious.<sup>57</sup>

### 3 Eugen Pissarskoi’s Non-Standard Use of a Precautionary Principle

Eugen Pissarskoi criticizes the presumption that in the case of climate change the possibly benign and catastrophic consequences are clearly distributed between two decision alternatives.<sup>58</sup> Instead the choice is between options each of which may have catastrophic consequences. For even limiting emissions to an increase of greenhouse gases in the atmosphere of 560 CO<sub>2e</sub> ppm, often connected with the goal of limiting the increase of average global temperature to below 2°C, risks an increase of average global temperature of 11°C according to one climate model assuming a high sensitivity of the climate to greenhouse gases and a correspondingly high radiative forcing. However, the radiative forcing induced by 560 CO<sub>2e</sub> ppm could also turn out to be low, leading only to a warming of 1°C. It is a situation of ignorance (195-197). The only way of avoiding a climate catastrophe is, according to Pissarskoi, to aim at the preindustrial level of greenhouse gases or carbon dioxide in the atmosphere of 280 ppm (197-199). For this is a level of greenhouse gases of which we know that it does not have catastrophic consequences. To achieve this goal almost completely greenhouse gas emission free global energy systems and agriculture have to be achieved quickly and then the carbon dioxide content of the atmosphere has to be aggressively reduced by afforestation, the use of bioenergy with emission capture and the massive application of negative emission technologies (NETs).

However, the downside of these strategies, Pissarskoi points out, is that these strategies would have massive space and water requirements which would conflict with the nutrition needs of a great part of mankind. Therefore, pursuing these strategies in order to avert a climate catastrophe and the connected threats to civilization and to the persistence of humankind may itself lead to catastrophic social conflicts and, with the use of nuclear weapons, to an end of civilization and humankind. On the other hand, Pissarskoi seems to assume there is also the possibility that the strategy will work out well and lead to post-growth societies of people living sustainable lives characterized by less material wealth and, instead, a focus on more fulfilling values (198f.).

Thus, contrary to the standard use of the precautionary principle the choice is (in the case of climate change) not between an acceptable option (for those living today) and a possibly catastrophic option (affecting those living in the future) but between two options which each may have either catastrophic or (relatively) benign consequences for future people. In view of the possible consequences, it is therefore not clear which option is the right option to choose. In such a case, Pissarskoi argues, procedural considerations should turn the balance (200-204). Concerning the potential natural catastrophe (which will trigger a social catastrophe) and the potential social catastrophe as a consequence of the measures to prevent the natural catastrophe, Pissarskoi assumes that different possibilities of governance and control are connected with the two options. While the unfolding of the causal chains of natural events from a certain point on cannot be

<sup>56</sup> Shue, *The Pivotal Generation* (fn. 8), 63.

<sup>57</sup> We do not want to conceal that we have changed our own former position here. For an evaluation of the 2°C goal quite similar to that of Henry Shue, see Steigleder, “Climate Risks” (fn. 6). The critique developed in this article represents in no small part a critique of our own previous approach to climate ethics.

<sup>58</sup> Eugen Pissarskoi, “The Controllability Precautionary Principle: Justification of a Climate Policy Goal Under Uncertainty” (fn. 5). Page references in the text refer to this paper.

changed by human intervention, social events and developments do not exclude the effectiveness of influencing measures. In view of these possibilities of averting the social catastrophe, the 280 ppm-option is to be preferred to the 560 ppm strategy. The normative considerations guiding such a choice are based on what Pissarskoi calls the “controllability precautionary principle”.

The argument has many troubling features. They highlight the dangers of an exclusive focus on the prevention of certain presumed catastrophes, which is typical for arguments based on a precautionary principle. The problem is not with the demand to prevent or avert a possible catastrophe but with the presumed correctness of a diagnosis which triggers such a demand by both singling out a certain possible catastrophe that must not be risked and an inevitable path for the prevention of the catastrophe.

The unilateral focus on a certain catastrophe, here the potential runaway global warming in consequence of a possible high sensitivity of the climate to greenhouse gases, is mainly the result of the following factors, which in part reinforce and in part underscore the problems encountered with the standard use of a precautionary principle. First, Pissarskoi relaxes the requirements as to when certain developments must be considered relevantly possible so that serious consideration of preventive action is demanded. While Shue tries to make sure that he works with realistic or “serious” possibilities in order to avoid the notorious problem of the application of precautionary principles that merely imagined catastrophes trigger far reaching actions, Pissarskoi allows for less stringent conditions, namely for both “verified possibilities” and possibilities neither verified nor falsified. However, even his use of “verified possibilities” seems to be a bit sloppy. His whole argument is based on a model which assumes high climate sensitivity. Pissarskoi claims that the catastrophic possibility of extreme global warming already connected with a relatively low percentage of greenhouse gases in the atmosphere is “verified by climatic modelling” (196). This misunderstands the status of models in general and of an outlier in modelling in particular.

