

Public Health Ethics Analysis 4  
Series Editor: Michael J. Selgelid

Cheryl C. Macpherson *Editor*

# Bioethical Insights into Values and Policy

Climate Change and Health

 Springer

# **Public Health Ethics Analysis**

Volume 4

*Edited by*

Michael J. Selgelid  
Monash University, Melbourne, Australia

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Editor

# Bioethical Insights into Values and Policy

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*This book is dedicated to Sondra Cox; the memory of Max and Dorothy Hirsch and Jess Morison; and everyone who instills in young children a deep appreciation for Mother Nature and the sustenance she provides for life, health, and well-being.*



# Foreword: Climate Change and Health – The Ethical Imperative

Despite ample evidence that climate change is occurring and is the result of human activities, agreement to cut greenhouse gas emissions has so far proved elusive. The UN IPCC reports have exhaustively summarised the climate science, current knowledge on impacts and vulnerability, the potential for adaptation and mitigation. The Working Group III report Chap. 4 outlines some of the ethical challenges posed by climate change and the policies needed to reduce greenhouse gas (GHG) emissions, but until now arguably the bioethics community has not fully engaged with the ethical dimensions of climate change. The challenges include the mismatch between historical greenhouse gas emissions, driven particularly by emissions from the industrialised countries, and the health and social impacts which are likely to be borne disproportionately by poor populations who have not yet enjoyed the fruits of development. Decisions to reduce the risks of dangerous climate change must be taken in the next few years, and many fossil fuel reserves will have to be left unexploited if we are to avoid high-end pathways of emissions which could result in global average temperature increases exceeding 4 °C (more over land) by 2100, compared with pre-industrial times. This implies that development will increasingly need to be fuelled by renewable energy sources accompanied by much more efficient use of resources to enable development within environmental limits.

Conventional economic analyses, including discounting of future costs of inaction and of the benefits which will accrue from policies to reduce climate change risks, may not be appropriate when risks are large and climate change has the potential to disrupt the long-term progress of humanity. At the same time many policies to reduce GHG emissions can result in health and other (co)-benefits, for example, as a result of reduced fine particulate air pollution from burning less coal. The decisions about who should pay for adaptation and mitigation measures will be intensely political, but they also raise profound ethical questions.



This book provides a much-needed overview of the ethical dimensions of climate change including contributions from many leading figures in the field of bioethics. It will be indispensable reading for public health professionals, bioethicists and the growing scientific community interested in the impacts of climate change, the effectiveness of strategies to adapt as far as possible to climate change and to dramatically reduce GHG emissions.

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Andrew Haines

# Preface

Scholarly and practical bioethics work today focuses heavily on the expression of individual autonomy and the use of emerging technologies in medical practice and research. The dilemmas and threats posed by climate change receive relatively little attention in bioethics publications or conferences despite the serious and inequitable health burdens they impose around the world. Some prominent bioethicists have expressed concern that in stemming from, and embodying, the norms and interests of wealthy Western nations, bioethics avoids more difficult and far-reaching population-oriented problems, particularly those involving human rights and injustices. Others question the taxonomy of, and relationships between, bioethics, environmental bioethics, environmental ethics, and other specialties. Very few explicitly address the ethics of climate change, and this book tries to rectify that.

This book aims to attract readers from varied disciplines and precipitate interdisciplinary dialogue about the causes and impacts of climate change and associated responsibilities and accountability. In the spirit of Van Rensselaer Potter's global bioethics, such dialogue may produce interdisciplinary collaborations that integrate bioethics into disciplines and projects dealing with climate change, greenhouse gas emissions, and other population-oriented concerns. The outcomes of such efforts may constructively inform policy determinations about the adequacy and appropriateness of national or institutional responses to climate change and other problems.

Contributors to this book were invited to reflect on whether and how bioethics might elucidate the causes, impacts, and ethics of the health impacts of climate change. Their reflections expose a range of views that are not inherent to environmental or climate ethics, and which are relevant across scientific and other disciplines. In its early years, bioethics was concerned with ethics pertaining to all living things. Potter conceived "global bioethics" as encompassing the ethical implications of connections between humans and other living creatures and systems, and the opportunities for health and associated responsibilities therein. Bioethicists working on individual autonomy in medical practice or research seem uninterested in Potter's construct of global bioethics although, as this book makes clear, it is directly relevant to their work and to other disciplines.

The premise of this book is that medical and research ethics can and should embrace Potter's global bioethics and integrate it into their practical and scholarly activities in all realms because it is relevant beyond environmental and public health ethics. Potter and early bioethicists including Warren Reich, Peter Whitehouse, the late Strachan Donnelly, and others understood bioethics as an interdisciplinary means of framing dilemmas in light of the well-being of humans, ecosystems, and other living things; drawing from the past to inform understandings of, and responses to, health-related and other dilemmas; and negotiating solutions with attention to short- and long-term consequences that may vary over time and distance. This global bioethics encompasses human relationships and responsibilities within medicine, research, and beyond. It appreciates the centrality of natural environments and resources to health and well-being and is directly applicable to climate change and actions that contribute to it.

There is no consensus about the extent to which global bioethics grounds environmental ethics, climate ethics, public health ethics, feminist ethics, animal and veterinary ethics, or the centrality of global bioethics to medical and research ethics. I believe that it is relevant to, and can strengthen, each of these specialties and can also strengthen nonethics realms like the "One Health One Medicine" movement which investigates connections between living things to improve understanding of how to prevent and manage zoonotic and other diseases. Those working in these specialties and realms may not see themselves as bioethicists, and are perhaps unlikely to submit their work to bioethics journals or conferences. With some exceptions, these topics have a relatively small presence in bioethics curricula and leading bioethics centers and conferences.

Bioethics has untapped opportunities with which to deepen its engagement with, and relevance to, population-oriented health problems around the world including climate change. The immense investment in medical and research ethics marginalizes global bioethics, and this seems to restrain its integration into medical practice, research, teaching, and policy. Global bioethics is at the heart of the United Nations Declaration on Bioethics and Human Rights, which explicitly addresses environmental aspects of health and associated concerns about rights and justice. Different approaches and scales can be used to integrate global bioethics into innumerable endeavors. Regardless of the topic or problem addressed, such integration would likely result in more holistic and constructive outputs that support climate change mitigation and generate symbiotic health benefits.

The evidence is copious that climate change harms health by, among others, reducing availability of safe food, water, air, and shelter. Simultaneously, global population growth and socioeconomic development raise demand for these resources and drive deforestation, energy consumption, pollution, and other activities that elevate greenhouse gas emissions (referred to herein as "emissions"). The direct and indirect health impacts of rising emissions vary with locations and include extreme weather, warmer air and seas, rising sea levels, and changing seasonal patterns. Independently and combined, these decrease agricultural productivity, alter distributions of disease vectors, and threaten health and well-being in wealthy and

poor nations. While the wealthy suffer from these impacts, the poor and marginalized are most harmed and least able to protect against or recover from them.

This book defines health impacts of climate change as bioethics problems, discusses specific impacts in different regions, and explores mechanisms for responding. Its contributors highlight geographic, cultural, and other considerations that bear on priorities and plausible solutions in different regions and contexts. In the Introduction, I discuss how its content supports the book's premise and draw connections between the views expressed by contributors. In the closing chapter, I discuss challenges to individual and collective abilities to reduce climate change and the responsibilities of bioethicists and others to investigate and guide climate-related dialogue, deliberation, and policy.

Thank you to those who have made this book possible including the Series Editor for Springer's Public Health Ethics Analysis Series and three anonymous reviewers whose critiques led to revisions that enhance the book's quality and depth. A special thanks to my Contributors, whose willingness to leave their comfort zones and write about topics peripheral to their own expertise warrants admiration and gratitude. Often without referring to global bioethics, they subtly encourage its integration into the norms, standards, and endeavors of "mainstream" bioethics. Their reflections will hopefully precipitate interdisciplinary partnerships and improve understanding of, and responses to, climate change. It was the 2008 WINDREF lecture by Sir Andrew Haines on the health impacts of climate change that inspired my interest in the ethics of climate change. His efforts continue to inform health professionals, researchers, educators, and leaders about the extensive evidence of global and grave impacts, their practical implications, and their ethical components. Finally, thank you to those interested enough to plunge into this book. It is you who will hopefully advance dialogue about these issues in your own life and work.

St. George's, Grenada

Cheryl C. Macpherson



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# Chapter 1

## Potter's Global Bioethics and the Premise of this Book

Cheryl C. Macpherson

*Unless medicine can extend its practice and moral scope beyond individual patient concerns to the health of communities and global ecosystems, the profession risks being perceived as unresponsive to the healthcare concerns of contemporary society.*

(Peter J Whitehouse and Jennifer R Fishman 2004, 43)

**Abstract** For decades, scientists from many disciplines have documented changes in earth's atmosphere, oceans, soil, weather patterns, and ecosystems that collectively reflect climate change. The websites of national and international health organizations, and other influential institutions, document their concerns about health impacts of climate change. These are seldom addressed in bioethics, despite bioethics practical and scholarly dedication to medicine, health, and wellbeing. The premise of this book is that medical and research ethics, and other disciplines, can and should embrace Van Rensselaer Potter's global bioethics. This bioethics is concerned with dependencies and relationships between humans and other living things, and extends beyond environmental ethics and public health ethics to human health and wellbeing and other realms. Integrating it into medical and research ethics, and related practical and scholarly activities will facilitate studies of, deliberation about, and deeper understanding of the causes and impacts of climate change; and help to identify and implement the most promising, effective, and fair responses to it. This Chapter develops and supports this premise; introduces some readings for understanding the ethics of climate change; and provides an overview of the book's aims, contributors, and contents.

For decades, scientists from many disciplines have documented changes in earth's atmosphere, oceans, soil, weather patterns, and ecosystems that collectively reflect climate change. The websites of national and international health organizations, and

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other influential institutions, document their concerns about health impacts of climate change. These are seldom addressed in bioethics, despite bioethics practical and scholarly dedication to medicine, health, and wellbeing. The premise of this book is that medical and research ethics, and other disciplines, can and should embrace Van Rensselaer Potter's global bioethics. This bioethics is concerned with dependencies and relationships between humans and other living things, and extends beyond environmental ethics and public health ethics to human health and wellbeing and other realms. Integrating it into medical and research ethics, and related practical and scholarly activities will facilitate studies of, deliberation about, and deeper understanding of the causes and impacts of climate change; and help to identify and implement the most promising, effective, and fair responses to it. This Chapter develops and supports this premise; introduces some readings for understanding the ethics of climate change; and provides an overview of the book's aims, contributors, and contents.

## 1.1 Aims and Purpose

This book aims to (i) make links between health, medicine, natural environments, and climate change more central to practical and scholarly bioethics; (ii) catalyze interdisciplinary collaborations that may meaningfully inform related dialog, policy, and governance; and (iii) enhance understanding, deliberation, and responsiveness across disciplines and sectors. To entice readers from varied disciplines, the book offers ethical perspectives on varied aspects of climate change. These perspectives are contributed by bioethicists, only some of whom specialize in areas associated at least indirectly with environmental concerns such as feminist, environmental, climate, and public health ethics.

While perspectives of environmental and climate ethicists on the causes and impacts of climate change are important, this book is unique in presenting related reflections from 'mainstream' bioethicists who publish and participate in prominent bioethics journals and conferences. Given contributor's diverse backgrounds, their chapters vary in depth and approach. The advantage of including such diverse authors is that they expose scholars and practitioners from policy, media, social sciences, hard sciences, mainstream bioethics, and other realms, to ethical concerns about climate change. By engaging contributors and readers from diverse backgrounds, the book invites a wide range of individuals and disciplines to participate in climate-related analysis and integrate their analyses into practice, research, education, and policy in their areas of expertise.

This introductory chapter highlights the structure and purpose of the book, connections between chapters and sections, and useful resources for further reading. Few chapters cite Van Rensselaer Potter or early bioethicists who advanced his conception of bioethics as reaching across time, distance, disciplines, and nationalities. Potter's global bioethics (1988) encompasses human relationships and responsibilities within medicine, research, and other realms, and appreciates natural environments and resources that make health and wellbeing possible; it is an inter-

disciplinary approach to scholarship and practice, and has direct relevance to climate change. Contributions herein are consistent with this global bioethics, even if they do not explicitly cite it. This consistency imparts strength to the book, and facilitates broader understandings of what bioethics is and can do within, and across, a range of disciplines and sectors.

## 1.2 Useful Resources

When this book was proposed there was a paucity of bioethics work on impacts of climate change. Given the relatively few bioethics sources to draw from at that time, chapters herein are mainly descriptive and reflective. To supplement their limited references and citations, several readings that ground this book's premise are highlighted here. These specifically address climate change but are applicable to other population-related problems. James Garvey's "The Ethics of Climate Change" (Continuum Press 2008) builds the case that there is moral and practical significance in whether and how individuals and societies respond to climate change. A short but thorough review of scientific evidence (which has since been shown to underestimate the severity of climate change impacts) precedes Garvey's examination of everyday behaviors and choices that worsen climate change. With moral and philosophical clarity, he presents analogies that are easy to follow and realistic enough to resonate with everyone. These analogies may motivate change and increase in relevance as the evidence of harms continues to accrue.

"Climate Ethics" (Oxford University Press, 2010) co-edited by Stephen Gardiner, Simon Caney, Dale Jamieson, and Henry Shue, grapples with ethical dilemmas grounded in scientific, economic, medical, and other types of evidence. Its chapters tease out implications of this evidence for economies, human rights, justice, risk assessments, policymaking, and more, and provide a solid foundation for further work on the ethics of climate change.

Dale Jamieson's "Reason in a Dark Time" (Oxford University Press, 2014) portrays climate change as a collective action problem that may be best addressed by linking economics (what does it cost) with ethics (what is the right thing to do). Economists are trained to inform our economic interests, Jamieson explains, but their language implies that they are trained to inform us of the right thing to do. Motivations and behaviors for climate-related actions can evolve in ways that facilitate meaningful responses to climate change, he argues, pointing out that capitalism was once seen as a vice of selfishness but is widely depicted today as a virtue that benefits everyone.

Jamieson reminds readers that human ingenuity cannot replace earth's resources, and suggests virtues with which we might hold ourselves more accountable for their destruction. Temperance, for example, could reduce environmentally damaging behaviors. These behaviors are often unthinking, so mindfulness could increase awareness of the health consequences and generate empathy, which could enhance concern for and accountability to those harmed. Jamieson also examines inconsistencies in the meanings and implications of the words 'prevention', 'mitigation', and

‘adaptation’ to show how this language impedes coherent responses. Among other things, he suggests that (i) climate policy proposals be made to compete against each other in order to improve their substance and impact; (ii) policies be piggybacked on others and integrated into socioeconomic development to produce a greater and more synergistic range of benefits; and (iii) forests and other carbon sinks be expanded while raising the price of emissions production to reflect its true costs.

Dan Callahan’s “Five Horsemen of The Modern World: Climate, Food, Water, Disease, Obesity” (Columbia University Press) is due out in 2016. Callahan explains therein that his horsemen represent five global crises which are worsening steadily despite billions of dollars spent to reduce them. As a founding bioethicist and prolific author, his perspectives on climate and these other crises will undoubtedly inform further studies.

Between the submission and review of this book, three climate papers were published in prominent bioethics journals by Cristina Richie; Charles Dupras, Vardit Ravitsky, and Bryn Williams-Jones; and Sean Valles. Their publication within one year is notable because PubMed searches revealed only two such publications between 2002 and 2012 (Macpherson 2013), and is evidence that bioethics can constructively inform climate-related norms and policy.

### 1.3 Content

The reflections in this book address social, cultural, geographic, political, and other influences on both the causes and impacts of climate change. The book is divided into three parts introduced below which (i) define climate change as posing health and bioethics problems; (ii) discuss the different impacts, and their significance, in different geographic regions; and (iii) explore mechanisms for responding. Their contents may be read in no particular order, but the chapters are ordered to support three sequential claims.

1. The health impacts and ethical implications of climate change are mostly neglected in bioethics despite bioethics responsibility to examine and inform health-related public and policy dialog.
2. Climate change generates environmental imbalances that manifest differently, and with different ethical and practical significance, in different locations and contexts.
3. Interdisciplinary bioethics collaborations can, for any given context, identify motivations and conflicts underlying policies that worsen climate change; illuminate the probable effectiveness of proposed interventions; and constructively inform regulatory and policy negotiations.

*Part 1* situates climate change as a dilemma warranting bioethics analyses. While recognizing the benefits that globalization and socioeconomic development bring, it identifies these as drivers of policies and consumption patterns that raise emissions and worsen climate change. Bruce Jennings, in Chap. 2, explores inconsistencies in

human relationships with each other and other living things, and with and within natural environments. Closely attentive to definitions and language, Jennings reconceptualizes relational autonomy and solidarity in ways that deepen understandings of environments as places in which to live and have relationships, rather than as things to use and use up. He argues that to meaningfully respond to climate change, bioethics must broaden its attention from individual to relational aspects of autonomy, and that doing so will strengthen bioethics itself.

In Chap. 3, James Dwyer calls for social and ethical changes with which to envision and implement effective responses to climate change. He urges readers to help re-design technologies, institutions, and economies accordingly. David Resnik, in Chap. 4, discusses how climate change worsens inequities in the global distribution and burden of poverty and disease. Zeb Zamrozik and Michael Selgelid substantiate Resnik's concerns by tabulating and discussing infectious and zoonotic disease burdens around the world. Their chapter warns of major climate-related outbreaks of mosquito-borne disease, and at least two such outbreaks, of Chickungunya and Zika, occurred after its submission. Overall, Part 1 describes health dilemmas posed by climate change and explains why these should concern bioethicists.

*Part 2* demonstrates that contextual features determine the local significance of impacts of climate change. It groups the 200 plus nations that exist today into five chapters based on geographic location and other features: wealthy Western nations; Southeast Asia and China; India and other South Asian countries; Africa and the Middle East; and Polar Regions and Small Island Developing States (SIDS). Cultural, geographic, socioeconomic, and other contextual considerations therein are described and linked to regional impacts and priorities.

To facilitate inclusion of perspectives from non-Western and non-wealthy nations, each contributor to Part 2 is originally from, or has extensive experience of, the region they address. The impacts and priorities they identify are consistent with those specified by the IPCC (2014). The Russian and Eastern European region is not explicitly addressed herein because it was categorized with the wealthy West on the basis of their similar geography and, when this book was proposed in 2012, its seeming aspiration to Western lifestyles and patterns of consumption.

Opening Part 2, Michael Doan and Susan Sherwin sketch harmful impacts in wealthy Western nations, and draw attention to how and why relational public health ethics is a useful means of reducing social justice problems including climate change. Like Jennings, and based on their earlier work, they urge a shift in focus from individual to relational autonomy, and explain how this could generate greater appreciation for natural environments, and translate into solidarity with which to implement effective responses. Lisbeth Withthøfft Nielsen focuses on vulnerabilities that affect health and governance in Southeast Asia and China, with particular attention to air pollution and urban areas.

Emphasizing agricultural impacts, Vijayaprasad Gopichandran and Angus Dawson describe societal and health repercussions across India and other parts of South Asia, and discuss the related ethics. Thaddeus Metz elucidates how some widely held values associated with Islamic and *ubuntu* norms in Africa and the Middle East bear on responsiveness to local impacts of climate change, and points

out that the unpredictability of local impacts may decrease investment in that region and leave more people in poverty and more vulnerable to these impacts.

In Chap. 10, Satesh Bidaisee, Calum Macpherson, and I examine impacts in the Arctic and SIDS from our respective expertise: public health, parasitology and zoonotic disease, and bioethics. We model an interdisciplinary approach that encompasses global bioethics and the One Health One Medicine movement (Shomaker et al. 2013) in our review of the changing distributions of zoonotic diseases and other health problems in these remote regions. These impacts of long term changes in average annual temperatures and precipitation, like qualitative data from Caribbean SIDS (Macpherson and Akpinar-Elci 2015), substantiate the reality that context bears heavily on the local significance of any climate impact.

Combined, Part 2 describes specific health and environmental impacts in different places; discusses their different ethical and practical implications; and invites further investigations of contexts in which climate change is manifest. It shows that given the significance of geographic and other differences, and their ethical and practical implications, policy and other interventions will be effective only when sensitive to local context.

*Part 3* examines mechanisms for responding to climate change. In Chap. 11, Merlin Chowkwanyun, Amy Fairchild, and colleagues discuss the applicability of the precautionary principle to climate change. With public health examples like tobacco use, they dissect weaknesses of the precautionary principle, some of which are reviewed elsewhere, and profile its inability to guide conflicting choices about whether, when, and how to implement a given intervention. They conclude that despite the limitations of the precautionary principle, precaution is a useful ethos that is applicable to public health responses to climate change.

Kevin Elliot shows that value judgments bear on whether and when climate-related risk assessments are conducted; what parameters and methods are used; how results are interpreted and communicated; and how individuals, populations, policymakers, and governments respond. Like Jamieson, Elliot demonstrates that such assessments are subjective and calls for more objective and balanced approaches. Supporting this view, Michael Gusmano shows that assessments and interventions conceived within the contexts of political and economic institutions often hinder development of meaningful climate mitigation policy because the structure of the analyses themselves derives from value assumptions that are at the core of related disagreements. Basing public opinion on deeper understandings of risk and what constitute 'expert' opinion would, he proposes, would make democratic deliberation a possible remedy.

John Coggon has elsewhere defined health as a public good worthy of protections. Using this definition herein, Coggon urges bioethics to partner with, and draw from, public health ethics in efforts to identify grounds for holding leaders and institutions accountable for failing to reduce climate change. The book concludes in Chap. 15 with my thoughts about the influences of globalization and global population growth on self interests and conflicts of interest; the usefulness of public deliberation; and the value of embracing relational autonomy without rejecting individual autonomy. Drawing from other chapters herein, I describe relational conceptions of autonomy and solidarity as being consistent with Potter's construct of global bio-

ethics, and suggest that embracing these would facilitate understanding of, and deliberation about, responsibility and accountability in ways likely to improve effectiveness of responses to climate change.

## 1.4 Conclusion

Climate change impacts practice, research, education, and policy in medicine, public health, and countless other realms. Hopefully, this book's readers will include practitioners, researchers, educators, scholars, and policymakers from bioethics, communications, economics, engineering, law, sociology, psychology, the sciences, and more. It uses layperson language to facilitate interdisciplinary and public dialog about causes and consequences of climate change, and related values and responsibilities. It aims to sensitize readers to the importance of context; differences in individual and collective priorities and responsibilities; and influences of institutions and political systems on responses to climate change. The book demonstrates how readers might begin integrating related ethical concerns into their own practice, research, education, and policy work. It reminds us that health and wellbeing require natural environments and resources, and that these are disappearing under pressure from global population growth, socioeconomic development, and climate change. Assimilating this understanding, and acting consistently with it, embodies global bioethics.

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**Part I**  
**Climate Change Is a Bioethics Problem**

## Chapter 2

# Putting the *Bios* Back into Bioethics: Prospects for Health and Climate Justice

**Bruce Jennings**

**Abstract** Global climate change is the most complex and significant ethical issue of our time. The urgent discussion of how to bring about alterations in human energy usage and economic production in order to mitigate the social and ecosystemic harm done by climate change calls for a bioethics voice. But bioethics will not be able to make this contribution if it merely addresses climate change as one more in a series of problems or dilemmas. The nature of the climate change challenge is such that bioethics will have to alter fundamentally its discourse and broaden its moral horizons. This chapter argues that bioethics should become more discerning and insightful concerning matters of political power and economics. It will also do well to establish new ties and overlapping perspectives with the ecological sciences. The purpose of this chapter is to explore the structure and the logic of the encounter between bioethics—understood as a particular kind of discourse—and climate change—understood as a systemic challenge to human and ecological health. Extended consideration is given to what needs to be added to the conceptual range of bioethics in its engagement with climate change, with particular emphasis on the concepts of autonomy, membership, and solidarity.

Philosophy, Marx said, only interprets the world, but the point is to change it. At its best and truest moments, the interdisciplinary field called “bioethics” does both, although its success in the past has been intermittent. Such a moment of critique and social change is urgently needed now because we stand in the midst of what Stephen Gardiner (2013) has aptly called “the perfect moral storm” of climate change and global warming. Can bioethics rise to this occasion and make a substantial contribution to the social intelligence of our societies in coping with this crisis? The conditions are perilous, success uncertain, the stakes are very high. James Hansen and colleagues pose the issue forcefully:

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a set of actions exists with a good chance of averting “dangerous” climate change, if the actions begin now. However, we also know that time is running out. Unless a human “tipping point” is reached soon, with implementation of effective policy actions, large irreversible climate changes will become unavoidable. Our parent’s generation did not know that their energy use would harm future generations and other life on the planet. If we do not change our course, we can only pretend that we did not know. (Hansen et al. 2013, 20)

Since its inception after the Nuremberg trials, and then in the renewal of interest in ethics, society, and public affairs in the 1960s, bioethics has effectively addressed a range of issues having to do with justice, power, technology, and life using modes of analytic reasoning from within the normative horizon of a liberal individualistic conceptual framework, including predominantly: self-interest, social utility, individual well-being based on health and choice, respect for the autonomy of persons, human rights, and equity or fair sharing in social benefits and burdens.

Clearly the issues of justice, power, technology, and life are not the purview of bioethics alone—other cognate disciplines and fields of ethics, such as environmental ethics and public health ethics have been shaped by these problems as well—but these themes have anchored the interdisciplinary focus and coherence of bioethics. However, bioethics in the future must recognize that power, justice, technology, and life cannot be addressed adequately any longer in the context of medicine, health care, and health care systems taken in isolation. It is becoming increasingly apparent that the institutionalization of health care and the practice and values of medicine—phenomena that bioethics has often considered as if standing alone and taken at ideological face value—are shaped by larger structures of neoliberal, capitalist political economy and by cultural forces of modernity and post-modernity on a global scale (Rose 2006). Bioethics is really a branch of political economy, and the state itself is increasingly relying on biological forms of science, technology, and commerce. Moreover, in the future bioethics must recognize that human health is merging with ecosystemic health, and that both are dependent on larger biogeological processes and systems on regional and planetary scales.

Climate change is the most complex and significant ethical issue of our time. It has all the elements of justice, science, technology, power, and life that have been mentioned, and the urgent discussion of how to bring about change required by moral duty and natural limits calls for a bioethics voice (Macpherson 2013). But bioethics will not be able to make this contribution if it merely addresses climate change as one more in a series of problems or dilemmas. The nature of the climate change challenge is such that bioethics will have to alter fundamentally its discourse and broaden its moral horizons.

Bioethics should adopt a global, not merely an international, perspective. It should become more discerning and insightful concerning matters of political power and economics, especially about new forms of biopower and bioeconomy. It will also do well to establish new ties and overlapping perspectives with the ecological sciences as it has done in the past with medical science and molecular biology.

Can we put the bios back into bio-ethics? Using an enriched vocabulary of moral value and normative social theory, can we in bioethics speak more forthrightly and more robustly in defense of the living world? And can we take a more ecocentric—interdependent, holistic—view of the human condition and the human good?

When I speak of reorienting bioethics in an ecocentric direction and supplementing the normative conceptual vocabulary that it offers to the broader democratic and professional conversation, what I have in mind is not quite the same as a paradigm shift along the lines pioneered by thinkers like Van Rensselaer Potter (1971, 1988); Potter and Whitehouse (1998). Potter's work is certainly worth revisiting today, particularly in its overlap with the land ethic proposed by his near contemporary, Aldo Leopold (Whitehouse 2002, 2003). In particular, I am not arguing that we need to take ethics and reground it in the findings of the contemporary biological, ecological, or evolutionary sciences. My notion is more historical, sociological, and ultimately political. I view bioethics partly through the lens of pragmatism in that I see it as a form of social intelligence: a mode of knowledge—a praxis of knowing—that is reflective and practical (Bernstein 2010; Schön and Rein 1994). It is not paradigmatic or heuristic but is instead an interpretive, discursive mode of active engagement with the world.

Can we put the bios back into bioethics? I believe that we can. My purpose in this chapter is to propose one tentative agenda for that endeavor and to explore the structure and the logic of the encounter between bioethics—understood as a particular kind of discourse—and climate change—understood as a thoroughgoing public problem of human and ecological health. In regard to bioethics as discourse I have two primary concerns: One is to reflect on the role that can be played by bioethics discourse—and by ethical or normative discourse as a whole—in the future of global justice and ecological democratic governance. The other is to consider what needs to be added to the conceptual range of bioethics, with particular emphasis on the concepts of autonomy, membership, and solidarity.

