Fair Chore Division for Climate Change

by Martino Traxler (2002)

A hitherto neglected way of dividing chores fairly offers the best likelihood of promoting international cooperation in dealing with the problem of global climate change. The largest obstacle to international cooperation in this matter is, arguably, the problem of allocation—how to divide among nations the costs or chores of climate change mitigation and adaptation. The difficulties of this allocation problem are compounded by the absence of an overseeing supra-national authority with the power to police and enforce any agreement that the nations of the world may reach. Allocation according to a fair chore division into equally burdensome shares best promotes international cooperation in the absence of such an overseeing authority. Still, for all its practical advantages, this approach to the allocation problem remains morally problematic for neglecting past iniquities and bringing only partial remedy to present and future iniquities arising from climate change.

…I review what I take to be the strongest grounds for our having moral obligations to deal with climate change. Given that it is highly likely that climate change will cause serious distress to large portions of the future human population, all those who can do something about it are under an obligation to deal with this threat to future humanity, Our obligation comes from two sorts of universal moral duties: a duty of non-maleficence—not doing wrongful harm to others—and a duty to assist those who need help in order to avoid harm and suffering. These two universal duties give rise to two distinct strains of moral argument for our having obligations to deal with climate change and they each support different ways of allocating the chores and costs of climate change adaptation or mitigation. Violations of duties of non-maleficence give rise to obligations to compensate for or rectify the maleficence for which one is responsible. Obligations of assistance, instead, fall equally on all who can help those who will otherwise suffer. Because of this, these last obligations are better suited to equitable or fair allocations or chore divisions. Thus there are grounds for resolving the problem of allocation according to two different principles—a principle of responsibility and a principle of equitable or fair allocation.

I evaluate the merits of different approaches to the allocation problem in the second part of the paper. I argue for the practical superiority of a chore division into equally burdensome shares. I then consider the iniquities left unanswered by this approach as well as some difficulties that would arise in implementing this solution to the allocation problem.

1. Why Should We Worry About Dealing with Climate Change?

Is the present human population (or a subset thereof) under some moral obligation to do something about the future effects of climate change induced by global warming from anthropogenic greenhouse gas emissions? Yes—on two counts. First, if past and current emissions will harm humans of future generations, then those who made those emissions may be responsible for causing this harm. Those responsible would then bear obligations toward the future potential victims of this harm. The second count does not turn on moral

responsibility for what one has done. It rests, instead, on the recognition that we have duties to help others avoid harm, that is, that we have duties not to let harm happen to them, particularly when we can do something about it and they cannot and will not be able to do so.

The stronger argument for saying that at least some of the present generation has a moral duty to deal with predicted climate change is the first, responsibility-based argument: we, the present human generation (or parts thereof), owe assistance to future humans for presently and knowingly violating our duties of non-maleficence toward future human beings. Duties of non-maleficence are duties to not bring about (whether by act or omission) bad results to others, unless our ignorance of doing so is non-culpable. These are duties to not bring about a worsening of the condition of others. Duties of non-maleficence range in moral stringency from the most stringent duties not to bring about physical harm or damage to others to the less stringent duty not to cause mere displeasure to others. The duty not to bring about physical harm or damage to others, I assume, is among our most stringent moral duties. So violating this duty is among the worst things we can do, morally speaking, to future human generations (among others). This means that, other things being equal, when we violate this duty, our subsequent duties to make amends for our violation are also among our most stringent duties. That is why this is the strongest or most compelling moral argument for having duties to deal with climate change from global warming.

This duty of non-maleficence is, moreover, a universal duty, which means that distance, whether spatial or temporal, does not directly affect the stringency of the duty. (Of course, even though this duty of non-maleficence is equally stringent for all, we may have other moral obligations that may counterbalance or outweigh it, so that the all-things-considered stringency of our duty to not harm particular people may be correspondingly weakened.) Rectificatory or compensatory duties arising from a violation of non-maleficence, however, are not universal—they invest only those responsible for the violation.

Thus, in order to establish the existence of obligations from either line of argument sketched above, one must establish that harm will occur from climate changes caused by global warming caused by anthropogenic greenhouse gas emissions, unless something is done. Establishing that much and establishing that we can only be culpably ignorant of these dire predictions is sufficient to establish that we have the weaker or less stringent duties to help future people to avoid this harm. In order to establish the more stringent duty from responsibility we must show that we are morally responsible for violating our duty of non-maleficence. Proving this responsibility, in turn, requires showing that we are inflicting suffering on future generations, that we know that we are doing so, and that we are not otherwise excused for doing so—in particular, that our actions are not excused by our intending to avoid either harm or comparable suffering to ourselves (or to still other intermediate generations). I will assume that these conditions, when persuasively established, are also sufficient to show responsibility for this maleficence.

Are harmful climate changes predicted for future generations? They certainly seem to be. The Intergovernmental Panel on Climate Change (IPCC) has reached a scientific near-consensus for the claim that anthropogenic emissions of greenhouse gases (GHGs) will

cause climate change from global warming. (4) The IPCC has also expressed something close to this near-consensus for the claim that this global warming will lead to disruptive, frequently devastating climate changes that are predicted to result in much human distress, including physical harm, unless something (sometimes a great deal) is done beforehand.

