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Dale Jamieson

University of Colorado, Boulder

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Global Responsibilities:
Ethics, Public Health, and Global Environmental Change

DALE JAMIESON*

In this article, Professor Dale Jamieson examines the relationship between climate change and public health from an ethical perspective. He begins by exploring the link between global environmental change and public health and concludes that global warming poses a serious potential threat to human health. Professor Jamieson then questions why the potential health effects of climate change have received so much attention when the other ramifications of climate change have been left unaddressed. He argues that the combination of several factors has brought the issue of potential health effects to the forefront of the climate change debate. One such factor is the championing of the issue by "issue entrepreneurs"; small groups of people who employ diverse forms of institutional authority to promote a specific issue. Another contributing factor is an effort to engage the general public in the issue of global change. The potential health effects of climate change have also been brought to the forefront by the rise of AIDS, a disease which has proven that the threat of infectious disease continues to affect public health. Finally, a new understanding of microbes and a new motivation for development aid have brought the potential health effects of climate change to public attention.

Professor Jamieson then examines both the direct and indirect health effects of climate change. He analyzes whether the hypothesized effects of climate change are currently observable and concludes that while recent outbreaks of infectious disease seem to suggest an affirmative answer, mortality and morbidity statistics indicate that the health effects of climate change have yet to be felt. He states that the future impact of the health effects of climate change will depend centrally on the social, political, and economic approaches adopted today.

*Henry R. Luce Professor in Human Dimensions of Global Change, Carleton College; Professor, Department of Philosophy, University of Colorado, Boulder; and Adjunct Scientist, Environmental and Societal Impacts Group, National Center for Atmospheric Research. The author thanks Dr. A.J. McMichael for his comments, Dr. Stacy Zamudio for helpful discussions; and Kelly Knutson, Miles Mercer, and Matthew Varilek for research assistance.
Finally, Professor Jamieson explores the ethical issue of moral responsibility. He discusses two paradigms of morality: (1) the causal paradigm, which assigns moral responsibility to those who cause harm; and (2) the paradigm that associates responsibility with the ability to provide benefits or prevent harms. The examination of these two paradigms leads Professor Jamieson to conclude that the adoption of the second paradigm of moral responsibility would best address the potential health effects of climate change. He states that those who are able to prevent global change-induced health problems are morally obligated to act in a manner that will prevent these problems.
INTRODUCTION

Since the first Earth Day in 1970, people have become increasingly aware of the human transformation of the planet. Over the last twenty-seven years scientists and theorists have come to see specific concerns about air and water quality, species extinction, resource exhaustion, climate change, and ozone depletion as part of a global pattern of human-induced change. While change is endemic to Earth, the emerging picture is that humans are systematically transforming the planet and its life-support systems at a rate and to such an extent that it is without precedent within the last fifty million years. In this article, I analyze the public health and ethical concerns that arise in connection with global environmental change, primarily with respect to climate change.

I. PUBLIC HEALTH AND GLOBAL ENVIRONMENTAL CHANGE

The idea that humans are systematically transforming the planet and its life support systems at an unprecedented rate has slowly gained recognition over the last two decades. Much of the discussion has been purely scientific in nature. It has been painfully difficult, expensive, and time consuming to establish links among chlorofluorocarbon (CFC) emissions, ozone depletion, increased levels of ultra-violet-B radiation on the Earth’s surface, and harm to biological systems. This is just one aspect of the problem of global environmental change; assembling the case for anthropogenic climate change has been even more difficult. However convincing this emerging perspective is to scientists and environmentalists, it has provoked no more than mild curiosity in most Americans. A warmer and wetter world, fewer species of arthropods, and even disappearing amphibians do not add up to much for most Americans—at least not compared to paying substantially more for a gallon of gasoline.

Beginning in the 1980s, the problems of global environmental change have increasingly been linked to human health concerns. A 1989 article in the New England Journal of Medicine brought this issue to the attention of the medical community. The author concluded that environmental change “has the potential to harm human health to an unprecedented and intolerable

degree." This issue was also addressed in 1990 in *Global Warming: The Greenpeace Report.* Throughout the early 1990s, attention to the human health threats posed by global environmental change grew and, in 1993, A. J. McMichael published *Planetary Overload*, a book that continues (deservedly) to receive quite a lot of attention. During the same year, Cambridge University Press also published the proceedings of a symposium on the impact of global change on disease, held by the British Society for Parasitology, the Royal Society of Tropical Medicine and Hygiene, and the Linnean Society.