The discussion will proceed in five steps. I turn first (Sect. 2.1) to climate change as a public health problem and as a problem for bioethics. Next (Sect. 2.2), I explore reasons why a set of relational concepts and values can be of service—indeed, I believe are essential—in recasting our cultural and political response. Then (Sect. 2.3), I reflect briefly on the factors that have given bioethics its sense of historical moment and function and its worldview concerning the proper place of humans in nature. Following this (Sect. 2.4) I sketch how bioethics could contribute to that reorientation thanks to a relational turn, already begun, that will provide our moral and political vocabularies with an enriched understanding of autonomy, membership and mutuality, and solidarity. I conclude (Sect. 2.5) with reflections concerning the extended time scale of the danger of climate change, which will be our Achilles heel both politically and ethically unless we can recognize—using our relational moral imagination to see—intergenerational obligations and interests and to face forthrightly the presence of the future.

## 2.1 Climate Change as a Public Health Problem

Subsequent chapters in this volume will address the health aspects of climate change in considerable detail. I will only briefly preview that topic here and suggest one way of framing the problem.

Let me begin by recalling an illuminating distinction made by the sociologist C. Wright Mills between what he called “personal troubles of milieu” and “public issues of social structure.” Mills defines “troubles” as those things that “occur within the character of the individual and within the range of his immediate relations with others; they have to do with his self and with those limited areas of social life of which he is directly and personally aware,” while issues “have to do with the organization of many such milieu into the institutions of an historical society as a whole” (Mills 1959, 8).

Climate change will bring about personal troubles aplenty, to be sure. But it must be understood first and foremost as a public and a structural issue—the clash between a historical form of institutionalized human activity and the natural limits imposed on human life. Social order and stability in virtually every society today, and certainly in every nation state, rests on economic activity based on the intensive procurement and use of energy rich fossil carbon. This is much more thermodynamically efficient than earlier fuels, and it has made possible most of modern technology and industrial civilization. We are now realizing that burning it is a fundamental threat to that very civilization.

The consumption of fossil carbon energy (coal, petroleum, natural gas) emits massive amounts of carbon dioxide and other greenhouse gases into the atmosphere, much of which will remain there for centuries. This is causing a net gain in the planet’s exchange of solar energy and it is changing the composition and behavior of Earth’s atmosphere and oceans. These alterations are discernable to scientific researchers and modelers—and are becoming evident to the experience of persons around the world—as increasing global temperature, melting ice masses, changes in ocean currents, salinity, and pH, unusually frequent and violent storm patterns, and alterations in the conditions for land ecosystems and habitats all over the world, such as drought, species migration, and loss of biodiversity (Nordhaus 2013). The thermal inertia of the deep ocean, the possible release of methane deposits in the permafrost, and the prospect of deep melting that destabilizes land-based ice sheets are some examples of threshold effects in bio-physical systems that are non-linear. As we come to better understand and model the behavior of complex physical and biological systems, we discover such threshold effects and other emergent properties. Human activity leading to temperature rise beyond a certain point will set in motion geophysical processes with long delayed effects. Once begun, they cannot be stopped, contained, or reversed by human remediation, and they will not abate for decades or even centuries. We do not know precisely what those trigger point temperatures are, but it is very likely that we are on track to reach and exceed them sometime in this century unless immediate action is taken. Substantial reductions in the amount of carbon entering the atmosphere is required via reduced emission,

increased natural sequestration such as reforestation, or a combination of both. Artificial sequestration of atmospheric carbon is also theoretically possible but would be enormously expensive (Hansen et al. 2013).

Moreover, emissions come not only from the consumption of fossil carbon energy but also from its production. Easily accessible fossil fuel deposits are becoming depleted, and more difficult and costly extraction methods are coming into widespread use—tar sands oil, mountain top mining of coal, and hydro-fracking of natural gas in shale. In addition to the CO<sub>2</sub> emissions caused by the downstream burning of the fuels they produce, each of these technologies and extraction processes is a significant source of atmospheric emission in its own right, and each has other serious environmental consequences in terms of fresh water use and degradation, toxic byproducts, destruction of habitat and ecosystem services in the region of the extraction operations (Goldman et al. 2013).

In short, use of the most significant source of energy upon which humankind now relies must be curtailed very soon and replaced with energy sources that do not rely on fossil carbon. Most of the remaining fossil carbon deposits must be left in the ground. Economic and political ways must be found to prompt this massive change in human behavior, especially among people and nations that are the most intensive carbon users and are the world's richest, most powerful, and most materially comfortable. Ways must be found to offset the hardship and disruption that these economic changes will cause, especially in societies that are very highly stratified in terms of wealth and income (Center for Health and the Global Environment 2005; WHO 2005). This is a global phenomenon, so these responses must be applied not only within nations but among them. It is also an intergenerational problem. If we don't pay these prices now, others will have to pay a much larger price for the health consequences and social disruption later, likely under much less auspicious circumstances.

The health effects that will build up around the world in response to climate change of course relate to the fact that climate is intimately connected to the basics of human survival, well-being, and social order. Climate change undermines food and water sources, stable housing, and biodiversity and ecosystem services, thereby fundamentally threatening population health (Haines and Patz 2004; Frumkin and McMichael 2008). Social, no less than natural, determinants of health are affected. Climate change will lead to increased drought and famine, flooding, violent damaging storms, and political conflict which disrupt vital public services, such as the production and distribution of goods and services, sanitation, and law enforcement. These are all outgrowths of direct physical disasters, fear, disrupted expectations, anger, and widespread loss of trust at a very fundamental level.

The pattern of life will change and a global distribution of benefits and burdens will emerge that, if anything, is more unjust than it is at present. A recent review of the literature on the public health effects of climate change and the current projections of the IPCC summarizes the situation in the following terms:

Impacts of climate change cause widespread harm to human health, with children often suffering the most. Food shortages, polluted air, contaminated or scarce supplies of water, an expanding area of vectors causing infectious diseases, and more intensely allergenic

plants are among the harmful impacts. More extreme weather events cause physical and psychological harm. World health experts have concluded with “very high confidence” that climate change already contributes to the global burden of disease and premature death. IPCC projects the following trends, if global warming continues to increase, where only trends assigned very high confidence or high confidence are included: (i) increased malnutrition and consequent disorders, including those related to child growth and development, (ii) increased death, disease and injuries from heat waves, floods, storms, fires and droughts, (iii) increased cardio-respiratory morbidity and mortality associated with ground-level ozone. While IPCC also projects fewer deaths from cold, this positive effect is far outweighed by the negative ones. (Hansen et al. 2013, 8)

Environmental health has been understood as a public health issue and an issue of social justice in relation to air quality, water quality, and exposure to environmental pollutants that are toxic, carcinogenic, teratogenic, or are chemically bioactive in other ways (Frumkin 2010). The rise of fossil fuels as the energy base for economic production and transportation, advances in mining and metallurgy on an industrial scale, and the creation and widespread presence of synthetic chemical substances have contributed significantly to environmental health risks during the course of the past two centuries, and indeed have redefined the meaning of environmental health. In the past, the field of bioethics has tended to overlook public health generally and environmental health in particular. However, insofar as bioethics has taken cognizance of environmental health, it has seen it through the lens of a “pollution” problem in which a normal background environment has been temporarily (and unethically) contaminated by careless human activity and insufficiently regulated industrial processes. That is to say, bioethics has viewed environmental health as an incidental or ad hoc problem, albeit one that may be widespread and may affect very large numbers of people.

Fortunately in both public health and in bioethics the understanding of environmental health is becoming broader and more expansive (Shrader-Frechette 2005). There are several reasons for this. First, research on the social determinants of health indicates that it is not straightforward to distinguish the social from the natural aspects of an environment’s health effects. Except in the most remote wilderness areas perhaps, the natural environment is shaped by human activity, while the social features of everyday life, such as stress and relative inequality, have not only psychological (happiness and well-being) but also physiological (cardiovascular, hormonal) effects (Marmot 2004). Second, the condition of the built environment, such as land use and zoning patterns leading to suburban housing sprawl and automobile dependency, are now understood to be affecting both greenhouse gas emissions, and also lifestyle factors (such as obesity) that impinge on human health (Frumkin et al. 2004).

Therefore, environmental health hazards can no longer be thought of simply as discrete entities, such as carcinogenic substances, pathogens, or toxic chemicals, that intrude upon an otherwise healthy bio-ecology (Kessel and Stephens 2011). They are manifestations of the current historical bio-ecology that our economic system and cultural values have created. This is nowhere more apparent than in the case of climate change, but its effects are not limited to that alone. Climate change is only one of the planetary boundaries whose safe operating margins human technology is encroaching on (Rockström et al. 2009).

The increasing discussion of the health effects of global climate change contributes to this more systemic and historical understanding of environmental health by calling attention to the fact that the environment is an interrelated holistic system and that health hazards come from factors that undermine the integrity or functioning of that system, such as biodiversity and ecosystemic resilience (Center for Health and the Global Environment 2005). For example, deforestation in tropical areas involves a chain of factors that ultimately affects the quality of life of persons with asthma in Central Asia; changes in the salinity, acidity, and temperature of the oceans will affect heat emergency events in Europe. A contaminated well is a localized health risk; environmental changes on the Himalayan plateau that alter the hydrology of entire river systems on which hundreds of millions depend for their fresh water supply represents a different challenge for public health analysis and response. The problem is global and institutional, which is to say, fundamentally political and economic. Climate change is a public issue (in Mills' sense) of human and ecosystem health. It requires more than merely specific protections and rules or laws. It requires a comprehensive engagement of governance on a number of different scales (The Hartwell Paper 2010).

This poses a serious anomaly to the general cognitive frameworks of human understanding of nature and a severe challenge to the assumptions and functioning of social, cultural, and political logics in contemporary technological societies. Simply put, the ideas and institutions upon which our current capability to respond collectively to climate change rests are out of step with the natural realities and threats we are discovering. Our collective capability to take climate stabilizing action is in question. More in question, by far, than the accumulating body of scientific knowledge and evidence concerning the anthropogenic causes of climate change.

## 2.2 Bioethics in the Face of the Perfect Moral Storm

Putting the bios back into bioethics involves finding a new consciousness and will to curb humankind's destructive economic and ecological behavior. As I shall argue in a moment, this demands civic *commonality* rather than merely self-interested *cooperation*.

The marshaled intelligence of humankind—three decades of concerted international scientific work represents precisely this—provides compelling reasons why further delay in drastically reducing atmospheric carbon (through both reducing emissions and enhancing sequestration in forests and other natural sinks) is irresponsible. Further delay risks triggering long-term lag effects that are much more severe than previously recognized. Permitting global temperature to rise by 2 °C by the end of the century, once considered a reasonable goal, is not an acceptable option. It appears to be still technically possible to avoid that or higher levels, but not for much longer (Hansen et al. 2013).

To be sure, there are powerful reasons of enlightened self-interest that by their own inner logic alone should lead to the steps required to limit the damage being

done not only to the climate system but also to other fundamental planetary systems of life, such as biodiversity, the planetary nitrogen load, and fresh water systems (Rockström et al. 2009). And yet look at what is happening and what seems likely to happen. Enlightened self-interest is not working. Apparently, its reasons are weaker than the logic of competitive advantage in market economics and market politics, and our institutions of governance are so constructed that they are overwhelmed by more short-term, short-sighted forces.

The hour is upon us when three great transformations are required. First, it is essential to *reorient* our predominant cultural understandings of the human place in the natural world. This is both a scientific and a philosophical undertaking.

Second, it is essential to *reconceive* the predominant economic worldview of neoliberal global capitalism (Harvey 2005; Klein 2011, 2014; Parr 2013). This requires a new understanding of the needs and circumstances of human societies and individuals—social welfare, human flourishing, rights and liberties, growth, progress, and wealth. It also requires new institutional forms and limits on the permitted functioning and effects of economic markets, on the organization of human labor and work, and on the basic activities of extraction of natural resources and the expulsion of waste products into natural systems (Schor 2010).

Third, it is essential to *restructure* our value priorities. This requires the widespread recognition and acceptance of the imperative of ecological responsibility, the present and intergenerational duties we have in our own individual and species flourishing, and also the duties humans have to all forms of life and to the sustainability and resilience of living systems (Jonas 1985). As dangerous as flirting with Ecotopia may be, imposing new responsibilities on each individual and each polity to conserve the ecological and planetary systems in which they subsist may be the only way out (Callenbach 1975; Ophuls 2013).

As far as the field of bioethics is concerned, this will involve seeing the demands of justice and the preconditions for a philosophically adequate concept of autonomy in ways that are quite new: seeing justice and autonomy as part of that imperative of responsibility of which Jonas speaks; seeing them in terms of each person's responsibility for sustaining the integrity and resilience of an ecological commons (both social and natural). This involves enacting shared rules and restraints based on an understanding of the good of human and natural flourishing, an understanding of the good that is necessarily rooted in robust scientific investigation and inference, but also premised on the enduring experiences and traditions of humankind, as we can know them from historical and anthropological study.

There has been a strong tendency in bioethics (and in contemporary liberal moral and political philosophy generally) to separate considerations of justice and autonomy from conceptions of the good (Mulhall and Swift 1996). And there has also been a tendency in bioethics to think mainly of utilitarianism and neoclassical economics, with their notions of preference satisfaction and consumptive, hedonic interests, as the only reasonable conception of the human good available in a secular society. A bioethics that is adequate to the task of responding ethically to climate change will need to move away from both of these tendencies.

Both justice and autonomy have to do with lives lived in relationship, interdependence, context, and connection; and right relationship is integral to the capability of both persons and natural and social ecosystems to function and flourish. In bioethics there is a movement in this direction. For autonomy, there is increasing interest in the notion of “relational autonomy” (Haliburton 2014; Nedelsky 2013; Gergen 2009; Baylis et al. 2008; Mackenzie and Stoljar 2000; Gaylin and Jennings 2003). In discussions of justice, there is a growing awareness of the need to look beyond the distributional pattern of resources among essentially individuated recipient parties and toward the relational contexts within which persons can fulfill their potential capabilities and pursue meaningful lives by turning those capabilities into abilities or “functionings” (Nussbaum 2011). The good news is that we don’t have to make this stuff up as we go along. These alternative understandings have been available for centuries, and the history of their interpretation and philosophical refinement is there to guide us (Jennings 2007).

The scenarios of environmental and social dislocation as a result of extreme climate change not only threaten to compromise the fulfillment of values like justice and autonomy, but also threaten to undercut the basic grounding of these concepts, rendering them lost to the moral imagination of everyday life, making them emotionally unintelligible and experientially unavailable. I do not see justice and autonomy as timeless ideas but as living concepts embedded in emplaced and historical forms of life upon which their intelligibility and motivational power depends. So understood, concepts can be resilient and able to survive social and historical change within limits, but they do presuppose a measure of continuity and stability in the lifeworld they inhabit. The potential dislocations associated with extreme climate change could undermine that continuity. To borrow an expression used by John Rawls, this is another way to understand the “circumstances” of justice and autonomy (Diamond 1988; Lear 2006).

No one should underestimate the stakes or the difficulty of the conceptual and the practical work—the moral and the political work—ahead. Two important books on climate change ethics, *A Perfect Moral Storm* by Stephen Gardiner (2013) and *Climate Change Ethics* by Donald Brown (2013), identify and discuss significant challenges to be met. In the following pages I explore some of the ways that bioethics might better address aspects of the moral storm of climate change. I believe that the most promising contributions of bioethics to moral and political challenges of climate change cluster around the following three broad questions:

- Can global justice be achieved? This is right relationship with, and right recognition of, contemporaneous humanity and nature. It is those of us in the developed parts of the world, (North America, Europe, and now China and India) who have brought about—and are still continuing to bring about—the carbon emissions leading to destabilizing global warming, while those in the less developed areas are going to bear the brunt of the dislocations. The distribution of these benefits and burdens associated with climate change will be disproportionate, and this injustice piles on top of the long-standing injustice of the distribution of global wealth and income and of health and welfare. The old paradigm of development



economics—growth through the dissemination of carbon intensive energy use and technology—won't work. That rising tide will swamp all boats. Can we find a way to share wealth and power more equitably in a world of lower growth?

- Can intergenerational justice be achieved? This is right relationship with, and right recognition of, future humanity and nature. As difficult as the challenge of practically meeting the requirements of contemporaneous global justice may be, the problem of intergenerational justice is even more perplexing. When we are talking about contemporaneous persons, the shaping of their quality of life, options, and choices are clearly matters of justice and human rights. What moral difference does their status as future beings make exactly? Moral philosophy today is not clear on how best to answer that question. The task of getting the rich to recognize the rights and common humanity of the poor is common to both problems of justice, but it is complicated in intergenerational justice by the issue of the moral standing of persons who only exist statistically and probabilistically, not individually and concretely.

Can we forge a new global social contract of justice and governance (Jennings 2016)? That is to say, a covenant of responsibility and trusteeship in place of the current contract of self-interested consumption. Can we find a place within the new covenant for those yet unborn? The metaphor of the social covenant (less individualistically and more powerfully than the metaphor of contract) captures reciprocal relationality and interdependence among contemporaneous persons. But when we talk about relationships with persons that do not yet exist, inhabiting ecosystems and states of the world that do not yet exist—and may never exist depending on what we do in our lifetimes—what is the moral force of those relationships with those not yet persons?

Surely it is incorrect to say that there is no conceivable relationship here, or that such a notion violates the meaning of the concept of relationship. What we do now will in fact affect the not yet and their natural world. Granted, this cannot be reciprocal since the future party cannot affect us, except through the medium of moral imagination and conscience. And yet our actions in the present do have the power to shape the quality of life and the options of future people and the integrity and resiliency of the future ecosystems they inhabit substantially. Climate change brings the pluperfect tense of ethics to the fore in dramatic fashion.

### **2.3 Reorientations: What Does Nature Ask and Humanity Require?**

Bioethics engages with moral philosophy and cognate disciplines (political philosophy, jurisprudence, theological ethics) to provide a basic normative conceptual framework. And bioethics also engages with the actually existing values, norms, and cultural belief systems that form the context for human behavior. It should meet actors and institutions where they are, but it cannot leave them there because change in assumptions, commitments, understanding, and action is the entire point of the

enterprise. If it is not critical, bioethics can become apologetic and do harm. This will be true of bioethics in the future as it engages with energy policy and the technology of carbon capture just as it has been true so far of the engagement of bioethics with health policy and biotechnology.

The discourse of bioethics is a sensitive barometer of the social context within which it germinates because the basic subject matter of this discourse—the human experience and meaning of health and illness—moves so fluidly from the most intimate, personal needs and experiences, to the broadest social, systemic, and policy questions. Pain makes policy vivid and compelling; suffering makes systems come alive as tangible social agents rather than as intellectual constructs or abstractions.

Every society needs to have a discourse to give expression to its sense of what history asks of it, a discourse with which to affirm and to contest power, equality, individual and group identity, knowledge, duty, and trust. Indeed, societies ideally need not one such discourse, but several layered and overlapping ones. Repressive and stagnant societies tend to flatten and winnow this discursive landscape; more dynamic and open societies tend toward more diversity and argumentative conflict. And every society needs a discourse to articulate the appropriate role and place of humans in nature: are we creators or creatures, are we destined to overcome limits or to accommodate ourselves to them? How should we use nature and what does nature ask of us? And how should we engage with our own humanity and what does our humanness ask of us and require? Finally, what is the calling of this moment in the ecological history of life on earth and in the history of humankind? What have we the power to do; what have we the responsibility to do?

These are questions as urgent as they are overwhelming. More manageable perhaps is our present focus on bioethics discourse. What kind of understanding of the human place in history and nature has bioethics contributed to thus far? How might it contribute differently in the future? How must it contribute in the face of climate change?

Let us begin by recalling some of the key ideas that gave the new field of bioethics its rationale and impetus as it emerged in the late 1960s. At a time of unusual cultural change, technological innovation, and popular unrest, social and professional elites were becoming increasingly anxious about the sources of social stability and political legitimacy. Bioethics arose as an ameliorative force in the midst of this change, a classically liberal force of reason and reasonable progress.

At the outset, bioethics was given impetus by the notion that there was a cultural lag between normative and scientific knowledge, especially in the context of the so-called “biological revolution” of the 1960s (Callahan 2012). What the new biology and the new medicine empowered us to do was expanding faster than the ability of our repositories of normative knowledge—ethics, cultural mores, religion, the law—to guide and govern the use of that power. Consequently, new forms of power threatened to break loose from their moral restraints and their legal bridles. Individuals were confronted with unprecedented choices in reproduction, in plumbing the body’s genetic secrets, in postponing or avoiding death. Physicians were becoming facilitators of these new powers and ranges of choice. Investors sought to profit from them, governments sought to regulate them. But all were acting without a legal roadmap or an ethical compass. A new discourse, later dubbed bioethics, was

needed to alleviate the danger inherent in this cultural and normative lag. Those skilled in normative discernment and calibration should anticipate and adopt bodies of cases, rules, and regulations proactively. They should not merely react to scientific *fait accompli*; their response should be neither knee-jerk rejection nor thoughtless affirmation and permissiveness.

This early response to the perception that slow-paced social, cultural, and legal adaptation lags behind fast-paced scientific and technological change gave bioethics an opening to serve as a mediating force between innovation and continuity. Bioethics rose to the occasion, but in retrospect two interesting blind spots stand out concerning it.

The first a blind spot concerned the nature of the lag phenomenon itself and the understanding of power at the level of institutions. Bioethics saw the relationship between science and technology in the bio-medical realm and the normative institutions and meanings of society at large as logical and detached puzzles for governance and social planning—as problems to be solved, dilemmas to be finessed, trade-offs to be made. Those in bioethics did not generally see this relationship between the technical and the normative in any broader historical narrative of modernization and social change. The metaphor of a “lag” effect between two social systems was borrowed from a structural-functionalist orientation in sociology that tended itself to be ahistorical (Mills 1959; Joas and Knöbl 2009). From an anthropological point of view, bioethics also did not inquire too deeply into the dynamics of cultural response to behavioral innovation or the varieties of ways in which values are given cultural meaning (Fox and Swazey 2008).

Bioethics developed the following powerful and influential prescription for solving the policy puzzles posed by the lag effect. Universal ethical principles (presumed to be both rationally authoritative and widely accepted in the broader society, at least implicitly and by those most articulate and morally self-aware) were identified as the touchstones for deducing justifiable conduct in particular situations (Beauchamp and Childress 2012). Then the conduct that was beginning to emerge from the new biomedical knowledge and technology (such as in vitro conception or extending the lives of permanently unconscious persons through the use of mechanical life-supports) was assessed in light of the normative standards deduced from the general ethical principles. Finally, regulation and governance of the new technology was proposed so that the morally beneficial conduct it induced would be promoted and the morally harmful conduct it induced would be minimized.

This pattern of discourse was widely endorsed over time by political and professional leaders and was welcomed into the precincts of law, policy, and clinical practice. For some, especially those who were unalloyed supporters of new technology and those who resented any incursion into professional self-sovereignty, the voice of bioethics was resisted and condescended to at best. But overall bioethics gained a strong measure of legitimacy from the establishment and the media from roughly the late 1970s on.

I think there is no doubt that bioethics succeeded in injecting a higher standard of ethical propriety and self-consciousness into medicine and health care, certainly into medical research with human subjects (and later with animal care and use in

research) and important areas of health law, but also into clinical practice and public policy. Nonetheless, bioethics did not fundamentally challenge or threaten the biomedical establishment with this pattern of discourse and analysis.<sup>1</sup> For the most part bioethics discourse took an episodic rather than a structural approach to the workings of institutional, political, and economic power. It scrutinized specific human and social consequences of particular uses of science and technology, but did not develop anything approaching a systematic or critical philosophy of technology as such. In short, the character of the analysis and the remedies contained in much of bioethics discourse over the years has been shaped from within and delimited by the conceptual frameworks that bioethicists (whether they be physicians, nurses, lawyers, philosophers, or social scientists) brought to bear on the troubles they identified. And these frameworks were largely individualistic, rationalistic, and economistic rather than social, cultural, and historical.

The second blind spot of bioethics thus far that we must attend to in relationship to climate change is parallel to its lack of contextual understanding in terms of historical change, political economy, and power. It is the influence of a human-centered ontology that discounts or ignores ecological context. The concerns of bioethics have been almost exclusively human centered, in sharp contrast to many works in environmental ethics. This abstraction of human interests and activity from broader ecological systems has ironically limited even the capacity of bioethics to understand human health and other problems in human terms. This is a serious distortion because so much of human health and well-being comes precisely from the relationality with natural ecosystems. Informing most work in bioethics is an idea of nature as an instrumental handmaiden in the service of human need and desire; it is the stage setting, the scenery behind the enactment of the human drama. Consider, for example, one of the more environmentally oriented developments within bioethics in the last few years, the so-called precautionary principle. The precautionary approach can convey ethical value and significance on non-human organisms, and even on natural ecosystems, because they are taken as entities that can be benefited and can be put at risk. This is surely correct. But by and large those who adopt this frame hold that the risk and benefit to non-human beings is morally significant only because it represents indirect risk and benefit to human beings.

A more fundamental question is: What is the “right relationship” between human agency and the rest of nature (Brown and Garver 2009)? How should human beings relate to nature, not instrumentally for the sake of their own interests, but intrinsically as a matter of obligation derived from the fundamental conditions and nexus of life (Jonas 1985)? All individuals living in a particular place at a particular time—a here and now—have a relationship of interdependence with the natural world and

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<sup>1</sup>Perhaps this moderation was fundamental to the success and subsequent influence of the field. Bioethics researchers and practitioners needed to gain entry into certain professional, governmental, and financial citadels; it was important that they retain academic respectability by not becoming too activist or radical; and it was important that they position themselves so as to make what was perceived by their patrons and clients as constructive contributions to problem solving (Fox and Swazey 2008; Evans 2012; Callahan 2012).

with each other. The human shaping of planetary systems through the medium of economic systems expand that here and now to the entire planet.

A hallmark of the modern era is the Baconian idea that the human realm is set apart and that we have moral leave to manipulate nature, to reengineer it as we see fit in accordance with what we find expedient in order to achieve, in Thomas Hobbes's nice phrase, "commodious living." We are still wedded to that worldview and seem determined to pursue it to its logical extremes. As far as I can see, thus far the conceptual framework of bioethics has completely bought into that ontology. The term "anthropocentric" has been used to describe the perspective that nature is simply raw material for human beings to use and manipulate in order to achieve our own species specific purposes and ends.

The alternative to an anthropocentric answer to the question of right relationship between humans and nature is an "ecocentric" answer. On an ecocentric view, biophysical systems, even when they are scientifically well-understood, are mistakenly seen when they are seen as *things we live off of*. They should be seen instead as *places we live within*. The ecocentric ethical view holds that value in the world resides in the natural and biotic context of which human individuals and societies are a part. From an ecocentric perspective, human beings are plain members and citizens of the biotic community together with other species, and they should be subject to the workings of ecosystemic constraints, the historical rhythms of evolution, and aesthetic values (Leopold 1989; Callicott 2014). Therefore, there is a natural standard of ethical rights and duties, and the good for which ethical agency and action strive can be understood in terms of systems of interdependence, relationship, sustainability, and resilience. Adopting this ontological frame as the background to its discourse—the ethical questions it asks and the ethical answers it gives—is one basis for what I shall discuss below as the "relational turn" in bioethics. This turn has already begun and has been gaining momentum for some time, but I believe that we should redouble our efforts to pursue and refine it because the relational reinterpretation of our core concepts and values is necessary if bioethics is to respond adequately to the challenge of climate change.

## 2.4 A Relational Turn in Bioethics: Expanding the Conceptual Frame

The relational interpretation of key concepts relating to human agency and its contexts is an important reorientation underway in bioethics today. It is made possible in part by the fact that the field of bioethics over the years has become more self-reflective and critically aware of the conceptual limitations of its own discourse. This is a relatively recent trend, prompted often by the work of feminists, philosophers working out of non-analytic traditions, social scientists, and others who are able to adopt an external stance on mainstream bioethics (Hoffmaster 2001; DeVries and Subedi 1998; Lindemann et al. 2008).

