



Climate change and global justice

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In this article, I examine matters concerning justice and climate change in light of current work in global justice. I briefly discuss some of the most important contemporary work by political philosophers and theorist on global justice and relate it to various considerations regarding justice and climate change. After briefly surveying the international treaty context, I critically discuss several issues, including climate change and human rights, responsibility for historical emissions and the polluter-pays principle, the ability to pay principle, grandfathering entitlements to emit greenhouse gasses, equal per capita emissions entitlements, the right to sustainable development, and responsibility for financing adaptation to climate change. This set of issues does not exhaust the list of considerations of global justice and climate change, but it includes some of the most important of those considerations. © 2012 John Wiley & Sons, Ltd.

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CLIMATE CHANGE AND GLOBAL JUSTICE

Anthropogenic climate change is widely recognized as a global problem affecting the lives and well being of millions of people, the stability of ecosystems, and the existence of many natural species. My assumption in this article is that justice involves moral considerations regarding relationships between people or between people mediated by institutions and policies, and that therefore this is the case with global justice as well. There are important moral questions regarding the effects of climate change on ecosystems, biodiversity, and species.^a But I shall not discuss these as matters of global justice.

My goal here is to review the most important issues concerning climate change and global justice.^b This is by no means, however, an exhaustive survey of this growing and important literature. I cannot hope to provide that here. In summarizing and commenting on the various issues, my aim is twofold: the first is to introduce the issues to readers who are unfamiliar with them; the second is to stimulate both readers who are already familiar with some of these debates as well as those who are just becoming familiar with them to further critical reflection.

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The section on *Global Justice* summarizes some of the recent work in global justice that is relevant here. The section on *The UNFCCC Treaty* discusses features of the international treaty context in which climate change negotiations are occurring. After that the section on *Climate Change and Human Rights* discusses the relationship between climate change and human rights. The section on *Responsibility for Historic Emissions* discusses responsibility for historical emissions and the polluter-pays-principle. The section on *Ability to Pay* discusses the ability-to-pay principle. The section on *Grandfathering* discusses the idea of grandfathering, namely that a state's entitlement to emit CO₂ should be based on its historic levels of emissions. The section on *Equal Emissions Entitlements* discusses the claim that each person has an equal entitlement to emit greenhouse gases within the limits established by the aims of mitigation in general. The section on *The Right to Sustainable Development* summarizes an account of the right to sustainable development. And, the section on *Adaptation* is devoted to a discussion of global justice and adaptation policy.

GLOBAL JUSTICE

Efforts to develop and criticize theories of global justice have recently developed into major research programs for several political philosophers and theorists.^c It is impossible adequately to summarize all of the

important details in the debates that have been occurring, but I shall point to a few areas where those debates are important to the concerns of justice and climate change.

The kind of justice in philosophical debates about global justice that is relevant to our theme is best thought of as social justice. Several closely related questions taken up in these debates seem directly relevant to climate change policy. These include the following: Do robust duties of justice exist between people that do not live in the same country? In virtue of what (if anything) are there such duties? And which principles best characterize those duties?

Cosmopolitans argue that robust duties of justice exist between noncompatriots.^{1–9} Noncosmopolitans of various stripes either deny the existence of such duties of justice or assert that they are substantially less robust than those between compatriots.^{10–16, d} There are a variety of reasons for the noncosmopolitan position but four have attracted the most attention. One is the claim that duties of egalitarian distributive justice exist between people only if they are subject to a common coercive legal structure,^{10,14,16} and currently states are the only structures of this sort. Another is that the content of duties of egalitarian distributive justice can be provided only by a cultural understanding of goods, which understanding only nations are capable of providing.¹¹ A third is that egalitarian distributive justice would conflict with national self-determination.¹¹ And the fourth is that state policy remains the most important factor in the well-being of persons.¹⁵ These are not mutually exclusive positions. And noncosmopolitans sometimes affirm more than one of these.

There are also a variety of cosmopolitan positions, providing different resources for responding to the noncosmopolitan positions. Some cosmopolitans hold that duties of social justice are owed by each person to all other persons, in which case the limits of state coercion and common national cultures establish no principled limit to duties, although the latter might affect their content somewhat.^{3,8,9} A variant of this view focuses primarily on human rights, which proponents take to be universal and to include rights to subsistence, which are violated by international practices that recognize the legitimacy of corrupt governments.⁷ Other cosmopolitans accept that duties of social justice are not owed to everyone, but that the set of people bound by duties of justice is larger than merely those who are subject to the same framework of legal coercion; it includes also those who are members of a common economic association, which exists globally.⁵

Some noncosmopolitans believe that duties of distributive justice exist between noncompatriots but

that they are either less strong¹² or less demanding.¹⁰ The content of the latter position is similar to one offered by some cosmopolitans, who defend only duties to meet minimum needs.² Many cosmopolitan positions take duties of distributive justice to require significantly more than that. One family of such positions holds that natural resources are rightfully commonly owned by all the Earth's inhabitants, not merely some of those who were lucky enough to be born near or on top of them; and that therefore some or all of the revenues collected from resource extraction should be shared globally.^{1,6,17} Other positions include a version of equality of opportunity applied globally.^{3,5} Still others maintain that the difference principle, which John Rawls famously defends for domestic justice, and which requires that inequalities in wealth and income maximize benefits to the least advantage people, applies globally.^{1,4,6}

Millions of people are already at risk of extreme weather and flooding. Currently around 344 million people are exposed to tropical cyclones, 521 million to floods, 130 million to droughts, and 2.3 million to landslides.¹⁸ Climate change is expected to increase these numbers very significantly. About 10% of the world's population lives at an elevation of 10 m or less above sea-level.¹⁹ Hundreds of millions of people are at risk of inundation from tropical storms and rising sea levels. But the poor living in the mega deltas of North Africa and Asia are particularly vulnerable. 'People living in the Ganges Delta and lower Manhattan share flood risks associated with rising sea levels. They do not share the same vulnerabilities. The reason: the Ganges Delta is marked by high levels of poverty and low levels of infrastructural protection'.¹⁹ The devastation caused by drought and flooding could result in long term setbacks to human development in many poor societies.¹⁸

Climate change related threats are not simply acts of God, but the result of energy use and multiple uncoordinated energy policies in countries and provinces throughout the world. Historically, however, greenhouse gas emissions have been highest in the industrialized world. 'When people in an American city turn on the airconditioning or people in Europe drive their cars, their actions have consequences. Those consequences link them to rural communities in Bangladesh, farmers in Ethiopia, and slum dwellers in Haiti'.¹⁸ Energy use brings tremendous benefits, but when fossil fuels are used it also brings significant climate change related costs. The privilege of using fossil fuels has mostly fallen to the relatively rich of the world, while the burdens of climate change are falling more heavily on the poor. The question of who is responsible for the costs of climate change, including

the costs of adapting to it, would appear then to be a significant concern of global justice.

