PLEASE READ BEFORE PRINTING!

PRINTING AND VIEWING ELECTRONIC RESERVES

Printing tips:

- To reduce printing errors, **check the "Print as Image"** box, under the "Advanced" printing options.
- To print, **select the "printer" button** on the Acrobat Reader toolbar. **DO NOT print using "File>Print…"** in the browser menu.
- If an article has multiple parts, print out only **one part at a time.**
- If you experience difficulty printing, come to the Reserve desk at the Main or Science Library. Please provide the location, the course and document being accessed, the time, and a description of the problem or error message.
- For patrons off campus, please email or call with the information above:

  Main Library: **mainresv@uga.edu** or **706-542-3256**   Science Library: **sciresv@uga.edu** or **706-542-4535**

Viewing tips:

- **The image may take a moment to load.** Please scroll down or use the page down arrow keys to begin viewing this document.
- Use the **"zoom"** function to increase the size and legibility of the document on the screen. The **"zoom"** function is accessed by selecting the **"magnifying glass"** button on the Acrobat Reader toolbar.

NOTICE CONCERNING COPYRIGHT

Climate Change, Vulnerability, and Responsibility

CHRIS J. CUOMO

In this essay I present an overview of the problem of climate change, with attention to issues of interest to feminists, such as the differential responsibilities of nations and the disproportionate "vulnerabilities" of females, people of color, and the economically disadvantaged in relation to climate change. I agree with others that justice requires governments, corporations, and individuals to take full responsibility for histories of pollution, and for present and future greenhouse gas emissions. Nonetheless I worry that an overemphasis on household and personal-sphere fossil fuel emissions distracts from attention to higher-level corporate and governmental responsibilities for addressing the problem of climate change. I argue that more attention should be placed on the higher-level responsibilities of corporations and governments, and I discuss how individuals might more effectively take responsibility for addressing global climate change, especially when corporations and governments refuse to do so.

The last 150 years of frenetic resource extraction and industrialization have significantly altered Earth's atmosphere, creating an increase in average global temperatures that could destabilize the climate system and lead to disastrous and irreversible impacts (Hansen et al. 1988; Oreskes 2004; IPCC 2007). Even a seemingly small 2°C rise in average temperature can severely threaten basic human security worldwide. Since the beginning of the industrial era, Earth has seen a 0.8°C temperature increase, with more than half of that increase occurring since 1970. Ecologists report that global warming and climate change are already fueling "wholesale changes in nearly every ecosystem on Earth" (Barnosky 2009, 46). Changes in temperatures and precipitation levels are shifting agricultural zones and habitats for wild and domesticated species, negatively affecting biodiversity, and creating challenges for food production and new opportunities for invasive species to flourish (Dukes and Mooney 1999; Keesing

et al. 2008; Bradley et al. 2010). Heightened temperatures and CO_2 levels have acidified the oceans and decimated deep coral reefs, endangering dozens of key marine species and threatening food security for hundreds of millions of people (Gorke 2003; Schmidt and Wolfe 2009; Secretariat of the Convention on Biological Diversity 2010). Nearly a quarter of the world's plant species are currently threatened with extinction, a clear and troubling sign of global ecological stress (Secretariat of the Convention on Biological Diversity 2010). The significance of these developments for human communities is monumental, as are the challenges we all face in addressing them.

Earth's atmosphere is composed mostly of nitrogen, oxygen, and the greenhouse gases: water vapor, carbon dioxide, methane, and nitrous oxide. These naturally occurring greenhouse gases are so named because they produce the greenhouse effect, absorbing an optimal amount of solar heat as it reflects off of Earth's surface and thereby maintaining a temperature zone suitable for living things. But since the early 1860s, over 500 billion tons of human-generated greenhouse gases have been spewed into the atmosphere, causing an additional *industrial* greenhouse effect, which traps too much of the sun's energy and has therefore led to increased average global temperatures. Adding fuel to the fire, extensive deforestation and land-use changes have compromised the planet's ability to maintain equilibrium by absorbing excess carbon.

The primary source of industrial greenhouse gases is the extraction and combustion of petroleum, coal, and natural gas. Carbon dioxide is the most notorious greenhouse gas, but methane, nitrous oxide, perfluorocarbons, hydrofluorocarbons, sulphur hexafluoride, and chlorofluorocarbons are also powerful contributors to global warming. These enter the biosphere via chemical fertilizers, decaying garbage, livestock farming, plastics, refrigeration, air conditioning, aluminum and insulation production, and countless other products and processes.[1] Air bubbles in ice cores show that before the industrial and fossil-fuel eras began, CO_2 in the atmosphere was at a relatively stable level of around 280 parts per million (ppm), but levels have increased appreciably since then. Readings taken at the Mauna Loa Observatory, where data on atmospheric composition has been collected continuously since the 1950s, show that in 2009 the average level of CO_2 in the atmosphere was 387 ppm, the highest annual average ever recorded (Tans 2010). In July 2010 the average CO_2 level was 392.04 ppm.

A common estimate is that a 20–25% or greater reduction of total greenhouse gas emissions by the year 2020 is necessary to avoid a very dangerous increase in average global warming. Nonetheless, in most nations fossil fuel and chemical use proceeds without restriction, and industrial greenhouse gas emissions are on the rise (IPCC 2007; Moore 2008; Stern 2009; Meinshausen et al. 2009).[2] Each day of business as usual adds to the problem and threatens to intensify and prolong the impacts of warming and climate change. Meanwhile, corporate and political misinformation campaigns stimulate naïve skepticism and

keep affluent consumers comfortable in denial (Hoggan 2009; Oreskes and Conway 2010).

Although temperature increases are driving climate change, "global warming" is probably not the best phrase to describe the problems caused by the industrial greenhouse effect, because average warming is not experienced as a universal shift toward warmer temperatures in every location or every season. An increase in average global temperatures does affect weather, but not in a simple one-dimensional fashion, and its ripple effects extend far beyond the weather. Earth's climate is a massive multidimensional pool of elements and factors, including air and soil temperatures, water systems, aerosols, currents, clouds, plant respirations, farm-animal flatulence, volcanic eruptions, human influences, solar impacts, and more. The real danger of global warming is that it is creating changes in the entire climate system, resulting in somewhat predictable effects like higher sea levels, melting glaciers, and drier deserts, but also increasing risk and uncertainty in nearly every sphere of life. "Climate change" or "climate chaos" therefore more accurately name the problems caused by the rampant use of fossil fuels and chemicals, a state of affairs that could also be described as planetary toxic overload.

Climate change is an ethical issue of epic proportions, for it endangers everything on Earth that human beings depend upon and care about. It is also a very difficult set of practical problems, for climate change has emerged from powerful and deeply entrenched economic and social norms and practices, and it is laden with unpredictable unknowns. It is also an urgent issue, and this urgency should shape our ideas about what ought to be done about it, and by whom.

Most philosophical discussions of the ethical dimensions of climate change emphasize the responsibilities of nations, especially the wealthy nations that created the problem, to drastically reduce greenhouse gas levels and to provide funding for poorer nations to address related impacts (Jamieson 1992; Shue 1993; Jamieson 2001; Brown 2003; Gardiner 2004; Gardiner 2006; Jamieson 2007). The need for mitigation, or reduction in greenhouse gas emissions, is a global matter requiring international agreements and actions on the part of nation-states and international bodies such as the United Nations and the World Bank. But nations and international bodies are not the only relevant parties with moral responsibilities related to climate change. Mitigation also involves policies, practices, and decisions at other "levels" of ethical agency, carried out by corporations, state and local governments, communities, households, and individuals. Climate change is a global issue that is also always local, as impacts occur and responses are implemented in specific locations. Anyone might be inclined to protect her own community, or the planet and its species and ecosystems, from harm, and anyone whose practices contribute greenhouse gases to the atmosphere may rightfully feel a moral obligation to change her practices.

