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# Climate Change, Policy, and Justice

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## Abstract

Climate change and climate change policy raise important issues of intergenerational and international justice. Intergenerational justice requires that CO<sub>2</sub> emissions be halted by the middle of this century or shortly thereafter. But since human development requires energy, the elimination of emissions raises important questions of international justice. Responding adequately to climate change requires international cooperation in order to affect a rapid transition to renewable energy production and consumption and to safeguard conditions in which continued progress in human development can be made.

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## 1 Introduction

The manifold damages of climate change have been the unintended consequences of a period of unparalleled growth sparked by the Industrial Revolution. Since the beginning of the Industrial Revolution the growth of the global economy, measured in terms of the growth of all economic transactions, has been enormous. Thomas Piketty reports that global economic growth per capita from 1700 to 2012 was on average 0.8% annually, which amounts to more than a 1000% increase over the entire period. “Average global per capita income is currently around 760 €s per month; in 1700 it was less than 70...” (Piketty 2014, p. 86). This has brought many gains. Greater wealth has been accompanied by increased longevity.

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B. Blätzel-Mink et al. (Hrsg.), *Nachhaltige Entwicklung in einer Gesellschaft des Umbruchs*, [https://doi.org/10.1007/978-3-658-31466-8\\_3](https://doi.org/10.1007/978-3-658-31466-8_3)

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In the United Kingdom at the dawn of the Industrial Revolution, life expectancy at birth was about 40 years. It is now about 80 years. Even many poor parts of the world have experienced significant increases in longevity. At the turn of the twentieth century life expectancy in India was about 24 years, and it's now about 65 years (Roser et al. 2013). Increased wealth is also correlated with educational improvements. At the time of the Industrial Revolution over 80% of the global population was illiterate; now it is less than 15% (Roser and Ortiz-Ospina 2016). More wealth has also brought leisure time. Retirement has been made possible on a wide scale for the first time in human history. In 1850 the majority of the male population 65 and older living in the USA was still working. Today less than a quarter of that population is working (Roser 2013). The legacy of the industrial revolution is one of both great gains for human well-being and looming environmental threats. Preserving the former and minimizing and compensating for the latter will be one of the central tasks of justice in the first half of the twenty-first century.

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## 2 Climate Change and Policy

The emission of greenhouse gases through manufacturing, modern agriculture, transportation, and home uses increased the concentration of CO<sub>2</sub> in the atmosphere from about 279 parts per million (ppm) at the dawn of the Industrial Revolution to over 400 ppm now, resulting in significant changes to the climate. The mean surface temperature of the planet is now about 1°C warmer as a result. Continued greenhouse gas emissions at present rates would be likely to add to the existing warming considerably. The range is forecasted to be between an additional 1.4°C and 4.8°C. That would be an amount, and a rate, of warming that is unprecedented in human history.

The damages caused by climate change cannot be known precisely, but there would surely be continued widespread loss of species and eco-systemic destruction, more frequent heat waves and droughts in some locations, more and more extreme precipitation events and tropical storms, sea-level rise causing inundation in some areas, and glacial melting leading to flooding, and later to water shortages. For humans these consequences would include significant threats to food security globally and regionally, increased risks from food- and water-borne as well as vector-borne diseases (such as malaria), greater internal and international migration due to environmental stress, increased risks of violent conflicts, diminished economic growth, and the creation of new poverty traps in some regions (IPCC 2014A). Harsh effects such as these are expected in various parts of

the world despite predicted continued global economic growth, forecasted to be between 300 and 900% over the course of the twenty-first century (IPCC 2014B).

Currently there are two primary kinds of policy responses to climate change. One is mitigation, which mainly involves reducing and ultimately halting activities that produce climate change; these are mainly the burning of fossil fuels and deforestation. The other kind of policy is adaptation, which involves altering human communities and activities so that the impact of climate change is less. A variety of things may be done to adapt. Sea walls may be built or reinforced; water can be used more efficiently; crops can be diversified and drought-resistant seed strains can be developed; storm drainage can be improved; public health measures can be adjusted; and communities can be relocated. In addition to these policies a third area of policy is now emerging. This policy area involves compensation for the losses and damages that people suffer as a result of climate change.