Although the conclusion that suffering will ensue is neither certain nor even as highly probable as that some climate changes or other will occur, still, the relatively small measure of uncertainty surrounding the potential for harm from our greenhouse gas emissions does not excuse our present inactivity. For it seems quite clear that we are morally required to prepare for this occurrence at least in proportion to its likelihood. Since that likelihood is great enough, it places us under enough of a moral obligation that we should acknowledge that we ought to act.

On to the next point: are we aware that we are inflicting suffering on future generations or is our apparent maleficence excused on grounds of ignorance? This question assumes that ignorance, or non-culpable ignorance anyway, would exonerate us from responsibility for the harm caused by our emissions. This assumption is highly questionable. But even if we assume that non-culpable ignorance exonerates, the conclusions of the IPCC and of other scientific bodies, and the play they have had in the media, should lead us to conclude that what ignorance exists of the possibility of climate change and of its potentially dire consequences can only be considered culpable ignorance—ignorance that does not excuse our responsibility. …

We may argue—as scientists and economists, among others, do—about how much future suffering we may be inflicting; but we cannot plausibly argue that we are unaware that we are most likely causing some serious future suffering. So we are not relieved of our responsibility either to help future humans avoid harm, or for our maleficence in causing them harm. …

If we are acting maleficently and if we are not excused by our ignorance, then are we morally obligated to act on account of our maleficence? Not necessarily: even if we are responsible for a maleficent result, we may still not violate a duty of non-maleficence when we are properly excused for the resulting maleficence. Are we excused somehow for knowingly inflicting this suffering on future generations? Arguably, not having any choice in the matter would excuse this maleficence. Matters of logical or nomological necessity—of literally not being able to do otherwise—would count as having no choice in the matter and therefore excuse us. Assuming that this is not the case, one may still reasonably argue that certain options among which we can choose are so rationally compelling as to count as excusing or *rationally forced choices*. Rationally forced choices are matters of social or physiological necessity. Social necessity amounts to what a society needs or finds indispensable in order to survive; physiological necessity is a matter of what is needed or indispensable in order for the members of a society to survive (barring illness or age, etc.) or in order for them to live at some minimally acceptable level of health, say, at which they are able to avoid enduring physiological harm or damage. When socially or physiologically necessary options, as rationally compelling options, are maleficent, they are excusably maleficent. Thus those emissions that are rationally compelling or indispensable emissions are excusably maleficent.

These socially or physiologically indispensable emissions—what Henry Shue[1] calls "subsistence emissions"—are excusably maleficent because they present their potential emitters with such a hard choice between avoiding a harm today or avoiding a harm in the future. Where the choice is hard enough to make, either option may be permitted and may excuse us from not opting for the alternative. For where the present harm from not emitting is conspicuous enough, we would be unrealistic, unreasonable, and maybe even irrational to expect present people to allow present harm and suffering to visit them or their kith and kin in order that they might avoid harm to future people far less closely related to them. In these cases, we may with good reason speak of having so strong or so rationally compelling a reason to emit that, in spite of the harm these emissions will cause to (future) others, we are excused for our maleficence. Much like self-defense may excuse the commission of an injury and even a murder, so their necessity for our subsistence may excuse our indispensable current emissions and the resulting future infliction of harm they cause. Subsistence emissions are emissions we cannot reasonably be expected not to make, because they are rationally compelling emissions, and we are excused for making them.

Another way of reaching the same conclusion is to state our duties of non-maleficence as duties not to inflict unnecessary suffering on others. The suffering of others may be unnecessary in at least two ways: it may not be necessary for others to suffer (we could do something to prevent their suffering) or, in the case that interests us here, it may not be necessary *for us* to inflict suffering on others in order to avoid greater, equal, or probably even some lesser measure of suffering to ourselves. I have proposed that subsistence emissions are rationally compelling emissions because they are socially or physiologically indispensable emissions, that is, roughly, because these emissions are necessary for us to make in order to subsist.

To some, this argument for complete exoneration from responsibility for future harm for currently indispensable emissions may seem excessive. They will argue that even maleficence excused by necessity may still give rise to compensatory or rectificatory obligations on the part of those whose actions harm others, even if their performance of the action is excused. It seems correct to hold those emitting greenhouse gases (especially if they know that they are (most likely) causing harm to others in the future) to be morally obligated to do what they can to minimize the damage caused by their presently indispensable emissions or to make some sort of reparation for the harm they have caused, even when the indispensability of these emissions leaves the emitters no choice but to emit. So it seems that while those rationally compelled to emit gases that are likely to cause damage in the future may be excused for their emissions, they may still, perhaps, owe some compensatory obligations to those who will be harmed in the future.

It seems clear that subsistence emissions present the strongest case for being fully excused. But what about our *dispensable* emissions? What about those emissions without which we would have been less well off, but whose absence would not have brought upon us any such harm as long-term physical or psychological damage or debilitation? Insofar as these emissions are not, strictly-speaking, indispensable or subsistence emissions, their maleficence is not excused.