In addition to being an unprecedented, difficult, and urgent practical problem that anyone and any group can justifiably care about, climate change is a matter

of global social justice. The greatest power to bring down greenhouse gas levels rests in the most privileged societies, but assessments emphasize the fact that the impacts of climate change are falling first and most heavily on the "poorest and most vulnerable people around the world" (IPCC 2007; Schmidt and Wolfe 2009; Stern 2009, 8). As a case in point, in 2010 high Atlantic Ocean temperatures contributed to the intense monsoons that led to catastrophic flooding in Pakistan, causing over 2000 deaths and displacing 20 million people, 85% of whom were women and children (Patz et al., 2005). The World Health Organization has estimated that 150,000 human deaths annually are attributable to climatic changes (Gronewold 2010; Reproductive Health Response in Crises Consortium 2010).

VULNERABILITIES AND INEQUALITIES

Climate change was manufactured in a crucible of inequality, for it is a product of the industrial and the fossil-fuel eras, historical forces powered by exploitation, colonialism, and nearly limitless instrumental use of "nature." The world's wealthiest nations, and the privileged elite and industry-owning sectors of nearly all nations, have built fortunes and long-term economic stability on decades of unchecked development and energy consumption. By dumping harmful waste into the common atmosphere we have endangered everyone, including those who have contributed little or nothing at all to the industrial greenhouse effect: the "least developed" nations, the natural world, and future generations. The Kyoto Protocol, the present binding treaty on climate change (adopted in 1997 and scheduled to expire in 2012) acknowledges that the structural and historical inequalities behind climate change create an ethical imperative for developed nations to prioritize serious mitigation efforts and to direct adequate resources toward mitigation and adaptation efforts in poorer nations. Adaptation refers to "practical steps to protect countries and communities from the likely disruption and damage that will result from effects of climate change" (Levina and Tirpak 2006, 6). Even the nonbinding Copenhagen Accord commits funding for adaptation for the world's "most vulnerable" countries (UNFCCC 2010).

The theme of vulnerability is common in discussions of the dangers of climate change. Ecological vulnerabilities can result from historical injustices and differences in power, although some are primarily a matter of geographical location. For example, due to the features of their unique location, Arctic communities are facing unprecedented problems resulting from the increases in average temperatures over the last several decades (Alaska had the highest increase in temperature on the planet from 1970 to 2004). In remote northern villages, erosion and melting of permafrost causes land to collapse and deteriorate, and subsistence practices bring increased risk because travel can be perilous on a landscape that ought to be frozen but is instead melting unpredictably (Cuomo, Eisner, Hinkel 2008). For

native communities whose lifeways and spiritual identities are based in subsistence traditions, much will be lost if local species are decimated and human connections to homelands are ruptured due to the industrial greenhouse effect.

The aftermath of Hurricane Katrina made it plain that structural inequalities produced by racism can determine who is most affected by severe weather events, and in turn disasters can greatly intensify social and political inequalities. In addition, within nearly any society the poorest and most vulnerable includes disproportionate numbers of females, people of color, and children. Research shows that large-scale disasters are especially devastating for those who lack economic and decision-making power, and that "economic insecurity is a key factor increasing the impact of disasters on women as caregivers, producers, and community actors" (Enarson 2000, viii). But economic security is not the only factor influencing female vulnerabilities. Existing social roles and divisions of labor can also set the stage for increased susceptibility to harm. The tsunami that struck Asia in late 2004 resulted in a much greater loss of life among women and girls in many locations, because women "stayed behind to look for their children and other relatives; men more often than women can swim; men more often than women can climb trees," and at the time the waves struck, many men and boys were working in small boats or doing errands away from home (Oxfam 2005; see also American Congress of Obstetricians and Gynecologists 2006).

Extreme droughts, already occurring due to climate change, exacerbate gender inequalities in places where it is women's and girls' responsibility to gather daily water, for when water becomes more scarce, "many poor people, but particularly women and girls, will have to spend more time and energy fetching water from further away" (Stern 2009, 70). Physical hardship for women and girls is multiplied, but there are also auxiliary effects, such as decreased opportunities for girls to attend school and increased risk of assault (American Congress of Obstetricians and Gynecologists 2006; Stern 2009; UN News Centre 2009). And wealthier high emitters with running water are not immune to such ecological pressures. In southeast Australia previously prosperous farmers are suffering due to reduced water availability and accompanying distribution policies. Women married to men in farming families report that their burden is greatly increased, because drought reduces farm income, and when wages are needed women find more opportunities for off-farm work. Some must travel far or temporarily relocate for employment, although their caretaking responsibilities remain. Male partners respond to the compounding impacts of loss of financial security, livelihood, and identity with increased incidences of depression and domestic violence (Alston 2008). Not surprisingly, their vulnerabilities are also shaped by norms of sex and gender.

Attention to ecological and social vulnerabilities should inform harm-reduction strategies, and as resources are directed toward communities facing imminent threats, claims about vulnerabilities will become increasingly influential.

But care should be taken when claims about vulnerability are employed to get decision-makers to pay attention and do the right thing. Framing structural inequalities only in terms of susceptibility to harms focuses attention on the supposed weaknesses or limitations of those who are in harm's way, but says little about whether injustices or other harms have put them in such precarious positions. Emphasizing vulnerability also tends to obfuscate the agency, knowledge, and resilience of members of disempowered or marginalized groups. Those who are categorically in harm's way are ethical agents and community members with individual and collective priorities and capacities, not sitting ducks requiring paternalistic regard, despite the fact that they may be entitled to resources for dealing with the impacts of problems created by wealthy corporations and societies. Alternatives to discourses of vulnerability are therefore emerging from indigenous, anti-globalization, feminist, and youth movements for climate justice. These movements point out that many communities are in vulnerable positions precisely because they uphold ecological values that have not been engulfed by global capitalism and technological modernization, recognizing marginal status in fossil-fuel cultures to be a sign of wisdom and resilience rather than weakness.

   The fact that climate change disproportionately affects women, people of color, and the poor provides sufficient reason to regard it as a matter of feminist concern (Masika 2002; Hemmati and Röhr 2007; Dankelman 2010). Ecofeminist writers in particular have examined the masculinism, misogyny, racism, and anthropocentrism behind the cultures that have produced and enabled such eco-destructive forms of development and progress (Griffin 1978; Merchant 1980; Haraway 1990; Warren 1990; Cuomo 1992; Gaard and Gruen 1993; Mies and Shiva 1993; Plumwood 1994; Cuomo 1998). Analyses such as these frame consideration of vulnerabilities and inequalities in relation to the aims of justice, empowerment, and biotic flourishing, and emphasize the promise of feminist perspectives for cultivating alternatives to destructive cultures and technologies. One such perspective I rely on throughout this essay takes responsibility to include attentiveness to histories of exploitation, and regards the cultivation of *responsible caring* attitudes and actions as necessary for the development of ethical social and ecological relationships.[3]

1.5° TO STAY ALIVE[4]

Questions about history and power are relevant to understanding many dimensions of climate change. For example, arriving at an agreement on the safe upper limit of carbon in the atmosphere, or the safe upper limit of cumulative average temperature increase, is a primary goal of international negotiations concerning climate change. In practice, the objective is to come to agreement on an "acceptable" or "livable" level of average global temperature increase, and to

then determine how much mitigation is required to avoid exceeding that limit. But to whom is a level of change supposedly acceptable? It appears that international agreements on greenhouse gas reductions are framed by considerations of economic feasibility rather than by questions about what is acceptable to most parties, or what is the right thing to do in ethical terms.