Any effective international treaty for climate change mitigation will have to lower global CO₂ emissions very dramatically. Emissions must be 50–85% below 2000 levels by 2050 in order to secure a reasonable chance of keeping planetary warming to 2 °C.²⁰ (Whether this warming limit is a morally appropriate one is a question of how much climate change we should avoid and ultimately a question of intergenerational justice and beyond the scope of this article.^e) To do this the cost of fossil fuels relative to renewables will have to increase. But human development is very energy intensive. Electrification makes possible hospitals and schools with modern equipment. Manufacturing uses energy but also provides better paying jobs than can usually be had in rural areas. Transport of manufactured goods consumes massive amounts of energy. A second important concern of global justice then is how an international treaty will assign mitigation costs, and in particular whether costs will be assigned in a way that constrains poverty eradicating economic growth in the developing and least developed countries.

THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE TREATY

The United Nations Framework Convention on Climate Change (UNFCCC), formed by international treaty in 1992, is the international institution in which, to date, all significant attempts to come to an international agreement dealing with climate change have occurred. Both the treaty and the institution that developed as a result of the treaty are called ‘The United Nations Framework Convention on Climate Change’. To distinguish these, I refer to the former as ‘the Convention’ and the latter as ‘the UNFCCC’.

The UNFCCC provides the institutional setting for international negotiations and the Convention provides a deliberative framework in a set of guiding norms. Article 3 sets out several principles to guide the achievement of the Convention’s objective. Paragraph 1 stipulates that efforts should be distributed differentially. It affirms assigning burdens to parties ‘on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities’. Paragraph 1 also states that, ‘the developed country Parties should take the lead in combating climate change and the adverse effects thereof’.²¹ Paragraph 2 requires full attention to ‘The specific needs and special circumstances of developing Parties, especially those that are particularly vulnerable to

the adverse effects of climate change’.²¹ Paragraph 4 opens by invoking ‘a right to... sustainable development’ and closes by requiring international policy to take ‘into account that economic development is essential for adopting measures to address climate change’.

These principles guide the course of subsequent deliberation with the net effect that acceptable additional treaties under the auspices of the UNFCCC must lay heavier burdens on developed country parties and be especially solicitous of the development needs of developing parties. This is fully consistent with accounts of global justice that require either eradicating severe poverty or reducing global inequalities. A group of developed country parties is compiled in Annex I of the Convention. This group includes 40 states and the European Union, including the western European states, the USA, Canada, Japan, Australia, and New Zealand. This same set of states is listed in Annex B of the Kyoto Protocol. Only the states in Annex B are assigned binding emission reductions under the Protocol.

Cosmopolitans are likely to favor distinguishing the burdens of responding to climate change in a way that provides allowances to developing countries. The Convention applies to a world characterized by extreme poverty and global inequality. Economic development can eradicate poverty but it is energy intensive. Given current technology and energy markets, the cheapest sources of energy are usually fossil fuels, coal in particular. A climate change treaty that raises energy prices in the developing world threatens to slow, or prevent, the process by which billions of people may be raised out of extreme poverty. Fundamentally, the Convention’s principles distinguishing burdens of the developed and the developing states is not about resource redistribution, then, although it has been maligned as such.²² Rather such principles serve to ensure that neither climate change nor a climate change treaty worsen the prospects for development for poor countries.

The list drawn up in 1992 at the time of writing of the Convention, however, does not include all of the states that are now among the group of most highly developed. But any commitment to human development needs in developing and least developed countries will necessarily place very heavy burdens on developed states. Energy supply, industry, and transport comprise over 50% of all greenhouse gas emissions. While forestry practices, including deforestation, and agriculture comprise over 30%.²⁰ Emissions in all of these categories are affected by economic development and rising populations in the developing world. In the absence of adopting additional mitigation strategies, emissions are projected to increase

by an additional 40–110% between 2000 and 2030.²³ Two thirds to three quarters of the increase is expected to come from developing countries, where both economic and population growth are highest.²³ Even if global justice requires laying heavier burdens on developed countries, an international treaty that adequately mitigates climate change will eventually have to constrain the emissions of non-Annex I countries.

CLIMATE CHANGE AND HUMAN RIGHTS

In the absence of mitigation, climate change is projected to have profound, often devastating effects, on hundred of millions of people by the end of this century. Human health is expected to suffer significantly. According to the Intergovernmental Panel on Climate Change (IPCC), ‘The health status of millions of people is projected to be affected through, for example, increases in malnutrition; increased deaths, diseases and injury due to extreme weather events; increased burden of diarrheal disease; increased frequency of cardio-respiratory diseases. . .and the altered spatial distribution of some infectious diseases.’²⁰ For hundreds of millions of people access to water and food will become more difficult. By 2020 from 75 to 250 million Africans are expected to suffer increased water stress; and yields on rain fed farms may be reduced by up to 50%²⁰ (p. 50). According to a United Nations Human Development Programme (UNDP) review of climate change projections, ‘Overall, climate change will lower the incomes and reduce the opportunities of vulnerable populations. By 2080, the number of people at risk of hunger could reach 600 million—twice the number of people living in poverty in sub-Saharan Africa today’.¹⁸

The calamities caused by climate change are pertinent to protections offered by international human rights documents. For example, Article 25, paragraph 1, of the Universal Declaration of Human Rights states that,

Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing and medical care and necessary social services, and the right to security in the event of unemployment, sickness, disability, widowhood, old age or other lack of livelihood in circumstances beyond his control.²⁴

Article 11 of International Covenant on Economic, Social and Cultural Rights holds that,

The States Parties to the present Covenant recognize the right of everyone to an adequate standard of

living for himself and his family, including adequate food, clothing and housing, and to the continuous improvement of living conditions.²⁵

Simon Caney argues that a central and fundamental wrong of climate change is that it will cause significant human rights violations.^{26,g} Caney make this argument in relation to three key rights: The right not to be arbitrarily deprived of one’s life, the right not to have others cause serious threats to one’s health, and the right not to have others deprive one of the means of subsistence. These are broadly accepted rights, less demanding and less controversial than the rights enumerated in the paragraphs of the human rights documents cited above. Hence, Caney’s point is on the face of it plausible.