[1] Henry Shue, "Subsistence Emissions and Luxury Emissions," Law and Policy 15 (1993): 39-59.

This conclusion is most obvious for straightforward *luxury emissions*—emissions produced to furnish goods and services that are luxuries. These luxury emissions are expendable or unnecessary, save perhaps for their status-conferring nature. If we reasonably expect (as we do) that these emissions will contribute to inflicting unnecessary suffering, then, excluding ignorance and excusing circumstances (as we do), these emissions are inexcusably maleficent. If they are inexcusably maleficent, then they are the emissions that we have obligations to omit or reduce as a matter of justice.

Of course, much of our emissions (in developed countries) fall somewhere in the middle—between the extremes of luxury and necessity. Should all these in-between emissions be treated the same way? Are only maleficent subsistence emissions excused or are all non-luxury emissions excused? It seems more reasonable to draw the line of excusable maleficence somewhere in between luxury and necessity. Perhaps we should hold that only subsistence and suitably defined near-subsistence emissions are excused on the grounds that they are the only emissions that we are rationally compelled to produce. An argument for drawing the line at near-subsistence emissions runs thus: they are the only emissions allowed by our duty of non-maleficence if it is correct to add that there is a priority to not harming those near or dear to us over not causing similar harm to strangers. Thus we can reasonably draw the line of excusable maleficent emissions at near-subsistence emissions.

An alternative way to settle this question of which maleficent emissions are excused is to hold that emissions become progressively more excusable as we move from inexcusable luxury emissions to fully excused subsistence emissions. One relatively familiar way to add some definition or particulars to this approach would be to suppose that our duties of non-maleficence are based on a fundamental concern to promote the least suffering or harm overall (over time). In this case, we could hold that the only infliction of suffering that is permitted is an infliction that still results in an improvement overall (over time) in this regard. Thus, all and only those emissions made today that avoid more suffering for us than they will produce for others in the future are morally permissible. So, in line with a view expressed by Peter Singer writing about famine relief,[2] we might say that if we were truly non-maleficent, we ought to refrain from all emissions that create more suffering to others in the future than they spare us today. What part of our current emissions is this? I do not know but I'll wager that it is a substantial part of the GHG emissions of developed nations.

The long and short of this excursion into matters of maleficence is that it is likely that a great deal of the world's current greenhouse gas emissions, at least in developed countries, are inexcusably maleficent because they are luxury emissions, or the least indispensable emissions. If emissions are maleficent, then we are morally obligated to refrain from making these emissions. If we emit greenhouse gases maleficently, then we are responsible for the future suffering that they will cause and we are obligated to do what we can to minimize this suffering. Here, then, is the source of our stronger obligation regarding climate change. Here also is the key to determining which emissions are most excusable: those that will avoid harm—subsistence emissions, above all. …

[2] Peter Singer, "Famine, Affluence, and Morality," Philosophy & Public Affairs 1 (1972): 229-43.

The foregoing conclusion—that we, the unexcused maleficent greenhouse gas emitters, ought to worry about the effects of climate change and that it is our collective responsibility to do something about this risk—should come as no great surprise. It is a conclusion that most politicians appear to have accepted, most notably in agreeing to the United Nations Framework Convention on Climate Change, in May 1992. …

Politicians of the world, however, have agreed to much less about how to deal with climate change. … By "dealing with climate change" I mean that it is in our power to do some of both of the following:

(1) mitigate harmful climate change by reducing our GHG emissions (that is, deal with the cause as the Kyoto Protocol envisions);
(2) adapt to predicted harmful climate change caused by global warming (that is, prepare to deal with the effects of climate change). …

Several considerations have prevented nations and their political leaders both from actively dealing with climate change … Emissions reductions are a hard sell for politicians of any stripe because they are costly. Reductions in greenhouse gas emissions generally require reductions in energy consumption, which, in turn, result in reductions in economic activity and in national and per capita earnings, which, almost invariably, make the government itself less popular.

Scientists are also uncertain about the precise changes in weather patterns that we should expect from global warming. More importantly, perhaps, many economists and others disagree about what should be done to adapt to this harm. For all these reasons, some hesitance to commit to action may be justified by caution or by the understandable fear of making technically unnecessary sacrifices. …

Moreover and no less importantly, even assuming politicians all were to agree both *that* something needs to be done and *on* what needs to be done, they would still face a typical problem of collective action here—a problem of cooperation before a commons. …

A public good is a good to which many have virtually unrestricted access and which they can enjoy, at a negligible cost, regardless of whether or not they contribute to its maintenance. Some public goods, like the starry skies above, are virtually imperishable (on a human time scale). Most of the public goods that we care about, however, including the night-time visibility of the stars, are perishable. Typically, our enjoyment of a public good reduces in some measure the enjoyment that we or others can subsequently derive from the good. This occurs, for instance, when one's enjoyment of a finite and non-renewable public good involves some, however slight, irreversible diminution of this good. But even renewable public goods are often perishable goods. For instance, their existence may be threatened by over-use. Many public goods require that we, collectively, devote some energies and resources to their renewal. Other public goods may require that we not use them up faster than they can renew themselves.