There are many unknowns about the cascading effects and complicating feedbacks that will be triggered by any significant degree of warming, so it is impossible to predict all that would come to pass with a particular temperature or greenhouse gas level increase. Nonetheless, risks and likelihoods can be identified. According to current assessments, an increase of 2°C could result in a situation in which scores of small island nations would face submersion, desertification and extreme heat would make much of the African interior virtually uninhabitable, and impacts on global coastlines, disease trajectories, and agricultural production levels could greatly intensify pressures nearly everywhere (IPCC 2007; Hansen, 2009; Schmidt and Wolfe 2009). Scientists estimate that if we continue on a high-emissions path without mitigation efforts, the planet could reach the 2°C threshold by 2050 (Hansen et al, 2009). Many leading climate researchers and environmental organizations therefore hold that sustained levels of carbon in the atmosphere should not exceed 350 ppm, an amount appreciably lower than current levels (in 2010, CO_2 levels hovered between 387 and 393 ppm).[5]

In the wake of recent data indicating that climate change is occurring more rapidly than predicted, debate continues about acceptable upper limits and mitigation targets. Some commentators believe that it was disagreement about whether the new treaty to succeed The Kyoto Protocol should accept an upper-threshold temperature of 1.5° C or 2°C that led to an impasse between developed and "least developed" nations and a breakdown of international climate treaty negotiations in 2009. Representatives of many African and small island nations describe 2° C as certain death for their homelands, so they continue to push for a global agreement to prevent an increase over 1.5°C, or to reduce levels to 350 ppm of carbon in the atmosphere. The Copenhagen Accord, the nonbinding agreement negotiated by the United States, Brazil, South America, India, and China in 2009, accepted an upper threshold of 2°C, but did not commit to the mitigation required to prevent a 2° average increase. As feminist geographer Joni Seager has argued, the 2°C limit itself is more a product of politics and economic predilections than a conclusion drawn from scientific analyses or considerations of equity and fairness (Seager 2009).

RESPONSIBILITIES FOR CLIMATE CHANGE

To better understand specific responsibilities for greenhouse gas reduction, it may be useful to clarify a more general question about *who* is responsible for mitigation,

remedying damages, and minimizing the complex harms of global climate change.[6] According to common understandings, causal responsibility for a serious harm such as a bodily injury is equivalent to a *prima facie* ethical obligation to make some amends, even if the harm was not intended. Nonetheless, philosophers have stressed that the relationship between causal responsibilities for harms and ethical responsibilities to redress harms is not always straightforward, for ethical responsibility implies blameworthiness, and one may not be blameworthy if it was not possible to avoid causing harm, or if the possibility of causing harm was practically unknowable when the harmful action occurred. Regarding a geographically and historically diffuse ecological harm such as climate change, causal links may be elusive or indeterminate, and harm-causing actions may have been carried out (by now deceased ethical agents) in justifiable ignorance of their harmfulness. But because the physical mechanism of the industrial greenhouse effect has been known for over a hundred years, it may be difficult to argue that all past ignorance of the harmful effects of greenhouse gases was justified.[7] Even if some emitters of greenhouse gases and other pollutants are not to blame for past actions, the question of whether one has an obligation to cease causing or magnifying an existing harm is not reducible to questions about blameworthiness for past actions. Once a nontrivial harm to a morally valuable being or entity has been determined, the right thing to do is to stop causing the harm, even if it takes extra effort to do so.

Who then is responsible for addressing climate change? In some scientific discourses, climate change is described as anthropogenic, or caused by humans, to distinguish it from other phases of warming and cooling that the planet has experienced over the billennia (Schmidt and Wolfe 2009). No other animals are directly responsible for the industrial greenhouse effect, and industrial greenhouse gases are indeed generated by humans, but the implication that humans as a species have caused climate change is also misleading. Particular people and particular cultures, nations, industries, and economic systems have caused and contributed to the pollution that created the industrial greenhouse effect, and we need not take those actors to be representative of the entire human species. Attributing blame to humans *simpliciter* diverts attention from the real sources of the problem and reproduces the narrow view that there is a universal greedy human nature that inevitably leads toward planetary destruction, and the mistaken assumption that everyone naturally desires the lifestyles enabled by modern Western colonial development.

Regarding historical material causes of climate change, the answer is no secret. Up to the year 2008 the majority of the historical emissions on the planet came from Europe (approx. 30.6%) and the United States (approx. 27.2%); the United States is by far the largest single national emitter on Earth (Hansen et al, 2009, 18). Basic justice and fairness imply that those who amassed wealth and other benefits through the nearly unrestricted extraction and use of petroleum,

coal, and chemicals bear ethical responsibility for addressing the harms produced by the industrial greenhouse effect. But addressing climate change is also a matter of protecting the future, and currently the highest emitting nations also include less wealthy nations, such as China and India. The Kyoto Protocol therefore states that nations have "common but differentiated responsibilities" in relation to climate change, referring to the different historical responsibilities of developed nations—whose economic growth and material modernizations have been fueled by high levels of greenhouse gas emissions, and who are capable of taking responsibility as needed—and developing nations, who have low historical emissions levels, low GDPs, and far less widespread modern technological development (Nakjavani and Tymowski 2002). Developing nations are responsible for mitigation efforts such as reducing deforestation and pursuing sustainable development paths, but they are held to less stringent emission targets so they might still achieve a baseline of economic and technological development. Nonetheless, commitments from historically low-emitting nations to refrain from pursuing polluting industrial development are necessary for successful mitigation. As economist Nicholas Stern laments, "it is profoundly inequitable that the difficult starting point is largely as a result of actions by the developed nations, but the numbers on population and future emissions are such that a credible response cannot come from rich countries alone" (Stern 2009, 13). For these reasons the responsibilities of wealthier nations to develop clean technologies, and to transfer those technologies to less developed nations at no or low cost, are also emphasized in international agreements concerning climate change.

RESPONSIBILITIES OF NATIONS

It is perhaps over-determined that global warming and climate change will be framed primarily in terms of the actions, responsibilities, and vulnerabilities of nations. Dealing with climate change requires large-scale multilateral actions at administrative levels, and nation-states are the ready-made units able to negotiate and enforce agreements concerning the use and protection of the global commons. Nations also have great incentives to position themselves as stewards of the planet and its abundant resources, and as the parties with the ultimate power to command those resources. It was in the context of the United Nations that a framework of international stewardship of Earth's ecological well-being was introduced in 1972 when the United Nations Environment Programme (UNEP) was launched to serve as "a global body to act as the environmental conscience of the UN system" (UNEP n.d., 8). Along with the World Meteorological Organization, the UNEP established the Intergovernmental Panel on Climate Change (IPCC) in 1988 to gather international climate experts to review and assess "the most recent scientific, technical and socio-economic

information produced worldwide relevant to the understanding of climate change." The UNEP also held the Earth Summit in Rio de Janeiro, Brazil, in 1992, where the United Nations Framework Convention on Climate Change (UNFCCC) was formed, with the aim of achieving "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" (Intergovernmental Negotiating Committee for a Framework Convention on Climate Change 1992, 4). That nonbinding treaty led to the adoption of the Kyoto Protocol in 1997, which set binding emissions reductions for 37 industrialized countries plus the EU to reduce greenhouse gas emissions by an average of five per cent less than 1990 levels by 2012 (UNFCCC 1998).

Many of the world's nation-states have mobilized to assess, track, and respond to global warming and climate change, and to do so collectively, indicating at least symbolic willingness to address the problem. There have, of course, been key exceptions, such as the refusal of the United States and Australia to ratify the Kyoto Protocol (Australia eventually ratified it in 2007), and China's refusal in Copenhagen to agree to the goal of a 50-percent reduction in global emissions by 2050, compared with a 1990 benchmark (Rapp et al. 2010). If nations are the entities with the necessary power and resources to implement the changes that can avert climate disaster, and we can identify nations that are causally responsible for climate change and also quite able to do their parts to address the problem, then of course it is crucial that those nations that bear causal responsibility also take responsibility for addressing climate change. To bear responsibility is to be considered morally responsible by common ethical norms, but to *take* responsibility is to accept responsibility and act on it. According to ideal concepts, whoever or whatever bears ethical responsibility for serious ongoing harms, intended or not, should accept culpability and in some way take responsibility for stopping the harm and redressing past harms. In real worlds those who bear ethical responsibility may or may not be legally liable for damages. If they are not legally liable and therefore not subject to the force of law, those who bear responsibility may decide to risk being seen as unethical and ignore their responsibilities, or otherwise fail to adequately take their responsibilities seriously.