Human rights have figured prominently in the recent literature on global justice. Many cosmopolitans have defended the importance of human rights in contrast to claims of states to sovereign control over the affairs within their borders.⁴ Others, as noted above, have argued that human rights form the basis of duties to reform the international state system to eradicate desperate poverty. So an account of the moral problems of climate change in terms of the threats that it poses to human rights is consistent with a broadly cosmopolitan approach to global justice.

There are, however, features of the employment of human rights in the context of climate change that bear special scrutiny. As invoked by Caney, and several others, human rights are meant to account as much for our duties to future generations as to people currently living in other countries. That is to say, human rights are said to account for our duties of intergenerational justice. There several important questions about whether human rights are the best way to account for our duties of intergenerational justice, but they elude the scope of this article.^b

RESPONSIBILITY FOR HISTORIC EMISSIONS

Both considerations of global justice and the Convention’s language of ‘common but differentiated responsibilities’ have led some people to conclude that a morally acceptable international treaty should distribute various responsibilities of states according to their historic contribution of greenhouse gasses, especially CO₂ (because of its long atmospheric residence time), to the atmosphere.ⁱ This view invokes a principle from other aspects of environmental policy

and ethics, known as the polluter-pays-principle. The idea is simple: Those who pollute should pay in proportion to their contribution to the overall pollution problem.

The polluter-pays-principle might be defended on either fault or no-fault grounds.^j Fault conceptions of responsibility are most at home in the law of torts, which seeks to assign responsibility for accidents, against a stable background of property entitlements. In order for an agent to be at fault typically at least three conditions must be satisfied: (1) Causation—the agent must have brought about the circumstance (for which responsibility is assigned) as a consequence of her actions; (2) voluntariness—the agent must have done so voluntarily; and (3) knowledge—she must have known (or—sometimes less demanding—a reasonable person would have known) the consequences of her action. Fault conceptions of responsibility are in some ways analogous to retributive accounts of punishment. Both require causation and a certain mental state in the agent in order to apply legal sanction. One kind of defense of a fault conception of responsibility stresses the importance of liberty. In the absence of causation and the requisite mental states any sanction of an agent is a violation of her liberty. A different kind of defense invokes forward looking considerations. By assigning responsibility only to those who voluntarily and knowingly create problems, we establish a system of incentives that reduces the incidence of such misdoing and we lower the incidence of externalities, the costs of misdeeds being passed along to others.

Recent philosophical discussions of fault in the context of climate change have pointed to several problems with using it to assign responsibility.²⁷ Consider two of these. First, because of the long life of CO₂ molecules in the atmosphere, much of the damage-causing stock of atmospheric CO₂ was produced by people who are now long dead, and from them no costs can be recouped. Second, among the still-living, many fail to meet the knowledge condition for some of their early emissions. General knowledge that climate change is produced by greenhouse gases is relatively recent. In 1988 the United Nations General Assembly adopted Resolution 43/53, 'Noting with concern that the emerging evidence indicates that continued growth in atmospheric concentrations of 'greenhouse' gases could produce global warming with an eventual rise in sea levels, the effects of which could be disastrous for mankind if timely steps are not taken at all levels. . . .'²⁸ That same year the IPCC was founded by the World Meteorological Association and the United Nations Environmental Programme. The first assessment of report of the IPCC was not issued

until 1990. At most a fault account of responsibility would seem to be limited to the emissions of those people currently living and only since the late 1980s or early 1990s. This leaves responsibility for earlier emissions unassigned.

It might be thought that responsibility for earlier emissions can be folded into a fault account if the bearers of fault are not individual people, now long dead, but states.^k Assigning fault to states has two apparent virtues. It would be consistent with the state-centered language of the Convention; and, at least with respect to those states which have endured from the dawn of the industrial revolution till now, there would be no worry about recouping costs from nonexistent debtors.

Assigning fault to states, however, faces at least two problems. The first is that it may not increase the net of responsibility for historic emissions broadly enough to cover most historic emissions. Most states will fail to meet the knowledge condition before the late 1980s and early 1990s; and the many new states, which were born in the 20th century, cannot any more be faulted for emissions before their coming into existence than individual people can for emissions before their birth. The second problem is that there are great practical barriers to assigning responsibility to states without preventing the costs from devolving to the citizens of the states since state revenues are raised by taxing citizens. In effect, then the responsibility devolves with the costs. So, were an international institutional arrangement to lay fault on a state for all its emissions since, say, 1988 it would for practical purposes assign costs to the citizens of that state, an increasingly large proportion of which who were born after that date. The embarrassment of such a fault account of responsibility is that many people will be assigned costs for emissions that they cannot be personally at fault for.

Given the problems noted above, a no-fault account of historical responsibility might seem more plausible. No-fault conceptions of responsibility simply deny the necessity of at least one of the three conditions for assigning responsibility on the basis of fault. One such an account could be developed on the basis of a conception of strict liability, which holds agents responsible if they caused the problem, regardless of whether they acted with knowledge.²⁹ Given the problems with the knowledge condition in the case of climate change, strict liability might seem to be a better basis for the polluter-pays-principle.

Strict liability is sometimes criticized on grounds that it is unfair to hold persons responsible for the costs of their actions when they are not at fault. In the law strict liability is typically applied only with

respect to activities that are especially dangerous or important to human health, in which a high standard of care is warranted, and when agents can be put on notice beforehand that they will be held responsible for the negative effects of their actions even if they are not at fault. The charge of unfairness is somewhat mitigated by the response that persons engaging in such activity are knowingly assuming the risks of being held responsible. This defense does not work well in the case of emissions prior to knowledge of their danger since persons could not reasonably be thought to have been put on notice that they would be held responsible given the general ignorance of the effects of CO₂ emissions. The lack of such notice raises doubts about whether it is fair to assign responsibility merely on the basis of causation.