Humans depend on a natural environment that is conducive to health and well-being. Mitigation serves this end not mainly by addressing the present effects of climate change. Instead, it mostly serves the health and wellbeing of people in the future. Economic development courtesy of energy generation and consumption has made us richer, healthier, better educated, and has given us more leisure time. Current innovations and economic productivity will not only benefit us but redound to the future. The future harms of climate change can be avoided in great measure. But a transition to renewable energy will require assuming short-term costs associated with generating renewable energy and changing machines, vehicles, and heating systems to consume that energy. Avoiding some future damage by transferring some of the costs from the future to the present might be thought of as investing in the future. But if great costs are taken on now, economic activity will slow considerably, affecting not only present but also future prosperity. Hence, mitigation raises the issue of the intergenerational distribution of the costs of climate change and energy policies. Moreover, because mitigation requires international cooperation, there is the risk of parties seeking to free-ride off the efforts of others. There are also, then, important questions of how the costs of climate change should be shared among states.

Adaptation policies and compensation for loss and damages can serve both present and future generations. Such policies are also relevant to human development since many of the people most vulnerable to climate change live in poor countries. In contrast to mitigation, adaptation seeks to guard against local damages caused by climate changes. For developing countries, some of which are especially exposed to sea-level rise and droughts, there is the danger that they will be left on their own both to fund adaptation projects and offer compensation of some

sort to people who have suffered losses. Hence, the need for adaptation and compensation for loss and damages also raises important questions about how costs should be shared internationally.

The questions of how costs should be shared between generations and states are considerations of intergenerational and international justice respectively. Considerations of justice concern the claims of agents under institutions and policies. Principles of justice are normative in the sense that they require us to adjust our institutions and policies to them, and not *vice-a-versa*. Adjustment of this sort amounts to using principles of justice to guide efforts to reform and construct new institutions and to formulate new policies. In climate change policy there are two primary axes of justice. These are considerations of what future people are owed and considerations of what people around the planet are owed. I briefly discuss both axes in relation to mitigation, adaptation, and compensation policies.

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### 3 Intergenerational Justice

Planetary warming is caused primarily by the concentration of greenhouse gases in the atmosphere. A particular increase in the concentration of atmospheric greenhouse gases causes an increase in average global temperature. The most prevalent of the anthropogenic gases is CO<sub>2</sub>. For that reason it tends to get the most attention in discussions of climate change policy. The precise relationship between CO<sub>2</sub> concentrations in the atmosphere, measured in parts per million (ppm), and warming is not yet known. The amount of warming caused by a two-fold increase of CO<sub>2</sub> in the atmosphere is referred to as “climate sensitivity.” Best current estimates by atmospheric scientists hold that climate sensitivity is between 1.5°C and 4.5°C (IPCC 2013).

Almost half the CO<sub>2</sub> emitted by humans into the atmosphere remains there more than a century; and about 20% of it remains there for thousands of years before cycling back to the Earth. Because of this longevity of residence, the concentration of CO<sub>2</sub> in the atmosphere is a function of total historical emissions since the beginning of the Industrial Revolution. The implication of this for stabilizing global warming is important. Halting warming at any particular temperature target requires arresting the increase of the concentration of CO<sub>2</sub> at some particular amount; and that requires stopping emissions completely. In other words, a net zero carbon global economy is required. I say “net zero” because if there were a scalable technological means by which for every particle of CO<sub>2</sub> emitted some particle could be removed and securely stored, then emissions could continue without increasing the atmospheric concentration. The required technology

would function like a CO<sub>2</sub> drain, depositing the material safely underground or at the bottom of the oceans.

The need to halt emissions is particularly urgent if we are to limit warming to between 1.5°C and 2°C, the goal adopted in the UN's 2015 Paris Agreement on climate change. Given the current understanding of climate sensitivity, in order to have a better than 66% chance of limiting warming to 2 °C, scientists estimate that total human emissions must not exceed one trillion tons of carbon. From the beginning of the industrial revolution to the present, humans have already emitted over 600,000,000 tons. We are not simply continually approaching the deadline of the trillionth ton by emitting CO<sub>2</sub>; the deadline is moving up in time because globally emissions have been increasing (Trillionthtonne).