Before turning to questions about failed responsibility, let us look a bit closer at some assumptions about the responsibilities of nations. What is really being discussed when we refer to the ethical responsibilities of nations in relation to climate change, such as the America's responsibility to reduce greenhouse gas emissions in order to effectively avert climate disaster? Surely the concept does not refer only to the responsibilities of a national government, for discussions of ethical responsibility in relation to climate change includes much talk of troubling consumption patterns in the global North and resource depletion in the global South, and about how the practices of individual gas-guzzlers and rainforest-cutters ought to change. In addition, businesses and corporations bear tremendous causal

and therefore ethical responsibility for industrial pollution and climate change. Governmental policies and practices surely shape corporate and individual practices, but the responsibilities of corporations and individuals are not reducible to the responsibilities of nations or their governments.

In some contexts it makes sense to frame responsibilities for global warming and climate change in terms of nations and governments, but we can also see that the so-called "responsibilities of nations" can also stand for the direct responsibilities of individuals and collectives, such as businesses. Those responsibilities may fall within the geographical, legal, or political boundaries of a nation, but they are not encompassed by governmental decisions or actions. On the flip side, sometimes individual responsibilities stand as proxies for governmental responsibilities, as when the phrase "national responsibilities" is used not to refer to the responsibilities of a government, but to the responsibilities of everyone who lives in a country, draws energy from its electrical grids and gasoline pumps, and creates pollution within its borders.

INDIVIDUAL RESPONSIBILITIES FOR MITIGATION

Imagine a fossil fuel-dependent earthling who learns that her nation is a high contributor of harmful emissions, historically or currently.[8] If she cares about doing her part to mitigate the industrial greenhouse effect, how might she assess her own causal and therefore ethical responsibility? And if she takes her responsibility seriously, how should she proceed? Most environmental organizations emphasize individual responsibilities for reducing emissions, their websites and t-shirts advising us with messages like "small changes in our everyday lives can make a big difference" and "make love not carbon," and with lists of "many simple things you can do to help stop climate change." On the DVD cover for the film *An Inconvenient Truth*, there is a list of ten things individuals can do to emit less carbon into the atmosphere. But what sorts of ethical actions are encouraged by most environmental advocates? Tellingly, every item on the list on that DVD cover, from "change a light" to "recycle more" to "plant a tree," is an individual action to be carried out in the personal sphere, and there is no mention of more political options such as "pressure your senator" or "rally against mountaintop-removal coal mining."

Why does an individual emitter have an ethical responsibility to stop contributing to harm in the first place, especially when her small contribution is just a drop in the bucket of the whole global problem? Philosopher Derek Parfit has shown that it is a "mistake in moral mathematics" to assume an act cannot be wrong because it has an imperceptible effect, or because it makes only a tiny contribution to a cumulative harm (Parfit 1984, 77-78). This is because if one knows her actions are part of a set of collective actions that together result in
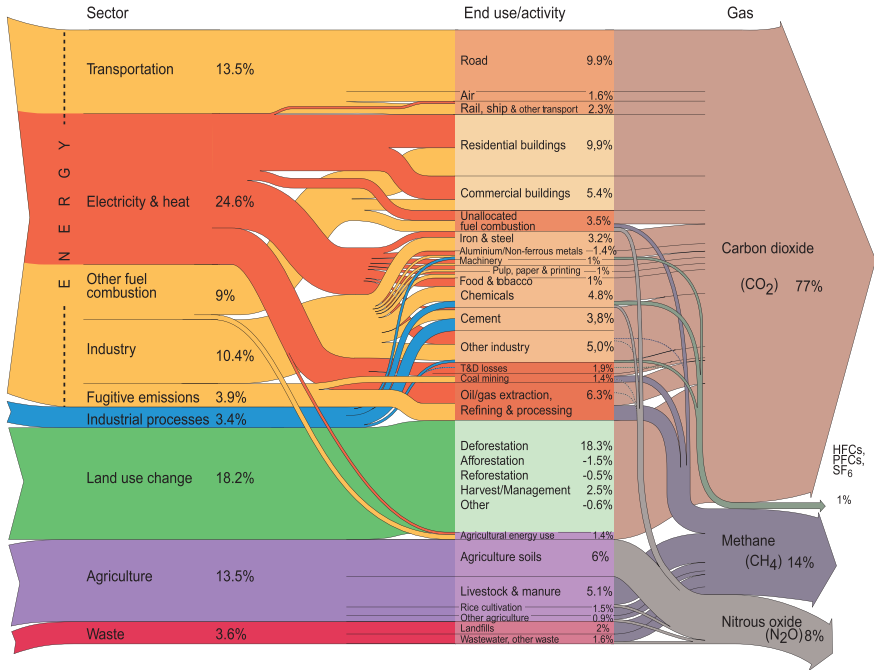
great harm, she must evaluate the rightness or wrongness of her contributions in light of the knowledge that others are also engaging in the activity, and together they create a cumulative effect. To make an anonymous contribution to a mob action is not to be blameless in relation to the cumulative harm caused. Even regarding individual actions that seem imperceptible, we therefore have duties to cease acting if we are contributing to serious harm.

How could high-emitting earthlings not be responsible for addressing global warming and climate change, when nearly everything we do adds to the problem, and when we seemingly could choose otherwise? All energy sources that are not entirely renewable, all forms of motorized transportation, nearly all forms of food production and distribution, the heating and cooling of homes and workplaces, nearly all cooking, manufacturing, and construction, and nearly every use of electricity on the planet contributes greenhouse gases to the atmosphere. Anyone who has felt a pang of guilt or ethical regret in light of her nation's historical and present contributions to greenhouse gas emissions probably agrees to some extent with Parfit's conclusion that even if we are contributing only slightly to a great harm, we ought to stop. Of course, whether we can or will stop is an entirely different matter, for unfortunately the level of choice and control we really have over our own fossil fuel and chemical use does not always match our levels of consumption.

It is an important but rarely emphasized fact that reductions that average consumers can control, such as household emissions and personal transportation, are insufficient to bring greenhouse gas concentrations down to safer levels, because household consumption and personal transportation account for a significant but minority slice of total greenhouse gas emissions worldwide (see Figure 1). I'll call this the "insufficiency" problem. Globally, emissions from the residential sector coupled with transportation equals less than 20% of total emissions. The U.S. Environmental Protection Agency reports that in 2008, 21% of American CO_2 emissions were from the residential sector, 19% were commercial, 27% were industrial, and 32% were from transportation, with just over half of that attributable to personal vehicle use. In addition, nearly all non-carbon greenhouse gas emissions (methane, nitrous oxide, hydrofluorocarbons, etc.) are from the agricultural, industrial, and commercial sectors (U.S. Environmental Protection Agency 2010). Even if personal sphere reductions that can be directly controlled by individuals and households are ethically imperative, they are insufficient for adequate mitigation.[9]

If a miracle were to occur and all automobile use was replaced by carbon-neutral transportation, larger-scale reductions that can only be achieved by meta-level emitters such as corporations and governments would still be necessary to avert climate disaster. Perhaps the easiest way to contribute to carbon mitigation is to stop eating beef and pork, but if our vegetable-based diets are produced through fuel- and chemical-intensive agricultural and commercial processes, the policies, practices, and profit motives of meta-level actors and decision-makers

World greenhouse gas emissions by sector

Sector		End use/activity		Gas	
Transportation	13.5%	Road	9.9%		
		Air	1.6%		
		Rail, ship & other transport	2.3%		
Electricity & heat	24.6%	Residential buildings	9,9%		
		Commercial buildings	5.4%		
		Unallocated fuel combustion	3.5%	Carbon dioxide (CO_2)	77%
		Iron & steel	3.2%		
		Aluminium/Non-ferrous metals	1.4%		
		Machinery	1%		
Other fuel combustion	9%	Pulp, paper & printing	1%		
		Food & tobacco	1%		
		Chemicals	4.8%		
		Cement	3,8%		
Industry	10.4%	Other industry	5,0%		
		T&D losses	1.9%		
		Coal mining	1.4%		
Fugitive emissions	3.9%	Oil/gas extraction, Refining & processing	6.3%		
Industrial processes	3.4%				
Land use change	18.2%	Deforestation	18.3%		
		Afforestation	-1.5%		
		Reforestation	-0.5%		
		Harvest/Management	2.5%	HFCs, PFCs, SF6	1%
		Other	-0.6%		
		Agricultural energy use	1.4%	Methane (CH_4)	14%
Agriculture	13.5%	Agriculture soils	6%		
		Livestock & manure	5.1%		
		Rice cultivation	1.5%		
		Other agriculture	0.9%	Nitrous oxide (N_2O)	8%
Waste	3.6%	Landfills	2%		
		Wastewater, other waste	1.6%		

ENERGY

All data is for 2000. All calculations are based on CO_2 equivalents, using 100-year global warming potentials from the IPCC (1996), based on a total global estimate of 41 755 $MtCO_2$ equivalent. Land use change includes both emissions and absorptions. Dotted lines represent flows of less than 0.1% percent of total GHG emissions.