All such public goods are *commons* when, for each relevant agent with low-cost, virtually free access to the good, the choice of whether to contribute to its maintenance or renewal or the choice to refrain from enjoying the public good has the payoffs of a Prisoners'

Dilemma (PD). Choices with the payoffs of a PD are those for which these two conditions hold:

1) it is in the interest of each agent that the public good not be exhausted so that each agent would prefer that everyone contribute to its maintenance (or refrain ...), that is, that all *cooperate* rather than that no one contribute to it, that is to say, that everyone *defect* or free-ride,
2) but it is more in the interest of each agent, or rational for each agent, to *defect*, that is, to not contribute to the maintenance of this good (or not refrain ...), regardless of what others choose to do. (The choice to defect is said to rationally *dominate* the alternative of cooperating.)

The typical fate of a commons is a "tragedy" in which each individual's rational choice to defect brings about a collective setback in the exhaustion or destruction of the public good from which all or many previously could benefit. To name but one sort of example, this tragedy is one we have come close to achieving by overfishing several fish and whale populations.

What is to be done about preserving a commons? In many cases, the maintenance of public goods that are commons can be ensured by altering the payoffs of this choice so that they are no longer the payoffs of a commons. This result can be achieved by altering the payoffs that agents face so as to make it rational for everyone (or for enough agents) to cooperate, that is, to contribute to maintaining the public good in question (or to reduce the use of the good so that it has time to renew itself). An adequate interest in cooperating in the maintenance of a public good may be achieved through the addition of inducements to cooperation, for instance, in the form of monetary rewards. More often, however, it is easier or more effective to employ coercive measures in order to increase either the costs of enjoying the good or the (expected) costs of defection or free-riding (for instance, by means of fines, etc.). Increasing the costs of enjoying the good typically occurs by enforcing restrictions on the enjoyment of the good. …

There are important public goods, however, for which neither inducements to cooperation nor coercive restrictions of access are advisable or practically feasible. This happens when, for instance, no overseeing authority can be trusted either to disburse inducements fairly or to properly enforce the sanctions threatened for defection. Such conditions presently obtain among the nations of the world that do not wish to grant international organizations, such as the United Nations, adequate independent enforcement muscle of their own in the form of an army or a police force, or of courts able to impose their own jurisdiction and judgments on states. …

The problem of dealing with the likely harmful effects of climate change from global warming presents just such a commons. In this case, the public good is constituted by our current global weather patterns. For, much as we may enjoy maligning the weather we experience, we still prefer it to the globally warmer weather patterns we are collectively bringing about. The costs of maintaining this global public good are whatever it would take for the current and future population of the earth to prevent the changes in these weather patterns or else what it would take to deal with the changes effectively so that the living conditions of those affected populations were not worsened by climate

changes. Climate change presents a commons precisely because, on the one hand, it is in each person's or each nation's interest that our climate patterns not be negatively affected by our greenhouse gas emissions while, on the other hand, it is in each person's or nation's interest to let others bear the burdens or costs of preserving this global good.

Thus, even if action against climate change today is thought worthwhile in the long run, its costs are such that each national government would rather see other nations take action while it avoids, as far as possible, making any such costly commitments. While it is in the interest of everyone that this problem be dealt with in a timely fashion, and while each nation would prefer that all act to deal with it effectively, it is also in each nation's interest to do as little as it can get away with doing. In short, nations face what is known as a commons, a collective-action or "free-rider" problem. …

As if these prudential grounds were not enough, nations may also claim moral grounds of justice or fairness for hesitating or refusing to contribute to dealing with climate change. I will discuss these below in considering the question of how the collective chore of dealing with climate change should be divided.

Just how much harm and suffering the damage from climate change causes is, to an important extent, up to us to determine in how we adapt to the predicted effects of climate change. Since we have moral obligations not to harm people, then, insofar as it is in our power not to harm others inexcusably, we have moral obligations to deal with climate change that is so likely to cause harm. This realization leads me to rephrase the previous conclusion and hold that we should heed the more sanguine reactions of many economists and conclude that a great deal of the world's current greenhouse gas emissions will prove inexcusably maleficent unless we do enough to deal with their maleficence—by mitigation or otherwise adapting to it. …

In the rest of this paper, I assume that the nations of the world can come to some agreement, or perhaps that a majority of its atmospheric scientists can come to some consensus, about what needs to be done to deal with this problem. With this assumption in hand we can ask, "How then should nations divide up this global bill—whatever it turns out to be—for mitigating the effects of climate change and for adapting to its effects?"

2. How to Split the Bill for Dealing with Climate Change?

Dealing with the problem of climate change involves abating and adapting. Abatement involves reducing emissions of greenhouse gases; adapting, instead, involves preparing in other ways for those climate changes that we do not expect to get around to abating. Adaptation is a cost, since resources that could have been used otherwise must be put aside or invested in adaptation. Abatement, too, is a cost. Reducing emissions typically involves foregoing those goods whose production involves emissions as a by-product. … Similar considerations are true of investments made in the sequestration of carbon dioxide in trees and other plants. Since all measures requiring investments can be divided up among nations, they are all matters for chore division.