Beneficiary responsibility is a second no-fault conception of responsibility that maintains a connection with historical emissions. Beneficiary responsibility jettisons the requirement of causation but still maintains a connection to the action through the requirement that those responsible must have benefitted from the particular action.³⁰ Perhaps persons living in industrialized countries can be held responsible because they benefit from the high standards of living produced by past emissions. Such accounts are burdened with providing compelling reasons to believe that a connection with a past action as tenuous as that one has benefitted from it should be the grounds for assigning one responsibility for it, especially since benefitting is something that persons do not always have much say in. In the case of the costs of historic emissions, most persons now living in industrialized countries were born there and had no say in that matter.

Each of these three bases for assigning responsibility for historic emissions contains problems that a fully adequate account would have to overcome.¹ But, regardless of which conception of responsibility is used to support it, the polluter-pays-principle is subject to a general problem. The principle can direct the assignment of the burdens of reducing CO₂ emissions (or financing adaptation) but it is silent on permission to emit CO₂ in order to fuel poverty eradicating economic growth.³¹ Various conceptions of global justice that aim either to eradicate severe poverty or to reduce inequalities between people around the world support laying responsibility for emissions reductions more heavily on industrialized countries in order to allow developing and least developed countries the leeway to pursue macro-economic policies that promote economic growth and poverty eradication. The polluter-pays-principle appears insensitive to this concern of global justice.

ABILITY TO PAY

Two no-fault principles for the assignment of responsibility, strict liability, and beneficiary pays have been mentioned. A third principle supports a different approach. The ability-to-pay-principle assigns responsibility in proportion to an agent's capacity—variously measured. Ability-to-pay and closely related no-fault conceptions of responsibility are often used in the assignment of burdens for financing state activities such as defense against various threats and the provision of certain aspects of the well-being of citizens. Generally, in financing programs directed to meet these aims, states do not look for citizens who are at fault for the wealth that they possess. Progressive income taxation to raise public revenue for the provision of goods and services is typically defended on grounds that the wealthier have a greater ability to pay.

Two reasons seem to count in favor of an ability-to-pay-principle for climate change. First, theories of global justice that condemn either severe poverty or deep inequalities between people around the world might be enlisted to support the fairness of an ability-to-pay-principle.^m When we are engaged in forming a new international institutional order that will establish entitlements to emit greenhouse gases, considerations of distributive justice seem particularly relevant (perhaps more relevant than tort considerations, which usually assume a pre-existing background of entitlements). Second, there is a basis for such a principle in the Convention's norms. The Convention, as we have seen, recognizes of the 'respective capabilities' of various parties and asserts 'the right to... sustainable development'. The first suggests something like an ability-to-pay conception of responsibility for mitigation and the financing of adaptation to climate change. The second seems to require that such institutions be consistent with macro-economic policies in developing and least developed countries that seek poverty eradicating growth.

There is still the issue of whether responsibility on the basis of the ability to pay should be assigned to states or to individuals. Here there are some competing considerations of morality and practicality. Insofar as we prize the well-being or dignity of individuals, we find the moral ideals of equality amongst individuals and poverty eradication for persons attractive. However, an international climate change regulatory regime will be the product of treaty negotiation between states that are likely to jealously guard their traditional sovereign powers. Consider, for example, China's reticence to allow international monitoring of its commitments to reduce CO₂ emissions. Moreover, it might be difficult to work out the international

institutions for holding individuals responsible, even if states were willing. This makes it doubtful that the assignment of responsibility for the costs of climate change through international negotiation can effectively lay burdens directly on individuals.

The consideration mentioned above is not merely a concession to realism at the expense of justice. The problems that need solving are practical. And to some extent then a conception of responsibility also has to be workable. The moral merits of a conception of responsibility would be diminished by its lack of practicality. Additionally, the state-centric language of the Convention concerning the respective capabilities of states and the right to sustainable development seems to provide protections for the well-being of the populations of states; and to the extent that such language forms the basis of an assignment of basic responsibility to states, the assignment is sensitive to individuals even if not directly laid on individuals.

One objection to the assignment of responsibility to states rather than to individuals is, as we have seen, the charge that responsibility would unfairly devolve on to individuals. But the force of the objection is less strong when applied to no-fault conceptions of responsibility. One worry about fairness is that a consequence of assigning responsibility to states is that wealthy people in poor states will carry a less heavy burden simply because they live in a poor state.ⁿ But if the conception of responsibility includes the idea that developed states are to carry a heavier burden so that other states may pursue development, then this worry is mitigated since the idea is not that the wealthy people should relieve the burdens of the poor, but that a society should not unreasonably hindered in the pursuit of development, a process that seems to require significant social stratification in any case.^o Another worry about fairness is that a burden may devolve to poor people in developed states. Whether or not this occurs depends on state policy, and international negotiations will be limited providing guarantees against it. This may be a moral cost of the assigning responsibility to states on the basis of the ability to pay.

GRANDFATHERING

The assignment of duties to reduce CO₂ emissions can be made either as percent reductions from a baseline of emissions at a certain point in history or according to some other set of considerations consistent with some moral ideal, such as equal per capita emissions or permitting sustainable development. When reductions are assigned against a baseline year the percent of the baseline emissions that remains after the reduction

is the grandfathered emissions that are allowed. For example, if some set of states are required to reduce their emissions by 85%, the remaining 15% of emissions at the index year are grandfathered into the state's entitlement to emit.

Grandfathering was employed to assign emissions reductions in the Kyoto Protocol. The obligations of parties are expressed as percent reductions (on average five percent) below the baseline year of 1990. And the voluntary reductions recorded in Appendix 1 of Copenhagen Accord are measured against a number of baseline years. The EU's baseline is 1990; Kazakhstan's is 1992; Australia's is 2000; and Canada's and the USA's are 2005.³² In each case, the after-reduction emissions of states at that baseline year are grandfathered to the limit for permissible future emissions.

One reason that grandfathering matters morally is that in the context of rising emissions the baseline year determines the total reduction commitment. The later the index year—the closer it is to the present—the less the state will be required to reduce from present levels. To clearly compare the percentages that various states are required to reduce one must control for the baseline. For example, the 17% reduction below 2005 levels that the USA pledged in Copenhagen amounts to only a 3.75% reduction below 1990 levels. This compares unfavorably to the 20–30% reduction below 1990 levels that EU pledged.