Source: World Resources Institute, Climate Analysis Indicator Tool (CAIT), Navigating the Numbers: Greenhouse Gas Data and International Climate Policy, December 2005; Intergovernmental Panel on Climate Change, 1996 (data for 2000).

Figure 1   This graphic disaggregates global greenhouse gas emissions by energy use sector, end use/ activity, and gas produced. The end use/activity column shows that residential buildings and transportation result in less than 20% of total emitted carbon dioxide, a significant amount to be sure, but far less than is under the direct purview of industries, corporations, and governments.

still dramatically limit the efficacy of individual efforts (Carlsson-Kanyama 1998; Carlsson-Kanyama and González, 2009).

In addition to the insufficiency problem there is also a problem of widespread disempowerment associated with personal and household efforts, because fossil-fuel consumption is rarely simply a personal decision. The options that most individuals are able to consider regarding energy and technology use are determined externally, and fossil-fuel use is woven into any household routine or local culture in ways that are very difficult to change without causing other problems. Again, power and control are relevant, for many people have little control over their general energy consumption options, such as the accessibility of public transportation, locally grown food, or renewable energy sources. When suggesting actions for those who care about climate change, popular

environmentalist discourse tends to emphasize personal responsibility, or the need to shift desires on the demand side, but instant replacements for existing technologies, materials, and forms of transportation are not readily available everywhere.

Any one individual or household's contributions to greenhouse-gas emissions represents a drop in the bucket of total emissions, but eliminating or drastically reducing them can require a great deal of effort in the context of an individual life, including significant investments of time or money. The force of daily pressures can make it very difficult even to curb appliance use or change travel patterns. Moreover, the exertion of effort required to adequately reduce personal emissions does not promise an equally high payoff, because one is assured that her reductions will matter only if many others act in accord. One may feel a sense of responsibility about climate change and want to do her part to address it, but if she has few alternatives available, she may end up feeling disempowered and more frustrated than enabled by her sense of personal responsibility. The awareness that one's efforts are costly but of potentially very low impact can intensify disempowerment and erode one's motivation to keep up the effort.

Also contributing to the problem is the public's lack of faith in higher-level decision-makers. It is arguably a sign of disempowerment in the extreme that the "things to do" list accompanying the film starring the environmentalist former Vice President Al Gore includes nary a suggestion about political action or involvement. Disempowerment and awareness of the insufficiency of one's own actions can be psychologically and cognitively debilitating. Studies show that there is a tendency for people to develop coping strategies such as denial in the face of cognitive dissonance or information about situations they have little power to change, and avoidant denial is all the more attractive when the truth is painful, depressing, or costly, as the truth about climate change certainly seems to be. According to conservation psychologists Susan Clayton and Gene Myers,

> If … (one) perceives high threat and believes they have low coping ability, they will use emotion-focused coping. In emotion-focused coping, the person tries to lessen or tolerate fear, anxiety, and helplessness by emotional means such as avoidance, denial, wishful thinking, religious faith, fatalism, and normalization/desensitization—believing the situation is normal and becoming numb. (Clayton and Myers 2009, 27)

Perhaps we are not to blame for going numb in relation to global warming and climate change, for if individual consumers cannot directly reduce emissions to a sufficient degree, and higher-level ethical agents seem bent on carrying on with business as usual, then why not just check out, or party like it's the end of the world?

Meta-level Responsibilities

Average consumers do have ethical responsibilities to stop contributing to greenhouse gas emissions, but their responsibilities are small in comparison to the responsibilities of meta-level emitters, such as corporations in the energy and chemical sectors, and state and federal governments. A typical American utility company generates wealth for its owners and investors and wages for its workers through processes such as coal mining and burning, which necessarily result in very high greenhouse gas outflows. The very existence of a coal-based utility company is predicated on the permissibility of greenhouse gas emissions, and such industries have been instrumental in creating global warming. Certainly a coal company's responsibilities are related to the responsibilities of individual consumers, for our collective needs and desires for energy might be seen as the driver of the coal company's emissions. But it is not always clear whose interests are driving whom. Most middle-class consumers of centralized fossil-fuel energy have spent our lives flicking on switches, adjusting thermostats, and paying electric and gas bills without much thought about where the energy originates. It doesn't seem true that we *choose* coal, although again, we are not devoid of responsibility either.

   If a utility company were to assume *its* ethical responsibility to stop causing harm through greenhouse gas emissions, say by shutting down coal operations and channeling its accumulated wealth into the development of renewable energy, all consumers served by that company would immediately and inadvertently reduce emissions, regardless of their intentions or personal ethics. Because utility companies and many other corporations and industries are meta-level emitters, their causal responsibilities are significant, so if they were to act in line with their ethical responsibilities, unplug from fossil-fuel sources, and use their wealth to develop alternatives, the beneficial impacts would be great. Even efforts to increase efficiency at the industrial level can have a surprisingly high impact (Lovins 1977). Some therefore argue that hope for a more sustainable future lies in the promise of businesses acting on their ecological responsibilities within a "greener" version of capitalism (Hawken et al. 2008; Derber 2010). Of course, without necessary regulations and penalties, economic development in light of ecological sustainability is wholly voluntary and therefore quite unreliable.

   Nation-states are also meta-level polluters. A nation's greenhouse gas emissions level is an aggregate amount representing all emissions originating from within its borders (with the exception of pollution related to military practices), but a powerful nation's causal responsibilities extend even further. For nations such as Great Britain or the United States, causal responsibilities include direct and indirect influences through policies, investments, and exports, laws related to fossil- fuel extraction and use, regulations of chemicals, exports, offshore pro-

duction, transportation plans and priorities, and international practices with implications for emissions or energy use in other nations, as well as the effects of neocolonialism and cultural hegemonies. Nations are not required to disclose the environmental impacts of their military operations, but the ecological costs of rampant militarism are definitely very high (Schulman 1994; Thomas 1994; Sanders 2009). One writer estimates that the war in Iraq has created at least 141 million metric tons of carbon dioxide equivalent, an amount similar to the effects of putting 25 million additional cars on the road in one year:

> If the war were ranked as a country in terms of emissions, it would emit more CO_2 each year than 139 of the world's nations do annually. Falling between New Zealand and Cuba, the war each year emits more than 60% of all countries. (Reisch and Kretzmann 2008, 4)

If nations are responsible for the many ways they contribute to greenhouse gas emissions, from an ethical perspective it is rather obvious that they ought to agree to binding treaties, greenhouse gas-reducing legislation, and equitable funding for communities that will be seriously affected by climate change. But what if meta-level emitters and decision-makers such as governments, industries, and corporations refuse to take responsibility for climate change, or to do so adequately? Culpable corporations can be determined, but only regulatory and enforcement agencies can effectively force accountability. Culpable governments can be identified, but economically powerful nations cannot be forced to act, and it seems they are immune to ethical persuasion unless appearing to do the right thing serves their own interests. Nation-states can pressure other nations through sanctions and military threats, but in this case the wealthiest and most powerful nations seem to hold all the cards.

ADDRESSING FAILURES OF RESPONSIBILITY

It is unethical for a bearer of great causal responsibility who is able to repair or alleviate a very harmful situation to which she is actively contributing to ignore her obligations to stop contributing to harm. But when this occurs, sometimes a problem can be addressed or solved by others who are able and willing to take responsibility for addressing the harm. Those others may decide to step up because they contributed to the problem in a lesser way, or because they feel a sense of responsibility or duty for a different reason, or because they are simply moved to do so because they care about whatever is harmed or threatened. When a serious harm is at stake it may even be excusable to use otherwise ethically questionable means to try to mend the situation. For instance, if you

accidentally poison my dog with a concoction whose antidote is possessed only by you, yet you refuse to give me the antidote, it would arguably be permissible for me to steal the antidote from you to save my dog.