The 2°C warming limit is, however, at best a rough estimate of what intergenerational justice requires on behalf of future generations (Moellendorf 2015A). A precise formulation of the temperature goal for the fair sharing of intergenerational costs would require an accurate understanding of several things that currently can only be approximated, including climate sensitivity, the manifold costs of climate change for any given temperature increase, and the costs of transitioning to a net zero carbon economy within the timeframe required to limit warming to a particular temperature. It would also require a justified principle of how costs should be distributed across generations, for example with an aim to maximize preference satisfaction or to equalize generational burdens (Moellendorf und Schaffer 2016). Defending such a principle is an important philosophical task but one that exceeds the limits of this chapter.

Still, it makes sense to consider the various costs to the extent that we can in order to get an idea of how pursuit of a target like the 2°C goal would assign costs across generations. Changing over to renewable energy is assumed to be costly. But the cost of producing energy by means of photovoltaic cells is dropping rapidly, and that makes an ambitious mitigation goal less expensive for present generations. Regarding future costs, models forecasting future climate change costs remain relatively crude and don't inspire confidence. Another problem is that many of the most worrying negative effects of climate change, such as rapid sea-level rise caused by the abrupt collapse of the Greenland and Antarctic ice sheets, are epistemically uncertain (Moellendorf 2014). These events involve processes that are so poorly understood in their details that scientists are not able to attach a probability to their occurrence, even though there is mounting evidence that conditions are becoming more favorable to their happening. Events of unknown probability belong in the category of uncertainties rather than risks. In light of the uncertain – but not non-negligible – probability of such catastrophes, it

is reasonable to think that the temperature limit should be kept low (Moellendorf 2014).

How low the temperature target should be also depends on how effective and expensive climate change adaptation is. The higher the temperature goes, the more important adaptation becomes. Some critics of ambitious mitigation argue that as our technological capacity develops over time we can do more to adapt at a lower cost. That might be true up to a point, but given the threat of irreversible catastrophic change, such as rapid land-based ice sheet melting or massive crop failures, it is also possible that our capacity to adapt could be outstripped by the enormity of the negative effects. The most important point for consideration in this regard is that cost-benefit analyses reckon with risks and not uncertainties. When the possible catastrophes are uncertainties rather than risks, it would be seriously misleading to factor them in as low probability events.

The arguments just surveyed suggest that intergenerational justice recommends an ambitious mitigation strategy. How low should the warming target be? Once again, there are no definite answers here. At the time of writing this chapter the Intergovernmental Panel on Climate Change (IPCC) is surveying scientific studies on the transition and the costs of limiting warming to 1.5°C. Total net emissions would have to be limited to about 750,000,000 tons. So, an extremely rapid reduction in net emissions would be required. Whether that could be achieved in the context of a growing global economy is currently unclear. In the most recent report of the IPCC, 87% of the scenarios for limiting warming to 2 °C assume the use of carbon dioxide removal (CDR) technology to drain CO<sub>2</sub> from the atmosphere (IPCC 2014A). Presumably, a bigger drain would be required. CDR technology is, however, only in its infancy, and it is by no means ready for large-scale deployment. Nor is it clear how extensively it could be used. Possible constraints include technological capacity, bio-physical limits of storage, and economic costs.

In the absence of wide scale use of CDR, bringing about a rapid reduction of emissions might require reducing economic activity to austerity levels. We know from the experience of the Great Recession of 2009 that recessions reduce emissions. Global CO<sub>2</sub> emissions fell by about 1% that year (World Bank). Advocates of using recessionary policies to reduce emissions sometimes refer to the approach as “degrowth.” A major problem with that strategy is that, in our financially interconnected world, recessions in the developed world invariably get transferred to poor countries through reduced investment by corporations, reduced remittances by individuals, and decreased demand for basic commodities from poor countries. The Great Recession of 2009 also taught us that global recessions can be

very harmful to the wellbeing of the global poor. As a result of the Great Recession, world economic growth fell from a rate of 3.9% in 2007 to 3.0% in 2008 all the way down to  $-2.2\%$  in 2009. Emerging and developing countries saw growth rates fall from 8.3% in 2007 to 8.1% in 2008 and down to 1.2% in 2009 (World Bank 2010). And that produced only a 1% decline in emissions.