A more fundamental moral issue with the practice of grandfathering is that in effect it gives states an entitlement to some of their historic emissions. The prevalence of grandfathering is probably due to a sense of entitlement that states bring to international negotiations. This might suggest that the practice of grandfathering has a certain pragmatic value in making an agreement possible.

The justice of assigning CO₂ emissions entitlements to states on the basis of historic emissions is however questionable since the practice rewards high-emitters. Although a state may not be at fault for emissions before, say, 1990, it far from clear that they should be rewarded for them. The resultant inequality also compounds the privileges of states that have developed through high emissions. Considerations of egalitarian global justice cast suspicion on policies that heap entitlements on the already advantaged.

Are there any moral considerations that might count in favor of grandfathering? One possibility is that states have a property right in their past emissions entitlements. If the atmosphere, or its capacity to recycle CO₂, is a good owned in common by all humanity, then perhaps past appropriation of that good establishes an entitlement for continued use on

the basis of something like the doctrine of adverse possession in property law.^p If one party puts a fence up that encloses some of the land of another, and if with knowledge of the fence and after a certain amount of time the second party has not objected, she might be interpreted as having consented to transferring the enclosed land to the first party. Perhaps the rest of the world has simply consented to the USA's appropriation of the otherwise collectively owned atmosphere by allowing its high emissions. This would establish the USA's historic entitlement to emit.

The requirement that the appropriation be known and not objected to is, however, problematic in the case of emissions. Before the relationship between greenhouse gasses and climate change was widely understood, the emission of CO₂ into the atmosphere would not have been thought of as an appropriation. After the relationship was well-understood, the emissions of high-emitting states were identified as a problem. The Convention—with its language of 'common but differentiated responsibilities and respective capabilities' and its division of states into Annex 1 and non-Annex 1—was written in 1992 just four years after United Nations General Assembly adopted Resolution 43/53 and two years after the first IPCC report. The Convention put the high-emitters on notice that their unequal appropriation of the atmospheric commons is not consented to by the other states.

Even if, as seems implausible given the argument of the previous paragraph, a property right to emissions on the basis of past practice did exist, there is no reason to think that it necessarily trumps other important public aims. Most states allow the practice of public takings of private property, within in specified constraints and in pursuit of important public objectives (for example highway construction). Establishing an international emissions reduction regime that also permits sustainable development is a very important public objective, affecting the lives and well being of hundreds of million people. According to some accounts of global justice it might even be a requirement of justice. Even if there were a property right in past emissions, the importance of the emissions reduction objective may give license to disregarding the right where doing so is necessary.

EQUAL EMISSIONS ENTITLEMENTS

In 2008 global per capita CO₂ emissions were 4.54 metric tons (mt). But there was considerable variability between countries. China, the highest total emitter, had per capita emissions of 5.16 mt, just slightly above average. The USA, the second highest total

emitter, had per capita emissions of 19.16 mt, among the highest. And India's per capita emissions, at 1.28 mt, were considerably below the global average.

A view that has garnered some support both from international NGOs and some moral and political philosophers holds that each person has an equal entitlement to emit CO₂ and that an emissions reduction regime can honor that by distributing the overall allowed emissions on an equal per capita basis.^q A standard basis for the claimed equal entitlement to emit is in thesis that the Earth's atmosphere, including its capacity to absorb CO₂, is collectively owned by all humanity.^r Assuming this, the idea is that the morally appropriate distribution of the common property is on an equal per capita basis. If one person emits more CO₂ than the allotment assigned equally to each, then she is appropriating the property of another.

Although the equal emissions entitlement view might seem to incorporate a morally compelling respect for basic human equality, it does not follow from the general premise of human equality.³³ Moreover, it has been roundly criticized, and not only by those who reject egalitarianism. Caney rejects the view on three grounds³⁴: First as an account of justice it focuses exclusively on the distribution of resource. But in doing so, it fetishizes the resource distributed; those who care about human equality do not care ultimately about equal resources. Second, it is insensitive different human needs that might require differential emissions to satisfy.^s And third, it is implausibly indifferent to past emissions. Those who have either had a greater share in creating the problem or enjoyed more benefits from past emissions may not be entitled to emit as much as those who have not. Each of these objections poses serious challenges to the equal emissions entitlement view. Perhaps further argumentation would produce defenses against these objections, but at the very least the luster of equal emissions entitlements as instantiating an attractive ideal of human equality has been tarnished.

There is another weakness of the equal emissions entitlement view. This is based on the constraints that equal emissions entitlements put on the ambitions of developing and least developed countries to pursue human development.³⁵ Two main factors conspire to reduce the equal per capita emissions entitlement to a level below that which is probably necessary for states to mount an effective economic development policy. One is the extent of global emissions reductions required to satisfy a plausible understanding of the demands of intergenerational justice; the other is global population growth.

According to IPCC limiting mean global warming to 2 °C requires that global emissions in 2050 be 50–85% below 2000 levels.²⁰ To get a get an understanding of how this would affect a per capita emissions entitlement consider that global per capita CO₂ emissions in 2000 were 3.92 mt for a population that was just over six billion.^f If we assume that population growth yields a global population of nine billion in 2050, the per capita emission entitlement of 50–85% reductions from 2000 levels would be in the range of 0.4–1.33 mt CO₂. We probably cannot say exactly how much CO₂ must be emitted in order to achieve high human development but there is very good reason to believe that it is much higher than the 0.4–1.33 mt per capita range. Consider the per capita emissions of the countries in the category of very high human development in the UNDP's 2009 Human Development Index (HDI). In this category the country with the lowest per capita emissions is Portugal, whose emissions in 2008 were 5.4 mt CO₂.⁴⁴ Of the 91 countries in the top half of the HDI only two—Albania and Peru—have per capita emissions within the 0.4 to 1.33 mt CO₂ range. Utilizing existing energy technology and given current energy prices, achieving very high human development in developing countries seems very unlikely if per capita emission must be kept within the 0.4–1.33 mt CO₂ range.

An international emissions entitlement trading arrangement could provide some relief from the constraints on human development imposed by the equal per capita requirement. Through the purchase of additional emissions entitlements states, or their populations, could increase their volume of allowed emissions. But this would raise the cost of energy consumption, resulting in delayed or forestalled human development. It is unlikely then to solve the underlying tension between equal per capita emissions and human development.