When meta-level decision-makers such as governments and corporations in high-emitting nations forsake their ethical responsibilities, practical responsibility for addressing climate change seems to fall onto consumers in those societies who care enough to take responsibility for the problem. If that is where hope for planet Earth lies, there is good reason to worry, for as we have seen even in a best-case scenario, personal and household reductions are significant but insufficient for adequately reducing greenhouse gas emissions (the insufficiency problem), and the disempowerment problem combined with media misinformation amplifies the tendency toward political inertia. In light of these difficulties, and the fact that emission levels in the United States have continued to increase despite all of the more accurate and useful scientific, political, and media attention to the issue in the last decade or so, it is interesting to see that a number of influential thinkers seem to believe that it is in the hands of "average citizens" in democratic nations to turn the world toward serious mitigation efforts. In some cases this is because they appear not to trust that governments and industries will do the right thing, and in other cases they characterize popular support as simply necessary for serious mitigation policies to be established.

The philosophical literature on climate change focuses on the responsibilities of nations and matters of international justice, yet even those analyses attribute a good deal of political influence to average citizens. For example, Dale Jamieson highlights the connections among attitudes, everyday actions, and political transformation:

> Successfully addressing climate change requires long-term, sustainable changes in the way we live. This will only come about when we take responsibility for our actions, and express our concern for future generations and the health of the Earth through our everyday actions. The transformation that is required is not only personal, but profoundly collective and political as well. (Jamieson 2007, 8)

Similarly, at the end of his recent book *Storms of My Grandchildren: The Truth about the Coming Climate Catastrophe and Our Last Chance to Save Humanity*, climate scientist James Hansen calls upon Americans' responsibility to do whatever they can to pressure politicians to do the right thing,

> (Y)ou cannot count on governments, the people paid to protect the public, to deal properly and promptly with the climate matter.

> … Our planet, with its remarkable array of life, is in imminent
> danger of crashing. Yet our politicians are not dashing forward. …
> Therefore it is up to you. You will need to be a protector of your
> children and grandchildren in this matter. … Civil resistance may
> be our best hope. (Hansen et al, 2009, 276-77)

In his address to observer organizations at the Copenhagen conference, chief
negotiator for the G77 group of developing nations Lumumba Di-Aping echoed
Hansen's plea, calling upon American civil society to demand a binding commit-
ment to a target of 1.5° C.

Even President Barack Obama seems to share the belief that grassroots enthu-
siasm is *necessary* for developed nations to take responsibility for climate change.
In the closed meeting of a small number of world leaders in which the Copenha-
gen Accord was developed, President Obama referred to the significance of popu-
lar "political will" in influencing a nation's position on mitigation efforts and aid
to other nations:

> From the perspective of the developed countries, in order for us
> to be able to mobilize the political will within each of our coun-
> tries to not only engage in substantial mitigation efforts ourselves,
> which are very difficult, but to also then channel some of the
> resources from our countries into developing countries, is a very
> heavy lift… (Rapp et al. 2010)

Two leading scholars of issues related to climate change and two world lead-
ers representing opposite ends of the global economic spectrum seem to agree
that the fate of the planet lies in the hands of the citizens of high-emitting
democratic nations. But unlike environmental organizations that direct that pub-
lic toward efforts to reduce personal emissions, their statements imply that what
the public ought to do is exercise political agency so as to enable or force the
hand of meta-level decision makers, especially governments. Hansen even
implies that there is an ethical obligation for those who care to engage in nonvi-
olent civil disobedience. Unfortunately, in the wake of the environmentalists'
disappointments over the Copenhagen Accord, we did not see increasing num-
bers of Americans become politically energized by their positions as members of
a nation with the power to determine future global climate change policy.
Nonetheless, the question bears asking: Regarding climate change, is the most
significant ethical obligation of members of high-emitting societies to more effec-
tively pressure industries and governments to implement serious and sustained
mitigation efforts? If so, political activism, popular education, and effective
coalitions may be even more important than private-sphere mitigation efforts
such as reducing one's own carbon footprint.

CARING AND POLITICAL POWER

Due to the scale of change that is needed, individual and household reductions in greenhouse-gas pollution will be effective only if they are deep and widespread, and only if they are accompanied by meta-level efforts, but meta-level policies and corporate practices seem unlikely to emerge without significant support from "below." Addressing climate change through mitigation and transnational funding for adaptation requires administrative action in the form of binding treaties, laws and regulations, taxes, incentives for technological development, and increased international aid, but such policies and practices require mass popular support. An unfair and possibly unmanageable degree of practical responsibility therefore falls on citizens and consumers, who may turn out to be ineffective as political actors because of the problems of insufficiency and disempowerment, among other things. Nonetheless, if national and corporate policies will not go in a more sustainable direction without a great swell of public support in places like the United States, then it is ethically and practically necessary that the significant minority who hopes to effectively address the problem of climate change find ways to build that support.

It would be tragic if increasing disempowerment fueled by well-intentioned green messaging were to magnify political ineffectiveness among environmentalists and global human rights advocates by making it more attractive to focus on personal or private-sphere changes, rather than investing time or energy in work for change at higher levels. Perhaps money and energy otherwise spent on high-priced home retrofitting or demanding lifestyle changes should be aimed directly toward growing movements that increase "green" consciousness and political influence and that effectively demand full corporate responsibility for pollution. If such efforts were to result in a few very significant policy changes, such as a global moratorium on gas flaring or a greening of the military, the payoff in terms of long-term mitigation could be great. Such successes could in turn energize cultural shifts toward more effective alternative technologies.

What can a well-organized collection of people who care accomplish through democratic politics and cultural transformation? Can advocates for environmental integrity and human rights better help us all to effectively reduce greenhouse gas emissions in due time? The problem of climate change provides opportunities to foster regenerating movements toward more sustainable and humane futures, and so inevitably some will step up and take responsibility for addressing the problem. Could they possibly succeed? Given the urgency created by the industrial greenhouse effect, an ethically motivated minority must effectively act on their caring while also making it contagious through the creation of a more effective political will. The insufficiency problem might be reduced if those who care about climate change and climate justice channel their mitigation efforts more effectively to influence decision-makers and policies at higher levels, where

actions can be carried out with significant and immediate effects on emission levels and matters of social justice. If more corporate and governmental actors are pressured (or inspired) to take responsibility for the causes of climate change, their decisions and innovations can in turn create more options for carbon-free lifestyles, which will also help reduce the insufficiency and disempowerment problems for average consumers. The knowledge we need to avert a more extreme climate disaster already exists, in many places and in multiple forms. Those who care about humanity and Earth's green growing mantle of life need the power to turn dominant practices and policies toward better futures. Grand successes along those lines are needed very soon.

Notes

1. Ironically, perfluorocarbons, hydrofluorocarbons, and sulphur hexafluoride were introduced into common use to replace chlorofluorocarbons when CFCs were banned by the Montreal Protocol in 1987. As a contributor to global warming, sulphur hexafluoride is 23,900 times more powerful than CO_2, and it has an atmospheric lifetime of 3,200 years, so once we emit in into the atmosphere it is ostensibly there forever (Schmidt and Wolfe 2009, 229). Currently CO_2 persists in the atmosphere for around 60 years (Kump et al. 1999, 257).

2. According to the IPCC, from 1990 to 2007 emissions from "developed" nations increased by 11.2% (IPCC 2007).

3. Much has been written by feminist philosophers on the significance of caring as a necessary, beneficial, and underappreciated aspect of human ethics, including matters of global justice and environmental ethics. In fact, the careful articulation of feminist care ethics is arguably one of the more sturdy analytical developments to have emerged from feminist philosophy. To cite one general definition, Virginia Held writes that "the central focus of the ethics of care is on the compelling moral salience of attending to and meeting the needs of the particular others for whom we take responsibility" (Held 2006, 10). Ethical caring is relevant throughout the various "levels" of responsibility discussed here, for governments, corporations, and individuals are all capable of appropriate caring about climate change, and prioritizing it as a serious problem through immediate and sustained attention and action. For discussion of the significance and limits of feminist care ethics, especially in light of the requirements of justice, see Card 1990.