If a cap in global emissions is set, then shares of these emissions can be allocated to various countries through a system of permits. This is the so-called allocation problem. Dealing with global warming forces us to confront problems of allocation and problems of chore division. Since both these sorts of problems can be solved according to the same principles, I will deal with them together in what follows.

I group the principal proposals made for the allocation or chore division into two—just proposals and fair proposals. This grouping highlights several differences in the moral concerns that the two sorts of proposals attempt to address. I also argue for the adoption of a fair division into equally burdensome shares because it offers the best prospects of success at promoting international cooperation in mitigation and adaptation. I conclude with some considerations about how to measure burdensomeness.

The distinction I adopt between just and fair proposals is, to some degree, a matter of expository convenience. The point of the distinction is to serve as a reminder that some proposals call for allocating according to backward-looking or historical rectificatory principles while other proposals appeal to forward-looking principles for the promotion of well-being. The just principles are mainly principles of rectificatory justice intended to restore an acceptable moral order that past actions had disturbed. In contrast to these just principles stand fair principles of chore division and allocation. These are forward-looking principles. They do not take account of past behavior or of past benefits or losses accrued, rather, they seek to maintain matters at least as morally acceptable as they are found to be at present in the future. In so doing, forward-looking principles of fair division can be faulted for taking the status quo as morally acceptable. …

[P]rinciples of fair division are, for the most part, various ways of trying to divide goods or chores as if each party had equal title or claim to a share of the good or chore in question. For this reason, it will be apparent that principles of fair chore division are intuitively better suited, morally speaking, to divisions of collective chores where each has an equally strong prima facie obligation to contribute, such as, for instance, universal moral obligations of assistance with famine relief.

Principles of fair chore division are intuitively less well suited to collective obligations that are crucially shaped by the history of their formation—for instance, obligations stemming from past violations of other duties, such as duties of non-maleficence. These last duties are intuitively better assigned according to responsibility. Yet even if the industrialized nations' obligations to deal with climate change should be, ideally, divided by responsibility, still we have good practical reasons to divide them fairly instead. The main reason for preferring a fair principle of division to a just one has to do with seeking the best solution to the associated problem of collective action or of commons.

2.1. Just (Backward-Looking) Proposals

In matters of climate change, the following proposals for allocation or chore division have garnered most attention: (i) pay or contribute in proportion to the benefits received from the greenhouse gases (GHGs) emitted; (ii) pay or contribute in proportion to the GHGs emitted (in proportion to responsibility); and (iii) pay or contribute on an equal per capita basis. This third proposal belongs to what I am calling "fairness-based

proposals," so I deal with it in the next section. Here I argue that although each of the first two "just" principles is admirable in its own way, neither is a serious candidate for an international chore division for lacking the practical advantages of a (fair) division by equal burdensomeness described in the subsequent section. …

A. Pay in proportion to the benefits received from the GHGs emitted

This principle is reminiscent of the Principle of Fair Play for political obligation. It allots shares in proportion to the benefits derived from the emission of GHGs much as the Principle of Fair Play requires contributions to the public good of the state from those who have benefited from the existence of this state. This principle is intuitively plausible for placing the burdens of dealing with climate change on those who have most benefited from the very cause of this climate change: the greenhouse gases they have emitted.

This principle, however, also has certain disadvantages. It penalizes the least beneficial GHG emissions just as much as it penalizes the most beneficial emissions if one considers only payments in fixed proportion to the benefits derived, regardless of the quantities of gases emitted to derive them. Applying this principle, in short, offers no incentive to emit GHGs efficiently and so to reduce wasteful emitting. The principle can be adjusted to avoid this drawback to the extent that payments are made proportional to the inefficiency of emissions made. But even this revised principle still has the further considerable defect of not taking into account the relative indispensability of these emissions, in the sense discussed above. In fact, we could reach the morally counterintuitive result that, insofar as indispensable or subsistence emissions bring the greatest benefits, they turn out to be the most heavily costed and penalized by this principle. Besides, if we assume that most GHG emissions have benefited humans to some degree or other, then there will be little practical difference between this principle and the next one, which is, perhaps, the most intuitive principle of all regarding the division of costs of dealing with climate change.

B. Pay in proportion to the GHGs emitted, or in proportion to responsibility

This principle follows the lead of "polluter pays" principles and reflects, to this extent, the intuitive idea that those whose actions cause harm or disturbance are liable to compensate for or rectify the ill done to those who have been affected. In its crudest form—where nations should pay in proportion to their total historical emissions—this principle, like its crude counterpart for paying according to benefits received, would violate the idea that we can only be responsible for what we were not excusably ignorant of. Since the IPCC was formed in 1998 and since it issued its first report in 1990, we should perhaps limit responsibility to emissions after 1990 and hold that the costs of dealing with climate change should be allotted in proportion to a nation's share of the global greenhouse gas emissions since 1990.