How do we know what we owe one another? How do we get people to see their obligations? How do we motivate them to act on those obligations even when it involves some denial or sacrifice of one's own wants and interests? One of the reasons why appeals to the prudent protection of enlightened self-interest have not succeeded in motivating political support for equalizing and redistributive policies is that well-off individuals can see the reality of relative inequality all around them—in the form of poverty, crime, inadequate education, health disparities, and so on—but they do not perceive that this inequality undermines their own quality of life or future prospects. Thus instead of feeling empathy and solidarity for the least well off, they feel threatened by and antipathetic toward them. Their main preoccupation is keeping their footing on the rung they have managed to attain and not slipping down the social ladder. In a discussion of health disparities and the social determinants of health, David Runciman observes, "...the politics is considerably harder here: you can't simply say that inequality means we are all suffering together. Instead, it may mean that the poor are doing so badly that the rich aren't interested in looking at the wider picture. They are focused on making sure they don't wind up poor" (Runciman 2009). Thus far this same syndrome has undermined political support for policies to reduce carbon emissions, such as a carbon tax or any other measures that would threaten to raise consumer costs or increase unemployment.

If we are to use self-interest as the primary motivating factor in garnering democratic political support for climate-smart public policies and the effective regulation of commercial and private behavior, then we need to break out of this syndrome of social antipathy and competition. Simply striving for conditions to facilitate long-term self-interest over short-term self-interest is not sufficient. The politics of falling down and falling behind in a stratified society is not so much a question of the time scale of the personal and social cost-benefit equation, as it is a failure to see the connections between one's own social-economic situation and that of others, a failure to perceive the underlying forces of economic and social power that are working on everyone in the society, albeit with differential effects.

How do we break free of this conundrum? I do not believe that we can simply try to bracket the notion of self-interest in the motivational structure of individuals and replace it with some overriding moral ideal of duty or principles of justice and beneficence in that sense. The best contribution that bioethics—with other forms of moral learning—can make is to temper and reconstitute self-interest by interpreting it in new ways. This concerns reconceptualizing the constitutive features of self-interest (or happiness), by not only expanding its horizons of time and place, but also by reconceiving the subject or self whose interests are at stake. Both aspects of this reconceptualization come about by seeing self-interest in light of important relational concepts. This provides a vocabulary to speak about who one is and what one is doing in new ways. And this leads to speaking about who we are and what we are doing in new ways as well. It gives us a lens through which to see ourselves, our situation, and our possibilities in a new light. If the current failure of self-interested motivation is the failure to see connections, and hence the failure to see and care about the consequences of how our activities are institutionalized and structured, then the remedy can come in the form of an enrichment of our connection-making moral imagination.

No doubt there are many important concepts that can be developed and added to the discourse of bioethics that will assist bioethics in contributing to an enhanced moral imagination in time to stave off the worst global outcomes of climate change. Here I wish simply to propose and briefly characterize three such concepts: relational autonomy, membership, and solidarity.

### 2.4.1 *Relational Autonomy*

Relational autonomy rejects two keystones of political philosophy in the liberal tradition. One is the privileging of individualistic values over communal ones. The other is setting up an antithesis between the individual and the community in the first place. These two features make liberal theories of individualistic autonomy remarkably devoid of the web of interdependencies—that is, culturally meaningful roles, styles, and self-identities; shared values, rituals, and practices. These theories tend to portray a privatized world of atomistic individuals, each with their own self-regarding interests and life-plans. In most cases, peaceful and predictable transactions of mutual advantage—in a word, “market” relationships—are thought to be sufficient to attain these aims.

Instead, in a relational conception of autonomy, agency and personhood are constituted, not *in spite of* connections and commitments linking self to others, but *in and through* these connections and commitments. Enacting relational autonomy in one’s life develops a self-identity built out of ongoing practices that exemplify the creative and aesthetic dimensions of a humanity naturally flourishing, a humanity healthy and resilient. A relational conception of autonomy and personhood contains a counter-vision to notions of alienation, commodification, and the objectification of the human or the natural other. It reflects the contextual, socially and symbolically mediated nature of self-identity and the agent’s interactions (Harré 1998). It reconciles individual self-direction (autonomy) with interdependence, community, and the common good.

Reductions in GHG emissions will come about only through change at both the level of individual behavior and of social norms and institutions. In practice this means that public policies must have recourse to values and purposes that the members of these societies will understand if they think and act like interdependent and relational selves. Discursively, part of the task of bioethics is to shape this relational self-identity and foster a moral imagination that can see autonomy, respect, rights and responsibilities in relational terms. If it was not morally evident before to all reasonable people (as the current global economy guided by neoliberal free market ideology suggests that it has not been), at a time of climate change it surely must be recognized now that there is no immunity, no safe harbor, no fortress of privilege and security. The health and well-being—as well as the possibility of a life of autonomous self-direction—of everyone is inextricably linked to the flourishing of others, the flourishing of enclaved communities, and the flourishing of the natural world.

In developing philosophically the concept of relational autonomy, it is important to recognize that not every form of human interaction or transaction constitutes a relationship through which individual autonomy or social justice are constituted. Interactions of domination, exploitation, coercion, violence, seduction, or duplicity, each of which effectively reduces human beings from the conditions of subjects to the conditions of objects, do not count as “relationships” in the requisite sense of the term. In just relationships, individuals enact an emplaced, contextualized, bounded freedom; they do not enact a fantasy of self-sovereignty or self-creation.

Relational autonomy, emplaced and bounded freedom, and justice as developmental capabilities for all, are closely linked to two additional concepts, neither of which has been adequately developed and explored in bioethics thus far, but which are essential in fashioning a moral comprehension and response to climate change. These are the concepts of membership and mutuality. Solidarity is a special mode of mutuality, and it is also a relatively neglected term in bioethics that needs to be developed future in the face of climate change.

### ***2.4.2 Membership and Mutuality***

Membership is constituted by the norm of parity of voice and participation and the norm of equality of civic respect. Social philosopher Nancy Fraser develops the notion of “participatory parity,” which she relates to a concept of justice encompassing both liberty and equality, in the following way:

Justice requires social arrangements that permit all (adult) members of society to interact with one another as peers. For participatory parity to be possible, I claim, at least two conditions must be satisfied. First the distribution of material resources must be such as to ensure participants’ independence and “voice.” ... The second condition requires that institutionalized patterns of cultural value express equal respect for all participants and ensure equal opportunity for achieving social esteem. (Fraser and Honneth 2003, 36)

To be a member of a moral community is to be subject to these norms and entitled to their protection and benefits. Solidarity is constituted by the norms of mutual concern and care. They are keystones of human flourishing and living a life fully realized and deeply experienced. Membership and mutuality are closely linked, and their common ethical ground is the valuing of others by the self (respect) and the valuing of the self by others (social esteem). To be a member in the normative sense is to have human standing. Membership status is conferred but it is also lived, earned, constructed and reconstructed by actions over time. To be in a condition of membership is to be interdependently self-aware.

Mutuality also consists in a form of life that justifies a certain type of self-recognition and perception. Mutuality involves the realization of an imaginative capability to see the linkages between the condition of others and the condition of the self. Membership and mutuality together intend a condition of the good as a *flourishing commons and a commons of individual flourishing*.



Membership confers standing; mutuality calls forth standing together. This is the symbiosis of each and all. Solidarity is a special type or aspect of mutuality in that it embodies that imagination of mutuality in a distinctive kind of emplacement and activity. To engage in solidarity is to stand up for those who lack standing and for change that will more fully realize the standing of all. Solidarity is the praxis of standing up and standing beside.

In the human condition, being individual and being together are linked: Aristotle called us *zōon politikon*, Seneca, *animal socialis*. To be human is to be a member of a community and a social order made up of culturally mediated lifeworlds and social and political-economic institutions. The moral point of those relationships is the individual flourishing of each participant. Therefore it follows that the justice, equity, parity of participation, engagement, and the exercise of autonomous agency within the web of relationships that make up a community are all required. The denial of parity in relational participation—disenfranchisement, exclusion, marginalization—is at one and the same time an exclusion from membership, a displacement, and a failure to respect one's person.

Justice and autonomy cannot exist within the context of arbitrarily restricted structures of “voice”—power, wealth, and social opportunity, health and psychological integrity—any more than effective human economic activity can exist sustainably amid the degradation and breakdown of geophysical and ecological systems. This provides a criterion for evaluating which types of relationships (transactions/interactions) are to be nurtured, facilitated, and promoted by common rules and public policy, and which are to be discouraged or prohibited.

I regard membership and mutuality not as separate from justice but as aspects of a certain perspective on justice and what it requires morally. Moreover, membership and mutuality are not separate principles to be added to a preexisting list of principles in bioethics but are to be seen instead as providing the very grounds for the possibility of other moral commitments. On this view, obligations arise out of, and require fulfillment within, venues of mutual recognition and respect. The existence and persistence, in turn, of these venues of recognition and respect depends on the ability to comprehend and be motivated by the idea of solidarity (Prainsack and Buyx 2011; Fraser 1986; Benhabib 1987).

It is certainly striking that so much work in bioethics has focused on individual autonomy and concerns about professional or social paternalism. It is often expedient to frame important ethical issues in this way—in the clinical encounter between physician and patient, for instance—but doing so incorporates certain ontological and normative views about society that are unnoticed and uncritically accepted. For example, it often seems to be assumed that we should begin our ethical consideration with an assumption of non-obligation and protecting the interests of the individual, and then the burden of ethical argument is to provide reasons why the needs and interests of others ought to be taken into account. Why not start with a presumption of right relationship and right recognition—acknowledging the moral force of reasons of connection and interdependence—and then put the onus on finding grounds for exceptions that permit individuals to override the obligations inherent in these relational reasons?

Another way to put this is to ask why we in bioethics so rarely question the presumption of individualism. Societies and communities are often treated in bioethics discussions as if they were mere backdrops for individual life and agency, much in the same way that non-human nature is taken to be something we use, not a place where we live and have our being. Being under an obligation is often thought of as a matter of consent and thus a situation that we can either choose to be in or not. Values are not viewed in any kind of historical or cultural context, nor are they seen as things that predate or constitute who we are. There may be some consideration of something like “externalities” or “public goods” in an economist’s sense, but they are of marginal interest to discussions in bioethics, while more constitutive conceptions of the commons or the common good are absent.

Many in bioethics have reservations concerning formulations such as these, reservations that parallel a number of liberal objections to communitarian or collectivist positions (Mulhall and Swift 1996). I do not regard the relational interpretation of autonomy and justice to be paradoxical or open to the usual objection of failing to take individuals seriously. Relational bioethics may take one of two different orientations, which, in the more general setting of communitarian theory, have been referred to as the “integrationist” and the “participationist” orientations by philosopher Seyla Benhabib (1992). Only the integrationist orientation risks a collectivism that eclipses the moral significance of each individual inasmuch as it enjoins a tight knit formation of permissible life plans and a narrowly constituted permissible self-identity. A participationist orientation is fully compatible with autonomy because it is open-textured, dynamic, and open to cultural and personal difference. Respect for difference bespeaks humility and an avoidance of the arrogance of certainty and control, a kind of moral arrogance that integrationist forms of community often espouse.

Benhabib’s distinction and line of reasoning are not satisfactory, however, if one holds that a pluralistic and diverse society that truly values and protects the individual is inherently incompatible with a relational ethics of membership, mutuality, and a shared sense of goods and purposes held in common. Can a relational bioethics account for the moral importance of the *individuality* of persons, while staving off a moral and societal *individualism* that is tending in the wrong direction in the era of climate change? I believe it can. Hoping to show this, it is to a more detailed model of the practice of solidarity that I now turn.

### 2.4.3 *The Practice of Solidarity*

Solidarity requires a public action. The act itself is to be seen and understood in a particular way, it is a positive identification with another and their position, whether individual or group, driven by sympathy and understanding. It is orientated toward improving or correcting past or present disadvantage or injustice. Solidarity is essential to counteract the centripetal forces that obscure our interdependence and lead us to toward an illusion of self-sufficiency and invulnerability. And

counteracted this illusion must be, for it is intolerable as a widespread mindset in the era of climate change.

Central to working with the concept of solidarity in bioethics is interpreting the meaning of particular types of relational and positional connections (Dawson and Jennings 2012). This is important to climate change because the reality of it is both global and local. The obligations of global justice and climate justice are inclusive of the broadest kind of human connection in space and time. They extend to all places on earth—all nations, all peoples, all cultures, all habitats, all landscapes, all ecosystems. They extend across generations to those who will be. They extend to the non-human living world, present and future. At the same time, political action on the global, international, or even national political levels is not working. Global solidarity must feed off of solidarity in place. Local modes of democratic deliberation and civic action are essential both for purposes of education and regional scale mitigation but also as the building blocks of larger networks which can have a global effect (Rayner 2010; Barber 2013).

Solidarity is a mutuality of care and a public expression of recognition and concern. If the characteristic gesture of membership is participatory voice, solidarity's characteristic gesture and stance as a moral action is *standing up beside*. This stance then has three relational dimensions: *standing up for*, *standing up with*, and *standing up as*.

*Standing Up Beside* When you stand up beside a person, a group, an organization, a species, a habitat, or even an idea or ideal, you make yourself visible; it is a public gesture, a communication in which saying and doing merge. Solidarity requires both taking a stand and standing up. This public posture also carries with it a sense of urgency and moral importance to both the agent being seen and to those who are looking. In standing up one is moving upward toward justice, such as the redress of the oppression or denigration of others, or the protection of a watershed, a forest, an endangered species.

*Standing up for* The first relational dimension of solidarity is standing up *for*. This suggests an intention to assist or to advocate for the Other (oftentimes a stranger, and again not necessarily a human individual—one can stand up for other species, an ecosystem, a cultural way of life). The Other for whom one stands up in solidarity is someone whose situation presumably is morally problematic either because of their own behavior or because of what is being done to them. Environmental and health conditions as well as broader forms of social, economic, and political oppression and injustice provide an occasion for this dimension of solidarity.

*Standing up with* The second dimension is solidarity as standing up *with*. It takes another step in the direction of mutuality and recognition of shared moral standing. Moving from *relationality for* solidarity to *relationality with* solidarity advances one further into the lifeworld of the Other. Doing so entails changes in one's initial prejudgments and perspectives, and solidarity as standing with requires an openness to this possibility. Relating to other people or groups in the specificity of their values

and vocabularies of self-interpretation simultaneously develops respect for the specific standpoints of others (Habermas 2005; Dean 1995, 1996; Calhoun 2002, 2006). Being with in this sense also reveals a level of commonality between the parties to this kind of solidarity. This commonality resides in the capacity for intercultural and transpersonal interpretive understanding. Without such understanding, Others cannot truly be treated with respect, and hence their relational autonomy cannot flourish, and they cannot be said to have attained the membership status that right recognition requires. Solidarity contains the possibility of being common readers of the diverse and distinct lives we each author.

*Standing up as* The third dimension is solidarity as standing up *as*. Obviously this suggests a yet stronger degree of identification between the agents of solidaristic support and the recipients of such support. However, mutuality and solidarity are not the same thing as a merger of identities or even literal identification with the Other. Solidary *as* is a relationship between an actual Other and an imagined possibility of the self. This is how I would interpret such familiar notions as “seeing through the eyes of another,” or “putting oneself in another’s shoes.” For agents engaged in the practice of solidarity who reach this mode of relationship, it is not a question of denying diversity or doing away with the continuing obligation to recognize and respect difference. Quite the opposite.

To move through the trajectory of solidarity is to move in the direction of greater imaginative creativity and range in the moral life. Standing up for depends upon a kind of abstract moral commitment to support the application of general norms to the life situation of the Other as a creature with a certain moral status. Standing up with involves adopting a perspective that is more internal to the lifeworld and the contextually meaningful agency of the Other. Standing-up-as solidarity is the solidarity of humanity in place, the solidarity of being embodied, vulnerable, located and locatable.

But there is another way to look at this as well. In the concept of solidarity in each of its modes, the particularity of respecting difference and the universality of inherent moral worth of humanity and life are two sides of the same moral coin. Acts of solidarity always “take place” somewhere sometime, not anywhere any time. But solidarity can (I would say, must) also inform cosmopolitan conceptions of citizenship and obligation. This suggests interesting lines for the further development of theories of global health justice and climate justice.

As the moral recognition of the Other is altered by this interpretive journey, so is the moral imagination of the self. Strong bonds of attachment, identification, and empathy may not be the destination of this journey. But arguably a growth in one’s capacity to project oneself imaginatively into the perspective and viewpoint of the other person, and a growth in moral awareness or the ability to see connections previously unseen are plausible outcomes of the interpretive transformation effected by the trajectory of solidarity. Need I add how integral these recognitions are to developing democratic political cultures morally and politically capable of supporting effective measures to mitigate climate change within nation states and to achieve global cooperation among them?

## 2.5 The Presence of the Future

Thomas Hobbes remarks that only the present is real because the past is gone and the future does not yet exist. Closer to the mark, I believe, is Marcel Proust's idea that the past exists through memory, and is not gone, while the future exists through imagination, and is already here. Creation is not a completed act but a continuing one. Reality is not the exclusive preserve of the past, the present, or the future.

Elsewhere I have attempted to explore the politics of memory and tradition (Jennings 1981). This essay has focused largely on imagination and the future. Can we muster the moral imagination necessary to appreciate the presence of the future? Can we grasp the fact that we have a responsibility here and now for what we are doing to the well-being and the conditions of life of those there and then, including those who are not yet?

Two considerations seem to me to lend weight to these questions. The first is that our actions in the present do have the power to shape substantially the quality of life and the options of future people and the integrity and resiliency of the future ecosystems they inhabit. In his famous essay, "What is Enlightenment?" Kant announced the arrival of the age of maturity for humankind (Kant 1949[1784]). The notion of the "Anthropocene" age carries much the same connotation: we have grown into great power and with it comes corresponding responsibility. The time for indulging our narcissism and *amour propre* is over.

The second consideration is the flip side of the first. If the future is vulnerable to our irresponsibility, we are already in the present vulnerable to harm from the degradation of the future. If we did not believe that there would be future people, would anything matter to us? Perhaps immediate circumstance and immediate pleasure, but no projects or activities that project themselves into a future, and nothing that depends for its essential point on some future state of affairs, such as finding a cure for cancer. If everything that is "not yet" turns into something that is "too late" in our intentional, purposive agency, then surely our humanity would be fundamentally altered and effaced (Scheffler 2013). Our belief in a human future (a key aspect of which is a viable, resilient natural future) is then essential to our present. How then can we say that future people do not matter?

My sense is that we do have the capacity to muster the moral imagination necessary to appreciate the presence of the future. We can grasp the fact that we have a responsibility here and now for what we are doing to the well-being and conditions of life of those who are not yet. Of course, we can only infer in a generic way how human beings will think, feel, and act and how the biotic communities of the Earth will function in the future. That generic knowledge and that imaginative connection between present and future experience are premised on an assumption of some measure of social and biological continuity and commensurability, to be sure. But this is sufficient to motivate judgments of moral responsibility for the actions we do now. That is really all a sense of responsibility and the logic of obligation require, or have ever required. I think it is time to stop wringing our hands about the philosophical puzzle of whether anything we do in the present can be said to harm even-

tual people because without our actions they would not come into existence at all. And we should stop distracting ourselves with hoped for technological fixes, acting like the economist who was at the bottom of a deep hole and when asked how to get out replied, “Assume a ladder.”

The mission of bioethics is the normative task of guiding the just use of power, the sciences of life, and technology. With the total situation of climate change (geophysical, biological, economic, political, and ethical), which I have tried to sketch here and which will be dealt with in depth in other chapters in this volume, this mission faces a much more demanding challenge than any it has encountered before in the domain of health affairs and the practice of medicine and biomedical research in national contexts.

It would be a shame if bioethics limited itself to commenting on the ethics of managing health care delivery in response to the deleterious health effects of climate change. I have nothing against that sort of commentary: it can be very helpful and informative, as evidenced time and again in the aftermath of natural disasters and health emergencies. But global climate change portends so much more than that, for beyond acute health effects, climate change will bring about chronic malady—“illth,” as John Ruskin (1985, 211, 299) so aptly called what we often produce in fact when we think we are producing wealth. Climate change will also prompt a slow, evolving attack on human health and well-being by undermining the social determinants of health, by exacerbating the social determinants of disease, and by degrading the integrity functioning of ecosystems upon which human health ultimately depends. A remarkable biosphere has evolved on earth during the Holocene; we are on course to ruin the natural work of millennia in just a few centuries.

In short, the health effects of climate change are ultimately the justice effects of climate change. I have argued that in order to respond adequately to climate change the field of bioethics must bolster its conceptual repertoire in two ways.

First, I have suggested that bioethics should rethink the “bios” aspects of its vision by eschewing an uncritically human-centered mode of theorizing, by seeing ecosystems as contexts we live in and through, not simply as resources that we use and use up.

Second, I have suggested that bioethics enrich the “ethics” aspects of its vision by taking a relational turn in its theorizing and by informing its discourse with certain fundamental concepts that provide alternatives to the individualism of the libertarian and capitalistic market tradition. Among these are relational rather than individualistic conceptions of autonomy and justice; membership, mutuality, and solidarity. These concepts will be fruitful for ongoing discussions of the ethical aspects of climate and energy policy. Bioethics, together with environmental ethics, should have an audible voice in those policy circles.

There are many philosophical reasons why one might support this relational turn, but it is given both theoretical and practical impetus today by the need to mitigate further deleterious global thermal imbalance and climate change through massive efforts, on both large and small scales, to alter human social, economic, and technological relations with nature. And, no less problematic, this must be done very, very soon. A fossil carbon civilization that has taken two centuries to construct must be

fundamentally reconstructed into a sustainable, renewable energy civilization in the next three or four decades: within the lifetime of our children.

Politically and culturally it is not obvious at all that this will happen. Close to the cognitive and the affective center of our incapacity lies a cultural blindness to relationality and interdependence. Other factors of greed and power and ideological politics may be equally important, but bioethics as a field and as a community of men and women of ideas has few resources to stand up to those forces. But we may be able to do something about the state of thinking and motivation in our societies and communities. We may be able to bring moral imagination and moral conscience to bear on behaviors and practices of consumption, pollution, and power that push us further toward disruptive planetary change and that promise to truncate the futures of persons for decades or even centuries to come.

The most daunting challenge of climate change is not technological or even economic, it is political and moral. Prosperity without unsustainable economic growth can be attained through rational orchestration of measures to slow down and reduce the consumption of fossil carbon and through technological transitions to new sources of low-carbon emission and renewable energy (Victor 2008). But these measures, such as carbon taxation, to reduce—or better, recast—economic growth must be accompanied by robust social policies that forthrightly, not begrudgingly, embrace goals of social justice and equality, education, meaningful employment, and democratic citizenship. If that is to happen, a certain moral maturity must be achieved in many of the political cultures in the world today.

Here finding the proper relationship between theory and practice—conceptual argument and discourse—is fundamental but also complicates the task. When interpreted relationally, the key concepts and categories of bioethics are not simply conceptual ideals, qualities, or rights individuals possess. They are forms of practice, culturally and socially meaningful structures of agency and activity that are deliberate, recognizable, and rule governed. Through enacting the practices of membership and solidarity, intentions are formed, new social possibilities are discovered and defined, and moral principles and ideals themselves are made meaningful. This occurs in the social perceptions and self-understandings of individuals precisely through the types and networks of social action in which they engage; precisely, that is to say, to the extent that membership is also a lived practice and condition of their self-identity and social awareness. And also to the extent that they are respected and free to develop their capabilities richly in and through their relational circumstances.

The notions of a membership of recognition and respect and a mutuality and solidarity of care and concern denote a future world that is open rather than closed, a hospitable Earth household of participation, voice, equity, trusteeship, preservation, and conservation. The ideas of membership and mutuality are not primarily distributive notions—they are concepts of plenitude rather than scarcity—although they clearly have important distributive implications, mainly in the direction of greater equality. But this is not what defines them most. What does so is the idea that the communal, connection-making side of ourselves and our existence (and not the

competitive, separation-making side) is most worthy of affirmation and encouragement in the human and natural future.

The moral imagination fostered by the notions of membership and mutuality is the ability to sense the presence of the future, and to see a place where we each attain moral parity with fellow sufferers, fellow creatures of need and aspiration, fellow inhabitants of the body natural, the body human, and the body politic.

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# Chapter 3

## Climate Change and Ethical Change

James Dwyer

**Abstract** This chapter approaches a crucial ethical question: How should we respond to climate change? To begin, I sketch some of the impacts that climate change will have on human health. Then I consider who will be most vulnerable to these impacts. People's vulnerability will depend on their temporal position, geographical location, social position, and on qualities of the society in which they live. Since some people and generations are more vulnerable to the risks of climate change, while other people and generations contribute more to the problem, climate change raises deep issues about justice. After noting why and where issues of justice arise, I focus attention on ethical issues about responsiveness, responsibility, and ethical change. I consider how people who are differently situated should respond to the current situation. Many people, especially in countries with high emissions, need to change the way they live: the technologies that they use, the social practices and institutions they participate in, and the habits and virtues that they embody. These are some of the social, political, and ethical changes that climate change calls for.

Climate change threatens human health. Both extreme weather events and gradual changes will adversely affect health prospects. Heat stress will cause more deaths, especially among the elderly and vulnerable. Storms and floods will kill people, damage infrastructure, and displace survivors. Changes in temperatures and humidity will lead to increases in malaria, diarrhea, meningitis, and dengue fever. Droughts and changes in precipitation will contribute to malnutrition. Melting glaciers will affect the supply of freshwater for billions of people. All these problems will contribute to social disruptions and increase the number of environmental refugees.

Although we are all at risk, we are not equally at risk. Climate change poses greater risks for some people because of their geographical location, social position, and place in time. Since the people who are at greatest risk are not usually the people who have emitted the most greenhouse gases and benefited the most from industrialization, climate change raises deep issues about justice. It also raises questions about responsibility and responsiveness. Who should bear and take responsibility

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for addressing the problem? And how should people and societies respond to the problem?

Although changes in technology are important and necessary, I believe that climate change also requires ethical change. For many people, a morally adequate response to climate change will require changes in habits and practices, changes in the way they live. For many societies, a morally adequate response will require changes in practices and institutions, changes in the way they organize social life. Changes like these are part of and associated with ethical change – or so I shall suggest in this chapter.

In the second section of this chapter, I will summarize some of the risks that climate change poses for health prospects. In the third section, I will consider who will be most vulnerable to climate change and why they will be at risk. The discussion of vulnerability will lead to considerations about justice. In the fourth section, I consider how people should respond to the current situation. This leads to a discussion of responsiveness, responsibility, and ethical change.<sup>1</sup>

### 3.1 The Impacts of Climate Change

Human beings are producing, in aggregate, more greenhouse gases than the natural world can absorb. In 2013, for the first time, the measurement of carbon dioxide at the Mauna Loa Observatory surpassed 400 ppm (NOAA Earth System Research Laboratory 2013). In 1959 the average measurement at the same observatory was 316 ppm. The preindustrial level was probably about 280 ppm. The net increase in greenhouse gases is changing the temperature, humidity, precipitation patterns, and wind patterns on earth (IPCC 2007a). These climate changes show up as gradual changes, extreme weather events, and greater variability in weather.

Some people in some places may benefit from moderate increases in temperature. For example, fewer people will be exposed to extremely cold weather. But overall, the effects on human health are likely to be adverse. I want to consider these adverse effects in five broad categories: heat waves, storms and floods, infectious diseases, water and food, and social disruptions.

Climate change will lead to more frequent and more intense heat waves. These heat waves, exacerbated by the heat island effect in cities, will lead to deaths by thermal stress. This risk will be greatest among the elderly, the very young, people who are chronically ill, and people who do physical labor. The heat wave in Europe in the summer of 2003 led to 70,000 more deaths than normal (Robine et al. 2008). I will return later to the question of how well people and societies can adapt to this risk and other risks.

Climate change will also lead to more intense storms. These storms will produce more rainfall, combine with rising sea levels to produce greater storm surges, and cause more flooding. In 1970, about 30 million people were exposed to floods in

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<sup>1</sup>In this chapter, I draw on some ideas from a previous publication (Dwyer 2013).

Asia. In 2030, according to the Intergovernmental Panel on Climate Change, about 78 million people will be exposed to floods (IPCC 2012). These storms and floods will kill people, damage infrastructure, compromise farmland, and displace people. How well people and societies can adapt to these risks is an open question. Since about 1990, Bangladesh has been able to reduce the death tolls from cyclones (WHO and WMO 2012), but climate change may overwhelm some of the adaptive measure that have been put in place.

Climate change will exacerbate a number of infectious diseases: malaria, dengue fever, diarrhea, meningitis, and other diseases (McMichael et al. 2006). Changes in temperature, precipitation, humidity, and extreme weather events will affect vectors, water and food quality, and the infectious agents themselves (WHO and WMO 2012). For example, with rising temperatures, the mosquitoes that transmit malaria will extend their range to higher elevations and greater latitudes.