THE RIGHT TO SUSTAINABLE DEVELOPMENT

The problem noted with the equal per capita approach suggests that an appropriate alternative should be based on a commitment to permit sustainable development.^v This would be consistent with theories of global justice that require eradicating poverty or decreasing inequalities. It would also be in line with the Convention's commitment to sustainable development.

The Convention has a robust conception of development. In the Preamble it pledges to be,

taking into full account the legitimate priority needs of developing countries for the achievement of sustained economic growth and the eradication of poverty;^g and it recognizes 'that all countries, especially developing countries, need access to resources required to achieve sustainable social and economic development and that, in order for developing countries to progress towards that goal, their energy consumption will need to grow (Ref 21, preamble).

The goal of development is to eradicate poverty; this requires economic growth; that requires growth in energy consumption; and, when cheap fossil fuels are used, a by-product of energy consumption is CO₂ emissions.

In order for poverty eradicating development to occur in a sustainable context, developed states will have either to make especially deep cuts in their emissions to allow emissions growth in the developing world or to transfer resources, technology and intellectual property so that economic growth can be achieved without growth in emissions. The moral idea behind the right to sustainable development is well expressed by Henry Shue: '[T]hose living in desperate poverty ought not to be required to restrain their emissions, thereby remaining in poverty, in order that those living in luxury should not have to restrain their emissions'.³⁶ Presumably there are many institutional ways of ensuring this.⁴⁰

ADAPTATION

The previous three sections were concerned with global justice in climate change mitigation. But no account of global justice and climate change would be complete without a discussion of adaptation to climate change.^x One reason for this is that when the planet finishes warming from just the current store of greenhouse gases, after the oceans reach their equilibrium point, it will be well over 1 °C warmer, probably close to 1.5°. This will have significant climatic effects. At even less than 1° warming the IPCC expects increases in water stress, malnutrition, diarrhea, and cardiorespiratory ailments on a vast scale.²⁰ Moreover, the odds of limiting warming to 2° are long. To have decent chance of hitting that mark, the IPCC predicts that global emissions would have to peak by 2015 and then rapidly decline.²⁰ One outcome of the 2011 Conference of the Parties to the UNFCCC meeting in Durban is that no significant global emissions are likely to occur before 2020. The prospects of a treaty that would effect significant reductions in the time frame required to maintain the warming limit are not good. And failure to invest

adequately in climate change mitigation will increase adaptation costs.

How should adaptation costs be borne? Shue argues against the view that each state should be responsible for the damages within its borders.³⁶ Two considerations militate against that. One is that it assumes that the background distribution of global wealth and resources is just; and with billions of people consigned to desperate poverty while millions live very well that assumption is controversial. Another is that it fails to account for the global source of the problem, that the effects realized within one country are caused by sources of emissions around the world. This latter consideration need not make a fault conception of responsibility for adaptation necessary, but it constrains plausible no-fault conceptions. A plausible conception of responsibility for climate change adaptation must be global in scope.

The Copenhagen Accord, which emerged out the 2009 Conference of the Parties to the UNFCCC, pledged that developed states would provide \$100 billion beginning in 2020 to fund the climate change adaptation in developing and least developed countries. This pledge was given an institutional home at the 2010 Conference of the Parties in Cancun. The document agreed upon at that meeting promised a Green Climate Fund under the trusteeship of the World Bank. But funding sources and mechanisms still remain vague. The \$100 billion sum may be based on a realistic assessment of the costs of adaptation. The economist Nicholas Stern endorses the United Nations Human Development Programme's estimates that adaptation to climate will cost about \$86 billion annually, if climate change mitigation policies manage to keep warming below 2–3 °C.³⁷

The agreement in Cancun also included the Cancun Adaptation Framework for the provision of technical support and the sharing of information as well as a mechanism to encourage technology development and transfer to developing countries, and a commitment to capacity building in these countries. The commitments made in Cancun make certain questions of responsibility for climate change adaptation more pressing: Who should provide the funds and technical support? And who should be the beneficiaries?

Some people favor a version of the polluter-pays-principle that would seek funding from parties in proportion to their contribution to the problem and deliver the funding with the aim making those affected whole. Paul Baer has developed a detailed state-centric proposal for a fault conception of responsibility for

adaptation, a proposal which takes the responsibility of a particular state to be the result of subtracting a state's claims for damages from its share in the production of total damages.³⁸ If the latter is greater than the former the state is a net debtor, and must provide to the fund for restitution. But if the damages exceed the contribution to the problem, then the state is a net creditor, and has a claim on the fund for restitution. The basic strength of fault conceptions of responsibility for climate change adaptation is that they conform to the thoughts that it is wrong to harm people avoidably and that climate change is doing just that. But such conceptions also falter in the way that fault conceptions of responsibility for climate change in general falter. They cannot account for all historic emissions because much of it is produced by people who are now dead or who were once excusably ignorant of their action.

The virtues of the-ability-to-pay-principle in this context are the same ones that it possesses for climate change in general: The principle is especially plausible with respect establishing background institutions that establish entitlements against which fault for noncompliance can be attributed; the Convention contains language that is well-interpreted as supporting ability-to-pay; and there are credible accounts of global justice that provide support for it.

The right to sustainable development could also serve to organize some of the aspects of responsibility for climate change adaptation. In this context the right might be taken as establishing claims of distributive justice between states. Developed states have the responsibility to ensure that the costs of adapting to climate change in developing and least developed states do not undermine their development objectives. There is no prior condition to aim at in order to make the affected states whole as is the intuition of restitution to the harmed in fault-based conceptions. So, there is room for reasonable disagreement about what would count as sufficient subsidies not to ensure that development is not undermined. But it is manifestly clear that many poor states have very little coping power for the climate-related disasters that are likely to befall them, and this conception of responsibility orients action toward ensuring that they are helped.

A criticism of this conception of responsibility can be found in the arguments of Eric Posner and David Weisbach. They argue that, even if global justice requires eradicating poverty, climate change policy should deal with climate change not distributive injustices.²² This criticism fails to appreciate what is required to deal with climate change. A morally

basic reason to be concerned about climate change is because we are concerned about human development. When climate change is likely to throw people into desperate poverty and set back human development in some states that are making progress, a treaty that seeks to prevent these evils is not addressing matters of distributive justice that are external to concerns about climate change. On the contrary, such a treaty is dealing with climate change. Moreover, it is doubtful that a treaty that did not address these matters would ever be acceptable to the developing world. And since emissions growth over the next several decades will come mostly from the quickly developing countries, an effective climate change treaty must address their concerns.