In requiring the developed nations to foot most of the bill for dealing with climate change, this principle recognizes their responsibility in causing the problem. To this extent, this principle reflects our intuitive views about what justice demands. This principle may also further reflect the demands of justice in requiring more from those nations that are relatively better off, especially if we think that they have been made better off by their

use of the very energy whose production released these greenhouse gases into the atmosphere. This principle retains the defect of not taking account of the relative indispensability of these emissions. Subsistence and luxury emissions are costed alike. …

C. Pay in proportion to one's ability to pay

This principle is not, strictly speaking, a backward-looking principle. It considers the current state of affairs and divides costs accordingly. For this reason it should not be considered in this section. On the other hand, this principle derives much of its moral plausibility as a principle of cost- or chore-division from our awareness of how nations came to have their current ability to pay. This ability results, to a great extent, from economic development which, in turn, resulted from or was, at any rate, accompanied by great greenhouse gas emissions. Thus, this principle, although in theory not a backward-looking principle and so not a just principle, according to my classification, is mentioned here because its supporting arguments are clearly those of the first two principles mentioned above. Only when economic development (and accompanying ability to pay) will have become effectively uncoupled from greenhouse gas emissions should this proposal to pay according to ability to pay be taken under consideration on its own merits.

The point of offering this list of just principles is to show the many ways in which one can reason morally to the conclusion that, as a matter of justice, the developed nations should pay for a lion's share of the bill of dealing with climate change. The developed nations caused the problem, they benefited most from these emissions, they most clearly violated the Lockean proviso to the just taking of goods previously held in common, and they, more than other nations, have the means to pay for the costs of dealing with the problem. So they, above all, should pay for most of dealing with climate change. This much, for instance, seems to be reflected in the Kyoto Protocol's approach, which requires emissions stabilization from only developed countries and eastern European countries "undergoing the process of transition to a market economy."

The largest drawback of adopting any of these just principles of chore or cost division is a practical one. As we have seen, dealing with climate change presents the nations of the world with a commons. Each nation is (let us hope) genuinely concerned with this problem, but each nation is also aware that it is in its interest not to contribute or do its share, regardless of what other countries do. … This problem of commons is exacerbated by the awareness that there is no overseeing authority capable of altering the situation so as to coerce contributions or to make contributions cost-effective for each country. In short, in the absence of the appropriate international coercive muscle, defection, however unjust it may be, is just too tempting. …

2.2. The Case for a Fair Chore Division

A. Pay or contribute on an equal per capita basis

This is surely the simplest proposal based on grounds of fairness. In this approach, the allotted chores or costs of the global collective effort required to deal with the effects of global warming are allotted to nations based on an equal per capita division for all persons

on the globe. So, for instance, each human on our planet would be assigned an equal share of the chore of dealing with climate change. This division could result in each person having to cut back on her or his emissions by the same amount, or it could offer each the same alternatives between cutting back emissions or contributing to some Adaptation Fund of the sort described above. Surely this proposal is unfeasible. If each Chinese and each North American were asked to reduce their emissions in the same amount, when per capita emissions are currently ten times higher in the U.S. than in China, this would impose ridiculously unjust or unfair emissions cutbacks.

Alternatively, if humanity on our planet, as a whole, chooses to cap its emissions—to allow itself to emit only a certain amount of greenhouse gases each year—then this approach of equal per capita division would hold that each person across the globe has an equal emissions entitlement. Each nation, presumably, would then have emission entitlements that are the aggregate of its residents' individual entitlements. The great moral attraction of this per capita entitlement approach is its egalitarian result of not making matters still worse for those who are presently emitting the least (on average) and who are worst off economically.

The main disadvantages of this approach are three. First, like all forward-looking principles of fair division, it does not consider the justice of the present inequalities in emissions or consumption levels. Second, it does not take into account the relative need or indispensability of these emissions. In dividing emissions entitlements into equal per capita shares, the populations of developing countries whose current emissions are very low would suddenly find themselves with emissions rights they cannot use while people of developing countries would be undergoing great reductions in their standard of living to comply with their emissions-rights restrictions. Neither scenario is particularly inviting nor has much hope of ever being politically palatable. One importantly palliative solution for emissions rights would be to allow for trading of these emissions rights, once they have been fairly allotted. This solution, if it were workable, would have the advantage of allowing everyone some time to adjust to their new entitlements. On the other hand, it would still require vast redistributions of income as developed countries rushed in to buy emissions rights from developing countries. It is quite likely that the size of these transfers of wealth and the disruptions they would create would be great enough to doom this proposal by themselves. …

These last two drawbacks combine to produce the following realization. Although this principle of per capita division is fair in giving the same thing to each, it is fair only in that sense and that sense need not amount to the last word, or what we care about most, in desiring a fair division of chores or of emissions rights.

What an equal per capita chore division fails to achieve is a division that affects each person in the same way or in the same amount. In particular, a per capita division places equal burdens on each person, but it fails to allot equally burdensome chore-shares, and, in matters of chore division, burdensomeness is the consideration that is closest to our hearts so that an equally burdensome division is deemed the fairest chore division.