The watershed year for concerns about the health effects of global change was 1996. The July 8 issue of *Time* published an article entitled "Global Fever", suggesting that "the real peril [of climate change] may be disease." The health effects of global warming were featured in such journals as *Science News* and *The Lancet*, and a new report from the World Health Organization (WHO) also appeared. Most importantly, the Second Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) discussed extensively the link between climate change and human health. Twenty-three pages were devoted to human health concerns in the Second Assessment, more than twice as many as were devoted to this problem in the First Assessment published in 1990.

In order to understand the importance of the extensive discussion of the link between climate change and human health in the Second Assessment, one must first understand the important role that the IPCC plays in bringing the issue of climate change to public attention. This in turn requires some understanding of the history of the climate change issue.

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2. *Id.* at 1583.
Speculation about human impact on climate is very ancient, and specific concerns about the role of carbon dioxide emissions in changing climate go back at least to the Swedish Nobel Prize winner, Svante Arrhenius, in the late-nineteenth century. In the twentieth century, speculation about climate change was episodic, sometimes focusing on the possibility of a cooling and sometimes on the possibility of a warming. By the early 1980s, concerns about global warming were becoming increasingly prominent in the atmospheric science community. In 1983, a group of scientists meeting in Villach, Austria adopted a statement of concern, which was followed by a series of other meetings, notably the Toronto Conference on the Changing Atmosphere held in 1988, that also adopted statements. As a consequence of this activity, the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) established the IPCC to assess the available scientific information on climate change, including its possible impacts, and to formulate response strategies. The First Assessment was published in 1990 and was supplemented in 1992 and 1994. The Second Assessment, published in 1996, declared that "[t]he balance of evidence suggests a discernible human influence on global climate." Because the UNEP and the WMO are international organizations, and because the goal of the IPCC was to characterize the current state of knowledge, the IPCC process was quite inclusive, enlisting the contributions of over 400 authors from twenty-six countries. While the IPCC has been under attack by the political right in the United States, internationally it is viewed as extremely credible. Thus, the IPCC's serious treatment of the health impacts of climate change in the Second Assessment gave this issue the stamp of scientific credibility.

15. Intergovernmental Panel on Climate Change, supra note 11.
II. CLIMATE CHANGE AND PUBLIC CONCERN

Climate change is at the center of the debate over global change, and much of the literature about the health effects of global change specifically focuses on climate change. For these reasons, I will focus primarily on climate change in analyzing the relationship between public health and global environmental change.

The first issue I will address concerns why the potential health effects of climate change have succeeded in capturing public attention when other dimensions of the problem have not. The gravity of the anticipated health problems and the growth of knowledge regarding them are certainly part of the explanation, but they are not the whole of it. It is much clearer that climate change would devastate natural ecosystems and wildlife than it would have profound effects on human health, yet threats to natural systems and wildlife from climate change have not succeeded in capturing public attention. The spotlight of public attention, while not random, is restless and difficult to predict. It sometimes rests on little-known risks that appear to be slight, such as electromagnetic fields, but ignores other, more well-understood risks that present major hazards, like pedestrian safety. I believe that several factors have contributed to bringing health concerns about climate change into play.

A. Issue Entrepreneurs

The issue of the possible health effects of climate change has been pioneered by a small group of people. A.J. McMichael of the London School of Tropical Medicine and Hygiene has authored various journal articles and an influential book on this topic. He was also the main author of the chapter on “Human Population Health” of the IPCC’s Second Assessment and the lead author of the WHO report. Paul Epstein of Harvard Medical School, who was a principal lead author of the relevant chapter of the IPCC report, is also a central player, teaching a course on this subject at Harvard and authoring numerous “op-ed” pieces and research articles.

Issues that reach public attention are often championed by a few individuals who promote their issues by wrapping themselves in diverse forms

17. See generally McMICHAEL, supra note 4.
GLOBAL RESPONSIBILITIES

of institutional authority. This approach is common and is not necessarily undesirable. The fact that an issue has promoters does not, however, fully explain why it succeeds in capturing public attention. A wide range of issues with influential and able promoters is lost in the cacophony of competing voices and agendas.