CONCLUSION

In this article, I have sought to review the most important issues concerning climate change and global justice. I hope to have introduced the uninitiated to the importance and complexities of the issues as well as to have stimulated even those readers already familiar with many of the debates to further critical normative reflection on the issues. There is a growing literature on these issues, written by ethicists, political philosophers, and political theorists. This literature will continue to fuel the debates and, perhaps, play a role in informing policy-making. Whether the latter occurs or not depends in part on how seriously its readers take the debates and disseminate the ideas. My hope is that this article will play a role in encouraging readers to do that.

NOTES

^aRecently philosophers have begun to take up some of these issues see, for example, Refs 39–41.

^bFor a good review of related material see Ref 42.

^cThere are several good surveys that serve as introductions to global justice. See, for example, Refs 43,44.

^dThe distinction drawn in this paragraph is less stark than it might seem. For there are theories that hold that in the absence of significant injustice noncompatriots do owe one another robust duties social justice, but given extensive historical and ongoing injustice they do. See Ref 13.

^eFor discussions of these two matters see Refs 45,46.

^fFor a claim that the Convention's norms are misguided efforts at redistribution see Ref 22.

^gThe human rights approach has been endorsed by several other writers as well. See Refs 47–50.

^hSome of the challenges are presented in Refs 51,52. For a partial response to these see Ref 47.

ⁱA thorough defense of this view can be found in Ref 53.

^jFor more on the application of the distinction between fault and no-fault accounts in climate change see Ref 36.

^kFor a defense of a fault conception of collective responsibility see Ref 54.

^lI have discussed these as three distinct approaches, but combinations may be possible. For an interesting combination of strict liability and beneficiary pays see Ref 55.

^mFor one such account see Ref 27.

ⁿObjections to statism in climate change policy based upon fairness to individuals are pressed in Ref 56.

^oA casual survey of recently rapidly developing states suggests this. But for a more sophisticated defense of the claim see Ref 57.

^pFor a property rights defense of grandfathering see Ref 58.

^qThe Centre for Science and the Environment (see www.cseindia.org/) and the Global Commons Institute (see www.gci.org.uk/) have spearheaded support for the idea that each person should have an equal entitlement to emit greenhouse gases. The view is defended in Refs 59,60. For some philosophical defenses of the idea see Ref 61. See also Refs 8,54.

^rThis is not the only moral basis, however. Singer seems to defend equal per capita emissions on utilitarian grounds. See Ref 8.

^sThis criticism is also made by Gardiner.⁶²

^tFor emissions data see Ref 63.

^uFor the 2009 Human Development Index see Ref 64.

^vArguments in this section are based on Ref 65.

^wOne example of this is the Greenhouse Development.⁶⁶

^xA much more thorough review of the recent work on moral responsibility and adaptation can be found in Ref 67.

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REFERENCES

1. Beitz C. *Political Theory and International Relations*. Princeton: Princeton University Press; 1999, 224.
2. Brock G. *Global Justice: A Cosmopolitan Account*. Oxford: Oxford University Press; 2009, 288.
3. Caney S. *Justice Beyond Borders*. Oxford: Oxford University Press; 2006, 336.
4. Moellendorf D. *Cosmopolitan Justice*. Boulder: Westview; 2002, 240.
5. Moellendorf D. *Global Inequality Matters*. Basingstoke: Palgrave Macmillan; 2009, 256.
6. Pogge T. *Realizing Rawls*. Ithaca: Cornell University Press; 1989, 296.
7. Pogge T. *World Poverty and Human Rights*. 2nd ed. London: Polity Press; 2008, 364.
8. Singer P. *One World: The Ethics of Globalization*. New Haven: Yale University Press; 2004, 272.
9. Tan KC. *Justice Without Borders: Cosmopolitanism*. Cambridge: Cambridge University Press; 2004, 236.
10. Blake M. Distributive justice, state coercion, and autonomy. *Phil Public Aff* 2001, 30:257–296.
11. Miller D. *National Responsibility and Global Justice*. New York: Oxford University Press; 2007, 264.
12. Miller RW. Cosmopolitan respect and patriotic concern. *Phil Public Aff* 1998, 27:202–224.
13. Miller RW. *Globalizing Justice: The Ethics of Poverty and Power*. Oxford: Oxford University Press; 2010, 288.
14. Nagel T. The problem of global justice. *Phil Public Aff* 2005, 33:113–147.
15. Rawls J. *The Law of Peoples* 1999. Cambridge MA: Harvard University Press; 208.
16. Sangiovanni A. Global justice, reciprocity, and the state. *Phil Public Aff* 2007, 35:3–39.
17. Steiner H. Territorial justice and global redistribution. In: Brighouse H, Brock G, eds. *The Political Philosophy of Cosmopolitanism*. Cambridge: Cambridge University Press; 2004, 28–38.
18. United Nations Human Development Programme. Human Development Report 2007–2008, 2007, Palgrave Macmillan: Basingstoke. Available at: http://hdr.undp.org/en/media/HDR_20072008_EN_Complete.pdf.
19. McGranahan G, Balk D, Anderson B. The rising tide: assessing the risks of climate change and human settlements in low elevation coastal zone. *Environ Urban* 2007, 19:17–37.
20. Intergovernmental Panel on Climate Change. Climate Change 2007: Synthesis Report, Available at: http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf.
21. The United Nations Framework Convention on Climate Change. Available at: <http://unfccc.int/resource/docs/convkp/conveng.pdf>.
22. Posner EA, Weisbach D. *Climate Change Justice*. Princeton: Princeton University Press; 2010, 240.
23. IPCC Climate Change 2007, Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Available at: <http://www.ipcc.ch/pdf/assessment-report/ar4/wg3/ar4-wg3-spm.pdf>.
24. Universal Declaration of Human Rights, Art. 25, para. 1. Available at: <http://www.un.org/en/documents/udhr/index.shtml>.
25. International Covenant on Economic, Social and Cultural Rights, Article 11, para. 1. Available at: <http://www2.ohchr.org/english/law/cescr.htm>.
26. Caney S. Climate change, human rights, and moral thresholds. In: Humphreys S, ed. *Human Rights and Climate Change*. Cambridge: Cambridge University Press; 2010, 69–90.
27. Caney S. Cosmopolitan justice, responsibility, and global climate change. *J Int Law* 2005, 18:747–775.
28. United Nations General Assembly, resolution 43/53, 1988, Available at: <http://www.un.org/Depts/dhl/res/resa43.htm>.
29. Weisbach D. Negligence, Strict Liability, and Responsibility for Climate Change The Harvard Project on International Climate Agreements, Discussion Paper 1-39 2010, Available at: <http://belfercenter.ksg.harvard.edu/files/WeisbachDP39.pdf>.
30. Neumayer E. Defence of historical accountability for greenhouse emissions. *Ecol Econ* 2000, 33:185–192.
31. Moellendorf D. Treaty norms and climate change mitigation. *Ethics Int Aff* 2009, 23:247–265. Available at: http://www.carnegiecouncil.org/resources/journal/23_3/features/001.
32. United Nations Framework Convention on Climate Change, Appendix I - Quantified economy-wide emissions targets for 2020. Available at: http://unfccc.int/meetings/cop_15/copenhagen_accord/items/5264.php.
33. Shue H. Environmental change and the varieties of justice. In: Hampson FO, Reppy J, eds. *Earthly Goods: Environmental Change and Social Justice*. Ithaca: Cornell University Press; 1996, 9–29.
34. Caney S. Climate change, energy rights, and equality. In: Arnold D, ed. *The Ethics of Global Climate Change*. Cambridge: Cambridge University Press; 2011, 77–103.
35. Moellendorf D. Common atmospheric ownership and equal emissions entitlements. In: Arnold D, ed. *The Ethics of Global Climate Change*. Cambridge: Cambridge University Press; 2011, 104–123.
36. Shue H. Subsistence emissions and luxury emissions. *Law Policy* 1993, 15:39–59.
37. Stern N. *The Global Deal 2009*. New York: Public Affairs; 2009, 256.