The principal reason why we dislike chores is that they burden us by requiring our time, effort, or resources, which we feel we could employ more profitably in other ways. In

other words, chores burden us because of the opportunity costs they present, that is, as a function of the difference in expected returns between the course of action under consideration and that course of action, from among those open to us, with the best expected returns for us (including doing nothing).

Thus, if we were to divide chores in the way that treats everyone equally in the sense that (I suggest) matters most to them, then we should be dividing the chore into equally burdensome shares. But how do we do this? What are equally burdensome shares? Insofar as it is the opportunity costs that chores present for us that concern us most, an equally burdensome chore division is one in which each contributor is asked to contribute chores with opportunity costs for her, him, or it (a nation) that are the same as are the opportunity costs of the allotted chores for every other contributor to this collective chore. These considerations lead me to propose another principle of chore division—division into equally burdensome shares.

B. Pay or contribute in inverse proportion to relative burdensomeness

The idea here is for the whole collective chore of what is to be done to deal with climate change, whether by mitigation or by adaption, to be divided among the nations of the world into shares such that each nation's share presents the same opportunity costs for that nation as every other nation's share presents for it. There are several important details concerning the nature of the opportunity costs in question that I will address in the next part of the paper. For now I accentuate the positive results of this proposal.

This principle of chore division deals effectively with the defects of the other principles. First, it takes account of indispensability by costing in inverse proportion to burdensomeness, that is, to the opportunity costs associated with either reducing emissions or with setting aside resources for adaptation. The same holds true for financial set-asides for adaptation mechanisms. Projects with the lowest or least beneficial returns for a nation present the lowest opportunity costs and they will be the first to be set aside. Projects with the highest beneficial returns for a nation present the highest opportunity costs and will be the last to be required to be set aside.

Which emissions present highest or lowest opportunity costs? The answer depends on how opportunity costs are measured. If current market prices are used to measure these costs, then forgoing luxury emissions may well present the highest opportunity costs. But if any reasonable measure of human welfare is used instead of market prices, then we can expect luxury emissions to have the lowest opportunity costs and so to be the first to be sacrificed. Subsistence emissions, meanwhile, will have the highest opportunity costs and so will be the last ones to be cut. …

Also, because this principle of fair division looks at opportunity costs, it promotes efficiency. For, the more efficient a particular use of greenhouse-gas emissions is, the higher are the opportunity costs of reducing these particular emissions. The higher the opportunity costs are, the less expendable these emissions are. In short, the principle of fair division fares at least as well as the other approaches do on these counts.

To clarify, this principle of division by equal burdensomeness would first require countries to act in those ways whose opportunity costs are lowest. This means that so-called "no-regrets" emissions savings are most encouraged (since they don't really cost anyone anything anyway). Which emissions would go next depends on how these opportunity costs are being estimated. If opportunity costs were measured in monetary amounts, as they are ordinarily measured in project evaluations by economic institutions, then the next emissions cuts would be those with the smallest monetary costs. The danger in this case is that subsistence or near-subsistence emissions might well be called for next, before cuts in luxury emissions are called for. The reason for this would be that cuts in luxury emissions may well cost more (monetarily) than would the more needed subsistence or near-subsistence emissions. Thus an approach that is intended to equalize the burdensomeness of dealing with climate change could easily result in a division which would require cuts in subsistence emissions—the most precious emissions to human well-being—before they require cuts in luxury emissions—the least precious emissions to human well-being. For this reason it is clear that the measure of opportunity costs must not be the standard currently used in the financial cost/benefit analysis; instead, a measure of opportunity costs in terms of human welfare must be adopted.

If, then, opportunity costs were measured in terms of human welfare, rather than in monetary terms, what cuts would occur next? In this case, presumably, nations with substantial luxury emissions will reduce those next because the opportunity costs in terms of human well-being of these cuts would be lowest. Next, countries with quasi-luxury emissions will be required to cut those next, as they have the next best opportunity costs. The idea is to keep requiring cuts in emissions (or savings for adaptation measures) with progressively greater opportunity costs or burdensomeness (in terms of human well-being) until the global chore of dealing with climate change has been completed with every nation being required to make equally burdensome sacrifices. So it should go in each country.

Can the total of what is needed to deal with the problem of climate change be so great that it will require great sacrifices by poor or developing nations? In this division scheme, every country is required to make sacrifices that are equally burdensome. This means that the opportunity costs for each country are supposed to be the same. This, unfortunately, means that, quite possibly, one (developed) country's aggregate opportunity costs from luxury and near-luxury cuts could be equaled in a developing country only if it makes cuts in near-subsistence emissions. What about cuts in subsistence emissions, proper? These should not be called for, because, as I argued above, when emissions and spending are *rationally compelling*, they are morally excused. This is the point at which this principle of fair division meets the two arguments for our having obligations to deal with climate change: no one and no country can be morally required to make cuts to its subsistence emissions. Besides, it makes no sense to attempt to enforce such cuts anyway.