Second, this problematic aspect of the argument is reinforced by declaring that the relevantly possible development of extreme global warming is a matter of complete uncertainty or ignorance. Thus, while one is requested to hold the extreme global warming connected with 560 ppm to be relevantly possible one is bereft of any means to weigh the relevant possibility as more or less likely in comparison to other developments.

Third, this leads to a unilateral focus on this one potential catastrophe and a presumed urgency of preventive measures. While Pissarskoi is aware of the potential catastrophic consequences of his proposed (extreme) measures to avert the catastrophe, he cannot allow for weighing the goal of the prevention of the catastrophe he is occupied with against other normatively relevant goals (like economic development, overcoming energy poverty).

Fourth, like many climate ethicists, Pissarskoi ignores the complexities and blessings of an economic system based on energy dense and power dense fossil fuels, like the triumph over regular famines and widespread prosperity. Therefore, he does not take into account the huge difficulties, the many risks and the potential economic and political repercussions with which the required deep transformations of the global energy systems will confront policy makers long before the concerted actions of massively decarbonizing the atmosphere could start.

Fifth, like Shue and other climate ethicists, Pissarskoi seems to assume something like a single (collective) actor who could execute what the climate ethicist considers necessary. Thus, achieving the required actions in time is mainly considered to be a matter of whether or not the actor is willing to act and not as a problem of the coordination of a multitude of actors with competing



interests (which are at least partly legitimate). Consequently, the prescriptions are conceived independently from the chances and possible problems of their realization. This is especially unfortunate in the face of a problem like climate change which must be resolved in a relatively limited time frame.

Sixth, one may doubt whether a return to 280 ppm constitutes a realistic aim at all. Pissarskoi hints at the enormous problems which would already be connected with a much smaller reduction aim. It is far from clear whether achieving such a goal would be technologically feasible. Politically, it certainly would not. Besides, Pissarskoi is relatively vague on the catastrophic potential of the measure. Additionally, the assumed possible benign outcome with post-growth societies living sustainably and probably in harmony with nature and with each other is more than vague. Presumably, Pissarskoi is expecting a much-reduced total population on earth. If so, how would this reduction have come about? One should be aware that one does neither sufficiently know how post-growth societies would or could function and how to make sure that they do not simply constitute a return to the misery of pre-growth societies nor how to bring about the transformation of existing economies into post-growth economies. So, coupling the aim of massively decarbonizing the atmosphere with a reinvention of the workings of the economy will further diminish the chances of realization. Therefore, one may doubt that the 280 ppm-strategy could have a benign outcome. Consequently, nothing seems to recommend it in the first place.

Seventh, and finally, the presumption of the better controllability of social in comparison to natural processes seems to be too sweeping. Maybe, one is able to react more easily and effectively to unexpectedly quick increases in global temperatures (say by measures of solar radiation management) than to the unfolding of widespread social conflicts. Besides, in comparison to the technical efforts needed to achieve a return to 280 ppm in a relevant time-frame excessive measures of adaptation which are rightfully considered to be completely unrealistic today might appear to be feasible.

## 4 The Need for a Reorientation of Climate Ethics

Our critique would be completely misunderstood if it were taken as a denial of the importance of combating climate change or of limiting global warming. What we are arguing instead is that fulfilling this task is much more complicated than is usually assumed in climate ethics and some quarters of climate politics. The recommended measures have the potential of bringing functioning economies down, of destroying existing energy security or preventing its achievement, of undermining the food-production on which billions of people are dependent and to prevent serious economic development and overcoming grave energy poverty. Meanwhile, they might fail to contribute to the limitation of global warming. To put it bluntly: The well-meant measures to fight climate change in order to prevent a catastrophe may produce or boost other catastrophes and may be ineffective in the prevention of the catastrophe they are concerned with. This is why a catastrophic precautionary principle is ill-suited for climate ethics. The choice is not between preventing a catastrophe or not. Instead, there is the challenge to effectively prevent one catastrophe without producing others. This requires the appreciation, evaluation and weighing of the risks of potential measures. The development and use of substantive risk ethics cannot be obviated with recourse to a precautionary principle.