Climate change will also impact human health by the effect it has on water resources and food production. Billions of people who depend on melt water from glaciers and snowpack will see their water resources decline (IPCC 2007b). And regional droughts will diminish water resources that are already overdrawn in many areas (WWF 2008). Droughts will also impact crop yields from rain-dependent agriculture in some areas (IPCC 2007b). Regional decreases in food supplies may lead to increases in malnutrition among the most vulnerable. Since malnutrition is already implicated in about 20 % of all childhood deaths, climate change may make a bad situation worse (WHO 2002).

Climate change could create social disruptions that impact population health. Rising sea levels, storms, floods, and droughts could create millions of environmental refugees. Both extreme weather events and gradual changes could increase poverty among the most vulnerable. And climate change could even exacerbate international conflicts over water resources.

How much climate change impacts human health will depend on how well people and societies are able to adapt to changes in the climate and on how much people and societies can reduce their emissions to prevent more drastic changes. Anthropogenic climate change has already impacted human health in a serious way. The World Health Organization commissioned a study to estimate the burden of disease that was attributable to humanly induced climate change (McMichael et al. 2004). The authors of this study estimated the percentage of deaths and illness associated with heat waves, floods, malaria, diarrhea, and malnutrition that was due to recorded changes in climate. They estimated that climate change was responsible for 160,000 deaths in the year 2000 alone. This estimate was based on an increase in temperature of about 0.5 °C. The Global Humanitarian Forum also commissioned a report to estimate the present harms of climate change. The authors of this report estimated that climate change causes 300,000 deaths each year (GHF 2009). Future health prospects will be much worse if we follow the business-as-usual approach or if we provoke non-linear changes by crossing thresholds that we don't yet understand (Dwyer 2008). Of course, the impact of climate change will not be limited to human beings. If emissions are not reduced, about 55 % of plants and 35 % of animals will lose more than half their present range in 70 years (Warren et al. 2013).

## 3.2 Vulnerability and Justice

All human beings are vulnerable to the health risks posed by climate change, but they are not equally vulnerable. People's vulnerability depends on their temporal position, geographical location, social position, and on qualities of the society in which they live. It will also depend on whether and to what degree emissions are reduced. I will consider these factors and the ethical issues that they raise.

People's vulnerability depends on their position in time – the generation to which they belong – because the effects of climate change are increasing. Since greenhouse gas emissions are increasing, and portions of those gases remain in the atmosphere for long periods, future prospects are worse than present prospects. Global temperature has already increased 0.5 °C, and it seems increasingly likely that future increases will exceed 2 °C. Along with temperature, storms and floods will also increase. By 2080, a 100-year flood on the east coast of North America – a flood of such magnitude that it is expected just once in 100 years – will be expected to occur once every 20 years (Sheppard 2013). Of course, the risks depend on how much emissions can be reduced and how well societies can adapt, but without better mitigation and adaptation, future generations will be at greater risk.

Vulnerability also depends on geographical location. People who live at low elevations near coasts, river deltas, and river floodplains are vulnerable to floods. This includes many people in Bangladesh, small island states, and other regions. People who live in Australia, central Asia, and parts of South and North America will be more vulnerable to droughts (GHF 2009). Farmers and other who depend on stable rainfall will be most affected by droughts. People who live in areas where the climate is already hot will be vulnerable to heat stress. This risk will be more pronounced in cities because the buildings, roads, and other infrastructure create a heat island effect.

People's vulnerability depends not only on their temporal and geographical locations, but also on the qualities of the society in which they live. People who live in wealthy and well-governed societies will, in general, be less vulnerable to the health risks posed by climate change. Wealthy societies have the resources to develop appropriate infrastructure, prepare public health responses, fund insurance schemes, manage freshwater, create responsive programs, educate citizens, and so on. Well-governed societies will use resources for and in consultation with citizens, in ways that protect health and life. And they will be concerned that their responses are foresighted and fair. People will also be less vulnerable in societies and communities with high levels of solidarity, civic engagement, and neighborliness.

People's vulnerability to climate change depends not only on the kind of society in which they live, but also on their relative position within society. Michael Marmot and others have shown how people's relative position within society, their socioeconomic status, affects their health prospects (Marmot and Wilkinson 2005). In many societies, aspects of this status may include power, wealth, income, type of job, education, housing, race, gender, and other factors. These factors constitute the social determinants of health. They also affect people's vulnerability to the health risks posed by climate change.

Consider one example. Because of climate change, most cities will experience longer and more severe heat waves. People's vulnerability to heat stress will depend on whether they have chronic diseases, which are themselves influenced by social factors. It will also depend on whether they do physical labor outdoors, whether they have air conditioning, and where they live within the city. The heat island effect in cities is greater in areas with more impervious surfaces and less tree canopy. One study found that in metropolitan areas of the United States, African-Americans were more likely than white Americans to live in areas with "heat risk-related land cover" (Jesdale et al. 2013). This correlation remained even when the authors adjusted for poverty and home ownership. At least in American cities, race affects a health risk posed by climate change.

I considered four broad aspects of vulnerability: temporal position, geographical location, kind of society, and social position. Sometimes these aspects will diverge. For example, wealthy people who live on the coast of Florida are vulnerable because of their location but not their social position. But sometimes many aspects will converge. Farm laborers in Bangladesh are vulnerable because of their location, social position, and the income level of their society. People's differential vulnerability is part of the story that leads to issues of justice. Another part concerns people's differential contribution to the problem.

Past generations in industrialized countries like the United Kingdom emitted a considerable amount of greenhouse gases, and many people in these countries benefited from the wealth that industrialization produced. Although some suffered from pollution, they avoided most of the health risks that climate change is creating. Future generations have not (yet) contributed any emissions, but they will enter a world with all the health risks associated with climate change. Even if we focus on the present generation, we see large differences between and within countries. Per capita emissions (measured in metric tons of carbon) in the United States are twice as high as in Japan, another high-income country; they are five times as high as in Chile, a moderate-income country; and they are fifty times as high as in Ghana, a low-income country (Boden et al. 2007). And in every country, some people emit much more than the average, and some emit much less.

Since some people and generations contribute more to the problem, while other people and generations are more vulnerable, climate change raises deep issues about justice. Issues of societal justice arise because of the distribution of emissions, health risks, adaptive measures, and power within a society. Issues of international justice arise because the countries that are producing the most emissions, and have benefited the most from past emissions, are not at greatest risk. And issues of inter-generational justice arise because present conduct will impact the environment in which future generations will have to live.

Although few people in bioethics have addressed these important issues of justice, many scholars in other disciplines have (Gardiner et al. 2010). As we should expect, different scholars take somewhat different approaches and suggest somewhat different proposals for allocating future emissions in a just way (Gardiner et al. 2010). The differences seem most pronounced when scholars consider the relevance of past emissions in a scheme that is reasonably just. But in spite of the

different approaches and proposals, there is a wide (but not universal) overlap on a basic judgment of justice: it is unfair that societies and people with high emissions are not doing more to reduce their emissions and to help vulnerable populations to adapt to changes that will occur. On this key point, many approaches and perspectives converge. Since I agree with this basic judgment of justice, I want to discuss issues about how to respond to the current situation – issues about responsibility, responsiveness, and ethical change. Fruitful discussions about these issues presuppose some rough and overlapping judgments of justice, but these discussions don't require agreement on particular theories of justice.

### 3.3 Ethical Change

I described how climate change poses health risks, how vulnerabilities to these risks vary, and how contributions to the problem vary. Then I suggested why the current situation is so unjust. Now I want to address the most urgent and general question: how should we respond to the current situation? Of course, the answer will depend on who the “we” is, on how each of us is situated with respect to the problem.

To avoid imposing further risks on the most vulnerable, and new risks on other people, overall emissions need to peak very soon and fall very rapidly (National Research Council 2011). To return the atmosphere to a safer level of carbon will require large changes in high-income countries, substantial changes in most moderate-income countries, and even some changes in low-income countries. In other words, most people in countries with high carbon footprints and many people in other countries will need to reduce their carbon emissions, increase carbon absorption, and finance adaptive measures.

People developed certain ways of living before carbon footprints mattered, but now these footprints matter for health, well-being, and justice. The situation has changed, but relatively few people have changed the way they live. For many people, carbon emissions are associated with a whole range of activities: boiling water, eating dinner, heating a home, taking a shower, going to work, using a computer, flying to a conference, providing health care, and so on. To respond adequately to the problem of climate change, a lot needs to change: technologies, actions, habits, attitudes, infrastructures, social practices, policies, and institutions. If it makes sense to think of ethics as the study of how we ought to live, then it makes sense to think of the change that is needed as ethical change.

The crucial ethical problem is one of responsiveness, of responding adequately to the current situation. In general terms, the ethical task seems clear: to fashion technologies, habits, attitudes, social practices, institutions, and economies that promote health and well-being in ways that are more just and sustainable. This task requires more than individual change; it requires social and political change. To change the background conditions and structures that encourage emissions requires collective action and social coordination. Of course, such change won't be easy. It



runs up against entrenched habits, the influence of money on politics, and many forms of short-term thinking.

Who is responsible for bringing about the social and political changes that are needed? Many people are responsible because of how they are related to the social structures that unfairly impose the risks of climate change on vulnerable populations and generations. Most of these people do not intend any harm to others, but they participate in or benefit from the background structures that unfairly disadvantage others (Young 2011). Although many people are responsible, they are not equally responsible. Consider three points. People have more responsibility to change the unjust structures when they are more privileged with respect to those structures, when they benefit more from the structures of a carbon-intensive society. People have more responsibility when they have more power, ability, and capacity to change unjust structures. And people have more responsibility when the problem is more serious, when further climate change threatens the minimum needs of vulnerable populations. These points are not necessary and sufficient conditions for holding people criminally responsible, but they are features of political responsibility that are morally salient in many cases.

### 3.4 Conclusion

Since there are few social practices and institutions that hold people accountable for climate change, there is a great need for people to take responsibility. Taking responsibility means accepting some responsibility for the problem and acting with others to create change. People will need to create, develop, and adopt technologies that have less impact on the climate. People will also need to create new ways of living or adapt older ways of living to the current circumstances. But the changes that are needed go beyond new technologies and individual choices. People will need to create new social practices and institutions. Most industrial economies, for example, depend on high levels of emissions and consumption to generate employment and well-being. That needs to change. But climate change may require even deeper changes. People may need to become persons who embody and emphasize different habits and virtues. They may need to place more emphasis on justice, solidarity, resilience, adaptability, modesty of consumption, humility with respect to nature, and a feeling of gratitude for the home the earth provides. To bring about creative changes like these, people may need to place more emphasis on the virtues of active citizenship.

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# Chapter 4

## Climate Change: Causes, Consequences, Policy, and Ethics

David B. Resnik

**Abstract** This chapter describes the causes and consequences of climate change and discusses some of the ethical and policy issues pertaining to climate change mitigation and adaptation. Bioethics scholarship helps individuals and government leaders think about how their decisions impact public health, the economy, social justice, the environment, and the well-being of future generations. A bioethical perspective on climate change can help decision-makers to weigh competing values and consider the global and long-term impacts of their choices.

### 4.1 Climate Change as a Bioethics Topic

In 1971, one of the founders of bioethics, Van Rensselaer Potter, articulated an expansive vision of the discipline. Potter argued that bioethics should address not only local issues that arise in medical practice and biomedical research but also global issues pertaining to public health, social organization, and the environment. Bioethics should also consider the long-term consequences of actions and policies (Potter 1971). Since the 1970s, bioethicists have focused mostly on local issues, such as informed consent, doctor-patient relations, death and dying, abortion, and clinical research, while largely ignoring global ones, such as climate change, population control, energy production, biodiversity, agriculture, and sustainable development (Resnik 2012; ten Have 2012). In the last decade, however, an increasing number of scholars and scientists have argued that bioethicists should address global and environmental issues (Moreno 2005; Selgelid 2005; Dwyer 2009; Resnik 2009, 2012; Macpherson 2013). Resnik (2012) argues that to deal with issues that pertain to human health and the environment, one should expand traditional bioethics principles, such as autonomy, utility, and justice, to include principles that focus on

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humanity's relation to the environment, such as animal welfare, environmental stewardship, sustainability, and precaution.

Climate change is an issue that can benefit from bioethics scholarship (Resnik 2007, 2012; Macpherson 2013). There are at least three reasons why bioethicists should pay greater attention to this topic. First, climate change raises difficult ethical issues involving conflicts among different values, such as economic development vs. environmental protection, individual rights vs. social justice, and national autonomy vs. international cooperation, and the welfare of existing vs. future generations (Gardiner et al. 2010; Brown 2012; Hayward 2012; Macpherson 2013). Second, the probable consequences of climate change (see Box 4.1) may have significant implications for public health and health inequalities, two topics that bioethicists have explored extensively (Singh 2012; Resnik 2012; Macpherson 2013). Third, although environmental philosophers, ecologists, economists, political scientists, and others have investigated and analyzed the social and ethical issues pertaining to climate change, bioethicists can offer a unique perspective on this topic by bringing insights from health care ethics to the discussion (Resnik 2012). For example, bioethicists have written extensively about distribution of health resources in society, which is an important concern in climate change.

#### **Box 4.1: Causes of Climate Change**

Solar activity

Solar radiation naturally fluctuates. Changes in solar activity can increase or decrease global temperatures. From 1650 to 1850 a reduction in the output of solar radiation caused the Little Ice Age in North America and Europe, which resulted in widespread crop failures and famine.

Trapping of infrared radiation

Heat is produced by greenhouse gases such as carbon dioxide (CO<sub>2</sub>), methane, water, ozone, and nitrous oxide. Increases in greenhouse gases in the atmosphere can increase global temperatures. Without greenhouse gases in its atmosphere the Earth would be too cold to support life as we know it. Particulate matter from combustion or volcanic activity can decrease global temperatures.

Blocking of solar radiation

Reflection of solar radiation	Highly reflective materials such as snow, ice and clouds can decrease global temperatures. The eruption of Mount Pinatubo in 1991 lowered worldwide temperatures by 0.5 °C by increasing stratospheric sulfur dioxide, which enhanced cloud reflectivity. The melting of glaciers and polar ice reduces reflectivity.
Increases or decreases in plant populations	Plants, forests, and algae remove CO <sub>2</sub> from the atmosphere.
Ocean currents	Transfer heat energy from warmer to colder locations. Changes in ocean currents can increase or decrease global temperatures.
Continental drift	Creates new land masses and mountains and triggers volcanic activity.

## 4.2 The Causes and Consequences of Climate Change

The Earth's climate has undergone many changes throughout its 4 billion year history and will continue to evolve. During the last 400,000 years, the Earth has alternated between colder, glacial periods (or ice ages) and warmer periods. The last ice age occurred 20,000 years ago, when sheets of ice covered much of North America and Europe. The Earth's climate has remained relatively stable since then. Another ice age will likely occur within the next 10,000 years. The Earth's climate is a highly complex thermodynamic system influenced by many different factors (Solomon et al. 2007; National Aeronautics and Space Administration 2013; Fletcher 2013, see Box 4.1).

For most of the Earth's history, natural factors, such as changes in solar radiation, volcanic activity, continental drift, and the evolution and growth of the biota, were entirely responsible for climate change. For example, the evolution of animals that feed on plants increased levels of atmospheric CO<sub>2</sub> and methane, which increased temperatures and spurred the growth of plants. In the last few hundred years, however, human activities that produce greenhouse gases, such as industry, electric power generation, agriculture, transportation, as well as those that decrease forestland, such as socioeconomic development and land development, have begun

to impact the climate. Population growth has widespread impacts on the climate because it increases the production of greenhouse gases and decreases the removal of atmospheric CO<sub>2</sub> by forests. Between 1980 and 1995, the world lost 120,000 km<sup>2</sup> of forest per year, as a result of agriculture, logging, and land development. Efforts to increase energy efficiency or develop alternatives to fossil fuels can be negated by population increases (Resnik 2012).

While there is some scientific disagreement about the degree to which anthropogenic factors impact the climate, most climate researchers agree that human beings have been at least partly responsible for an estimated 0.75 °C increase in global temperatures since 1900, and that global temperatures will continue to rise between 1.8 °C and 4.0 °C by 2100, unless we take steps to reduce our impact on the climate, such as reducing greenhouse gas emissions (Solomon et al. 2007).

The expected increase in global temperatures will have many different impacts on the environment and human populations (Patz 2010; Resnik 2012; Fletcher 2013, see Box 4.1). These will likely have implications for human values, such as economic prosperity, public health, and justice. For example, rising sea levels may destroy homes, docks, piers, roads, and recreation areas in some coastal regions and require communities to build sea walls and relocate buildings and businesses. Rising sea levels will adversely impact economies and lead to the loss of property and human life. The expected increase in the frequency and severity of tropical storms will cause widespread devastation in some regions and lead to loss of property and human life. Places not usually affected by severe tropical storms will have to make preparations as storm trajectories change and residents find themselves in the path of destruction. Flooding from increased rainfall and tropical storms in some areas will lead to increases in diseases spread by water, which will adversely impact public health. Communities may need to take steps to deal with the impacts of flooding, such as protecting water supplies and building water removal systems. Finally, climate change will have its most pronounced effects on socioeconomically disadvantaged populations, which have fewer resources to deal with floods, tropical storms, droughts, and other problems. For example, Hurricane Katrina had disproportionate impacts on socioeconomically disadvantaged people living in New Orleans and other areas affected by the storm. Climate change has implications for social justice because it can exacerbate existing socioeconomic inequalities (Resnik 2012).

### 4.3 Climate Change and Bioethics

Although climate change is an abstract concept, individuals and societies can make choices that have an impact on global warming. While the impacts of individual choices are negligible, collectively they can have significant effects on the climate. For example, automobiles contribute a great deal to greenhouse gas emissions. How often people drive and the type of vehicle they use have definite effects on the climate. People can reduce their individual impact on climate change by driving less, using mass transit, carpooling, telecommuting, and switching to a more fuel

efficient vehicle. A person who wants to reduce their own impact on the climate may have to sacrifice convenience to reduce their greenhouse gas emissions.

Agriculture plays a key role in greenhouse gas emissions. Food production and transportation produces CO<sub>2</sub>, and farm animals, such as cows, pigs, and chickens, produce methane. A diet in which most of the calories come from ingesting animal products has a greater impact on the climate than one in which most of the calories come from vegetables, fruits, and grains (Resnik 2012). Traditionally, people have opted for vegetarian diets out of concern for the welfare of animals or to promote their own health. Since meat eating can contribute to greenhouse gases emissions, vegetarianism also has implications for climate change.

Reproductive decisions also impact climate change, because population growth leads to deforestation when people clear land for new housing developments, schools and businesses, and population growth also increases energy use. Thus, the decision to have children affects not only one's life plans, family or community, but also the entire globe and future generations.

While individual behavior plays a key role in climate change, most of the ethical and political debate has focused on social choices. Energy use has occupied center stage in climate change debates. Most countries rely heavily on coal to produce electricity. Using alternatives to coal, such as hydroelectric, nuclear, geothermal, solar, and wind power, as well as natural gas and biofuels, can help reduce greenhouse emissions. Although burning coal is currently the cheapest way to produce electricity, governments can reduce dependency on coal by requiring electric companies to derive a percentage of the electricity they produce from alternatives and making it easier for individuals and companies to feed electricity into the power grid. However, alternatives to coal can also have adverse environmental impacts that must be considered when formulating an energy policy. For example, nuclear power produces radioactive waste, natural gas exploration and drilling can contaminate the water supply, building dams to generate hydroelectric power can disrupt ecosystems, and wind turbines can kill birds (Resnik 2012).

Urban planning can help to reduce greenhouse gas emissions. In the last century, cities have grown in a development pattern, known as urban sprawl, in which people live in suburbs outside the main city and often must travel many miles for school, work, shopping, recreation, and so on. Urban sprawl creates an environment in which people depend on automobiles for transportation. Communities can control urban sprawl by adopting zoning regulations that require new housing developments to include convenient access to schools, shopping, mass transit and recreation areas. Communities can also require developers to build sidewalks to encourage walking and bike lanes to encourage biking (Frumkin et al. 2004).

### ***4.3.1 Climate Change Policies and Bioethics***

The two basic policy options that governments and individuals have for dealing with climate change are mitigation and adaptation. Mitigation involves taking steps to reduce the expected rise in global temperatures resulting from human activities.

Most of the mitigation strategies focus on reducing greenhouse gas emissions by increasing energy efficiency of automobiles, appliances, and buildings; developing alternatives to fossil fuels; urban planning to reduce sprawl; support for mass transit and biking and walking; and increasing taxes on fossil fuels. Other mitigation strategies include preventing deforestation; growing trees and other plants to remove CO<sub>2</sub> from the atmosphere; capturing methane from landfills; using machines to remove carbon from the atmosphere and store it; and reducing the use of meat as a source of food. Adaptation includes measures to adapt to climate change, such as building seawalls to protect cities from rising sea levels, reinforcing dams and levees, preparing for tropical storms, developing additional sources of water, implementing crop irrigation systems, and growing drought-resistant crops (Resnik 2012).

Some of the proposals to reduce greenhouse gas emissions could have adverse social and economic impacts that would require significant lifestyle changes. The Kyoto Protocol, which was signed by 84 nations in 1997, required developed nations to limit greenhouse gas emissions to 1990 levels. Proposed mechanisms for reducing emission levels, such as significant tax increases on fossil fuels or a cap-and-trade system for major greenhouse gas producers (such as electric utilities), would drive up the cost of energy. Because energy plays an important role in the economy, these policies could have significant adverse social and economic impacts. A key reason why the U.S. did not ratify the Kyoto Protocol is that it was concerned about the economic costs of complying with it (Resnik 2012).

### ***4.3.2 Climate Change Mitigation***

A key question concerning climate change policy is how much should nations do to mitigate climate change? Doing nothing will likely result in many adverse impacts on the environment, human health, and society (see Box 4.2), whereas taking extensive action to limit greenhouse gas emissions could help prevent some of these dire consequences from occurring or soften their impact. Taking effective action to mitigate climate change is difficult, because it requires nations and individuals to forego short-term benefits in order to prevent long-term harms. Individuals and nations may not be willing to sacrifice their own interests for the common good (or the good of future generations), especially since the problem of climate change is abstract and difficult for most people to comprehend (Gardiner 2006; Brown 2012). Although one might argue that it is actually in an individual's long-term interests to help mitigate climate change, most people will not appreciate this point, since, with the exception of extreme weather events, most of the effects of climate change are not readily perceivable to most people, and some of the worst effects may not occur for many years. Additionally, since climate change is a global problem, policy solutions require considerable international cooperation. Restrictions on greenhouse gas emissions implemented at the state or national level will not be very effective unless other states and nations abide by similar restrictions. Indeed, a nation could gain an economic advantage by not taking significant steps to reduce greenhouse gas emissions.



**Box 4.2: Consequences of Climate Change**

## Rising sea levels

Sea levels are expected to rise between 0.5 and 1.4 m in the next hundred years as a result of melting polar ice caps and glaciers. The rise in sea levels will have a significant impact on coastal cities, such as New York, Miami, New Orleans, Venice, Singapore, and Tokyo, as well as island communities living in Indonesia, Malaysia, Thailand, the Philippines, the Maldives, and other countries. Rising sea levels are likely to impact human living arrangements, urban planning, and agriculture.

## Increased flooding

Floods will occur as a result of rising sea levels, increased rain in some areas, and increases in tropical storm severity and frequency. Flooding may have adverse impacts on infrastructure, agriculture, and access to clean water. Floods will also increase diseases spread by pathogens or parasites that live in the water, such as cholera, typhoid, and diarrhea, malaria, encephalitis, and Deng. Countries prone to flooding as in certain areas, such as Pakistan, India, Bangladesh, and the U.S., will be particularly affected.

## Increased heat waves

Heat waves during the summer months are expected to occur with greater frequency and intensity. 40,000 people died during Europe's 2003 heat wave.

## Increased droughts

Although global warming will put more water into the atmosphere to produce rain, precipitation will be distributed unevenly. Some areas will have floods, while others will have droughts. Droughts will have an adverse impact on agriculture and the food supply, leading to famine in some parts of the world. Droughts will also reduce the amount of potable water available and increase forest fires.

## Increased infectious diseases

In addition to increases in water-borne and pathogenic and parasitic diseases due to flooding, other infectious diseases will increase as a result of changes in the geographic range of different animal populations. For example, changes in the range of rodent and deer populations could lead to increases in Hantavirus and Lyme disease.

Increased allergies	Higher levels of atmospheric CO <sub>2</sub> will increase the growth of plants that trigger allergies. Increased temperatures will also result in increases in tropospheric ozone, which exacerbates asthma.
Decreased fisheries	Rising CO <sub>2</sub> levels will likely increase the acidity of ocean water, which adversely impact organisms that produce shells from calcium carbonate, such as mollusks, corals, and some types of plankton. Reductions in these organisms will negatively impact fish that depends on them for food or shelter. Fisheries will also be impacted by changes in water temperatures, which will affect the habitats of some marine species.
Changes in biodiversity	Some species are already adapting to climate change by modifying their geographic range. For example, fire ants are spreading northward in the U.S. Species that are able to adapt to climate change will maintain or increase in population, while those that have difficulty adapting, such as polar bears, will decrease in population. Some species may go extinct. Because evolution has different impacts on various species, the impacts of climate change on biodiversity are difficult to assess at this point.

Given the practical and political challenges facing policies that require considerable individual sacrifice and international cooperation, one might argue that nations should pursue climate change mitigation policies that are less socioeconomically burdensome before implementing policies that have drastic socioeconomic impacts. For example, private or government investment in research and development on alternative fuels could yield significant dividends. Presently, fossil fuels account for nearly 80 % of the world's energy consumption and are much cheaper than alternatives (Resnik 2012). This could change, however, if alternatives become economically competitive with fossil fuels. Investments in research and development can bring down the costs of alternatives and make them more attractive. Investments in mass transit and urban planning policies that reduce sprawl could also help societies to reduce consumption of fossil fuels without significantly harming their economies. Limits on deforestation could be implemented without drastic impacts (Resnik 2012). Additionally, some scientists have begun to conduct research on geoengineering

strategies. Geoengineering involves the deliberate attempt to alter the climate by blocking solar radiation, increasing cloud reflectivity, or removing CO<sub>2</sub> from the atmosphere through machines or plant growth. However, since geoengineering may have adverse impacts on human health and the environment and raises difficult issues concerning oversight and regulation, geoengineering should be pursued on a precautionary basis. Small-scale projects should be attempted before large-scale ones (Resnik and Vallero 2011).

Regardless of whether individuals, states, or nations take steps to mitigate climate change, some form of adaption is almost inevitable. As sea levels continue to rise, coastal communities will have no choice but to take steps to deal with the changing environment. Indeed, many coastal communities, such as New York and San Francisco, have already begun to make plans for rising sea levels. Additionally, farmers will need to take steps to deal with droughts, and governments will need to find additional sources of water. Communities impacted by tropical storms and floods will need to prepare to respond to these natural disasters.

### ***4.3.3 Climate Change and International Justice***

Climate change raises international justice issues because the human causes and human consequences are likely to be distributed unequally. Up to this point in time, developed nations have contributed more to climate change than developing ones. During the industrial revolution, the U.S., England, Germany, France, and other European countries accounted for the majority of the increase in greenhouse gases. However, in the last few decades other nations that were previously undeveloped have industrialized, and are now major contributors to greenhouse gas production. In 2011, the nations with the highest total greenhouse emissions were China, the U.S., India, Russia, Japan, Germany, South Korea, and Canada. The countries with highest emissions per capita were Netherlands Antilles, Trinidad and Tobago, Qatar, Kuwait, Brunei Darussalam, United Arab Emirates, Bahrain, and Luxemburg (Emission Database for Global Atmospheric Research 2013). Also, as mentioned previously, population growth is a major factor in climate change. While developed nations have stabilized their population growth, developing nations, such as India, Indonesia, Ethiopia, Pakistan, Bangladesh, Nigeria, and Congo continue to grow at a high rate.

Since climate change will have a variety of impacts on different nations, it is difficult to accurately predict how the effects of climate will be distributed. For example, in North America some areas will be impacted by droughts and floods, while other areas may suffer no adverse effects or may even prosper. Some parts of Canada that are too cold for agriculture may be better able to support it. In the U.S., decreased precipitation may lead to droughts in southwestern states, but increased precipitation may benefit agriculture in Midwestern states (National Aeronautics and Space Administration 2013). That being said, it is likely that island nations will have more harmful than helpful impacts of climate change, due largely to rising sea levels, which will not be offset by any gains. Additionally, developing nations and

socioeconomically disadvantaged people living within developed nations will have the most difficulty adapting to climate change, due to a lack of economic resources (Patz 2010). Thus, climate change has the potential to exacerbate existing socioeconomic inequalities among different nations and among people living within the same nation (Resnik 2012).