4. According to the website of the Association of Small Island States (AOSIS; http://www.sidsnet.org/aosis/), "In September 2009 in New York, leaders of the World's 42 island states, called the AOSIS grouping, delivered a resounding declaration to the United

Nations General Assembly. The AOSIS group demanded that global warming be kept well below 1.5 degrees Celsius (°C). Dubbed '1.5°C to Stay Alive' a campaign based on their declaration to the UN gives voice to those living with the most devastating impacts of climate change."

5. One fine global activist group focused on this issue is 350.org (http://www.350.org).

6. Some readers may think that the ecological harms caused by the industrial greenhouse effect are not really harms at all, because they are damages to things rather than people, and things cannot be harmed in an ethically significant way except insofar as they are peoples' property. Regarding potentially catastrophic climate change from industrialism, it seems quite mistaken to say that nonhuman living systems cannot be harmed. In any case, the tremendous human suffering that is likely to result from the industrial greenhouse effect and climate change make them extremely serious problems from both anthropocentric and biocentric ethical positions.

7. French physicist and mathematician Joseph Fourier first proposed the effect of atmospheric composition on earth's temperature in 1824, and in the late 1890s Swedish scientist (and noted eugenicist) Svante Arrhenius first considered the question of what would occur to the earth's temperature if CO_2 in the atmosphere were to rise dramatically. Arrhenius estimated that a doubling of CO_2 would create a rise of around 5 to 6 degrees, which is surprisingly close to what scientists currently predict (Bolin 2008).

8. Lumping emissions by nation can be misleading, because any nation's cumulative emissions may be attributable to only a small sector of that nation's population, and reported emissions do not include a nation's military sector. National "per capita" averages can also be deceptive. For example, the World Bank's data on per capita carbon dioxide emissions is calculated by dividing a nation's total reported emissions, including all industrial and commercial emissions, by total population. In such scenarios "per capita" does not represent average household or personal emissions, otherwise known as carbon footprints (nonetheless, anyone can calculate her own carbon footprint at the website http://www.carbonfootprint.com/calculator.aspx).

9. An influential 2004 article by Stephen Pacala and Robert Socolow contains an important analysis of the potential for private-sphere mitigation. Pacala and Socolow argue for a strategy to maintain greenhouse gas emissions at a flat level for the next fifty years by implementing a variety of "wedges," each wedge representing an available alternative technology or practice that would reduce emissions by one gigaton (one billion tons) of carbon a year (Pacala and Socolow 2004; see also Vandenbergh et al. 2008; Dietz et al. 2009). For example, four wedges of reduction could be created by: 1) increasing fuel economy for two billion cars from 30 to 60 miles per gallon, 2) implementing established means of increasing energy efficiency to reduce carbon emissions by one-fourth in buildings and appliances, 3) increasing wind power to fifty times the current capacity, and 4) applying conservation tillage to all cropland, reducing the rate of decomposition of organic matter. On their analysis, the implementation of seven such wedges would maintain current levels of emissions over the next fifty years. *But nearly all of the wedges they discuss require changes in governmental or industrial policies as well as compliance from individuals and households.*

REFERENCES

Alston, Margaret. 2008. The big dry: The link between rural masculinities and poor
     health outcomes for farming men. *Journal of Sociology* 44 (2): 133–47.
American Congress of Obstetricians and Gynecologists. 2006. The effects of natural
     disasters on women and infants: Hurricane Katrina. www.acog.org/departments/nfimr/
     erumreview.pdf (accessed December 1, 2010).
Barnosky, Anthony. 2009. *Heatstroke: Nature in an age of global warming.* Washington, D.C.:
     Island Press.
Bolin, Bert. 2008. *A history of the science and politics of climate change: The role of the
     Intergovernmental Panel on Climate Change.* Cambridge, UK: Cambridge University
     Press.
Bradley, Bethany A., Michael Oppenheimer, and David S. Wilcove. 2010. Climate
     change increases risk of plant invasion in the eastern United States. *Biological Inva-
     sions* 12 (6): 1855–72.
Brown, Donald A. 2003. The importance of expressly examining global warming policy
     issues through an ethical prism. *Global Environmental Change* 13 (4): 229–34.
Card, Claudia. 1990. Caring and evil. *Hypatia* 5 (1): 101–08.
Carlsson-Kanyama, Annika. 1998. Climate change and dietary choices: How can emis-
     sions of greenhouse gases from food consumption be reduced? *Food Policy* 23 (3/4):
     277–93.
Carlsson-Kanyama, Annika, and Alejandro D. González. 2009. Potential contributions of
     food consumption patterns to climate change. *American Journal of Clinical Nutrition*
     89 (suppl): 1704S–9S.
Clayton, Susan, and Gene Myers. 2009. *Conservation psychology: Understanding and promot-
     ing human care for nature.* Oxford: Wiley-Blackwell.
Cuomo, Chris J. 1992. Unraveling the problems in ecofeminism. *Environmental Ethics* 15
     (4): 351–63.
———. 1998. *Feminism and ecological communities: An ethic of flourishing.* New York: Routl-
     edge.
Cuomo, Chris J., Wendy R. Eisner, and Kenneth Hinkel. 2008. Environmental change,
     indigenous knowledge, and subsistence on Alaska's north slope. *The Scholar and Femi-
     nist Online* 6 (4). http://www.barnard.columbia.edu/sfonline/ice/cuomo_eisner_hinkel_
     01.htm (accessed December 1, 2010).
Dankelman, Irene. 2010. *Gender and climate change: An introduction.* London: Earthscan.
Derber, Charles. 2010. *Greed to green: Solving climate change and remaking the economy.*
     Boulder, Colo.: Paradigm Publishers.
Dietz, Thomas, Gerald T. Gardner, Jonathan Gilligan, Paul C. Stern, and Michael P.
     Vandenbergh. 2009. Household actions can provide a behavioral wedge to rapidly
     reduce U.S. carbon emissions. *Proceedings of the National Academy of Sciences* 106
     (44): 18452–56.
Dukes, Jeffrey S., and Harold A. Mooney. 1999. Does global change increase the success
     of biological invaders? *Trends in Ecology & Evolution* 14 (4): 135–39.

Enarson, Elaine. 2000. *Gender and natural disasters. Working paper no.1, Infocus Programme on Crisis Response and Reconstruction.* Geneva: International Labour Organisation, Recovery and Reconstruction Department.

Gaard, Greta, and Lori Gruen. 1993. Ecofeminism: Toward global justice and planetary health. *Society and Nature* 2 (1): 1–35.

Gardiner, Stephen M. 2004. Ethics and global climate change. *Ethics* 114 (April): 555–600.

———. 2006. A perfect moral storm: Climate change, intergenerational ethics and the problem of moral corruption. *Environmental Values* 15 (3): 397–413.

Gorke, Martin. 2003. *The death of our planet's species: A challenge to ecology and ethics.* Washington, D.C.: Island Press.

Griffin, Susan. 1978. *Woman and nature: The roaring inside her.* New York: Harper & Row.

Gronewald, Nathanial. 2010. Pakistan: A sad new benchmark in climate-related disasters. *New York Times*, August 18. http://www.nytimes.com/cwire/2010/08/18/18climatewire-pakistan—a-sad-new-benchmark-in-climate-re-4283.html (accessed December 1, 2010).

Hansen, James. 2009. *Storms of my grandchildren: The truth about the coming climate catastrophe and our last chance to save humanity.* New York: Bloomsbury.

Hansen, James, Inez Fung, Andrew A. Lacis, David H. Rind, Sergei Lebedeff, Reto A. Ruedy, Gary L. Russell, and Peter H. Stone. 1988. Global climate changes as forecast by Goddard Institute for Space Studies three-dimensional model. *Journal of Geophysical Research*, 93: 9341–9364.