38. Baer P. Adaptation: who pays whom? In: Adger W, Paavola J, Huq S, Mace MJ, eds. *Fairness in Adaptation to Climate Change*. Cambridge, MA: The MIT Press; 2006, 131–156.
39. Jamieson D. Climate change, responsibility. *Justice Sci Eng Ethics* 2010, 16:431–445.
40. Nolt J. Non-anthropocentric climate ethics. *WIREs* 2011, 2:701–711.
41. Palmer C. Does nature matter? The place of non-humans in the ethics of climate change. In: Arnold D, ed. *The Ethics of Global Climate Change*. Cambridge: Cambridge University Press; 2011, 272–292.
42. Okereke C. Climate justice and the international regime. *WIREs* 2010, 1:462–474.
43. Pogge T, Moellendorf D. *Global Justice: Seminal Essays*. St. Paul: Paragon House; 2008, 736.
44. Brooks T. *The Global Justice Reader*. London: Wiley-Blackwell; 2008, 768.
45. Moellendorf D. A normative account of dangerous climate change. *Clim Change* 2011, 108:57–72.
46. Moellendorf D. Justice and the intergenerational assignment of the costs of climate change. *J Social Phil* 2009, 40:204–224.
47. Bell D. Does anthropogenic climate change violate human rights? *Crit Rev Int Social Polit Phil* 2011, 14:99–124.
48. Hayward T. Human rights versus emissions rights: climate justice and the equitable distribution of ecological space. *Ethics Int Aff* 2007, 21:431–450.
49. Miller D. Global justice and climate change: how should responsibilities be distributed? *The Tanner Lectures on Human Values*. Tsinghua University: Beijing; 2008, 24–25. Available at: http://www.tannerlectures.utah.edu/lectures/documents/Miller_08.pdf. (Accessed January 26, 2012).
50. Shue H. Bequeathing hazards: security rights and property rights of future generations. In: Dore M, Mount T, eds. *Global Environmental Economics: Equity and the Limits to Markets*. Oxford: Blackwell; 1999, 38–53.
51. Beckerman W, Pasek J. *Justice, Posterity, and the Environment*. Oxford: Oxford University Press; 2001.
52. Parfit D. *Reasons and Persons*. Oxford: Oxford University Press; 1987.
53. Gardiner SM. Ethics and climate change: an introduction. *WIREs* 2010, 1:54–66.
54. Vanderheiden S. *Atmospheric Justice: A Political Theory of Climate Change*. Oxford: Oxford University Press; 2008.
55. Bell D. Global climate justice, historic emissions, and excusable ignorance. *The Monist* 2011, 94:391–411.
56. Harris P. *World Ethics and Climate Change: From International Justice to Global Justice*. Edinburgh: University of Edinburgh Press; 2010.
57. Cohen GA. *Karl Marx's Theory of History: A Defence Expanded*. Princeton: Princeton University Press; 2000, 430.
58. Bovens LA. Lockean defense of grandfathering emission rights. In: Arnold D, ed. *The Ethics of Global Climate Change*. Cambridge: Cambridge University Press; 2011, 124–144.
59. Agarwal A, Narain S. *Global Warming in an Unequal World: The Case for Environmental Colonialism*. New Delhi: Centre for Science and the Environment; 1991.
60. Athanasiou T, Baer P. *Dead Heat: Global Justice and Global Warming*. New York: Seven Stories Press; 2002.
61. Jamieson D. Climate Change and Global Environmental Justice. In: Miller CA, Edwards PN, eds. *Changing the Atmosphere: Expert Knowledge and Environmental Governance*. Cambridge, MA: The MIT Press; 2001, 287–307.
62. Gardiner SM. Ethics and global climate change. *Ethics* 2004, 114:555–600.
63. United States Energy Information Administration. Available at: www.eia.doe.gov/. (Accessed January 29, 2009).
64. United Nations Human Development Programme, Human Development 2009, Overcoming Barriers: Human Mobility and Development. Available at: http://hdr.undp.org/en/media/HDR_2009_EN_Complete.pdf. (Accessed January 26, 2012).
65. D, A Right to Sustainable Development. *Monist* 2011, 94:433–452.
66. Baer P, Athanasiou T, Kemp-Benedict E. *Greenhouse Development Rights Framework: The Right to Development in a Climate Constrained World, Christian Aid*. Berlin: Heinrich Böll Foundation, EcoEquity and the Stockholm Environment Institute; 2008.
67. Hartzell-Nicholls L. Responsibility for meeting the costs of adaptation. *WIREs* 2011, 2:687–700.