Some have argued that developed nations have greater moral responsibilities for responding to climate change than developing ones. This argument is based on two different rationales. The first is that responsibility for dealing with a problem should be based on one's contribution to it. Since developing nations have contributed more toward anthropogenic global warming over the last 150 years than developing ones, they bear a greater moral responsibility. The second is that responsibility for dealing with a problem should be based on one's ability to handle it. Since developed nations have more social and economic resources to deal with climate change than developing ones, they should bear a greater responsibility for dealing with it. Developed nations may be able to reduce their greenhouse gas emissions without severe consequences to their economies, but requiring developing nations to make similar reductions could cripple their vulnerable economies. Developed nations may be also able to afford to provide financial assistance to developing nations impacted by climate change (Baer et al. 2008).

International climate change treaties negotiated in the 1990s were crafted under the assumption that developing nations should bear a greater moral responsibility for dealing with climate change. The Kyoto Protocol exempted developing nations from greenhouse gas emission restrictions. The U.S. objected to exempting developing nations from the treaty, and the fact that China and India did not sign it (Resnik 2012).

Some have objected to the idea that developed nations should bear a greater responsibility for dealing with climate change (Posner and Weisbach 2010). First, one could argue that while developed nations have played a significant role in anthropogenic global warming up to this point in time, in the future, developing nations will play a greater role. For example, China, India, Brazil, Indonesia, Ethiopia, and other countries that contributed relatively little to global warming in the twentieth century will play an increasingly significant role in global warming in the twenty-first century, as their economies continue to develop and their populations increase. Responsibility for addressing global warming should be based on future contributions to global warming, not just past ones. Second, one could argue that although reducing greenhouse gas emissions will have a greater economic impact on developing nations than on developed ones, developed nations will also suffer adverse economic consequences. It is unfair, one might argue, to expect developed nations to bear the brunt of the economic consequences of climate change mitigation while exempting developing ones. Third, one might also argue that using climate change treaties to deal with issues of international justice is ill-advised, because this will fuel resentments and interfere with international cooperation. The most prudent course of action is to develop treaties that all countries, especially those that play a prominent role in anthropogenic global warming, are willing to accept (Posner and Weisbach 2010).

As a result of these and other arguments, more recent climate change treaties reflect the principle of shared responsibility. In 2011, dozens of nations adopted the Durban Platform, an agreement in principle, not a treaty, which calls for all nations to do their part to reduce greenhouse gas emissions and requires developed nations to establish a fund to help developing nations adapt to climate change (United Nations 2013). The Durban Platform holds that all nations have a responsibility to deal with climate change, but also recognizes that developing nations need some additional help to adapt to the consequences of climate change. Climate change negotiations among countries, such as the Paris Agreement of 2015, and internal debates in countries are continuing as of the writing of this article. Bioethics can contribute to these discussions by helping decision-makers to appreciate the competing values that are at stake and facilitating reasoned debate.

## 4.4 Conclusion

Many of the personal and policy choices that people have regarded as a matter of economy, convenience or personal preference take on an added ethical dimension when one considers their cumulative impacts on the climate. Bioethics scholarship can lend some insight to these choices by helping individuals and government leaders think about how their decisions affect public health, the economy, social justice, the environment, and the well-being of future generations. A bioethical perspective on climate change can help decision-makers to weigh and consider competing values and consider the global and long-term impacts of their choices. Appreciating the ethical dimensions of individual behavior and government action can motivate decision-makers to make choices that strike a reasonable balance among competing values and acknowledge the importance of taking appropriate measures to deal with climate change.

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# Chapter 5

## Ethics, Climate Change and Infectious Disease

Euzebiusz Jamrozik and Michael J. Selgelid

**Abstract** This chapter focuses on the risks from infectious diseases whose geographic and epidemiological distribution is evolving with climate change. Major examples with strong evidence of such effects include (i) mosquito vector-borne diseases such as malaria and the arboviruses, and (ii) diarrhoeal diseases such as cholera and salmonellosis. Yet the burden of many other viruses, bacteria and parasites, is also likely to increase by similar mechanisms, and be felt first and foremost in poor, marginalised and displaced communities, raising issues of international justice. This chapter summarises the evidence for links between climate and infectious pathogens, and the common ethical issues that arise. Addressing these diseases and related global health inequality requires immediate action, particularly aimed at (i) reducing or reversing climate change, (ii) predicting future harms, and (iii) harm reduction where the risk of disease and death from infection is already increasing. There is a strong ethical case for wealthy countries to act in order to mitigate harm and injustice among vulnerable populations. This chapter ends with a discussion of how ethical analysis can guide health policy and practice at all levels.

### 5.1 Introduction

Anthropogenic climate change is already having negative impacts upon the health of human individuals and populations in numerous ways, and relevant harms are expected to increase in the coming decades. Increases in temperature cause direct thermal stress, while more frequent extreme weather events adversely influence food yields and displace vulnerable populations. Temperature increases combined with pollution raise the risk of non-communicable diseases – including respiratory and cardiovascular disease. The risk of many infectious diseases is also increased via multiple mechanisms, which are described in detail in this chapter. Conservative World Health Organisation estimates suggest that climate change was already causing 150,000 excess deaths per year by the year 2000, and this mortality rate is

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expected to increase (Ezzati et al. 2004; Patz et al. 2005). While such harms have initially, and primarily, affected impoverished regions (especially Sub-Saharan Africa)—and especially the poor and marginalised within these regions (Patz et al. 2007)—the risks of death and disease are expected to grow, and their distribution to expand widely in coming years.

This chapter focuses on (i) current evidence regarding the ways in which climate change is driving the spread of globally important infectious diseases in humans; (ii) future predictions of these phenomena; (iii) ethical implications of these adverse impacts on; and (iv) ways in which these risks should influence global and regional health policy both now and in the future. There is already a strong ethical case to do more to combat these infectious diseases. *Inter alia*, this is important to reduce currently preventable harms and death, and to help reduce global inequality that is at least partially reflected by high prevalence rates of infectious diseases in poor populations (Selgelid 2008). Reducing the burden of these diseases now will also proportionately reduce harms expected to increase as a result of climate change.

Though it is beyond the scope of this chapter, climate change is also expected to drive an increase in infectious diseases in plants and animals. This may also affect human health in diverse ways—for example, through the emergence of new zoonoses and decreased food security due to diseases among crops and livestock (Wheeler and von Braun 2013; Epstein 2001).

## 5.2 Infectious Diseases

Climate change is likely to influence the incidence and prevalence of infectious diseases caused by microbes from many branches of the phylogenetic tree including viruses, bacteria, fungi, and parasites (Table 5.1). Small increases in temperature can significantly increase rates of microbial replication and development, facilitate expansion of vector habitats, and alter mosquito breeding and biting behaviour. More complex interactions occur at the level of extreme weather events, displacements of human populations and alterations in human behaviour.

Poverty, limited health infrastructure, and political and geographic vulnerability are major factors that increase susceptibility and vulnerability to infectious disease in different contexts. Such social determinants of health will contribute to the unequal distribution of harms arising from climate change and further exacerbate existing patterns of global injustice. For many infectious diseases, it is difficult to attribute increased risk specifically to climate change due to the complexities of changing human population density, migration, vector dynamics, and implementation of disease control interventions (prevention of infection, access to treatments) and changing healthcare infrastructure—each of which contribute in different ways to changing patterns of disease. Nevertheless, emerging data indicates that climate change has a significant role in the regional patterns of a number of infectious diseases, and the causative mechanisms involving temperature and extreme weather



**Table 5.1** Infectious diseases influenced by climate change

Disease	Organism	Vector/transmission	Mechanism
<b>Malaria</b>	<i>Plasmodium spp.</i> (parasites)	<i>Anopheles</i> mosquitoes	Vector expansion, parasite replication
<b>Arboviruses</b>	Dengue, Yellow Fever, Japanese Encephalitis, other arboviruses	<i>Aedes</i> Mosquitoes	Vector expansion, viral replication
<b>Tick-borne Encephalitis (TBE)</b>	TBE virus	Ticks	Vector expansion
<b>Cholera</b>	<i>Vibrio cholerae</i>	Water	Algae, water temperature, flooding, extreme weather
<b>Salmonella</b> and other diarrhoeal disease	<i>Salmonella typhi</i> and other enteric bacteria	Food	Bacterial replication, human behaviour
<b>Schistosomiasis</b>	<i>Schistosoma spp.</i> (parasites)	Snails	Vector expansion/reduction
<b>Leishmaniasis</b>	<i>Leishmania</i> (parasite)	Sand-flies	Vector expansion
<b>Onchocerciasis</b>	<i>Oncocerca volvulus</i> (parasite)	Black flies	Vector expansion
<b>Chagas Disease</b> (American Trypanosomiasis)	<i>Trypanosoma cruzi</i> (parasite)	Triatomine bugs	Vector expansion
<b>African Trypanosomiasis</b>	<i>Trypanosoma brucei</i> (parasite)	Tsetse flies	Vector expansion
<b>Rickettsial</b> (incl. Lyme disease)	Rickettsial bacteria	Ticks	Vector expansion
<b>Leptospirosis</b>	<i>Leptospirae</i> (bacteria)	Rats	Vector expansion, extreme weather events
<b>Melioidosis</b>	<i>Burkholderia pseudomallei</i>	Soil	Extreme weather events

events in outbreaks are well described, although there is scope to improve prediction methods so as to anticipate and respond appropriately to outbreaks.

While climate change will no doubt influence trends in infectious diseases, the best predictors of infection, severe diseases, and death, remain socioeconomic factors: especially poverty (Lafferty 2009) and the vulnerability associated with the extremes of age (the very young and the elderly). In what follows, we assess the empirical evidence regarding the effects of climate change on a range of infectious diseases and then discuss the ethical implications of associated harms with a focus on those most at risk.

### 5.2.1 Malaria

Malaria is a major infectious disease (Table 5.2) whose distribution is expected to increase as the world gets warmer and weather patterns change, especially rainfall which promotes mosquito breeding (Githeko et al. 2000; Martens et al. 1995). At present, malaria kills approximately one million people per year, mainly children under five in Sub-Saharan Africa. It infects many millions more in tropical zones worldwide, and about half of the world's population live in zones where malaria is present (Epstein 2005). Malaria is caused by *Plasmodium* parasites transmitted to humans by *Anopheles* mosquitoes. Of the four *Plasmodium* species *falciparum* and *vivax* are the most epidemiologically important worldwide in terms of mortality and morbidity, with *falciparum* causing the most deaths. A one degree Celsius increase in temperature has been shown to significantly shorten the time required for the maturation of malaria parasites (of any species) within mosquitoes (Epstein 2001), meaning that in a warmer world, other factors being equal, the burden of malaria infections transmissible to humans is expected to increase.

Small changes in climate can also significantly expand the habitat of *Anopheles* mosquitoes and lead to increased human blood feeds and thus malaria transmission. For example, increased rainfall can result in larger populations of *Anopheles* mosquitoes. Warmer temperatures can increase mosquito lifespan and breeding, and promote prolonged daily feeding times that are increased in duration by warmer nocturnal temperatures and also by corresponding changes in human behaviours. While all of these factors increase the rate of malaria transmission, the relationships between malaria and climate change are highly complex. Some areas with reduced temperatures under certain climate change scenarios may experience reduced transmission, and other climatic factors not yet identified may also influence mosquito numbers and malaria risk (McMichael et al. 2006). However, overall estimates suggest that climate change will lead to an increase in malaria cases, and that the burden of this increase will mostly be borne in highly endemic regions of Sub-Saharan Africa (McMichael et al. 2006). Clearly, areas with the highest pre-existing human disease burden have the greatest capacity for large outbreaks, and an increase in the density of endemic infection.

Studies investigating links between malaria and climate change suggest that climatic factors have already contributed to the spread of malaria in East Africa (Hay et al. 2002), and even the re-emergence of *vivax* malaria in Greece (Andriopoulos et al. 2013), although these findings are controversial because diverse causes including recent economic factors may also have contributed. Other regions that have successfully eliminated malaria—including Southern Europe, the Southern United States, and Northern Australia (Martens et al. 1999)—may also be at risk of its re-emergence in places where temperature or rainfall increases. One study of the numbers of people in malaria-free zones who could be newly at risk of malaria by 2080 because of these factors estimates up to 300 million more people at risk of *falciparum* malaria, and up to 150 million more people at risk of *vivax* malaria (Martens et al. 1999). In the case of *falciparum*, this reflects an increase of over

**Table 5.2** Global burden of climate-sensitive infectious diseases and risks of expansion with climate change

Disease	Current estimates			
	Global deaths annually (×1000)	Global DALYs annually (×1000)	Curative treatment	Vaccine
Malaria <sup>a</sup>	1169	82,869	Yes	No <sup>f</sup>
Dengue (DHF) <sup>b</sup>	14.7	830	No	No
Yellow Fever <sup>b</sup>	<1	<1	No	Yes
Japanese Encephalitis <sup>c</sup>	13	604	No	Yes
Cholera <sup>d</sup>	93	N/A	Yes	Yes
Salmonella <sup>e</sup>	216	N/A	Yes	Yes
Schistosomiasis <sup>b</sup>	11.7	3310	Yes	No
Leishmaniasis <sup>b</sup>	51.6	3320	Yes	No
Onchocerciasis <sup>b</sup>	0	490	Yes	No
Chagas Disease <sup>b</sup>	10.3	550	Yes	No
African Trypanosomiasis <sup>b</sup>	9.1	560	Yes	No

Some diseases from Table 5.1 are excluded due to smaller numbers or a lack of reliable data

N/A Not available

DALYs Disability adjusted life years, one DALY equals 1 year of healthy life lost due to death or disability

Data from: <sup>a</sup>Lozano et al. (2013)

<sup>b</sup>Hotez et al. (2014)

<sup>c</sup>WHO (2002)

<sup>d</sup>Ali et al. (2012)

<sup>e</sup>*S. typhi* only Crump et al. (2004)

<sup>f</sup>Partially effective vaccine which, at time of writing, is not yet in widespread use

10 % more than the 2.4 billion currently at risk. Risk estimates may evolve with improvements in surveillance data from developing regions, as well as inclusion of the impacts of malaria control initiatives which, where effective, may help to decrease the attendant risks related to climate change.

For malaria control, effective preventative measures (such as insecticide-treated bed nets) and curative drug treatments exist (although resistance to first line artemisinin combination therapy is increasing, especially in border zones of South-East Asia). Where available, these strategies can substantially mitigate malaria mortality and morbidity, and expansion of malaria control efforts has reduced malaria mortality during the last decade by approximately 40 % globally (WHO 2012). There is thus an ethical imperative to improve access to these cost-effective control measures—and to ultimately make them universally available in malaria-endemic regions. At present, global funding for malaria programs is approximately half of the amount required to fully implement them (approximately US\$5 billion) (WHO 2012). The effects of climate change may increase this shortfall and lead to a resurgence of deaths and disease due to malaria in some regions. Improving availability of prevention and treatment for malaria in endemic areas now would reduce future risk. The same holds true for other diseases (discussed below) where effective prevention and cure are available (Table 5.2).

### 5.2.2 *Arboviruses*

Arboviruses, transmitted by the mosquito species *Aedes aegypti*, are a major group of mosquito-borne diseases whose global distribution may increase with climate change. Over 200 arboviruses are known to cause disease in humans and animals. Geographically widespread, and clinically significant, arboviruses include Yellow Fever (with a high mortality largely prevented by vaccination) and Dengue Fever (with mortality due to repeated infection and dengue haemorrhagic fever). Other arboviruses (Japanese Encephalitis Virus, West Nile Virus, Chikungunya, Rift Valley Fever, Murray Valley Encephalitis, Ross River Virus) cause less mortality but significant morbidity, and the geographic distribution of most if not all of these infections has expanded in recent years into regions that have become warmer due to climate change.

Prior to the development of a vaccine and major control efforts in the early twentieth century, Yellow Fever caused epidemics with significant mortality in Africa and South America, as well as in North America (Rogers et al. 2006). Today, Yellow Fever is well controlled by widespread vaccination in endemic regions (Table 5.2), yet 2.5 billion people are annually exposed to *Aedes* mosquitoes annually and are thus potentially at risk of Yellow Fever, Dengue, and other arboviruses (Rogers et al. 2006). The Yellow Fever vaccine is generally considered to be safe, effective and inexpensive; so there is an ethical imperative to maintain full vaccine coverage in at-risk populations in order to dramatically reduce the avoidable disease, death and healthcare costs associated with infection.

Although Dengue (for which no vaccine is available) causes fewer deaths than malaria, its most severe form (Dengue Haemorrhagic Fever) is severe, with a high mortality rate, and significant epidemics cause major morbidity by infecting a large proportion of populations exposed (Rogers et al. 2006). In contrast, Japanese Encephalitis is preventable via an existing vaccine which, when widely deployed, is effective in reducing disease burden (Beasley et al. 2008); however, in some countries it is either too expensive or not licensed for use (Tsai 2000). Thus, in endemic regions of Asia the disease causes similar rates of death and morbidity as Dengue (Table 5.2) (Mackenzie et al. 2004). West Nile Virus (WNV) is generally less severe, though the last decade has seen a gradual increase in its global distribution, including a steady progression across the majority of the continental United States, illustrating the potential for other arboviruses to spread to new regions where populations of *Aedes* mosquitoes are already present or may be present in the future (Mackenzie et al. 2004).

Other related arboviruses causing significant morbidity in specific regions include Chikungunya, Rift Valley Fever, Murray Valley Encephalitis and Ross River Virus. Relevant mosquito populations are sensitive to temperature and to extreme weather events such as flooding, which is a known precipitant of mosquito-borne disease outbreaks. Mortality from these viruses is rare, but significant morbidity is a major population health problem where epidemics occur or endemic infection becomes established (Friel et al. 2011).

*Aedes* mosquitoes capable of transmitting arboviruses are widespread in Europe and the continental United States, and warmer climate predisposes to greater human-mosquito interaction year round, and therefore to greater risk of progression from an outbreak to epidemic or endemic infections. Based on mosquito density and climate variables, mathematical modelling indicates a theoretical possibility that a single infected traveller introducing the arbovirus Chikungunya to the continental United States could result in this virus becoming endemic in warmer parts of the country, and this would necessitate costly prevention efforts and loss of productivity due to morbidity (Ruiz-Moreno et al. 2012) This is of particular concern as the first cases of local transmission of Chikungunya in Puerto Rico (Staples and Fischer 2014) and Florida (Kuehn 2014) were reported in mid-2014, necessitating increased efforts in active public health surveillance. Apart from supportive care, there are no effective treatments available for arboviral infections, and vaccines are available only for Yellow Fever and Japanese Encephalitis. While prevention in the form of mosquito nets and bite avoidance remain important, these measures may be difficult to attain in impoverished and/or displaced populations, and this poses an ethical concern about their access to such measures.

The development and availability of effective vaccines for other arboviruses (e.g. Dengue, West Nile Virus, Chikungunya) would greatly improve the ability of national and international public health agencies to mitigate the human costs of infection by preventing or controlling epidemics, including those precipitated or worsened by extreme weather events and climate change. A number of Dengue vaccines are currently in early clinical trials (Webster et al. 2009) and, if effective, their widespread availability could have a dramatic effect on disease burden, just as an effective Yellow Fever vaccine helped to control or eliminate it in some regions in the past.

### 5.2.3 *Neglected Vector-Borne Tropical Parasites*

Important vector-borne parasites (and their vectors) include Leishmaniasis (sand flies), Onchocerciasis (black flies), Chagas Disease (triatomine bugs), African trypanosomiasis (tsetse flies), and Schistosomiasis (freshwater snails), which together cause significant morbidity and mortality, predominantly in Sub-Saharan Africa (Table 5.2) (Hotez and Kamath 2009). These are five of the ‘neglected tropical diseases’ that have only recently been subjected to intensified scientific study of trends in infection. While there are around 20 ‘neglected tropical diseases’ (Farmer 2013), we focus on these five as they are vector-borne and have been best studied in the context of climate change. Further data and models of future risk are urgently needed, including for diseases not discussed here such as intestinal helminth infections, which are a major contributor to global morbidity, especially in developing nations (Hotez and Kamath 2009).

Treatments are available for Leishmaniasis, Onchocerciasis, Chagas, African Trypanosomiasis, and Schistosomiasis, but the impoverished populations that they

most often infect have variable—and usually minimal—access to healthcare. The insect vectors for the four former diseases are sensitive to changes in climate, with warmer conditions predisposing to greater interaction between vectors and humans. The current paucity of epidemiological data regarding these diseases is largely due to poverty in endemic areas, with poor healthcare infrastructure including diagnostics and public health surveillance databases. This makes it difficult to draw conclusions regarding the impact of recent and future climate change on their incidence and prevalence (Githeko et al. 2000), thus the provision and maintenance of adequate data collection as well as treatment programs is an ethical priority for all neglected tropical diseases.

The effects of climate change on schistosomiasis are likely to be more complex. There are three major parasite species causing human infection (*Schistosoma mansoni*, *S. haematobium*, *S. japonicum*), each with different geographical distributions that together are spread widely across tropical and sub-tropical zones. Over 80 % of schistosomiasis cases occur in Africa and are due to *S. mansoni* and *S. haematobium*. The latter is also found in the Middle East, whereas *S. japonicum* occurs in Japan and South-East Asia. The vectors of these parasites are snails, which require fresh water and hibernate at low temperature. Parasite development within snails requires minimum temperatures of around 15° centigrade (Zhou et al. 2008). As a result, while higher temperatures promote infection, local variations in rainfall and drought may decrease snail populations available for transmission. Some regional models thus predict an increase in schistosomiasis due to climate change (Zhou et al. 2008), while global rates of infection may actually decrease (Patz et al. 2005). Further local data are required in relevant regions to clarify future trends.

#### 5.2.4 Cholera and Salmonellosis

Diarrhoeal disease is a major global cause of morbidity and mortality, especially among the poorest populations worldwide and, in particular, among young children within these groups (Sheffield and Landrigan 2011). Multiple causes of diarrhoea exist and commonly co-exist in such populations in the context of malnutrition and widespread infection with viral, bacterial and parasitic pathogens. Enteric bacteria causing infections such as cholera and typhoid salmonellosis together cause over 300,000 deaths per year (Table 5.2), and cholera in particular is prone to epidemics. These two pathogens have been most widely studied in relation to climate change and will be the major focus of discussion here, although climate change may have diverse effects on other causes of diarrhoeal morbidity and mortality that are, as yet, incompletely understood. Decreased hygiene in the context of drought may be one way in which local climate factors influence infectious diarrhoeal disease.

Cholera is caused by exposure to water or food contaminated by the bacteria *Vibrio cholera*, and constitutes a major global disease with a high case fatality rate. Fluctuations in sea surface temperature are strongly correlated with rates of cholera

in affected areas, with warmer temperatures in areas such as the Bay of Bengal producing higher rates in adjacent countries—e.g., India and Bangladesh (Lipp et al. 2002). In South Asia as well as Central and South America, warmer temperatures and extreme weather events associated with El Niño have been implicated in cholera outbreaks (Pascual et al. 2000).

Related non-cholera *Vibrio* bacterial infections have been increasing in multiple regions, including the northern hemisphere, (partly) due to an increase in sea surface temperatures (Baker-Austin et al. 2012). On the Baltic coast of Europe, warmer years have seen higher rates of *Vibrio* disease; and modelling estimates suggest that a one-degree rise in sea temperature can double the population risk of infection (Baker-Austin et al. 2012).

Typhoid (*Salmonella typhi*) and paratyphoid fever (*S. paratyphi*) are major food-borne enteric bacterial infections, with the former causing significant global mortality (Table 5.2), which are also closely linked with temperature. A one-degree increase in ambient temperature has been shown to produce at least five per cent more cases of *Salmonella* infection in temperate zones, and the effect may be even greater in tropical climates (D'Souza et al. 2004). Clearly, even low levels of global warming can therefore contribute to significant increases in food-borne infections and resultant costs to society in both developed and developing nations (Bambrick et al. 2008).

### 5.2.5 Other Bacterial Infections

Climate sensitive non-enteric bacterial infections include rickettsiae (Lyme disease and others), leptospirosis, and melioidosis. Tick-borne rickettsial diseases are spread in a wider distribution at higher latitudes than many so-called tropical diseases. Some data suggest that warmer winters in the northern hemisphere are driving an increased risk of rickettsial infection due to tick vector expansion and human behaviour resulting in higher incidence in North America (Githeko et al. 2000) and Northern Europe. Viral tick-borne encephalitis—though not related to rickettsial bacteria—has also increased in Scandinavia, possibly due to warmer winters (Lindgren and Gustafson 2001).

Leptospirosis—transmitted to humans by rats and contaminated water—is strongly influenced by overcrowding, poverty and inadequate sanitation in urban slums (Reis et al. 2008). Extreme weather events including hurricanes, cyclones and flooding are well-recognised causes of leptospirosis outbreaks and the anticipated increase in such events due to climate change is a major concern for increasing leptospirosis disease burden among vulnerable populations (Lau et al. 2010). Notably, leptospirosis is also present in many countries in temperate zones, although in restricted geographical areas, and producing clinical cases and death more rarely. Yet the potential remains for the disease to spread in the context of natural disasters or increases in the population of rodent vectors (Epstein 2005). Worldwide, data on leptospirosis epidemiology are generally poor (Abela-Ridder et al. 2010), and it is

important to know the current burden of disease in order to guide public health responses now and in the context of future climate change.

Similarly, melioidosis, caused by hardy *Burkholderia* bacteria that persist for long periods in soil and other environmental niches, has been shown to be sensitive to extreme weather events which have been linked to seasonal disease variation and outbreaks in Brazil (Rolim et al. 2005) and northern Australia (Inglis 2009). However, it can be difficult to diagnose, there is currently insufficient high-quality regional and global data on the epidemiology of melioidosis.

### 5.3 Ethics, Climate Change and Global Infectious Diseases Health Policy

As is often discussed in environmental ethics, a core ethical problem is an asymmetry between those who are responsible for the actions that lead to climate change related harms, and those who suffer such harms (Gardiner 2010). While the greatest producers of greenhouse gases per capita are wealthy citizens of industrialized countries, the harms of climate change are likely to be felt first and—in the long-term—most severely by the poor, by children and other vulnerable populations, and by future generations (Gardiner 2010). WHO estimates suggest that 99% of the disease burden already attributable to climate change occurs in developing countries; and, of that, 88% in children under five (Sheffield and Landrigan 2011)—i.e., the populations already at greatest risk of malaria and diarrhoeal diseases, as discussed above.

Anthropogenic climate change is largely a consequence of industrialization (and the associated greater production of greenhouse gases). The responsibility for climate change is thus highest among countries with a long duration and/or high intensity of fossil fuel use. In the last decade, developing nations have overtaken developed countries in terms of total annual greenhouse gas emissions, yet (i) per capita emissions are still much higher in developed nations (although this is changing fast), (ii) many developing countries pollute in the process of producing goods for consumption in developed nations, and (iii) developed nations have a much longer history of being the major contributors to climate change.

While fossil fuel use may produce local health and other problems due to air and environmental pollution, climate change is a global problem. The damages to human health related to climate change are already disproportionately shouldered by poor communities that are less able to adapt due to insecure water and food supplies, insufficient protective and preventative measures, poor healthcare systems, and a higher prevalence of infectious diseases that are influenced by global warming. Climate change therefore represents a major problem of global injustice, and one in which injustices are being perpetuated and exacerbated by current practices, including the ongoing contributions to climate change by developed nations, and international economic policies which perpetuate disadvantage (Pogge 2008).



There is an ethical imperative for global and regional policies to address three areas: (i) prevention of climate change by reduction of greenhouse gas emissions, (ii) improvements in predicting the infectious diseases risks related to climate change, which have already begun to grow, and (iii) harm reduction through continued and intensified programs of disease prevention (including development of new drugs, vaccines and diagnostics—and increasing access to such things) where they are most needed. This imperative stems from a need to reduce current and future harms, as well as to reduce global injustice and inequality that may be exacerbated by an increase in infectious diseases in the context of climate change.