Haraway, Donna J. 1990. *Simians, cyborgs, and women: The reinvention of nature.* New York: Routledge.

Hawken, Paul, Amory Lovins, and L. Hunter Lovins. 2008. *Natural capitalism: Creating the next industrial revolution.* New York: Back Bay Books.

Held, Virginia. 2006. *The ethics of care: Personal, political, global.* Oxford: Oxford University Press.

Hemmati, Minu, and Ulrike Röhr. 2007. A huge challenge and a narrow discourse: Ain't no space for gender in climate change policy? *Women and Environment International* 74–75: 5–9.

Hoggan, James. 2009. *Climate cover-up: The crusade to deny global warming.* Vancouver, B. C.: Greystone Books.

Intergovernmental Negotiating Committee for a Framework Convention on Climate Change. 1992. United Nations Framework Convention on Climate Change. In *Report of the Intergovernmental Negotiating Committee for a Framework Convention on Climate Change on the work of the second part of its fifth session. Addendum. (A/AC.237/18 (Part II) /Add.1, Annex I.)* New York: United Nations.

Intergovernmental Panel on Climate Change (IPCC). 2007. *Climate change 2007: Synthesis report. Contribution of working groups I, II and III to the fourth assessment report of the Intergovernmental Panel on Climate Change*, ed. Core Writing Team, Rajendra K. Pachauri and Andy Reisinger. Geneva: IPCC.

Jamieson, Dale. 1992. Ethics, public policy, and global warming. *Science, Technology, & Human Values* 17 (2): 139–53.

———. 2001. Climate change and global environmental justice. In *Changing the atmosphere: Expert knowledge and environmental governance*, ed. Clark A. Miller and Paul N. Edwards. Cambridge, Mass.: MIT Press.

———. 2007. The moral and political challenges of climate change. In *Creating a climate for change: Communicating climate change and facilitating social change*, ed. Susanne Moser and Lisa Dilling. Cambridge, UK: Cambridge University Press.

Keesing, Felicia, Robert D. Holt, and Richard S. Ostfeld. 2006. Effects of species diversity on disease risk. *Ecology Letters* 9 (4): 485–98.

Kump, Lee R., James F. Kasting, and Robert G. Crane. 1999. *The earth system*. Upper Saddle River, N.J.: Prentice Hall.

Levina, Ellina, and Dennis Tirpak. 2006. *Adaptation to climate change: Key terms. Information Paper*. Paris: Organisation for Economic Co-operation and Development.

Lovins, Amory B. 1977. *Soft energy paths: Toward a durable peace*. New York: Friends of the Earth.

Masika, Rachel. 2002. *Gender, development and climate change*. London: Oxfam.

Meinshausen, Malte, Nicolai Meinshausen, William Hare, Sarah C. B. Raper, Katja Frieler, Reto Knutti, David J. Frame, and Myles R. Allen. 2009. Greenhouse-gas emission targets for limiting global warming to 2°C. *Nature* 458 (7242): 1158–62.

Merchant, Carolyn. 1980. *The death of nature: Women, ecology and the scientific revolution*. San Francisco: Harper and Row.

Mies, Maria, and Vandana Shiva. 1993. *Ecofeminism*. London: Zed Books.

Moore, Frances C. 2008. *Carbon dioxide emissions accelerating rapidly*. Earth Policy Institute. http://www.earth-policy.org/indicators/C52/carbon_emissions_2008 (accessed December 1, 2010).

Nakjavani, Salim, and Witold Tymowski. 2002. *The principle of common but differentiated responsibilities: Origins and scope*. Centre for International Sustainable Development Law. http://www.cisdl.org/publications/legalbriefs.html (accessed December 1, 2010).

Oreskes, Naomi. 2004. Beyond the ivory tower: The scientific consensus on climate change. *Science* 306 (5702): 1686.

———, and Erik M. Conway. 2010. *Merchants of doubt: How a handful of scientists obscured the truth on issues from tobacco smoke to global warming*. London: Bloomsbury Press.

Oxfam International. 2005. *The tsunami's impact on women*. Oxfam Briefing Notes. http://www.oxfam.org/en/policy/bn050326-tsunami-women (accessed December 1, 2010).

Pacala, Stephen, and Robert Socolow. 2004. Stabilization wedges: Solving the climate problem for the next 50 years with current technologies. *Science* 305 (5686): 968–72.

Parfit, Derek. 1984. *Reasons and persons*. Oxford: Oxford University Press.

Patz, Jonathan A., Diarmid Campbell-Lendrum, Tracey Holloway, and Jonathan A. Foley. 2005. Impact of regional climate change on human health. *Nature* 438 (7066): 310–17.

Plumwood, Val. 1994. *Feminism and the mastery of nature*. London: Routledge.

Rapp, Tobias, Christian Schwägerl, and Gerald Traufetter. 2010. How China and India sabotaged the UN climate summit. *Der Spiegel*, May 5.

Reisch, Nikki, and Steve Kretzmann. 2008. *A climate of war: The war in Iraq and global warming*. Oil Change International, http://priceofoil.org/climateofwar/ (accessed December 1, 2010).

Reproductive Health Response in Crises Consortium. 2010. Needs of women and girls must be addressed in Pakistan flood response and recovery. http://www.rhrc.org/RHRC-PakistanStatement-FINAL-Aug6.pdf (accessed December 1, 2010).

Sanders, Barry. 2009. *The green zone: The environmental costs of militarism*. Oakland: AK Press.

Schmidt, Gavin, and Joshua Wolfe. 2009. *Climate change: Picturing the science*. New York: W. W. Norton and Company.

Schulman, Seth. 1994. *The threat at home: Confronting the toxic legacy of the U.S. military*. Boston: Beacon Press.

Seager, Joni. 2009. Death by degrees: Taking a feminist hard look at the 2° climate policy. *Women, Gender & Research* 18 (3-4): 11–21.

Secretariat of the Convention on Biological Diversity. 2010. *Global biodiversity outlook 3— Executive summary*. Montreal.

Shue, Henry. 1993. Subsistence emissions and luxury emissions. *Law and Policy* 15 (1): 39–59.

Stern, Nicholas. 2009. *The global deal: Climate change and the creation of a new era of progress and prosperity*. New York: Public Affairs.

Tans, Peter. 2010. *Trends in atmospheric carbon dioxide*. National Oceanic and Atmospheric Administration/Earth Systems Research Laboratory. http://www.esrl.noaa.gov/gmd/ccgg/trends/ (accessed December 1, 2010).

Thomas, William. 1994. *Scorched Earth: The military's assault on the environment*. Gabriola Island, B.C.: New Society Publishers.

United Nations Environment Programme. n.d. Organization Profile, http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=43 (accessed December 1, 2010).

United Nations Framework Convention on Climate Change (UNFCCC). 1998. Kyoto Protocol to the United Nations Framework Convention on Climate Change. In *Report of the Conference of the Parties on its third session. Addendum. Part Two: Action taken by the Conference of the Parties at its third session. Decision 1/CP.3, Annex (FCCC/CP/1997/7/Add.1.)* UNFCCC, Bonn, Germany.

———. 2010. Copenhagen Accord. In *Report of the Conference of the Parties on its fifteenth session. Addendum. Part Two: Action taken by the Conference of the Parties at its fifteenth session. Decision 2/CP.15*. Copenhagen: UNFCCC.

United Nations News Centre. 2009. With better stoves, UN aims to cut risk of murder, rape for women seeking firewood. http://www.un.org/apps/news/story.asp?NewsID=33275&Cr=wfp&Cr1=# (accessed December 1, 2010).

U.S. Environmental Protection Agency. 2010. Inventory of U.S. greenhouse gas emissions and sinks: 1990–2008. Executive summary, April 2010. http://epa.gov/climatechange/emissions/usinventoryreport.html (accessed December 1, 2010).

Vandenbergh, Michael P., Jack Barkenbus, and Jonathan Gilligan. 2008. Individual carbon emissions: The low-hanging fruit. *UCLA Law Review* 55 (6): 1701–58.

Warren, Karen J. 1990. The power and promise of ecological feminism. *Environmental Ethics*, 12 (2): 125–46.