B. The New Rhetoric of Environmentalism

Climate change, the central global change issue, was very much on the United States' national agenda during the summer of 1988, which saw the worst North American drought since the dust bowl days of the 1930s. The issue did not remain salient for very long, in part because of the lack of a "dread factor" and a clear connection to human welfare. Part of what drives the concern for the health impacts of global environmental change is a concern to make global change issues salient for the general public. From the first Earth Day in 1970 to the present, the environmental movement has evolved from a focus on "pure" ecological goods toward a greater concern for human health and welfare. It can be said without too much overstatement that for all intents and purposes the United States Environmental Protection Agency has become a public health agency.

C. The Rise of AIDS

A third reason why the health effects of global change have captured attention is the rise of AIDS. Before AIDS, it was commonly believed that the age of infectious disease was over, at least in the affluent countries of the world. In 1967, "the United States Surgeon General, William H. Stewart, announced that the time had come 'to close the book on infectious diseases.'" The emergence and continuing prevalence of AIDS showed that this was not the case. The sudden eruption of a virulent infectious disease stimulates a variety of questions, including those about its origin and causes. Because the rise of the disease itself is an environmental change, it provokes questions about what changes in behavior or environment contributed to its development.


and spread. AIDS has brought with it an upsurge of various other infectious diseases previously considered under control, such as tuberculosis and gonorrhea. AIDS and other emerging infectious diseases have helped make the fear of infectious disease salient for many people, creating a more fertile ground for an awareness about the human health threats of climate change.

D. New Understandings of Microbes

A fourth reason for the concern about global environmental change, also associated with the rise of AIDS, is the new understanding of relationships among people, environments, and infectious agents that is beginning to take hold. Stimulated by recent work in virology, immunology, parasitology, and other fields, and popularized most recently by Laurie Garrett, we are beginning to think in a more evolutionary way about our relations with microbes. This new attitude is well-expressed by Imre J.P. Loefler, reflecting on his career as an infectious disease specialist.

In the 60 years since my aunt Teresa's pekinese, treated for balanitis with topical Prontosil, left red spots on the settee, I have seen infectious disease retreating, almost disappearing, and now coming back in force. Our folly ultimately was not just due to carelessness and avarice; the concept was wrong. We the healers, went to war against countless unwanted species and the war was a total one aiming at annihilation and extinction. Our terminology in the process was that of the warrior: we were fighting, conquering, eliminating, exterminating, and, as in all wars with infinite aims, the damage incurred is inestimable.

Increasingly, we have come to recognize that antibiotics and other anti-infectious disease agents change the selection pressures on microbes, resulting in large populations that are resistant to these agents. As Garrett has written:

What is required, overall, is a new paradigm in the way people think about disease. Rather than a view that sees humanity's relationship to the microbes as a historically linear one, tending over the centuries toward ever-decreasing risk to humans, a far more challenging perspective must be sought, allowing for a dynamic, nonlinear state of affairs between *Homo sapiens* and the microbial world, both inside and outside their bodies.\(^2\)

From this perspective it may be that the most we can hope for is to live with tolerable levels of disease-causing microbes. Any aggressive action, whatever its intention, that dramatically changes ecologies may well worsen the situation. Thus, global environmental change, which dramatically changes the environments of microbes, may unloose serious new diseases.

**E. The New Motivation for Development Aid**

A fifth reason for the focus on human health in the context of global climate change flows from concern in some quarters about how to make a convincing case for development assistance. Appeals to altruism alone no longer motivate people to favor these policies, if they ever did. Indeed, despite commitments that have been made by most industrialized countries, there has been a downward spiral of development assistance since 1987. In Rio in 1992, most of the industrialized countries pledged to reverse this trend by boosting development aid from .35 percent of gross national product (GNP) to .7 percent of their GNPs.\(^3\) In fact, since 1992, aid has further declined from .33 percent to .27 percent of GNP.\(^4\) To a great extent, the growing unpopularity of development assistance in the United States is based on erroneous information. According to surveys, most Americans wildly overestimate the amount of development aid provided, believing that about fifteen percent of the federal budget goes to such aid. This is three times the amount that most people believe to be the proper level of spending, but fifteen times the amount