The fall in the rate of growth among emerging and developing countries is especially significant for poverty eradication efforts. The World Bank estimates that for every percentage point in growth lost 20 million people are trapped in poverty (UN 2009). So, in the absence of scalable CDR, there is reason to be concerned that pursuing a warming limit of less than  $1.5\text{ }^{\circ}\text{C}$  might involve economic policies that are inconsistent with the first Sustainable Development Goal, namely the eradication poverty in all its forms (UN). Of course, the global economy is not an unchangeable and elemental force of nature, but restructuring it so as to achieve poverty eradication in the midst of austerity in the industrialized world would be a major social task, and one for which we lack perspicuous guiding ideas. This casts significant doubt on the moral desirability of setting a temperature target too low. The burdens on the poor in the present and near future could be unreasonable.

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## 4 Global Justice

The matter of how much warming should be limited on behalf of future generations does not exhaust the questions of justice in mitigation policy. An additional concern is whether a global mitigation regime would hinder poverty-eradicating human development. Recent history suggests that national development strategies are very important in this effort. Consider the case of China. In 2001 there were 400 million less people living in poverty in China than in 1981 (Chen and Ravallion 2004). That achievement, however, involved a massive increase in  $\text{CO}_2$  emissions. In 1981 China emitted 1,439.84 million metric tons of  $\text{CO}_2$  from the consumption of energy. But by 2001 this had more than doubled to 3,226.52 million metric tons (IEA). Obviously, other forms of energy are available to fuel human development, but if they are more expensive than fossil fuels, mandating their use could slow poverty eradication. The United Nations Framework Convention on Climate Change recognizes the need for energy in the pursuit of poverty-eradicating human development. The Preamble to the UNFCCC affirms the importance of the “right to sustainable development” (UNFCCC 1992). The assertion of the right to sustainable development is a claim of justice. A plausible

interpretation of that claim is that any mitigation agreement must be consistent with the aim of least developed and developing countries to pursue human development (Moellendorf 2011).

Energy poverty still affects billions of people. Recent estimates indicate that 2.8 billion people lack access to modern cooking fuels and 1.1 billion lack access to electricity (IEA 2017). There is a strong correlation between developing energy capacity and improving human development in a country (IEA 2012). Achieving significant human development gains in the least developed and developing countries will require a massive increase in the consumption of energy. If such an increase were to involve an increase in the consumption of fossil fuels, in order to achieve ambitious mitigation goals developed countries would have to reduce their emissions very substantially to make up for the emissions increase in poor countries. In that case the right to sustainable development would require very robust emissions reductions on the part of developed countries. Alternatively, ambitious global mitigation could be achieved by means of an expansion of renewable energy use in poor countries. Insofar as that would be more expensive than fossil fuel use, respecting the right to sustainable development would require subsidizing the use of renewable energy generation (Moellendorf 2014).

Is respect for the right to sustainable development in climate change policy morally required? Two arguments suggest that it is. First, when states agreed to the treaty that is the UNFCCC they agreed to the treaty language that includes the right. Such an agreement amounted to a promise that any further mitigation agreements under the auspices of the UNFCCC would respect the right. That promise is morally binding. But even if they had not made such a promise, respecting the right is supported by considerations of fairness. Responding adequately to climate change requires international cooperation. It would be unfair that participants in such an effort would be required to take on a burden that would harm their ability to perform the morally mandatory task of eradicating poverty. Hence, respecting the right to sustainable development in assigning the burdens of climate change policy seems to be required by fairness (Moellendorf 2014).

Climate change cannot be adequately addressed by mitigation policies alone. The mean surface temperature of the planet is already nearly 1 °C higher than before the Industrial Revolution. And even if justice in mitigation is served, the mean temperature may rise another full degree Centigrade. Warming of that amount will continue to bring profound changes to the planet, such as those mentioned above. And even if warming were limited to 2°C, the possibility of catastrophic change cannot be ruled out. Respecting the right to sustainable development does not only insulate states' development agendas from the demands of climate change policy; it also protects these agendas and the people they serve



from the ravages of climate change. Such protection requires adaptation policies, and when the damages occur it also requires compensation. The assignment of the costs of such policies is an additional important matter of justice.