## 5.4 Prevention of Climate Change

At every level of global society, there is an urgent need for nations, communities, and individuals worldwide to reduce their contribution to climate change through a reduction of fossil fuel use and an increase in reforestation, as well as to prepare and support policies that anticipate adverse effects on health in a warmer world. Until recently, policymakers have largely ignored the negative health effects of climate change, and these harms are expected to increase (McMichael et al. 2006). Developing nations will clearly require ongoing fossil fuel use (or alternative forms of affordable energy) as more of their populations are gradually lifted out of extreme poverty. It is likely to remain the case that the poorest people in the world contribute least per capita to climate change and have the greatest need to burn fossil fuels in order to achieve minimum levels of quality of life. At an international level, wealthy countries have a duty to reduce their contributions to climate change as much as possible, as well as to assist poorer nations to develop sustainably. These duties arise because, to date, the greatest benefits of greenhouse gas producing industrialization have been accrued in developed countries while the burdens of climate change will be shared unevenly—the poor in both affluent and impoverished countries will be more likely to experience harms sooner and to a greater degree. In the present, individuals in both developed and developing nations have duties towards future generations to minimize the harms that will arise due to climate change. The specific harms related to the context of infectious diseases, and means to reduce them, are discussed below.

## 5.5 Prediction of Harms

In recent decades there has been a dramatic improvement in the accuracy of global climate models owing to greater international attention, computational resources, and more climate data becoming available. This has not only strengthened the evidence for human-induced climate change beyond all reasonable doubt, but can now

also be used to predict the negative health impact of climate change. Despite the complexity of infectious disease epidemiology (influenced perhaps most strongly by control programs and socioeconomic factors), climate change and global temperature rise has been clearly implicated in the increased risk of a number of major infectious diseases discussed above, especially malaria, arboviruses, cholera, and salmonellosis. Data collected after extreme weather events has demonstrated epidemics of these diseases and many others, and these retrospective data may eventually be helpful in predicting, and securing adequate resources to deal with, outbreaks after future natural disasters.

Although global models are important, generating local and regional data including temperature, rainfall, and other variables relevant to rates of climate-sensitive infections is a vital step in planning the response to increased rates of disease (Altizer et al. 2013; Thomson et al. 2006). Climate models have already facilitated strengthening of prevention and treatment programs. For example, local climate data for Botswana (including temperature, rainfall, and other variables) were used to successfully predict seasons with a particularly high risk of malaria several months in advance, fostering the deployment of healthcare measures appropriate to the anticipated incidence rate (Thomson et al. 2006).

For some diseases, such as leptospirosis, meliodosis and many ‘neglected tropical diseases’, there are few current high quality data for affected regions, making current public health priority setting and treatment programs difficult, as well as future predictions fraught with uncertainty. Fortunately, recent work has focused attention on this lack of data, and, for example, members of the WHO Global Burden of Disease study have produced some early analyses of neglected tropical diseases, while noting that incomplete local data make regional and global estimates difficult at present (Mathers et al. 2007).

The crucial point here is that there is an ethical imperative that more relevant research gets done, both on the current and future burden of disease—e.g., because (in the latter case) we will be best able to mitigate the harmful effects of climate change on health if we are better able to predict what they would (otherwise) be. Such research requires the collaboration of the WHO and other international health agencies with regional and local health authorities, including healthcare workers many of whom practise in under-resourced settings. Ideally, local healthcare workers would be both producers as well as consumers of research, even if final analyses are not done on site. Thus education, scholarships for further training, and research on implementation of existing findings may be valuable ways to both improve data as well as the quality of healthcare delivery.<sup>1</sup> A continued interest from international groups such as the Global Burden of Disease study, among others, will help to inform global health policy debates and attract funding and researchers to neglected diseases. In the context of climate change, linking epidemiological and outbreak data

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<sup>1</sup>For an example of translational research initiatives, see the WHO Special Programme for Research and Training in Tropical Diseases Toolkit: <http://www.who.int/tdr/publications/topics/ir-toolkit/en/> (Accessed online 31-March-2014).

with climate variables will improve understanding of the associated risks and the potential to reduce future harms.

## 5.6 Harm Reduction

Recent decades have seen a dramatic increase in international funding for prevention, treatment, and research programs related to many of the infectious diseases discussed in this chapter, resulting in significant reductions in the rates of morbidity and mortality worldwide. Yet global funding for malaria control is less than half the level required level to ensure adequate coverage of endemic areas, and the persistence of large disease burdens for each pathogen discussed in this chapter (Table 5.2) supports the moral claim that more should be done. Continued and intensified prevention, treatment, and research programs are vital in order to promote global health, reduce inequality and also respond to the increasing rates of disease due to climate change.

Wealthy nations should continue—and strengthen—assistance to poorer countries and communities in order to improve their ability to mitigate the harms of climate change. The necessary assistance includes improvements in water and food security, healthcare systems, diagnostic infrastructure, treatment and vaccine supplies, disaster response mechanisms, local climate models and research and surveillance capacity-building. Additional research should particularly aim at local predictions of extreme weather events and disease outbreaks, and at improved disease treatment and prevention—e.g., development of more/better drugs, diagnostics and (especially) vaccines for neglected diseases. Given the strong relationship between poverty and disease burden, primary goals of global harm reduction and equality promotion would both be promoted by ensuring that a maximum proportion of the world's population is free of preventable infectious diseases.

One group of people at especially high risk of an increase in infectious diseases from climate change will be refugees and other displaced communities whose numbers are likely to increase in the context of extreme weather events, sea level rise, and reductions in food and water security. Poverty, malnutrition, multiple co-existing infections, lack of infrastructure, and political vulnerability all contribute to a higher risk among such groups. In addition to health implications, a related concern is the social distancing measures such as isolation and quarantine will be used to control the movements and limit the liberty of migrant populations. Such measures have frequently been used inappropriately against marginalized groups in the past. There is a significant risk that such measures could again be used with the ostensible aim of containing the spread of infections such as cholera, resistant malaria, and tuberculosis.

Providing assistance to these and other highly vulnerable populations is an ethical imperative that is only strengthened by the observation that climate change, caused largely by the rich and powerful, is likely to swell the numbers of refugees worldwide in the coming decades. Refugee populations are among the 'worst off' groups

in global society, and multiple factors including climate change and disease conspire to make these groups even worse off in the future. This represents a potential ethical tragedy that requires sustained national and international policy efforts to be mitigated or averted.

There are also clear implications for security. As competition for scarce resources increases and large numbers of people are placed in desperate situations due to poverty, inadequate nutrition, inequitable disease burdens, and forced migration due to natural or human forces, political unrest and small or large scale conflicts are likely to result. Wealthy nations thus have a degree of self-interest in preventing climate change and anticipating the attendant health risks. The potential for infectious diseases to increase or spread to new areas, including in the developed world, provides an additional self-interested reason for wealthy nations do more to reduce global disease burdens and investigate new strategies for treatment and prevention (including climate change reduction).

## **5.7 Conclusions and Future Directions**

Climate change is already adversely affecting human health, and its health effects are anticipated to increase in the future. One major threat to health is the increased risk of infectious diseases due to higher temperatures, vector expansion, extreme weather events and population vulnerability to infection due to poverty, and lack of adequate food, water and healthcare. Climate change has already been linked to increased rates of disease and death due to malaria, arboviruses, cholera and salmonellosis. Many other bacterial and tropical parasitic diseases may also become greater problems and may expand into regions previously free of such infections. Extreme weather events have been implicated in epidemics of multiple infectious diseases as well as with damaging physical and mental health in other ways, and climate change is contributing to higher risks of such events now and in the future.

In a world already characterized by great global inequality, climate change is a clear case of harms inflicted first and foremost on the poor, resulting from the long-standing and ongoing energy policies of wealthy, developed nations. Urgent action is required by all people and nations. This action should be focused on reducing climate change itself by reducing emissions and creating or rehabilitating mechanisms for greenhouse gas capture (including by reforestation), strengthening predictive tools to anticipate harms to human health and the environment, and continued and intensified programs of harm reduction. In the case of infectious disease, harm reduction can be achieved through targeted prevention, treatment and research programs aimed at reducing the global burdens of climate-sensitive diseases and responding to their expected increase under different climate change scenarios and regional weather patterns.

Ethical analysis of the expected harms and injustices should help to drive global, regional and national energy and health research and policy agendas to reduce the harms of climate change, including infectious diseases in particular. To be effective,

such analyses require, first and foremost, high quality epidemiological data and accurate prediction of risks arising from changes to climate variables. The ongoing collection, empirical analysis and ethical formulation of such findings requires active and fruitful collaboration between local and regional healthcare agencies and international centres in order to inform and drive the appropriate local and global healthcare policy responses. If the harms to human health due to climate change are to be minimized or averted, including harms arising from infectious diseases, policies must aim at reduction of climate change, accurate prediction of health risks and epidemics, and well-informed, well-resourced health networks now and in the future.

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**Part II**  
**Regional Contexts, Priorities, and**  
**Vulnerabilities**



# Chapter 6

## Relational Solidarity and Climate Change in Western Nations

Michael D. Doan and Susan Sherwin

**Abstract** The evidence is overwhelming that members of particularly wealthy and industry-owning segments of Western societies have much larger carbon footprints than most other humans, and thereby contribute far more than their “fair share” to the enormous problem of climate change. Nonetheless, in this paper we shall counsel against a strategy focused primarily on blaming and shaming and propose, instead, a change in the ethical conversation about climate change. We recommend a shift in the ethical framework from a focus on the role of individual agents and a conversation about guilt; in its place, we propose a relational approach to public health ethics that is centered around the idea of relational solidarity. We begin by briefly reviewing the most common—and woefully inadequate—approach in the West to reducing emissions and responding to the health-related impacts of climate change. We then go on to propose a relational approach to public health ethics as an alternative ethical framework that better fits the moral problems associated with climate change and holds promise for a more meaningful response.

Western nations are in an uncomfortable place when it comes to global discussions of climate change. It is well known and widely documented that industrialized Western nations have historically been among the highest emitters of industrial greenhouse gases, and have not done nearly enough to reduce those emissions. In spite of numerous injunctions to stop worsening the harms of climate change, the use of fossil fuels and chemicals continues to proceed without restriction in many parts of the West; indeed, emission levels are continually on the rise (IPCC 2007). The evidence is overwhelming that members of particularly wealthy and industry-owning segments of Western societies have much larger carbon footprints than most other humans, and thereby contribute far more than their “fair share” to the enormous problem of climate change.

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Clearly, there is ample reason to blame wealthy and industry-owning segments of the West for their disproportionate contributions to climate change and for their strong resistance to the kinds of changes required to significantly reduce its adverse effects. Nonetheless, we shall counsel against a strategy focused primarily on blaming and shaming and propose, instead, a change in the ethical conversation about climate change. We recommend a shift in the ethical framework from a focus on the role of individual agents and a conversation about guilt; in its place, we propose a relational approach to public health ethics that is centered around the idea of relational solidarity. In Sect. 6.1 we shall briefly review the most common—and woefully inadequate—approach in the West to reducing emissions. Then, in Sect. 6.2 we shall propose a relational approach to public health ethics as an alternative ethical framework that better fits the moral problems associated with run-away climate change in the West and holds promise for a more meaningful response.

## 6.1 Climate-Related Policy, Ethics, and Bioethics in the West

The adverse effects of climate change are now familiar. They include unusually frequent and intense weather events (heat waves, cold spells, “supercharged” storms), ecological disturbances (melting glaciers, rising sea levels, floods, droughts, wildfires), and pressures to modify traditional agricultural practices. Each of these effects poses enormous threats to the lives and health of innumerable humans and countless other species. Because of the interrelated implications for population-level patterns of (water- and vector-borne) disease and mortality; food and water security, sanitation, shelters and settlements; and migration (e.g., forced displacements and relocations of peoples as “climate refugees”), climate change has been identified as “*the biggest global health threat in the 21st century*” (Costello et al. 2009, emphasis added).

The adverse effects of climate change are already intensifying the ecological and social vulnerabilities of large portions of the world’s population, in many cases “precisely because they uphold ecological values that have not been engulfed by global capitalism and technological modernization” (Cuomo 2011, 695). These devastating impacts are expected to continue to fall first and most heavily on poor peoples and communities of color around the globe, especially women, children, the elderly, and people with disabilities living in impoverished urban areas, coastal regions, and other areas with severe air quality issues (Bullard 2008; Cuomo 2011; Shiva 2012; MacGregor 2014). Even in the industrialized West, poor communities face more urgent challenges from climate change than do those in wealthier and better serviced neighborhoods. Thus, feminist philosopher Chris Cuomo is quite right when she stresses that, “climate change is a matter of global social justice” (Cuomo 2011, 693).

Indeed, mitigating climate change is an enormously complex *political* challenge in addition to an ethically and practically demanding one. Significant changes in policies and practices are required at all levels of human organization, from individual citizens, through community groups, corporations, and reaching to local and national governments, as well as international bodies (Sherwin 2012). Yet, at

present the area of greatest consensus and activity seems to be primarily at the level of individuals: citizens of industrialized nations are called upon to cultivate and exercise political agency in recognition of responsibilities we share with others worldwide (Young 2011). Difficult public decisions urgently need to be made concerning what and how much to produce and consume, and on what forms of energy to rely—decisions that have wide-ranging consequences for the lives and livelihoods of large numbers of differently located and situated peoples around the globe. Especially weighty claims have been pressed upon citizens of Western nations that have contributed the most to producing the industrial greenhouse effect over the last century and a half, and that continue along unsustainable pathways of resource extraction, production, consumption, and waste.

While government and corporate agents in high-emitting Western nations persistently refuse to acknowledge their roles in causing climate change, and decline to take responsibility for addressing the problem, people living in the West have been encouraged to accept the individualization of responsibility for addressing climate change, so much so that this particular division of labour is in many cases simply taken for granted (Maniates 2001; Cuomo 2011; Webb 2012; Doan 2014). Various environmentalist groups, businesses, and governments have been promoting the idea that changing light-bulbs, recycling more, riding bicycles, and planting trees are particularly effective ways of slowing the pace of climate change and transforming into environmentally conscious citizens. The prevalence of these recommendations needs to be understood in the broader context of neoliberal micro-economic governance strategy in nations such as the United States, the United Kingdom, and Canada. In response to the question of how best to strike a balance between the apparently contradictory requirements of economic growth through resource- and energy-intensive consumption on the one hand, and extensive reductions of greenhouse gas emissions on the other, the most consistent message is that each of us can help to mitigate climate change if we shift patterns of personal and household consumption toward low-carbon alternatives and transform ourselves into “green consumers” (Szasz 2011; Webb 2012).

Meanwhile, the operations of markets and large corporations, including major energy firms, have for all practical purposes been exempted from questions of government regulation and collective responsibility, leaving governments and citizens to shoulder the burdens of cleaning up air, soil, and water pollution and providing disaster assistance in the wake of severe storms, flooding, desertification, and wildfires. In effect, current techniques and processes of resource extraction and distribution (notably, the extraction of fossil fuels, such as oil, through offshore drilling and the surface mining of tar sands; coal, through depth mining and mountain-top removal; and natural gas, through hydraulic fracturing or “fracking”), existing relations of production and manufacturing, and corporate waste practices have been left to the discretion of powerful decision-makers in private industry, who are able to guide and respond to shifting market conditions under limited regulatory constraints. To the extent that these largely corporate controlled processes, relations, and practices are in any way subject to reorganization through collective decision-making processes involving the wider public, it is mainly through indirect, highly

individualized means: primarily via market mechanisms, where “consumer demand” is expressed as an aggregate of the everyday choices of consumers given the options made available for consumption. And those indigenous peoples, environmentalists and others who publicly challenge the mitigation policies proposed by neoliberal politicians, or who engage in direct action campaigns to disrupt the resource extraction and distribution projects of energy firms, are routinely branded as “threats,” labeled “extremists” or “eco-terrorists,” and subjected to criminalization and intense surveillance (Shiva 2012, 22).

In this way, the individualization of responsibility for addressing climate change leads to the privatization and depoliticization of crucially important areas of decision-making that affect the lives and livelihoods of billions (Swyngedouw 2010, 2011; Macgregor 2014). Control over the direction of resource extraction, production, consumption, and waste is ceded to powerful decision-makers in private industry on the one hand, and to their market-mediated interactions with far less powerful consumers on the other. Concerns for equity and social justice are effectively sidelined by this strategy for addressing climate change, for their expression is limited to the endorsement of particular goods, services, and companies through everyday commercial transactions. Public deliberation and participation in collective decision-making processes are eschewed in favour of the injunction to “vote with your dollars,” regardless of whether “you” have very much money, and hence influence, to begin with. Even if the individualization of responsibility did not offer “limited and largely self-defeating means of transition to a sustainable society” (Webb 2012, 121), it would still be an inadequate strategy for significantly reducing emissions. For as Cuomo points out, “Even if personal sphere reductions that can be directly controlled by individuals and households are ethically imperative, they are insufficient for adequate mitigation,” seeing as how “household consumption and personal transportation account for a significant but minority slice of total greenhouse gas emissions worldwide” (Cuomo 2011, 701).

Despite the limitations individuals face in having an impact on climate change, questions of ethical and political responsibility for the excessive production and consumption patterns of the West have come to focus primarily on the role of individuals, qua individuals. Just as the dominant trend in ethics and bioethics in the West has been preoccupied with concern over the moral duties—or moral virtues—of individual agents, the attention of theorists, activists, and ordinary citizens worried about climate change has been directed primarily to the actions and practices of individual agents. Mainstream ethics and bioethics typically encourage environmentalists to focus on individual agents and government agencies and to concern themselves with assigning blame and seeking reparations for wrongful behavior. It is true that many people, groups, and institutions in the West are guilty of excessive contributions to climate change, but it is not often recognized that agents of various types at multiple levels of organization are not offered meaningful ways to significantly reduce emissions, and are not always well positioned to do so on their own initiative. Furthermore, talk of blame and guilt has had limited effects on actually changing policies and practices. It is often ineffective in persuading those who are charged with wrongful behavior to make significant changes, and it can suggest to

others who are “less guilty” that they do not need to make changes themselves, or at least not until the worst offenders are on board (a pattern that has unfortunately been mirrored during negotiations at the international level).

Hence, we suggest a different approach to the ethics of climate change, involving an alternative understanding of the role and character of ethics. We propose moving away from an exclusively backwards-looking, finger-pointing ethics of blame, which falsely imagines individuals making decisions and acting in isolation; in its place, we propose a shift towards a more forward-looking ethics of responsibility, which recognizes how tangled together all agents are in networks of highly interdependent relationships, not to mention how changeable those relations and relationally constituted agents can be. We believe such an ethics will help us figure out how agents and agencies at multiple levels of human organization can coordinate their actions to make effective and wide-ranging changes in existing patterns of resource extraction, production, consumption, and waste. It will do so, in part, by helping differently located and situated agents see the need to build trusting relationships with one another while learning to work collaboratively for the protection and achievement of health-related public goods (Young 2011; Sherwin 2012; Doan 2014). For this task, we shall propose a relational approach to public health ethics—an approach that upholds the values of relational autonomy, social justice, and solidarity.

## 6.2 Relational Public Health Ethics

As noted above, climate change poses a major threat to public health. Hence, the ethical framework to appeal to in the West—and around the globe—should be one developed to address issues central to public health. Public health ethics is an approach to ethics that recognizes the *collective* nature of public health and acknowledges the limitations of bioethics strategies that were developed to deal with clinical care for individual patients and research involving individual subjects. Whereas the primary focus of clinical bioethics is on individual patients and, often, individual providers, the principal concern of public health is with *populations*, not individuals. At least in the case of public health ethics, then, it is reasonable that we seek a more collective understanding of ethics which attends to the activities of agents and agencies of many levels of complexity (Baylis et al. 2008; Sherwin 2012).

There are various proposals relating to public health ethics available to us. The most thoroughly worked out is that offered by Madison Powers and Ruth Faden in their book, *Social Justice: The Moral Foundations of Public Health and Health Policy* (Powers and Faden 2006). We are very sympathetic to their approach and share their commitment to placing social justice at the very core of public health. But we differ somewhat in our understanding of social justice and we do not agree that social justice alone constitutes “the foundational moral justification for public health” (Powers and Faden 2006, 81). We favor an explicitly *relational* approach to public health ethics that is centered on three important relational values: autonomy, social justice, and solidarity (Baylis et al. 2008). We shall speak very briefly about relational approaches to

autonomy and social justice and then turn to the matter of relational solidarity, which in our view holds the key to involving the wealthy industrialized West in responding to the demand of public health ethics to address climate change.

The sort of relational theory we favor is rooted in an understanding of persons as *relational*—that is, as constituted within specific historical, economic, social and political circumstances and through inter-relationships with other persons, both chosen and unchosen. It is a theory that is particularly sensitive to ways in which membership in various groups defined along such categories as age, gender, (dis)ability, sexuality, race, nationality, and economic status are systematically associated with power and privilege or with disadvantage and oppression (Downie and Llewellyn 2012). Relational public health ethics is, then, an approach to public health ethics in which the core values of autonomy, social justice, and solidarity are understood from the perspective of a theory attentive to the relational nature of persons.

Relational autonomy, like its more familiar cousin, traditional autonomy, is concerned with the interests, values, and commitments of those who will be affected by policy decisions and related practices. It differs, though, in asking us to be sensitive to ways in which members of oppressed groups are particularly vulnerable to having their interests sacrificed in favor of those with greater power, and it demands that we be attentive to the value of autonomy in responding to the resistance of the vulnerable to oppressive treatment. It also reminds us that not everyone is equally well situated with respect to the options and opportunities available to them when making choices. Hence, it is important in public health to consider how differently located agents will be affected by various policy options. We also need to be sensitive to ways in which those who are most seriously disadvantaged and oppressed may face fewer, and less acceptable, choices so that we can take action to ensure that there are meaningful options available for them to benefit from public health measures (Sherwin 2012). For example, when a severe storm is predicted for a specific geographical region and residents are advised to evacuate, we must ensure that public transit, safe shelter, and adequate medical care is provided to the poor, elderly, and disabled and avoid assuming that every citizen has access to private or public transportation out of the danger zone (Pastor et al. 2006; Bullard 2008).

With regard to social justice, we follow Iris Marion Young (1990) in understanding relational social justice to be concerned not only with fair distribution of the material benefits and burdens of our social policies and practices, but also with fair access to social goods such as rights, opportunities, power, and self-respect as well as substantive participation (as opposed to merely formal representation) in collective decision-making processes. Powers and Faden make clear that human well-being is itself an important social good (Powers and Faden 2006, 15). In the context of public health, they identify six essential dimensions of well-being: health, personal security, reasoning, respect, attachment, and self-determination. We agree with them that public health policies and practices should strive to secure a sufficient level of each of these dimensions for each individual. On our relational account, this requires that policy makers, and those charged with implementing public health practices, be attuned to ways in which members of oppressed groups are at particular risk with regard to each dimension, and recognize the need for

substantive participation in collective decision-making processes and policy adjustments to bring all groups up to acceptable levels. In the context of climate change, this surely requires that we find ways of reducing the threats to life and health confronting those living in impoverished nations and communities who are confronted with the most immediate and severe effects of climate change.

The value we think most useful in our discussion of the industrialized West is that of relational solidarity (Baylis et al. 2008). Solidarity is central to public health insofar as we humans have a shared interest in survival, safety, and security, and climate change imperils the very survival of our species. Moreover, in many areas of public health, these interests can only be achieved or protected through the pursuit of *public goods*, where a public good is understood to be a good “that is non-excludable ... and, in pure form is non-rivalrous,” such as scientific knowledge and control of communicable diseases (Labonté and Schrecker 2007, 4). Public goods benefit nearly everyone; hence, everyone is called upon to act in solidarity with one another in light of our having a shared interest in supporting their defense and pursuit. Because all humans will suffer severely if the pace of climate change is not immediately reduced, slowing climate change is undoubtedly a public good. Moreover, the pace of climate change can only be effectively slowed if there is widespread commitment to the task and broad-based participation in the elaboration and enactment of long-term coordinated response strategies. We truly all are in this together, for every single person depends on the health of the Earth’s oceans, waterways, air, flora and fauna, not to mention the technical and social infrastructure necessary for the continued survival and flourishing of human lives. Since serious degradation and destruction of any of these elements threatens everyone, solidarity is a pragmatically as well as ethically and politically important value when it comes to climate change and other threats to health-related public goods.

We propose a distinctly relational understanding of solidarity—that is, an understanding that is sensitive to important differences in the power and privilege of various individuals, groups, and institutions, and to the significance of these differences as experienced and (re)negotiated in efforts to work collaboratively for the protection and achievement of public goods. In its Statement of Principles for public health approaches to the control of pandemic flu, The Bellagio Group emphasizes that *trust* is an essential element for public health efforts: “public health efforts are more likely to succeed in an atmosphere of social solidarity and trust, including the trust of disadvantaged people” (Bellagio Group 2007). Relational solidarity reminds us that not every human will be affected as early and severely as others; indeed, some communities and groups are already suffering profoundly from the adverse effects of climate change. Relational solidarity requires us to exercise concern for the needs of the disadvantaged and vulnerable and to contribute to building trusting relationships while learning to work collaboratively. Thus, it encourages us to work out strategies of the sort that contrast starkly with the currently dominant, highly individualized, and evidently ineffective responses still favored in many parts of the West.

In helping us move away from the individualization of responsibility for addressing climate change, relational solidarity helps agents operating at multiple levels shift towards participation in genuinely *collaborative* forms of collective action.

Consider some of the differences between a familiar threat to health-related public goods, such as community (or “herd”) immunity, and those associated with the adverse effects of climate change. In the case of vaccination programs (e.g., the MMR and flu vaccines) there is something that each citizen can do qua individual to help secure the public good of community immunity—indeed, once certain conditions are in place (e.g., the provision of vaccines by healthcare providers), individuals can each act separately, performing tasks that are identical for all (i.e., arranging for a vaccination). Thus, the relevant kind of collective action is *additive* in nature—the effects of each of our individualized actions add up, and we all end up benefiting from the achievement of a public good.

Although there is no way for people living in the West to immunize ourselves to the adverse health-related effects of climate change (e.g., increased prevalence and severity of respiratory illness due to more frequent and intense heat waves in urban areas), we can act collectively at and across multiple levels to reduce risks and harms to entire populations. When compared to the work of securing the public good of community immunity, one important difference is that what each of us can do as individuals is clearly insufficient—the sum of our efforts to reduce private-sphere emissions may well make a difference, but not one big enough to secure the health-related goods at issue. Hence, the kind of collective action required must be other than simply *additive* in nature; further, it must also be other than the sort that aims to protect or achieve all public goods directly. Instead, agents and agencies at multiple levels need to coordinate our actions to mitigate climate change while also preparing for its downstream effects—forms of collaborative action that are instrumental to, or that indirectly help to defend, health-related public goods.

To coordinate our actions effectively, agents of various kinds need to get down to the hard work of sorting out the complex *interconnections* of responsibilities to be assigned and assumed and learn to work collaboratively in the process. Thus, in the context of climate change a relational approach to public health ethics encourages us to make sense of how precisely “we are all in this together,” emphasizing that we truly need to be coming together, building trusting relationships, and acting together to bring about dramatic shifts in existing patterns of resource extraction, production, consumption, and waste. We simply cannot afford to be planning and acting separately when such important public goods are at stake.

Finally, relational solidarity helps us to understand that some people, especially affluent and industry-owning citizens of Western nations, have the luxury of being able to deny the realities of climate change (Norgaard 2011), or to engage in what are known to be woefully inadequate responses a bit longer (Doan 2014). Indeed, many of those with the most wealth seem to believe that they can evade the serious consequences of climate change since they have not yet been seriously affected. However, these delusions cannot be maintained for much longer. Even industrialized Western nations have experienced unusually frequent and powerful storms, devastating droughts and wildfires in some areas, and frightening floods in others. In an increasingly interconnected global order, patterns of illness, disease, displacement, and migration tend to both presuppose the actions of physically distant agents and come to affect the lives and livelihoods of differently located and situated



groups in various, frequently unpredictable ways. Not everyone yet recognizes the need for solidarity with our fellow humans from all strata of our own societies and all those across the planet, but surely this need will become increasingly impossible to deny.

Relational solidarity provides an ethical basis for environmental activists and policy-makers to investigate ways of building trust and solidarity with the privileged and powerful as well as with the disadvantaged and oppressed. When considering responses to the public health threats of climate change, we need to go even further than the Bellagio Principle by speaking to the importance of building trusting relationships among communities, groups, and institutions with varying kinds and degrees of privilege and power. Particularly wealthy and industry-owning segments of Western societies, too, need to be part of our emphasis in efforts to forge relations of solidarity. Indeed, relational solidarity must aim for inclusivity and resist the temptation to frame policies in terms of “us” versus “them” in light of the complex array of coordination problems that need to be explicitly addressed. We will need the skills, knowledge and resources of all sorts of persons, groups, and institutions to devise and implement strategies that can significantly slow the pace of climate change. As the rich and powerful come to appreciate the public health threats of climate change, they can become powerful catalysts of collaboratively orchestrated change within and among the various organizations of which they are members: multi-national corporations, governments at all levels, communities, religious organizations, and so on. Since the structures of these organizations are also subject to change, working for broadly inclusive relations of trust and solidarity could well be crucial to ensuring that strides are taken in the direction of relational social justice.