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22. GARRETT, supra note 20, at 11.
24. *Id.*
that is actually spent. When informed of the facts, most people think the level of spending is about right.\textsuperscript{25}

Whatever the basis of resistance to development aid, if it can be shown that disease in Africa is a threat to Americans, then the discussion of development aid will have migrated from the marginalized discourse of altruism to what is regarded as the vastly more efficacious discourse of self-interest. Rather than resting the case for development aid on sentiment, the argument can be made on the basis of steely self-interest; on this view, Americans should provide aid to suffering Africans so that new and emerging diseases do not get exported to Chicago, Los Angeles, or New York.

III. THE CASE FOR CONCERN

Thus far I have discussed the social, political, and rhetorical context that has helped to put the health effects of climate change on the global environmental agenda. In this section, I will summarize some of these anticipated health effects.\textsuperscript{26}

Concerns about the health effects of climate change are typically divided into two categories: direct and indirect. Direct effects include the results of exposures to extreme weather events such as heat waves, floods, and storms. An example of a direct health effect is the excess deaths that would result from the doubling in the number of very hot days in temperate regions expected to result from a two to three degree centigrade global warming.

Indirect health effects of climate change are those that are mediated by physical or social systems. An example of an indirect effect is the deaths that would occur as a result of increases in the geographical ranges and incidences of vector-borne diseases, such as malaria and dengue fever, caused by climate change-induced disturbance of ecological systems. Another example is the deaths that would result from breakdowns in health and nutrition programs caused by climate change-induced disturbances of social systems. Of course, direct and indirect health effects can occur simultaneously. If climate change occurs, we can imagine some people finding themselves with greater exposure to extreme weather events, in societies that are less resilient, and in a world in

\begin{itemize}
\item \textsuperscript{26} See \textit{CLIMATE CHANGE 1995: IMPACTS, ADAPTATIONS AND MITIGATION}, supra note 10; \textit{INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE}, supra note 11.
\end{itemize}
which there is a greater prevalence of infectious disease. There is research on a range of the possible health effects of climate change, but the possibility of increases in the prevalence of infectious disease has captured the most attention. Table 1 is a summary of how the prevalence of some of these diseases might shift in a greenhouse world.

While the links between climate change and increases in disease prevalence are often highly inferential and even speculative, in some cases the chain of reasoning is quite plausible. For example, malaria is spread by Anopheles mosquitoes. A greenhouse world is likely to be wetter and warmer with a climate likely to increase anopheline breeding densities and survival rates. Predictions of changes in regional climates would suggest that areas of the United States and Europe would become hospitable to Anopheles.

Researchers are generally loathe to provide precise estimates of the "body count" that might result from global warming, but Johns Hopkins University epidemiologist Jonathan Patz has provided the makings of an estimate of the number of people who might die from global warming induced malaria.27 Currently about 2.1 billion people are at risk from malaria and about 270 million suffer from the disease.28 One to two million of these people die annually. Global warming would place an additional 620 million people at risk by the year 2050.29 Virtually none of these people would have the partial immunity characteristic possessed by many of those who are currently at risk. Even if we optimistically assume that prevalence and mortality rates would be the same in a greenhouse world as they are now, these numbers suggest that there would be about eighty million new malaria cases and about 600,000 additional deaths per year by 2050.30

Similar computations could be performed for other infectious diseases such as schistosomiasis, trypanosomiasis (sleeping sickness), onchocerciasis (river blindness), dengue, and yellow fever. When these impacts are joined with other indirect health impacts relating to food and social organization, and