So, for all its attractions, and even when opportunity costs are measured in terms of human well-being rather than in straightforward monetary terms, this scheme for chore division can weigh more heavily on developing countries than on developed countries, because it may require them to make cuts in near-subsistence emissions.

To recap, chore or cost division by equal burdensomeness allocates to each nation equally burdensome shares of what has been collectively decided needs to be done to deal with the problem of climate change. This does not mean that each nation is allotted the same amount to do (nor that it shoulders costs of the same dollar value). On the contrary, because this fair chore division uses opportunity costs to determine equally burdensome shares and because luxury emissions are currently very unevenly distributed across nations, those nations with more luxury emissions will be required to do or spend more. Fair chore division requires sacrifices or emissions cuts from everyone. Cooperation from poor or less economically developed countries is required only when rich or developed countries have to make equally painful contributions. However, because these opportunity costs are aggregated by nation, this fair division scheme may well require cuts to near-subsistence for some before it requires them of others.

This principle of contribution in inverse proportion to relative burdensomeness has three further advantages. First, because it is not backward-looking—because it does not consider past emitting behavior—it avoids allotting responsibility for their past actions to the various parties in question. It thus avoids a predictable occasion for recrimination and ill will to which such judgments would most likely give rise at international negotiations where national contributions would be apportioned. I consider this an advantage, though it would be viewed as a most conspicuous drawback by those, for instance, who believe that (backward-looking) considerations of justice are being improperly neglected. …

In practice, requiring an agreement by which to implement a division into justly proportional shares would amount to holding the question of division hostage to reaching a prior international agreement on what constitutes international distributive justice and on how to compensate for this injustice in this fair division. Since I doubt that such an agreement is likely in our lifetime, I conclude that insisting on this requirement would amount to putting off any implementation concerning climate change indefinitely. That would be a shame, I think. Plain equally burdensome chore division, complicated enough as it is, seems greatly preferable if we want to see anything done at all. *Fiat iustitia, pereat mundus*—let justice be done, even if the world perish—just does not seem to be an especially appealing principle for developing countries who stand to be the first and worst victims of climate change. …

The second advantage of this principle of fair division is one that it shares with all principles of fair division. It offers to all a point or position by which to measure the fairness and unfairness of resolutions reached in international bargaining sessions from positions of unequal bargaining strength.[3] I doubt that the nations of the world will easily agree to divvy up the costs of dealing with climate change just as this principle of fair division would tell them to. But insofar as this principle serves to indicate to all what is fair in principle (in this sense of fairness), it should help everyone appreciate the

[3] For concern with the problem of bargaining for a fair agreement under conditions of great inequality, see Henry Shue, "Avoidable Necessity: Global Warming, International Fairness, and Alternative Energy," in Ian Shapiro and Judith Wagner DeCew (eds.), Theory and Practice (NOMOS XXXVII) (New York: New York University Press, 1995), pp. 239-64.

unfairness or iniquity of other bargaining outcomes. That is a morally useful measure to have, I think, especially if it can help weaker nations obtain a fairer deal.

Finally, there is a third and most important reason for preferring this kind of principle of division in the version requiring a division into equally burdensome shares. As I mentioned above, dealing with the adverse consequences of global warming presents nations with a commons-type problem of collective action and, under suitable conditions, an equally burdensome chore division holds the promise of giving each nation no stronger reasons to defect from doing its (fair) share than it gives any other nation. This result, in turn, would place the most moral pressure possible on each nation to do its part. This is a precious result in dealing with problems of commons for which enforcement is impractical, unadvisable, or unacceptable.

What are these suitable conditions? (1) that the terms of this fair division can be made public; (2) that cooperation or defection can be monitored and recorded publicly; (3) that each nation be satisfied that this division is truly an equally burdensome one (or as close to a truly equally burdensome one as can be hoped for in practice).

Under these conditions, the broadcasting of the results of an equally burdensome division and the public monitoring of compliance could prove particularly useful in assuring better cooperation whenever nations wish to avoid public embarrassment and where defecting would prove embarrassing. No nation would have a better excuse for defecting than any other nation had, at least not in terms of what it costs to cooperate. So when the burdensomeness is equal, defecting when others cooperate simply indicates ill will or not wanting to do one's fair share. In this manner, this kind of chore division would place the most moral pressure possible on each nation to do its part. This pressure is the pressure that comes from knowing that each nation's interests are being given equal concern and that defecting means treating one's own condition differently in the absence of better prudential (or non-moral) reasons for doing so. This, I think, is a precious result in dealing with problems of commons for which enforcement is unadvisable or unacceptable. It is an important reason for advocating efforts to "crunch numbers" to make public what such a division would look like.

Conclusion

How should the "bill" of dealing with climate change be split up among the nations of the world? I have argued that there are strong practical reasons for agreeing to divide this bill or these chores fairly—into equally burdensome shares—even though the evidence for maleficence and so for a just division according to responsibility is very strong. Since a just treatment of this problem can be expected to lead to international defections in the face of a commons, a fair division into equally burdensome shares is the best solution available for ensuring international cooperation in dealing with climate change.