Nevertheless, it is essential that those developing policies and practices to slow the pace of climate change be attentive to the ways in which members of differently located and situated communities, groups, and institutions can be expected to become leaders in developing strategies for evading its most devastating consequences. As more and more people discover the need to foster broad-based solidarity in responding to the public health challenges of climate change, we hope that a relational approach to public health ethics will be adopted. It will direct us to invoke the core values of relational autonomy and social justice, which will (hopefully) guide our long-term coordinated responses to this unprecedented threat to public health. It will remind everyone to be particularly attentive to the vulnerabilities and agency of the disadvantaged and powerless, and also attuned to the importance of including those with privilege and power. Relational solidarity can help us to approach our collective problems of climate change in accordance with the values of trust, collective responsibility, and accountability that are at the heart of relational public health ethics.

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# Chapter 7

## Climate Change Vulnerability and Health Impacts in South East Asia and China

Lisbeth Witthøfft Nielsen

**Abstract** This chapter outlines climate vulnerabilities for countries in South East Asia and how these may influence human health in this region, and discusses the ethical issues related to the governance of climate adaptation within this context. Section 7.1 focuses on national climate adaptation strategies among countries in South East Asia, and discusses the bioethical issues arising from these strategies. It argues that the distinction between non-health and health adaptation measures gives rise to ethical concerns because the potential for preventing or alleviating the health threats from climate change long term may be overlooked. Section 7.2 focuses on vulnerabilities to climate of human health among urban populations in South East Asia and China, and discusses the ethical issues related to the governance of sustainable megacities in this region. It argues that health impacts of climate change and air pollution on urban populations must be taken into consideration in the development of governance strategies for sustainable development, with a view to ensuring that the health and wellbeing of urban populations is not compromised in the pursuit of socioeconomic development by a country as a whole. The paper concludes that bioethicists can contribute to raising awareness, among those involved in governance, of the importance of more proactive involvement of the health sector in the development of national climate adaptation strategies; and to flagging pitfalls in existing strategies regarding urban sustainable development that may compromise the health and wellbeing of urban populations, and of the urban poor in particular.

This chapter comprises two main sections. Section 7.1 focuses on the climate-related vulnerabilities for countries based in South East Asia. It outlines the predicted health impacts on the populations of these countries and discusses ethical issues related to the governance of climate adaptation within this context. The health impacts of climate change in China as a whole are not comparable to those seen and predicted for South East Asia because China's large geographical area covers several types of climate and environment that differ significantly from South East Asia.

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For this reason, the climate-related vulnerabilities facing China are not considered in Sect. 7.1.

Section 7.2 focuses on the climate-related health risks to urban populations, especially those associated with heavy outdoor air pollution which is widespread in cities of South East Asia and in China. Section 7.2 summarizes the ethical issues arising from problems with urban outdoor air pollution, and discusses the implication of these for governance strategies to urban sustainable development, including sustainable development of existing and future megacities in South East Asia and China.

The ethical concerns regarding health and climate impacts identified in this chapter pertain primarily to priorities in the governance of climate adaptation. Governance has many meanings. It can refer to the principles and instruments by which a government administers a country's affairs, and it can refer more generally to the process by which institutions (governmental and non-governmental) and stake-holders interact in decision making (The World Bank 2013). In this chapter 'governance' refers to government initiated national strategies to climate adaptation; government supported strategies to urban sustainable development, and the interaction between institutions and stakeholders in the practical management of these strategies at national or local levels.

## **7.1 Climate Vulnerability, Health, and the Governance of Climate Adaptation in South East Asia**

The countries of South East Asia are among the world's most vulnerable in regards to the challenges associated with climate change. This is partly due to the geographic characteristics of the region as a whole, and partly due to socioeconomic and demographic conditions in the individual countries. In this chapter, South East Asia is defined according to the member states of the Association of Southeast Asian Nationals (ASEAN), which includes Brunei, Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam. These countries have in common similar climate conditions; they are characterized geographically by large areas of low-coastal land, and face similar physical challenges in terms of climate change. The region as a whole has a monsoon climate, and is regularly exposed to natural hazards from extreme weather events such as cyclones, and heavy rainfall often leading to flooding. In recent years, South East Asia has experienced an overall increase and intensity in cyclones (Cruz et al. 2007). For example, the Philippines were hit by the worst cyclone ever on record in November 2013 (Vidal 2013). In addition to the increase in cyclones, the region as a whole is also likely to experience climate changes such as heat waves and increased frequency in periods with heavy rainfall over the coming decades (Cruz et al. 2007).

### ***7.1.1 Climate-Related Health Impacts and Vulnerabilities***

Extreme weather events and rising sea levels caused by climate change increase exposure to, and risk of, diseases among the populations in South East Asia. In addition to the risk of death and injury associated with extreme weather events such as cyclones, heat waves, or prolonged periods with heavy rainfall, the health impacts associated with or exacerbated by climate change include malnutrition caused by food insecurity from flooding and droughts. Other health impacts include illness and premature deaths due to increased urban outdoor air pollution; and increase of water-borne and infectious diseases as a result of drinking water contamination caused by flooding (Cruz et al. 2007). Water security is already a common problem for all countries in the region and climate change related heat waves, floods and intrusion of sea-water exacerbates problems with fresh water security, and especially poses a threat to the health of poor populations, because they are often geographically situated in urban slum areas with lack of sanitation or in rural low coastal land areas where access to fresh water is already limited, and exposure to flooding and rising sea-levels is higher (Cruz et al. 2007).

In recent years some countries in South East Asia have experienced an increase in vector-borne diseases such as malaria and dengue fever (UNEP 2012). In 2013, for example, Singapore had an epidemic of dengue fever (Khalik 2013). While there is no clear evidence that links this trend directly to climate change, the number of dengue cases tends to rise in years when the average temperature is higher than normal (Banu et al. 2011; UNEP 2012). Furthermore, there is evidence that an increase in average temperature provides for better breeding conditions of the disease carrying *Aedes* mosquitoes (UNEP 2012).

### ***7.1.2 Socioeconomic Factors and Priorities in Climate Adaptation Strategies***

Many of the ASEAN countries are faced with multiple societal stressors such as food security, poverty, and lack of access to health care, which impact socioeconomic development and the capacity for climate adaptation. Except for Singapore and Brunei Darussalam, all countries of this region are low- or middle-income countries, with a Gross National Income (GNI) of US\$12,736 or less (The World Bank 2016a, b). The impacts of climate change, whether in the form of increased frequency and intensity of extreme weather events, or of rising sea levels, exacerbate existing societal stressors and challenge the possibilities for socioeconomic development in at least two ways. Firstly, the economic costs associated with the recovery process from extreme weather events, and with securing coastal areas against rising sea-levels, are high. Secondly, extreme weather events have a negative impact on food and agricultural production, and pose a threat to the livelihood of the poor population, especially in low-income countries such as Cambodia where

agriculture contributes a significant proportion of the GDP – 40 % – and where many people in rural areas live below the national poverty line and earn their primary income from fishery or agriculture (Ministry of Environment 2006).

The ASEAN countries have ratified the United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol. The Convention implements the concept of sustainable development as part of its objective. The concept of sustainable development promotes a development where economic, social and environmental goods are balanced in such a way that the needs of the present generations are fulfilled without jeopardizing the needs of the future generations (World Commission on Environment and Development 1987). The concept of sustainable development reflects an ethical dimension in the sense that it recognises the environment as more than just an economic asset, and requires a long-term ethics that includes considerations for future generations (Kemp and Nielsen 2009). The UNFCCC's articles 2 and 3.4 describe sustainable development as one that promotes economic growth and social development while managing greenhouse gas emissions in a way that allows ecosystems to adapt while ensuring that food production is not jeopardized over time (UNFCCC 1992). Some low-income countries, including Cambodia, Lao PDR, and Myanmar have developed a National Adaptation Programme of Action (NAPA) under the climate convention (Koh and Bhullar 2011). Most other ASEAN member states have developed national climate adaptation strategies (Koh and Bhullar 2011). The concept of sustainable development is the guiding principle in these strategies and is reflected in the priorities of specific adaptation measures. In regards to the impacts of climate change and the need for adaptation measures to protect the health and wellbeing of people in South East Asia now and in the future, however, there are some common aspects of adaptation strategies in South East Asia that call for ethical discussion.

The common aspects of adaptation strategies in South East Asia are the need to address (i) water shortages and (ii) develop disaster strategies for different climate change scenarios in order to protect lives and properties. Climate adaptation programmes in South East Asia also tend to include the development of surveillance systems for diseases such as dengue and malaria in order to prevent and manage epidemics (National Climate Secretariat 2012; Ministry of Environment 2006; The Socialist Republic of Vietnam 2011). The strategies adopted by each of these countries vary with national interests, needs, and environmental conditions.

Given the importance of agriculture and fisheries to the livelihoods of poor population groups, some low-income countries in South East Asia tend to focus their adaptation measures on food security and sustainable development within agricultural production to allow an increase in production with minimal harm to the environment (Ministry of Environment 2006; Department of Meteorology and Hydrology 2012). Higher middle-income countries such as Thailand, and high-income countries such as Singapore, place greater emphasis on measures aimed at promoting low-carbon production and energy efficiency in consumption, with the aim of establishing a cleaner environment over time (Pipitsombat 2012; National Climate Secretariat 2012).

The protection of public health is among the priorities in the adaptation strategies for low-, middle-, and high-income countries, but it is unclear to what extent the health sectors are perceived as stakeholders in climate adaptation strategies. The outlined strategies for the various countries suggest that a distinction is made between non-health and health adaptation measures, and that non-health adaptation measures such as flood protection, improvement of water storage, or measures to reduce carbon emissions may take priority over health measures specifically aimed at reducing health risks related to climate hazards. Non-health measures, such as measures aimed at reducing air pollution, have the potential to indirectly contribute to reducing health risks, but without directly involving or consulting the health sectors in the development and implementation of such measures, this potential may not be fully explored.

### ***7.1.3 Bioethics Concerns About Adaptation and Governance***

From a bioethical point of view, the gap between health and non-health adaptation strategies gives rise to concern. Firstly, it may reflect limited awareness in governance approaches to climate adaptation about direct and indirect health impacts from climate change. Secondly, prioritizing non-health adaptation measures may mean that the health-orientated climate adaptive measures primarily will take the form of what is described by Koh and Bhullar (2011) as *reactive* measures in response to observed climate changes or specific climate events, rather than *anticipatory* measures, aimed at reducing the health vulnerability associated with climate change now *and* in the future. This is unfortunate because reactive measures tend to address immediate health impacts as and when they occur, and the potential for preventing or alleviating the health threats from climate change long term may be overlooked. Reaction without prevention may also compromise the ethical requirements embedded in the concept of sustainable development, to consider the needs of generations in the present *and* the future. Anticipatory measures could for example include engagement of the health sectors in education programmes aimed at promoting public awareness about climate change impacts and health vulnerability, and education promoting climate awareness targeted to vulnerable population groups.

Bioethicists could play an important role in encouraging a more direct involvement of the health sectors in governance of climate adaptation, by flagging the need for health adaptation measures to be part of strategies promoting sustainable development in this context. Bioethicists could also shed light, for those involved in governance, on the value of engaging the health sector as a stakeholder to help identify direct and indirect ways of reducing climate related health risks in the development and governance of adaptation strategies.

## **7.2 Climate Vulnerability, Urbanization and Health: Ethical Issues in the Governance of Cities in South East Asia and China**

With 75 % of the Gross Domestic Product (GDP) being produced in cities, urbanization plays a defining role in the economic transformation from low-income to middle-income countries in South East Asia (ADB 2013). The urbanization process in South East Asia and in China has led to the appearance of megacities. The United Nations define megacities as cities with more than ten million inhabitants. In South East Asia and China these currently include Jakarta, Manila, Beijing and Shanghai and Guangzhou. Future megacities include Shenzhen in China and Bangkok in Thailand (United Nations 2012). Climate change is likely to exacerbate this urbanization process. Rising sea-levels, droughts, flooding and decrease in marine biodiversity due to acidification of oceans, may limit the capacity to adapt for people living in rural areas, particularly for those whose livelihood is primarily dependent on income from fishing or agriculture (Cruz et al. 2007). As a result, climate migration from rural areas to the cities may increase and contribute to the expansion of existing megacities and the appearance of new ones in this region.

### ***7.2.1 Climate-Related Health Impacts on Cities and Urban Populations in South East Asia and China***

As population density increases in urban areas the risk of transmission of infectious diseases and epidemic outbreaks grow (Kovats and Akhtar 2008). More than half a billion people in Asia, including South East Asia and China, are currently living in poverty in urban slum areas where hygiene is poor due to lack of sanitation, and this makes them more vulnerable to climate-related health risks outlined in Sect. 7.1 (UN-HABITAT 2014). Climate migration is occurring as the rural poor move into urban slum areas which are expanding and becoming increasingly populated.

Another problem exacerbated by climate change is illness and premature death associated with outdoor air pollution. Many countries including China and those in South East Asia are currently experiencing large scale urbanization leading to very high levels of outdoor air pollution in their urban areas today. Existing megacities in China, such as Beijing, Shanghai and Guangzhou, are associated with severe problems with outdoor air pollution (Li Jing 2013). The main contributors of air pollutants dangerous to human health are industry and transportation, both of which are growing steadily in urban areas (Kovats and Akhtar 2008). To reduce the impacts of their pollution on health, the World Health Organization (WHO) guidelines for air quality recommends limits for a number of specific air pollutants (WHO 2006). For the majority of large cities in China and South East Asia, levels of air pollution currently exceed the limits established by the WHO guidelines (Health Effects Institute (HEI) 2010 Executive Summary Figure 2).



The WHO's International Agency for Research on Cancer (IARC) recently reviewed the impact of outdoor air pollution. It concluded that exposure to outdoor air pollution can cause lung cancer even among populations living in areas where the concentrations of particulate matter are below the recommended threshold in WHO's 2005 guidelines. Outdoor air pollution also increases the risk of bladder cancer in humans and of premature death among people with heart and respiratory diseases (IARC 2013; Loomis et al. 2013). Vulnerable groups such as elderly people and those with cardiopulmonary diseases, cardiovascular disease or other chronic illnesses are likely to be more sensitive than healthy individuals to air pollution. Furthermore, the health risks associated with air pollution are higher among people living in poverty because poor nutrition and lack of access to medical care reduces the ability to overcome illnesses associated with exposure to air pollution (HEI 2010). WHO estimates that, worldwide, outdoor air pollution in urban areas contributes to approximately 1.3 million deaths every year (WHO 2011). Climate change will exacerbate this problem. A recent climate modeling study predicts that globally, climate change will increase air pollution-related mortality by as much as 100,000 deaths annually if the emission level of air pollutants remains constant throughout the twenty-first century (Fang et al. 2013).

Air pollutants tend to absorb solar radiation and contribute to further increases in temperature in urban areas where the level of air pollution is already high (Fang et al. 2013). An increase in urban temperatures also increases the risk of heat stress on urban populations and impacts energy utilization and water availability and consumption (Cruz et al. 2007). An increase in energy utilization and consumption involves an increase in fossil fuel emission, which can escalate existing problems of climate change and air pollution. Considering that China as a whole is already a major contributor with an estimated 27 % of global carbon emissions (Duggan 2013); and that large cities in Asia – including those in South East Asia – are predicted to become greater contributors to anthropogenic climate change in terms of greenhouse gas emissions in the near future (ADB 2013); there is an urgent need to address the problem of outdoor air pollution to protect the health of urban populations, and mitigate the problem of climate change.

### ***7.2.2 Outdoor Air Pollution and Governance of Climate Adaptation and Mitigation: Ethical Issues***

The health risks associated with outdoor air pollution have generated concern and become an important policy issue to most countries in South East Asia as well as China (HEI 2010). For example, in September 2013, the media reported that due to its heavy urban air pollution and consequent health problems China had introduced a plan to improve air quality by making significant reductions of coal consumption in three major cities (Beijing, Shanghai and Guangzhou) by 2017 in order to reduce levels of Particulate Matter PM<sub>2.5</sub> which is among the most dangerous air

pollutants to human health (Li Jing 2013). China's effort may bring an unintended positive gain in that there are already signs that the effort to reduce Particulate Matter PM<sub>2.5</sub> has a mitigating effect on the emission of greenhouse gasses (Duggan 2013).

The problems created by urban outdoor air pollution raise ethical issues for the objectives of sustainable development and the governance of climate adaptation in South East Asia and China. On the one hand, cities play a key role in generating economic development in low-and middle income countries in Asia, and this is important in order to increase the capacity to adapt to climate change on a long term basis (ADB 2013; Cruz et al. 2007). Also, it may be argued that a temporary trade-off in terms of an increase in greenhouse gas emissions is necessary for economic growth to occur, and to reduce vulnerability to climate change over time. On the other hand, the risk that urban outdoor air pollution poses to health, and to the urban poor in particular, raises ethical concerns about limiting the focus to economic growth and suggests that it may be counterproductive by hindering the objectives of sustainable development. Increasing industrial production without considering the need for mitigation of air pollution may contribute to socioeconomic development of a country as a whole, but it would do so at the cost of air quality and environmental protections essential to health and that will ultimately have such far reaching health and environmental harms that further socioeconomic growth will be permanently obstructed. Furthermore, it would jeopardize the health of urban populations in the present and the future, and impose harms on the urban poor who are more vulnerable to health impacts associated with outdoor air pollution and climate change. Thus, it may be argued that measures to reduce outdoor air pollution, including stronger mitigation efforts, should be introduced for large cities as an anticipatory climate adaptation measure to limit increases in premature mortality due to outdoor air pollution among urban populations at present and in the future.

### ***7.2.3 Ethical Challenges to Sustainable Development and the Governance of Cities***

The challenges and vulnerabilities associated with climate change in South East Asia, together with the important role that cities play in socioeconomic development in this region and in China, leave little doubt that the capacity for climate adaptation in the future, to a large extent, depends on the ability to establish 'sustainable' and 'livable' cities. This requires careful management of air pollution and waste management, as well as provision of effective sanitation and drainage systems and safe drinking water. According to a study conducted by the Stockholm Environment Institute's Centre at York University and the Clean Air Initiative for Asian Cities (CAI-Asia), some cities have a high capacity to address and manage problems around air pollution, whereas others have less capacity and face major challenges in terms of managing pollution, especially pollution generated from the

massive increase in motorized vehicles and traffic (Earthscan 2006). In China, for example, an increase in the use of private vehicles for urban transport has been seen as a result of increased income level among urban populations. Overall, the number of registered vehicles in China has gone up from one million in the 1990s to approximately 61 million in 2010 (ADB and Ministry of Transport 2012).

Urban sustainable development has been on the policy agenda among the ASEAN countries for nearly a decade and is included in the ASEAN framework for sustainable development. Included in this framework are initiatives such as The ASEAN Vision 2020; The Blueprint for the ASEAN Socio-Cultural Community 2008–2015; The ASEAN Declaration on Environmental Sustainability; The Singapore Declaration on Climate Change, Energy and the Environment; The Network of East Asian Think-tanks (NEAT), and the Regional Environmental Sustainable Cities Programme (RESCP) (Koh et al. 2010). Among the priorities for a sustainable development reflected in these documents are initiatives that can address the challenges of climate change as well as promote a clean and green environment, establish energy security, sustain natural resources, and take into account health issues (Koh et al. 2010).

A distinction has been made between the concept of eco-cities and the concept of sustainable cities. Both the eco-city concept and RESCP have found support among the ASEAN member states. The reason for this support may be the potential for innovation that may encourage economic growth through development of new technologies and practical management strategies to improve waste and water management, and reduce energy consumption.

The concept of eco-cities has been promoted as a model for urban sustainable development in China and South East Asia. For example, Singapore and China have collaborated on the development of the Tianjin eco-city in China (Koh et al. 2010, [http://www.tianjinecocity.gov.sg/bg\\_intro.htm](http://www.tianjinecocity.gov.sg/bg_intro.htm)). The vision for an eco-city reflected in the Tianjin eco-city Project is a city designed and built to be environmentally sustainable, economically viable and which promotes social harmony. In practice, this involves use of clean, renewable energy, green transport, and ecologically sustainable water and waste management. Technologies applied for these purposes must be affordable and commercially viable. Social harmony is promoted by providing public housing to accommodate lower middle and low income families ([http://www.tianjinecocity.gov.sg/bg\\_intro.htm](http://www.tianjinecocity.gov.sg/bg_intro.htm)). The eco-city concept is meant to be ‘replicable’ and ‘scaleable’ to other cities in different countries.

Some aspects of the eco-city concept give rise to questions about its application as a model for urban sustainable development. The model eco-city is a relatively small city that offers a standard of living which would be affordable to a limited population group. The concept does not seem to be scalable to large or megacity level, because it fails to address the need to accommodate the millions of poor people in South East Asia (Koh et al. 2010).

‘Sustainable cities’ is a different concept, with a broader scope, that has been promoted among the ASEAN countries through the RESCP. The concept promotes a threefold vision for a sustainable city, namely ‘Clean Air’, ‘Clean Water’ and ‘Clean Land’ (Koh et al. 2010). These visions are can be applied to existing cities,

including megacities. The RESCP includes 24 cities, of which some are also enrolled in the Kitakyushu Initiative for a Clean Environment (<http://kitakyushu.iges.or.jp/about/index.html>) – a wider network established between 18 nations in the Asian-Pacific with a similar objective to the RESCP. This programme also includes a number of cities in China. Even though the concept of ‘sustainable cities’ can be applied on megacity scale, the visions tend to focus primarily on environmental sustainability, and may therefore not be sufficient to address all aspects needed for urban sustainable development.

Considering the important role that cities play for economic growth in South East Asia and China, and the existing problems with urban outdoor air pollution, there is no doubt about the importance of initiatives aimed at creating urban sustainable development. It is important to consider potential pitfalls in initiatives promoting concepts such as ‘eco-cities’ and ‘sustainable cities’ in order to avoid inadvertently generating bigger socioeconomic disparities and leaving the poor to live in urban slums. Urban sustainable development is not merely about creating a basis for economic development while protecting the environment; it is also about the necessity of taking into consideration the health and well-being of urban populations overall, and their most vulnerable groups in particular. The three visions for sustainable cities under the RESCP are important goals which indirectly have positive impacts on human health. As mentioned by Koh et al. (2010), there is still a need to develop and adopt approaches specifically targeted to addressing the needs of the urban poor.

It is crucial to consider the health impacts of climate change and air pollution on urban populations in sustainability assessments in order to ensure that the health and wellbeing, particularly of the urban poor, is not compromised by the pursuit of socioeconomic development by a country or a region as a whole. Bioethicists can play a role in this context by promoting debate about ethics of sustainability and the importance of considering health and well-being of vulnerable population groups as part of social development. Promoting dialogue with local interest groups and communities in the development of governance strategies aimed at urban sustainable development and climate adaptation may help identifying and implementing measures targeted to meet specific needs of the urban poor. This may also help pinpoint potential pitfalls in governance initiatives aimed at urban sustainable development and climate adaptation that can cause harm to specific population groups.

### 7.3 Conclusion

Taking into consideration the climate-related health impacts and socioeconomic situation for countries based in South East Asia, it may be necessary to re-evaluate the existing priorities in climate adaptation strategies to better protect the health of the population in these countries. Bioethicists can play an important role in promoting debate with a view to strengthening awareness about climate-related health risks, and emphasizing health adaptation as part of a sustainable development in this

context. Considering the ethical dimension embedded in the concept of sustainable development, it is important ethically to encourage involvement of the health sector as stake-holder, and to flag the importance of anticipatory climate adaptive measures because reactive measures address climate-related health impacts at the present, without offering ways to prevent or reduce health risks long term. Given the role and importance of urbanization for socioeconomic development in South East Asia and China, there is also a need to flag the inherent conflict between the benefits of urban economic growth and the consequent harms to health and environmental resources necessary to promoting health. Promoting dialogue about the concept of sustainable development and its role in urban governance may help to resolve the ethical issues associated with these conflicts and the resultant problems caused by urban outdoor air pollution.

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# Chapter 8

## Ethics and the Impact of Climate Change in South Asia

Vijayaprasad Gopichandran and Angus Dawson

**Abstract** Climate change is a major problem globally and it is increasingly recognized as a matter of public health concern (Doherty et al. 2009). The increasing temperature of the earth's surface and its associated consequences such as melting polar ice caps, rising sea levels, changing patterns of wind and rainfall and fluctuations in temperatures lead to a large burden of morbidity and mortality. Though climate change has a global impact, there are significant regional differences depending upon geo-climatic conditions (Patz and Olson 2006). In this context it is important to study the geography, climatic conditions, and social features of the various regions to better understand the health impacts. Moreover discussions on ethical issues associated with climate change will strongly rely on regional context of values and priorities. Given the present state of economic development in the region India, Pakistan and other countries in South Asia contribute much less to the global proportion of greenhouse gas emissions than might be expected given their populations. However, they suffer a disproportionate impact from climate change due to social and geographical features that combine to increase the population's vulnerability. In this chapter we focus on the geographical and climatic characteristics of the region, the public health impact of climate change in these areas, the socioeconomic consequences of climate change, and climate change vulnerabilities and adaptations. We also briefly discuss some of the relevant ethical issues in the context of these factors.

### 8.1 Introduction

Climate change is a major problem globally and it is increasingly recognized as a matter of public health concern (Doherty et al. 2009). The increasing temperature of the earth's surface and its associated consequences such as melting polar ice caps,

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rising sea levels, changing patterns of wind and rainfall and fluctuations in temperatures lead to a large burden of morbidity and mortality. Though climate change has a global impact, there are significant regional differences depending upon geoclimatic conditions (Patz and Olson 2006). In this context it is important to study the geography, climatic conditions, and social features of the various regions to better understand the health impacts. Moreover discussions on ethical issues associated with climate change will strongly rely on regional context of values and priorities. Given the present state of economic development in the region India, Pakistan and other countries in South Asia contribute much less to the global proportion of greenhouse gas emissions than might be expected given their populations. However, they suffer a disproportionate impact from climate change due to social and geographical features that combine to increase the population's vulnerability. In this chapter we focus on the geographical and climatic characteristics of the region, the public health impact of climate change in these areas, the socioeconomic consequences of climate change, and climate change vulnerabilities and adaptations. We also briefly discuss some of the relevant ethical issues in the context of these factors.

## **8.2 Geographical and Climatic Characteristics of South Asia**

### **8.2.1 *India***

Located between 66° E to 98° E and 8° N to 36° N India comprises diverse environments including mountainous terrain, northern plains, peninsular plateau, desert, coastal plains and island groups. The Himalayas in the north and the Thar Desert in the west along with the Indian Ocean, Arabian Sea and the Bay of Bengal all influence the climatic conditions in the country strongly. The northern plains experience a severe heat wave in the summer and freezing cold temperatures in winter, whereas the coastal areas are relatively warm throughout the year. Monsoon is a unique and essential feature of the Indian climate. It is the time of heavy rains. There are two phases of monsoon in India, the Southwest monsoon which occurs between June and September and the Northeast monsoon which occurs September to November. Despite rapid urbanization during the last 50 years, much of the population of India is still highly dependent on the monsoon for successful agriculture (Ministry of Environment and Forests, Government of India 2012). Monsoon rains seem to be becoming less reliable, resulting in both periods of drought and sudden dramatic floods.

### **8.2.2 *Pakistan***

The country forms a rectangular mass of land covering 880,000 km<sup>2</sup> situated between 61° E to 75° E and 24° N to 37° N. Like India, Pakistan also has a very diverse climatic profile. The country lies on a steep elevation of about 8500 m above sea level. There are

glaciers in the north of the country which melt and serve the rivers that flow within. There is a brief 3-month monsoon during the summer when the combination of monsoon rain and the melting of the glaciers leads to an increased risk of sudden flash floods. Recent climate change has increased this vulnerability through greater melting of the northern glaciers but also more erratic monsoon rainfall (Khan et al. 2011).