28. Id.
29. Id.
Table 1: Major tropical vector-borne diseases.31

<table>
<thead>
<tr>
<th>Disease</th>
<th>Vector</th>
<th>Population at Risk (million)*</th>
<th>People Currently Infected or New Cases per Year</th>
<th>Present Distribution</th>
<th>Likelihood of Altered Distribution with Climate Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malaria</td>
<td>Mosquito</td>
<td>2,400</td>
<td>300-500 million</td>
<td>Tropics/Subtropics</td>
<td>+++</td>
</tr>
<tr>
<td>Schistosomiasis</td>
<td>Water Snail</td>
<td>600</td>
<td>200 million</td>
<td>Tropics/Subtropics</td>
<td>++</td>
</tr>
<tr>
<td>Lymphatic Filariasis</td>
<td>Mosquito</td>
<td>1,094</td>
<td>117 million</td>
<td>Tropics/Subtropics</td>
<td>+</td>
</tr>
<tr>
<td>African Trypanosomiasis (Sleeping Sickness)</td>
<td>Tsetse Fly</td>
<td>55</td>
<td>250,000-300,000 cases per year</td>
<td>Tropical Africa</td>
<td>+</td>
</tr>
<tr>
<td>Dracunculiasis (Guinea Worm)</td>
<td>Crustacean</td>
<td>100</td>
<td>100,000 per year</td>
<td>South Asia/Arabian Peninsula/Central-West Africa</td>
<td>?</td>
</tr>
<tr>
<td>Leishmaniasis</td>
<td>Phlebotomine Sand Fly</td>
<td>350</td>
<td>12 million infected, 500,000 new cases per year</td>
<td>Asia/Southern Europe/Africa/Americas</td>
<td>+</td>
</tr>
<tr>
<td>Onchocerciasis (River Blindness)</td>
<td>Black Fly</td>
<td>123</td>
<td>17.5 million</td>
<td>Africa/Latin America</td>
<td>++</td>
</tr>
<tr>
<td>American Trypanosomiasis (Chagas' disease)</td>
<td>Triatomine Bug</td>
<td>100</td>
<td>18 million</td>
<td>Central and South America</td>
<td>+</td>
</tr>
<tr>
<td>Dengue</td>
<td>Mosquito</td>
<td>1,800</td>
<td>10-30 million per year</td>
<td>All Tropical Countries</td>
<td>++</td>
</tr>
<tr>
<td>Yellow Fever</td>
<td>Mosquito</td>
<td>450</td>
<td>&lt;5,000 cases per year</td>
<td>Tropical South America and Africa</td>
<td>++</td>
</tr>
</tbody>
</table>

* = likely, ++ = very likely, +++ = highly likely, ? = unknown.

*Top three entries are population-prorated projections, based on 1989 estimates.

31. Table is taken from CLIMATE CHANGE 1995: IMPACTS, ADAPTATIONS AND MITIGATION, supra note 10, at 572.
direct impacts involving extreme weather events, it is clear that there is a case for taking the health effects of global warming very seriously.

IV. SOME GROUNDS FOR CAUTION

Global environmental change is clearly underway. According to the IPCC, climate change is underway as well. The global mean surface air temperature has increased between .3 and .6 degrees centigrade since the late-nineteenth century, and the evidence suggests that at least part of this increase is caused by human activities.\textsuperscript{1} It is reasonable to ask, then, whether the hypothesized health effects of climate change can now be observed.

Some might answer the question affirmatively. They would point to recent outbreaks of emerging and reemerging diseases. Malaria is perhaps the clearest example of a reemerging disease,\textsuperscript{3} and malaria disease vectors seem to be migrating. For the first time, in response to a particularly wet and warm year (1987-88), malaria disease vectors were observed at high altitudes in Rwanda.\textsuperscript{4} There have also been outbreaks of other new diseases or those that were thought to be under control. By way of summary, Figure 1 is a map produced by the U.S. National Science and Technology Council Committee on International Science, Engineering, and Technology Working Group on Emerging and Re-emerging Infectious Diseases (CISET) illustrating recent outbreaks of infectious diseases worldwide.

Despite these apparent outbreaks, the mortality and morbidity statistics are equivocal. Whether we think global-change related health risks are increasing depends on what we choose as a baseline and on what populations and diseases we examine. For example, malaria may be more prevalent now than twenty-five years ago but not more prevalent than fifty years ago. Malaria may be more prevalent now than twenty-five years ago, but other diseases, such as polio and measles, have shown a consistent downward trend. The poor, whether they live in Rio or New York, may suffer more from some diseases than they did in the past; but the middle class, whether residents of Delhi or Paris, are better off now in almost all respects.