As already mentioned, there is a growing frustration that the 30 years since the Rio Conference went by unused. This has led to an increase in moralizing and moral condemnation. Stephen Gardiner, e.g., holds that “we may end up being remembered not just as a profligate generation, but as ‘scum of the earth,’ the generation that stood by as the world burned.”<sup>59</sup> Henry Shue speaks of “our feckless leaders”<sup>60</sup>, of “the desultory, almost leisurely approach of the world’s national states to climate change”<sup>61</sup>, and implores the lack of “national political leadership with the integrity and courage to tackle the energy consumption of its wealthiest citizens”.<sup>62</sup> However, how should the politicians know what *particular* policies to pursue? What *specifically* should the citizens demand from their politicians in fulfillment of their “second order-responsibilities”<sup>63</sup> or “promotional duties”?<sup>64</sup> What are the right and effective policies to pursue?

A precautionary principle – in standard or non-standard use – has its merits in providing powerful reasons that make clear the moral necessity of taking action against the looming climate catastrophe. Its shortcomings, as we pointed out, follow from the unsaid premise that the measures for countering that catastrophe (as well as the agents that could enforce and implement such measures) are already at hand. By this assumption specific evaluations about risks and chances of certain measures and about the politically feasible, technically efficient, ethically acceptable and justified ways of dealing with the conflicting goals of energy security, economic prosperity and decarbonization in a global perspective are neglected. The focus on the one catastrophe as suggested by the (Catastrophic) Precautionary Principle, is, while helpful for providing reasons for moral obligations in the face of global warming, a distraction from the many other possible catastrophes which could occur while trying to prevent the more immediate “big” catastrophe at the horizon.

Climate ethics so far has focused mainly on the climate sceptic, the uninterested bystander or the defender of business as usual. Against this backdrop it has forcefully shown that climate change must be taken seriously and that it must be fought ambitiously and without delay. This argument was developed with the help of important general normative clarifications concerning climate justice and the connected questions of who must bear the main responsibilities (the polluters, the beneficiaries, the able?) and important clarifications concerning the moral status of future generations. However, climate ethics must now become much more specific on what is to be done. It must get involved in the many difficult normative questions of how to deal with conflicts of goals and the normative problems involved in the decarbonization of different sectors and in the different strategies to be pursued to achieve deep decarbonization. For this, we climate ethicists must specialize and become much more knowledgeable in, say, synthetic fuels, biofuels, carbon

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<sup>59</sup> Stephen M. Gardiner, “In Defense of Climate Ethics,” in: Stephen M. Gardiner; David A. Weisbach, *Debating Climate Ethics*, New York: Oxford University Press, 2016, 3-133.

<sup>60</sup> Henry Shue, “Face Reality? After You! – A Call for Leadership on Climate Change,” *Ethics and International Affairs* 25, 1 (2011), 17-26, 18.

<sup>61</sup> Henry Shue, “Human rights, climate change, and the trillionth ton,” in: Denis G. Arnold (ed.), *The Ethics of Global Climate Change*, New York: Cambridge University Press, 2011, 292-314, 292.

<sup>62</sup> Henry Sue, “Mitigation gambles“ (fn.5), 9.

<sup>63</sup> Simon Caney, “Two Kinds of Climate Justice: Avoiding Harm and Sharing Burdens,” *Journal of Political Philosophy* 22,2 (2014), 125-149, 136-141.

<sup>64</sup> Elizabeth Cripps, *Climate Change and the Moral Agent: Individual Duties in an Interdependent World*, Oxford: Oxford University Press, 2013. For an attempt to improve and further develop Cripps’s approach, see Anna Luisa Lippold, *Climate Change and Individual Moral Duties* (fn. 41).

capture and storage, aviation engines, nuclear energy, cement. We must start to work in interdisciplinary ways with the many involved experts in the different fields who work on the side of possible solutions (and not only on the side of the diagnosis of climate change and the involved climate impacts). The hope is that for this we will meet and can work together with enough “informal ethicists”, i.e., scientists, engineers, economists, political scientists who are not formally trained in ethics but reflect normatively on what they do or on what must be done. The kind of specific and solution-oriented climate ethics that we need now will involve many additional methodological and normative tasks which we must leave for further papers.

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