One important difference between adaptation and compensation policies, on the one hand, and mitigation policies on the other, is that whereas the latter benefits everyone by stabilizing the climate, the former can be directed towards specific groups of people and even individuals who are either especially vulnerable to climate change or have suffered a loss. How is this relevant to justice? A demanding climate change mitigation agreement will require at least the semblance of international justice. This is because robust climate change mitigation will occur, if it occurs, as a result of an international effort to reduce and then halt emissions globally. The international cooperation required to accomplish that is fraught with collective action problems. The central problem is that although every state has an interest in there being robust climate change mitigation, states also seem to have an interest in not assuming the costs of mitigation regardless of what other states do. Building cooperation in such circumstances requires both institutions of accountability and mutual trust. The latter requires that parties be seen to be accepting a fair share of the burdens. Given the right negotiating strategies, poor states can leverage the cooperation of wealthier states in mitigation burden-sharing by threatening non-cooperation. That strategy would be less successful in the case of adaptation and loss and damage policies since wealthier states can pursue these without the cooperation of poorer ones. But insofar as addressing adaptation and compensation for climate change-caused losses are costly, human development and poverty eradication are at risk.

Adaptation and compensation for loss and damages differ in that the former seeks to pre-empt losses before they would occur, whereas the latter seek some form of compensation for the losses after the fact (Moellendorf 2015B). Pre-emptive planning looks to reduce vulnerabilities, whereas loss and damages seek reparation. It is useful to think of vulnerability to climate change as the product of exposure to the risks of climate change and the lack of capacity to protect against them. The first of these is a matter of geography; the second is often a matter of poverty. Other than relocating communities there is nothing that adaptation policy can do to affect the geographical location that exposes people to climate change-related risks. So, the object of adaptation policy is typically to protect those people who will be exposed to risks. The object of loss and damage policies is to provide some kind of compensation to people who have suffered losses or damages due to climate change. Insofar as the poor are especially vulnerable to climate change, and are least able to absorb losses, repair for losses and damages is especially important for them.

How should the distribution of the burden to fund adaptation and compensation for losses and damages be assigned? Unlike climate change mitigation, a collective response is not necessarily required. That renders the most vulnerable states and people at risk of being abandoned by the wealthy. In principal the burden of financing adaptation and compensation funds could fall completely on the states where the vulnerable and affected live. That would place a heavy burden on poor states with especially vulnerable populations. If, as I argued above, respect for the right to sustainable development is a matter of justice in climate change policy, then it is relevant to adaptation and loss and damage policy as well (Moellendorf 2015B). The development prospects of states should be safeguarded in the funding of these policies as well. The right to sustainable development would require that states not be left in a worse position with respect to their development agenda because of their need to adapt to climate change and to provide compensation to those who have experienced losses and suffered damages. Because wealthy states do not need the cooperation of poor states regarding adaptation and compensation, the best political strategy for poor states is to make their cooperation on mitigation contingent on support from wealthy states for adaptation and loss and damage funding.

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## 5 Concluding Remarks

If CO<sub>2</sub> emissions are not halted, the concentration of CO<sub>2</sub> in the atmosphere will continue to grow, warming the planet at a rate and to an extent that could jeopardize human civilizations. There are compelling reasons to think that limiting warming to 2°C is required by intergenerational justice. Achieving that aim will require mitigation policies that transition the global economy completely away from the consumption of fossil fuels this century. It seems also to require the development of technology to capture and store atmospheric CO<sub>2</sub>. International justice requires, however, that states be able to pursue poverty-eradicating human development without constraints from an international mitigation treaty. And climate change itself poses threats to human development. The right to sustainable development requires that rich states provide support for adaptation and compensation policies in poor countries in order that the latter may establish protection against the threats of climate change. Justice makes demands. In the case of climate change, responding adequately to these demands requires international cooperation in order to affect a rapid transition to renewable energy production and consumption and to safeguard conditions in which continued progress in human development can be made.

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