\textsuperscript{32} See McMichael, \textit{supra} note 4, at 140.
\textsuperscript{33} Donald J. Krogstad, \textit{Malaria as a Reemerging Disease}, 18 EPIDEMIOLOGIC REVIEWS 77 (1996).
\textsuperscript{34} See Michael E. Loevinsohn, \textit{Climatic Warming and Increased Malaria Incidence in Rwanda}, 343 THE LANCET 714, 717 (1994).
Out of the welter of ambiguity some clear trends emerge. To begin with, average life expectancy has increased almost everywhere, including Africa, where life expectancy increased from forty-six years to fifty-three years between 1975 and 1995. In addition to the increase in average life expectancy, infant and child mortality rates have declined significantly in virtually all developing countries. Furthermore, the incidence of vaccine-preventable diseases such as polio and measles has decreased virtually everywhere. Finally, chronic, noninfectious, adult diseases of affluence, such as heart disease, diabetes, and certain cancers, are increasing significantly in rapidly developing countries. Given these clear trends, it would be surprising if the health effects of climate change are now being felt. If they are already manifest, then they are quite minor when compared to other influences on human health. However, it is quite possible that the health effects of climate change are minor as yet, but that they will become much more significant in the future. While this may be true, there are important influential world health forecasts that seem to suggest the opposite.

Recently the WHO, the Harvard School of Public Health, and the World Bank produced a comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected them to the year 2020. While their forecasts are sensitive to various assumptions, the projected world of 2020 is one in which life expectancy increases almost everywhere and the burden of infectious disease significantly declines. The summary states that "[e]ven under the pessimistic scenarios, deaths from infectious diseases, maternal and perinatal conditions and nutritional deficiencies are expected to fall slightly." Any study, even one as sophisticated as this, is open to criticism, and forecasting of all sorts is a hazardous business. Moreover, when considering the consequences of altering fundamental planetary systems, the possibility of surprises and unpredictable nonlinear effects must be taken very seriously. Still, it seems fairly certain that for the foreseeable future deaths caused by

36. The following claims are based on data taken from THE WORLD RESOURCES INSTITUTE, ET AL., WORLD RESOURCES 1996-97 192-93 tbl. 8.2 (7th ed. 1996). But see id. at 177-78 (explaining that the nations of the former Soviet Union are an exception to these trends; they are in a virtual free fall as far as health statistics go).
37. Id. at 179, 192-93 tbl. 8.2.
38. See id. at 180, 187.
39. Id. at 179.
41. Id. at 34.
engaging in high-risk behaviors such as unprotected sex or smoking will continue to be much greater than the health risks posed by environmental change. In 1995 alone, tobacco killed more than three million people; and by 2025 the number is expected to rise to at least ten million per year.42

Exactly what mortality profile prevails in the future will centrally depend on social, political, and economic factors. The likelihood that this is true can be seen by comparing the present disease profiles of rich and poor countries. In the rich countries more than two-thirds of all deaths are from cancer or circulatory disease, more than three times the proportion in poor countries.43 In poor countries, 41.5 percent of all deaths are caused by infectious disease, compared to only 1.2 percent in rich countries.44 Although infectious disease is the leading cause of death in the world, it is of only minor importance in the rich countries.

In order to examine in detail how these social and economic factors manifest themselves, consider the case of malaria. Between 1780 and 1840, malaria was common in many regions of North America. In Ontario after 1840, the incidence of malaria declined from "being almost universal to afflicting fewer than one patient per decade."45 Land use changes, including the management of wetlands and surface waters, and public health measures involving disease surveillance and rapid isolation of patients produced this decline in malaria prevalence.46 Most societies in the developing world do not have the capital and high degree of social organization required to follow the nineteenth-century Canadian example.

In 1958, a worldwide campaign was launched to eliminate all malaria-carrying mosquitoes. This campaign was a spectacular failure, and it is now generally conceded that this goal cannot be accomplished.47 Still, simple measures can be taken to reduce human contact with these mosquitoes even if their populations cannot be substantially reduced. Mosquito nets impregnated with insecticide are very effective in this regard. Despite the fact that drug resistant strains of malaria are increasingly prevalent, new drugs such as

42. Anne Platt McGinn, Preventing Chronic Disease in Developing Countries, in STATE OF THE WORLD 1997 60, 71 (1997).
44. Id. at 306.
46. Id.
47. See GARRETT, supra note 20, at 47.
Malarone that appear to be quite effective both as preventives and treatments are being developed, and traditional antimalarials continue to be effective against many strains of the disease.\textsuperscript{48} Finally, it should be noted that in a well-nourished person with a strong immune system and access to good health care, malaria is generally a chronic condition rather than a fatal disease. But few people in the developing world can spare the five to ten dollars required for mosquito netting, and antimalarial drugs are even farther out of reach. Consequently, when malaria strikes those who are malnourished and suffering from other disorders as well, a controllable disease turns fatal.

V. MORAL RESPONSIBILITY

At this stage, it is difficult to assess fully the potential health impacts of global environmental change. But it is clear that environmental changes in one country affect people across boundaries and that the effects of these changes are profoundly mediated by social, political, and economic structures. If the medical maladies that some expect occur, they will have been produced by people. However, people can mitigate or prevent their occurrence. Because human agency is so deeply implicated in the problem of global environmental change, it is reasonable to examine the issue of moral responsibility.

One claim about the uniqueness of global environmental change should first be pushed aside. Throughout history, people have adversely affected each other across borders in ways that were both unintended and ill-understood. For example, Asian traders and travelers introduced the Black Death to Europe in 1346, resulting in the destruction of one-third of the European population by 1350.\textsuperscript{49} European soldiers and settlers introduced diseases such as smallpox to North America that wiped out well over a majority of the continent's indigenous inhabitants.\textsuperscript{50} In fact, one benefit of increased globalization may be that it reduces the risk of epidemics on such a massive scale by globalizing disease exposure thereby conferring immunity.

Whether global environmental change is unique or not, it still raises questions of moral responsibility. Moreover, despite these historical precedents, humans now have ways of adversely affecting each other that they did not have in the past. For example, the use of CFCs in Europe and North America contributed greatly to producing the southern hemisphere ozone hole. The massive use of fossil fuels in six or seven countries may be largely

\textsuperscript{48} See Krogstad, \textit{supra} note 33.
\textsuperscript{49} \textsc{William H. McNeill}, \textit{Plagues and Peoples} 149 (1977).
\textsuperscript{50} Id. at 180.
responsible for changing the global climate. These behaviors are part of a lifestyle that is characteristic of the rich but largely foreign to the poor. To a great extent global environmental change involves the rich inflicting harms on the poor in order to maintain their profligate lifestyles.

Nor can the rich claim ignorance about the consequences of their actions. Unlike the Asian traders and the European soldiers, we have the IPCC forecasting the results of our carbon-intensive lifestyles. Yes, there are uncertainties in the science. Of course these forecasts may be wrong. But almost no one would deny that in principle our actions and policies should be informed by our best scientific judgments, and it is hard to deny that our best scientific judgments about climate change are expressed in the IPCC reports.

Despite the complications and uncertainties, it is difficult to evade the idea that the actions and policies that produce global environmental change are candidates for moral evaluation. The question then becomes not whether we should think of moral responsibility in the context of global change, but rather how we should think of moral responsibility. In the moral and legal traditions of the West, two broad conceptions of responsibility have been prominent. I will describe them briefly in turn.

A. The Causal Paradigm

According to the causal paradigm, central cases of responsibility are those in which one agent causes a clearly identifiable harm to another agent. Harms and their causes are individual; they can readily be identified, and they are local in space and time.

Consider the following example. Jones breaks into Smith’s house and steals Smith’s television set. Smith is made worse off by having lost her television set, and Jones’ action is the cause of this setback to Smith’s interests. This paradigm, which is associated with contractarian moral philosophy, is historically connected to the rise of capitalism in low-technology, low-population societies with seemingly unlimited access to land and other resources. It is less helpful, however, with harms that result when many agents, acting in an apparently innocent way, together cause harms that are diffuse and remote in time and space. These are the kinds of harms that are likely to result from global environmental change. From the perspective
of the causal paradigm, anthropogenic climate change may occur, yet no one may be responsible.\textsuperscript{51}

B. The 

"Ability to Benefit or Prevent Harm" Paradigm

The second paradigm associates responsibility with the ability to provide benefits or prevent harms. This paradigm is associated with the utilitarian tradition moral philosophy; and, since it does not require us to trace past causal linkages to assign responsibility, it does not founder on the problems of global environmental change.

This paradigm is responsive to a central feature of what people care about in morality. Suppose that you see that a child is drowning, that only you can save her, and that the cost to you would be negligible. Almost everyone would agree that you have a moral responsibility to save her. It would be morally obscene for you to walk by, justifying your behavior on the grounds that you did not push the child into the lake and therefore have no obligation to save her. What matters, for the purposes of morality, is not how she got into her present predicament, but rather who can get her out of it. You find yourself in that position, and so you are morally obliged to save the child. Like the person responsible for saving the child, those who are in a position to prevent or mitigate climate change are responsible for doing so regardless of their causal contributions.

There is a great deal of literature examining the philosophical soundness of both of these paradigms as well as clever attempts to develop subtle variations on them.\textsuperscript{52} I will not try to engage with that literature here. Instead, I will simply assert that contemplating harms that result from global environmental change should lead us to reject the first paradigm in favor of the second or at least to complement the first paradigm with the second. This seems to be a plausible conceptual response to a highly technologized and interconnected world.

\textsuperscript{51} This paragraph is based on a more extended discussion in a previous article. Dale Jamieson, \textit{Ethics, Public Policy, and Global Warming}, 2 Sci., TECH. & HUM. VALUES 139 (1992).

\textsuperscript{52} For a version of the causal paradigm see DAVID GAUTHIER, \textit{Morals By Agreement} (1986). For a version of the alternative paradigm see SHELLY KAGAN, \textit{The Limits of Morality} (1989). For a working out of the implications of the alternative paradigm see PETER SINGER, \textit{Practical Ethics} (2d ed. 1993).
VI. WHAT MORALITY REQUIRES

In the past, when famines and other extreme events occurred, it often was not known outside the affected regions that people were dying. Even when it was known and people were willing to help, little could be done to help those in need. When people are not culpably ignorant and not in a position to provide assistance, there is little point in ascribing duties to them. Today things are very different with respect to information and causal efficacy. We live in an age in which national boundaries are porous with respect to almost everything of importance: people, power, money, and information, to name a few. These help to make obligations possible. If people, power, money, and information are so transnational in their movements, it is hard to believe that duties and obligations are confined by borders.

The main practical consequence of these reflections follows more or less directly from adopting a version of the second paradigm of moral responsibility. Those who are in a position to prevent global change-induced health problems have a strong moral obligation to act in ways to prevent them. This means that they should seek to stabilize climate, and they should also do what they can to help those who are most vulnerable to the change that may already be occurring.

The second conclusion results from two observations. First, the World Bank predicts that the percentage of undernourished people in the developing world could decline over the next two decades from twenty percent to eleven percent. If we couple this optimistic prediction with the anticipated growth in population, then we should expect that in 2020 the world will have about the same number of malnourished people as it does now: around one billion. Second, the people who suffer and die as a result of global change-induced health problems will largely be those who now have inadequate nutrition, lack access to clean water, and fail to benefit from the most basic advances in public health. This is because infectious diseases take their heaviest toll on those whose health is already compromised, and because poor people do not have the resources to permit them to adapt to global change, such as reengineering coastlines, installing air conditioners, or even to purchase drugs. Adopting the second paradigm of moral responsibility implies that we should act now to benefit those who live in misery, whatever the cause. Such action

53. This paragraph is based on a more extended discussion in a previous article. Dale Jamieson, Global Environmental Justice, in Philosophy and the Natural Environment 199 (1994).

would also help to mitigate the negative health consequences of global change. But ultimately, as far as our duties go, it matters little whether global environmental change occurs since there is already plenty to do and, in my view, we are already obliged to be doing it.

CONCLUSION

In this article, I sketched the increasing concern with the human health consequences of global environmental change and reviewed the evidence supporting the argument that humankind is adversely affecting the planet’s climate. I have suggested that consideration of these problems should lead us to give more weight to the paradigm of moral responsibility that focuses on the ability to benefit or prevent harm. Putting this conclusion into practice would require us to act now to address problems of nutrition and sanitation that make people, mainly in developing countries, but also the poor in rich nations, vulnerable to disease.