### **8.2.3 Sri Lanka**

Sri Lanka is an island country to the south east of India situated in the Indian Ocean. It covers a total land area of about 65,000 km<sup>2</sup>. The country has a coastline of about 1500 km. The country, based on the quantum of monsoon rains received is classified into the south-western wet zone with about 2500–5000 mm of rainfall, the dry zone in the north, east and central parts with less than 1500 mm of rain, and the intermediate zone which received around 1500–2500 mm of rain per year. The southwest monsoon brings rain to the wet zone and the dry and intermediate zones are served by the northeast monsoon (Ministry of Environment, Democratic Socialist Republic of Sri Lanka 2011).

### **8.2.4 Bangladesh**

Bangladesh, situated between India and Myanmar covers a total land area of 147,570 km<sup>2</sup>. It forms part of the Bengal basin which is one of the largest geosynclinals in the world. To the south of this country is the Bay of Bengal. The country largely comprises of low land with some hilly regions in the northeast and south-east. Bangladesh has a tropical monsoon climate with heavy rainfalls and floods every year during the monsoon. Floods, tropical cyclones, tornadoes and tidal bores attack the country every year and cause serious damage. As climate changes the risks to the people of Bangladesh increases (Ministry of Environment and Forests, Government of the People's Republic of Bangladesh 2009).

### **8.2.5 Maldives**

The Maldives are situated to the southwest of India and consist of 1190 coral islands spread over a total land area of 90,000 km<sup>2</sup>. The country has relatively high humidity. The northeast monsoon does not bring much rain, but the southwest monsoon brings rainfall to the extent of 2500–3000 mm per year. Because the Maldives are low-lying islands, they are especially vulnerable to rising sea levels from storm surges and damage to fresh water supplies, as well as predictions that many islands will simply disappear under water in the next century if current trends continue (Woodworth 2005).

### **8.3 Public Health Impact of Climate Change in the Region**

The influence of climate change in the region is manifest in many ways, but here we will just pick out a few key examples of the impact on health.

#### ***8.3.1 Waterborne Diseases and Outbreaks***

According to a report of the Ministry of Health and Family Welfare in India, about 40 million people are affected by waterborne diseases per year. The report also estimated 1.5 million deaths among children under 5 years of age due to diarrheal diseases (Liu et al. 2012). About 75 % of the rural population in India does not have proper water supply and sanitation facilities. In a situation of decreasing water supply due to dry climate and monsoon failures, there is a likelihood of worsening of sanitation issues in the country, thus leading to an increase in diarrheal diseases and outbreaks. Pakistan ranks high in the incidence of diarrheal deaths of 55.2 per 100,000 (Liu et al. 2012) and Bangladesh also has a high prevalence of diarrheal diseases. The floods and cyclones that affect the country every year lead to an increase in outbreaks of waterborne infections. With climate change it is expected that the frequency and intensity of these floods will increase thus escalating the risk of waterborne infections (Haines et al. 2006).

#### ***8.3.2 Heat Stress and Heat Waves***

The blazing heat waves that successively attack much of the region every year are increasing in intensity and severity. There is an escalation in the incidence of heat strokes, heat exhaustion, and heat related organ injuries. Apart from this there is also agricultural failure leading to increased malnutrition and famine through crop failure and the death of farm animals due to heat (Hajat et al. 2005; McMichael et al. 2008).

#### ***8.3.3 Respiratory Problems Due to Air Pollution***

Due to higher levels of air pollution there is an observed increase in the attendance in hospitals for respiratory emergencies. Some of this is due to economic development and the impact of increased industrialization and transportation. However, seasonal differences in air quality also occur due to the impact of differences in humidity and temperature levels. Another important reason for increasing respiratory morbidity is the high use of solid fuels in the context of domestic cooking and heating resulting in worsening indoor air pollution. Apart from exacerbating the

greenhouse gases emissions, and thus increasing the levels of global warming, such uses also increase respiratory morbidity, particularly amongst women and children given their greater occupation of domestic space (Pande et al. 2002).

### **8.3.4 Vector Borne Diseases**

There are six different vector borne diseases prevalent in much of the region, namely, malaria, dengue, chikungunya, filariasis, Japanese Encephalitis and leishmaniasis. Malaria ranks as the disease with the highest incidence with 1.5 million people being affected in a year and close to 1200 deaths in India alone. All these disease causing agents spend a part of their life cycle inside a vector, usually an insect whose survival is largely dependent on temperature and rainfall. With rising temperatures there is an increase in the rate of growth of the parasites in the vector and also increased vector breeding and biting of the host, thus increasing the chance of disease transmission. The pattern of rainfall also significantly affects the vector population. Excess rainfall increases mosquito breeding sites. It also increases relative humidity which in turn increases the longevity of the mosquitoes. Changes in the temperature and rainfall levels have also seen shifts in the transmission windows (time period during which the disease is transmitted). Regions which were previously free from some of these vector borne diseases have now started having these infections due to changes in climatic conditions. The classical example is the incidence of visceral leishmaniasis in the cold areas of Himachal Pradesh (Kumar et al. 2007). In stark contrast, Sri Lanka despite the internal political unrest, has managed to reduce the incidence of malaria to a great extent and aim to eliminate malaria during 2014. The reason for this success is political commitment and a systematic approach of the public health system to tackle malaria (Abeyasinghe et al. 2012).

The important vector borne diseases in Pakistan are malaria, leishmaniasis, Crimean Congo Hemorrhagic fever, dengue and scrub typhus. The arid climate of Pakistan with rising temperature levels due to climate change have resulted in increased transmission of these diseases in recent years (Rai et al. 2008).

Till the mid-1990s vector borne diseases other than malaria were rare in Bangladesh. But outbreaks of dengue have been reported in the past 20 years. With change in temperatures and rainfall patterns an increase in incidence of dengue, Japanese encephalitis and chikungunya are expected in the country (Ministry of Environment and Forests, Government of the People's Republic of Bangladesh 2009).

### **8.3.5 Malnutrition**

India ranks second only to Bangladesh in the prevalence of malnutrition in the world with up to 48 % of its children under 5 years of age being malnourished. The production of crops such as rice, maize and sorghum can be reduced due to changes

in temperature and rainfall. The climate change can also affect livestock and therefore milk and meat products (Rylander et al. 2013). Changes in agriculture patterns also lead to a reduction in the variety of nutritious food choices, again exacerbating the problem of malnutrition.

### 8.3.6 Disasters

With changing climate there is an increased risk of flash floods, storms, and cyclones. The coastal areas of the region are vulnerable to cyclones and tsunamis. Bangladesh is particularly vulnerable to floods, cyclones and storms. There is an emerging risk of tsunamis and rising water levels in the Maldives thus making it highly vulnerable to disastrous situations (Haines et al. 2006). The recent flash flood in Uttarakhand, India is an excellent example of a disaster situation affected by climate change and environmental degradation. This is described in Box 8.1.

#### **Box 8.1: The Uttarakhand Flash Floods: Cultural Catastrophe**

June 2013 saw a major disaster in Uttarakhand, the hilly state in northern India, well known for its location in the Himalayan belt and its famous Hindu pilgrimage centers. Flash floods due to torrential rainfall literally washed away hamlets and villages and around 1000–5000 people were reported dead. According to Hindu tradition thousands of pilgrims from all over the country visit the pilgrimage centers also called the *Chardham* in Uttarakhand during the summer months of May and June and return before July, when the monsoon usually begins. This time unprecedented heavy rainfall started in June and this unexpected rain caught everybody unawares. The state government of Uttarakhand mobilized rescue operations and thousands of pilgrims were rescued and sent back to their homes. The heavy loss of life and livelihood during this disaster, also known as the “*Himalayan Tsunami*”, has been attributed to climate change. The Intergovernmental Panel on Climate Change had already predicted that several weather and climate related events may continue to occur in the Himalayan belt. Apart from the consequences of global warming, the unregulated process of deforestation, road building, digging of tunnels in the mountains and poorly planned dams and hydropower projects all contributed to the massive damage caused due to the floods. This flood, one of the worst calamities seen in recent times, is a case study in the interaction between climate change, unregulated economic development, cultural beliefs and disaster (Chopra 2013).

## 8.4 Socio Economic Consequences of Climate Change

Climate change can impact not just upon health directly, but upon human welfare more generally. For example, climate change can result in erratic variations in the supply of water to regions, with a resultant internal displacement of individuals and communities. This can, in turn, create territorial disputes and conflicts. For example, trans-border migration is happening in the Indo-Bangladesh region as thousands of Bangladeshi migrants have moved into India in search of improved livelihood. It has been reported that the main reason for such an exodus across the border is the situation of failed crops, devastating floods and cyclones (Alam 2003). This has led to significant tension in the diplomatic relationship between India and Bangladesh. Another important consequence of climate change is the impact of rising sea levels on tourism. The Maldives is a country extremely vulnerable to any rise in sea levels. Not only does this threaten the health of the population, but in a country largely dependent on tourism for its income, it is likely to affect the economic status of the country as well.

In India farmers have been forced to change the nature of their farming due to the impact of climate change upon their crops over the past 30 years. Since the country is largely dependent on monsoon rains for water, cultivation of water-requiring crops is likely to change. Even if crops that do not require much water can be grown instead, such changes in production can also lead to socio-cultural changes (World Bank 2013). Climate change can result in changes to soil quality and fertility, water availability, changes in salinization and alkalization of the soil, changes in growth of pests and rodents, and changes in patterns of growth of the crop. This in turn causes significant changes in agricultural yield (Khan et al. 2009). A series of farmer suicides have been reported in India following crop failure, poverty and indebtedness (Dongre and Deshmukh 2012). This is a major social consequence of climate change. Box 8.2 explains the association between climate change and farmer suicides.

### **Box 8.2: Farmer Suicides in India: The Role of Climate Change**

Since 1995 roughly 270,000 farmer suicides have been reported in India. Initially recognized largely in the cotton growing areas of Maharashtra, more suicides are now reported from all over the country. One of the main reasons reported for this is heavy debt due to crop failure. The past three decades have seen more than three instances of severe monsoon failure and drought. This has led to heavy debts among the marginal farmers in India. The stress of the debts and subsistence agricultural practices has pushed many of these young farmers, most of them men, into suicide. The farmers perceived debts, addiction to alcohol and other substances, environmental problems, government apathy, increased cost of cultivation and crop failures due to monsoon failure are the main reason for mental stress and hence suicide. Though social and political reasons play a major role in this complex social phenomenon, the role of climate change has complicated it further (Dongre and Deshmukh 2012).

## 8.5 Climate Change Vulnerabilities and Adaptations

It is clear that climate change places the countries in this region at increased risk of impact on health. There is a need to understand social, cultural, behavioral and environmental determinants of health in this region and facilitate the process of adaptation to climate change. In disaster prone regions there is a need for disaster preparedness and response strategies. Closer monitoring and surveillance of vector borne diseases and elimination of vector breeding sites can help in mitigating the effect of climate change on vector borne diseases. Systematic improvements in water supply and sanitation can help in preventing the water borne epidemics due to increased precipitation. Strong disease surveillance systems are required. Establishment of early warning systems for natural disasters is also an important capacity that could be enhanced. Satellite and geospatial technology could be effectively used to study climate change patterns and prepare for the health impacts. Since the vulnerabilities are regional, each country should plan to respond based on its own priorities and vulnerabilities (Bush et al. 2011; Patz and Olson 2006). However, many of the problems are not within the control of the individual countries themselves, and a more regional and global effort is required.

## 8.6 Ethical Issues

A number of important ethical issues emerge from the discussion of climate change in South Asia. Perhaps the most important one is the issue of justice, because the impact of climate change is already significant in this region, despite the fact that much of it has been caused by developments elsewhere in the world. The lack of public health infrastructure, and the strain upon what exists, means that climate change has a disproportionately negative impact upon the population in this region. Climate change is a global phenomenon, but the impact of existing changes and projected future change upon individuals and populations is not equally distributed. Where the greatest impact has occurred upon those without the greatest responsibility for causing the problem, especially when the relevant population cannot protect themselves, this raises questions about justice. Climate change results in harm to humans, both directly from weather events themselves, and indirectly from the impact on food production and changes to environmental risks such as vectors for disease. We know about such risks and something can be done to mitigate their effects and to reduce their causes. Those that benefit from the economic growth that creates massive amounts of greenhouse gases surely owe those harmed from these processes the basic protections required for human flourishing that they are currently denied. Many different moral theories might be used to support such an idea. Justice may well require not just direct support for direct health impacts, but also assistance with developments in agricultural practice to deflect the impact of climate change and the creation of surveillance activities and sustainable public health

infrastructure to provide a means of addressing the long-term issues identified. Without such action, major global health inequities are likely to be exacerbated.

Traditionally bioethics has overwhelmingly focused on clinical medicine and protecting and promoting the interests of individuals, and particular values such as autonomy and privacy that are seen as central to this task. However, this has been criticized for a number of reasons including a tendency to exclude deep engagement with public and environmental health (Dawson 2010). Some authors seem to think that some version of the principles of biomedical ethics can be extended and adapted to consider environmental issues (Resnik 2012). However, it is unclear that such an approach can help much when we are thinking about climate change given its gradual nature and the fact that the relevant harms are the result of millions of actions by millions of people over a long time period. This accumulated harm, the result of rising private car ownership, greater use of power resulting from fossil fuels, industrialization, growing consumption of meat, the use of ozone-depleting aerosols etc., is difficult to adequately conceptualize if one's focus is the individual. If any calculation of risks focuses on the immediate risks of action, it may be too easy to justify carrying on with activity of immediate benefit to the individual, as potential harms can only be seen far in the future.

What we count and how we count harms and benefits is vital to the issue of fair assessment of our actions and inactions. One option is to consider these issues in terms of global public goods and bads. Such thinking developed by economists to capture the idea of different kinds of 'externalities' or costs and benefits that flow from our individual actions and how they collectively impact on others. How exactly a public good is defined is disputed but will often focus on the two key aspects of being non-rivalrous (if I enjoy the benefits it does not diminish the chances of your enjoyment) and non-excludable (I cannot exclude you from enjoying the benefits even if I wanted to—which I may wish to do because I've paid more to create or maintain the relevant good) (Dawson 2007). A good example of a public good would be clean air. A good example of a global public bad (a public good covering the globe) might be climate change. Global public goods/bads can be used in arguments about the obligations of states in relation to climate change on the basis of self-interest, presumably because this seems as a practical way to ensure that states "buy into" the importance of acting to avoid future catastrophic harm to their own states and citizens (Kaul et al. 1999).

A third alternative would be to place justice at the very heart of our discussion. Various writers have sought to develop accounts of environmental justice, with a focus on looking at relevant issues from a contextual and ecological perspective (Schlosberg 2007). Such accounts will differ in their details, but the broad approach is one of looking at the way that human health is a consequence of interactions with the environment and other species. In addition, the focus is on justice as the key ethical value, but not in the sense of trying to ensure equal distributions of any relevant good, but based on taking into account present vulnerabilities and past injustice as a way to create a more just outcome. This approach would obviously have significant impact in relation to thinking about climate change in South Asia, given the relative contribution to the problem but differentially greater suffering in the



region. Of course it is important for each country to think about what it can contribute to ensuring reduced emissions targets are achieved. It has been argued that substantial development can still occur whilst working towards targets if clean energy measures are put in place (Pollin and Chakraborty 2015). However, others argue that much more can be done and that ‘development’ can be used as an excuse to hide behind as the rich in low income countries enjoy an increasingly affluent lifestyle with related levels of consumption (Adve and Kothari 2015). There is a balance to be struck between development, poverty reduction and lower emissions. An environmental justice approach would argue for substantial redistribution of resources to ensure protection of those that are most vulnerable through the actions of others. This may well focus on distributions between countries, but is also relevant within them too.

Recent years have seen significant gains in health outcomes, as work continues to achieve the Millennium Development Goals and move into working towards the Sustainable Development Goals. Such work needs to take into account environmental issues related to climate change. Otherwise the recent gains in global health may well be lost in the future if the impact of environmental change is not factored into global action.

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# Chapter 9

## Climate Change in Africa and the Middle East in Light of Health and Salient Regional Values

Thaddeus Metz

**Abstract** This chapter principally addresses the likely effects of global warming on health in developing countries in sub-Saharan Africa, northern Africa and the Middle East as well as how medical professionals, such as doctors, nurses, bioethicists and public health researchers, should respond to them in light of *ubuntu* and Islam, values characteristically held in those regions.

### 9.1 Introduction

My main task in this chapter is to provide an overview of current thought about how climate change, by which I primarily mean global warming, is expected to affect Africa and the Middle East, particularly when it comes to health in developing countries there.

Note that I do not address global warming alone, also briefly considering well documented, related environmental shifts such as oceanic acidification. I also address the implications of such environmental shifts for some values beyond that of health, in particular, moral goods held dear in certain regions that those working in medicine, public health, bioethics and related fields have reason to take into consideration. Specifically, I consider facets of global warming in light of not only what is widely known as ‘*ubuntu*’ in sub-Saharan Africa, a view of human excellence obtained through communal relationships, but also some Islamic bioethical norms prominent in northern Africa and the Middle East.

After prognosticating about the likely effects of climate change on these regions and diagnosing moral concerns about them, I provide reason to think that those working in health have a duty to push for appropriate remedies in their respective locales and indicate some that they should take seriously.

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## 9.2 Climate Change and Related Environmental Shifts

By ‘climate change’ I mean in the first instance the warming of the planet, most likely as a result of greenhouse gas emissions, as it has been happening so far and is expected to increase over the next several decades in the absence of radical measures. These processes have been firmly established by the scientific community (e.g., IPCC 2013; WMO 2013; for an overview by a philosopher, see Moellendorf 2014), and I take them for granted in what follows. In this section, I note some related ecological concerns as they bear on Africa and the Middle East, which I downplay in this chapter but that merit exploration elsewhere as part of a complete picture about environmental shifts and their likely harms to human health.

Beyond plain old industrial pollution and deforestation, consider that depletion of the ozone could be a concern for southern Africa in terms of not merely the expected effects of increased solar radiation such as cancers, but also unforeseen changes to the jet stream and hence to the climate (Kang et al. 2011). While the evidence suggests that the holes over the earth’s poles are slowly reversing, the chemicals now typically being used to replace CFCs, which had been largely responsible for ozone depletion, are themselves expected to contribute to global warming (Fergusson 2001).

In addition, it is worth addressing how the decrease of oxygen and the increase of CO<sub>2</sub> in the world’s oceans, which are also results of greenhouse gas emissions (Doney 2006; Rogers and Laffoley 2011), are likely to affect Africa, the Middle East and other parts of the world. Just as I am writing, a new report has emerged indicating that oceans are acidifying at a much greater rate than was thought, leading to noticeable changes to ecosystems, including losses of plankton, fish and other sea creatures (IPSO 2013).

Finally, note that the bare fact of *uncertainty* with regard to climate change and other environmental shifts is a likely problem for developing countries. Suppose that it is correct, as I discuss below, that the effects of climate change are likely to be greatest in Africa and the Middle East, and suppose, too, that specific changes are substantially unpredictable, at least with regard to a particular country or region. In that case, because investors naturally want to avoid unpredictability, investment in these areas is likely to decrease (African Development Bank 2009: 4), which would presumably leave people in a state of poverty and hence not well able to avoid disease and to afford healthcare.

## 9.3 Climate Change, Health and *Ubuntu* in Sub-Saharan Africa

It is commonly said that developing countries, particularly in Africa, are the least responsible for climate change, but will bear the greatest costs of it (e.g., Stern 2006: xxvi; Africa Partnership Forum 2008: 1–3, 24–26). Estimates of Africa’s

contribution to greenhouse gas emissions range from less than four percent (Africa Partnership Forum 2008: 3) to no more than seven percent (African Development Bank 2011: 2), and they would probably be on the low end once the oil producers in northern Africa were excluded (on which see 9.4). Note that even if one is a sceptic about humankind being the source of global warming through CO<sub>2</sub> production, it remains the case that, whatever the cause, higher temperatures will likely harm sub-Saharan Africa the most, not only because the effects in terms of drought, flooding and the like are expected to be the largest there, but also because that region most lacks the ability to cope with them (Boko et al. 2007: 435; AMCEN 2009; World Bank 2009: xvi–xix; African Development Bank 2011: 2, 8–11). Still more, the negative effects of global warming *specifically with respect to health* are likely to be the worst in Africa, and particularly in the sub-Saharan region (Stern 2006: 84; Africa Partnership Forum 2008: 75; African Development Bank 2011: 11–13).

The literature on climate change in Africa routinely notes that much of the continent (even beyond the Sahara desert) consists of drylands, that at least two-thirds of the economy is dependent on agriculture, that population growth is particularly high, that people tend to be socially and economically badly off, and that adaptive and governance mechanisms are typically poor (Boko et al. 2007; Africa Partnership Forum 2008; World Bank 2009). The combination of these factors make the sub-Saharan region particularly vulnerable to changes in rainfall and water generally, whether they come in the form of, say, drought, on the one hand, or flooding, on the other. As is also often pointed out, harms expected from climate change are largely mediated through water: either there will be too little of it, or there will be too much of it, or it will be contaminated. Four distinguishable water-related harms stand out in relation to health in sub-Saharan Africa.

First, in the event of drought and heatwaves, which are expected to substantially increase in sub-Saharan Africa (e.g., Lyon 2009), more people would die directly from heat stress, and, in addition, people would have less access to fresh water, leading to increased vulnerability to disease as a result of reduced hydration and poorer hygiene. According to one widely cited document, the *Stern Review*, a temperature rise of 2 °C would likely mean a 20–30 % decrease in water availability in southern Africa, with a rise of 4 °C projected to entail up to a 50 % decrease (Stern 2006: 57).

Second, consider the converse event of flooding, expected to result from storms and from oceans rising due to thermal expansion and ice sheet collapse. Inundation of water would increase risks of vector-borne diseases such as malaria and dengue fever, transmitted by mosquitoes (and also rats in the case of the latter), as well as risks of water-borne diseases such as cholera and typhoid. Again according to the *Stern Review*, a temperature rise of 2 °C would likely entail that 40–60 million more people become exposed to malaria (Stern 2006: 57, 76), which is well known for already killing at least half a million people (mostly children) in Africa every year. Another concern with regard to flooding is the state of people's mental health, with risks of depression, post-traumatic stress syndrome and related maladies identified (Ahern et al. 2005: 38–39, 43).

Third, whether it is drought or flooding, major changes to rainfall are strongly expected to impair food production. In addition, it appears that simply higher

temperatures will ‘reduce yields because crops speed through their development, producing less grain in the process’ (Cline 2008: 24). And less food, combined with substantial population growth, can be expected to result in even more malnutrition than there already is and hence a greater susceptibility to disease, particularly diarrhoea on the part of children. The *Stern Review* remarks, ‘In many developing countries, even small amounts of warming will lead to declines in agricultural production because crops are already close to critical temperature thresholds. The human consequences will be most serious and widespread in Sub-Saharan Africa, where millions more will die....’ (Stern 2006: 84; see also 75, 77). At a global level, some of the most well respected work in the field, put out by the Intergovernmental Panel on Climate Change, indicates with ‘medium confidence’ that ‘climate change would increase the number of hungry and malnourished people in the twenty-first century by 80–90 million’ (reported in Campbell-Lendrum et al. 2003: 145).

Fourth, any sort of extreme environmental shifts, which beyond drought and flash flooding could well include cyclone storms and rising oceans on the coasts, will probably lead to large-scale migration. Those in transit, at least who are not pastoralists or other nomads accustomed to migrating, are particularly vulnerable to dehydration and malnutrition, and those who have settled in, say, slums are more likely to pick up diseases associated with poor sanitation. The Africa Partnership Forum, a collection of leaders from the African Union, the African Development Bank, the United Nations, the G8 and similar groups, says projections suggest ‘that the number of people at risk from coastal flooding could increase from 1 million in 1990 to 70 million in 2080, forcing major population movements’ (2008: 2).

Another harm that the literature often mentions as expected from climate change below the Sahara desert is that the above kinds of water-related effects would impair Africa’s ability to get out of poverty and would probably worsen it. It is pointed out, for example, that about three-quarters of jobs there are based on agriculture, which, in turn, largely depends on rainfall (e.g., Lisk 2009: 9). And poor harvests leading to reduced income will bring in their wake inadequate medical facilities, a brain drain of medical personnel, the inability to afford preventive measures and treatments, and other familiar outcomes.

Finally, one can expect drought, flooding, hunger, migration and poverty to increase social conflict, and perhaps even occasion wars, beyond what the continent has already experienced since World War Two. For example, consider the tens of millions of pastoralists in Eastern and Western Africa, who live in arid and semi-arid regions and are highly mobile, migrating as necessary to find water and to enable their livestock to graze. Given their tendency to move wherever they need to survive and flourish, pastoralists are disinclined to respect what they tend to see as artificial borders between countries or rules about ownership of land used for agriculture (Oxfam 2008), with the Niger and Nile regions often mentioned as tinderboxes (Hsiang et al. 2013; Kloos et al. 2013). Competition for aquifers and rivers could also prompt inter-state military strife. In sum, it is not merely illnesses that medical professionals below the Sahara need to be concerned about, but also injuries.

In addition to these commonly discussed effects of global warming expected below the Sahara desert, I here mention some concerns that are not encountered in

the literature, but that those in health-related fields have reason to take into account in relation to this region. In sub-Saharan Africa, the dominant approach to ethics is communal. It is commonly thought that one's basic aim in life should be to develop the higher, distinctively human parts of one's nature, which are conceived in relational or social terms. Specifically, many believe that one can realize oneself or display human excellence, i.e., *ubuntu* as it is known in the Nguni languages of southern African, only if (and even insofar as) one shares a way of life with others and cares for their quality of life (Gyekye 1997; Kasenene 2000; Metz 2013). This basically means experiencing a sense of togetherness, engaging in joint projects, helping one another and doing so consequent to sympathetic and altruistic motivation.

Given this ethical orientation, disease and poverty can be seen to have certain meanings that they usually do not have in, say, North America and Europe. For instance, according to an Afro-communitarian ethic, one's foremost duty is to take care of one's family (Appiah 1998). The fact of one's child being sick is bad, but the fact of one being unable to help one's child is worse (even if not an occasion for blame). Disease and poverty do not merely signify a poor quality of life for individuals; they also inhibit the kinds of *sharing and caring relationships between individuals* that sub-Saharans characteristically prize. Lacking resources essential to health, people cannot give important goods to others with whom they identify, a morally desirable condition. This is true for a head of household wanting to medically care for her children, as well as for hospitals and governments in relation to citizens.

Similarly, from a typically sub-Saharan moral standpoint, conflict or discord, in which people think of themselves as divided against one another and are out to harm each other, is in itself a serious moral wrong. Speaking of African ethical thought, Desmond Tutu, renowned chair of South Africa's Truth and Reconciliation Commission, remarks,

Social harmony is for us the *summum bonum*—the greatest good. Anything that subverts or undermines this sought-after good is to be avoided like the plague. Anger, resentment, lust for revenge, even success through aggressive competitiveness, are corrosive of this good (1999: 35).

Hence, people contesting one another for scarce medical care or fighting over water, for instance, would be bad from this perspective not merely because of the harm inflicted, but more because of the denigration of relationship between people into one of enmity.

It might not be possible for those working on health matters below the Sahara to prevent climate change or its immediate effects on populations there (though I discuss a few strategies in the conclusion); even so, they could try to encourage people to react to crises by pulling together instead of exhibiting division and ill-will. Sometimes when natural or other disasters strike a society, people can be prompted to identify with one another and to exhibit solidarity with each other. So, developing rationing systems in which everyone is clearly given a fair chance might be one way to get people not to become overly focused on themselves and those close to them to the point of being willing to steal, bribe, cheat or coerce. Another

strategy would be to draw on aspects of *ubuntu* that emphasize the idea that everyone, regardless of nationality, race and the like, has a dignity and is part of a human family, i.e., is a person with whom to commune. Such an attitude largely underlay the common pre-colonial practice of welcoming strangers to a village with food and shelter. Reinvigorating that strand of ethical thought below the Sahara might be a promising strategy by which to respond to scarcity and hardship.

To be sure, no one expects uniformly negative results to come from global warming in sub-Saharan Africa. For two small examples, there is some evidence that farmers with 'heat-tolerant' livestock such as goats and sheep would benefit from warming (Boko et al. 2007: 448), and it could be that an increase in CO<sub>2</sub> would improve yields of certain crops by enhancing photosynthesis (Cline 2008: 24). In addition, perhaps human pluck and ingenuity will turn out to find solutions; for example as I write a promising new malaria vaccine appears to be forthcoming (Seder et al. 2013) and novel techniques for detecting underground water are being deployed in Kenya (Gramling 2013).

However, no respectable source of which I am aware welcomes global warming on the whole, especially below the Sahara desert. And while any beneficial effects of climate change and innovative preventions of harm from it are to be appreciated, it is hardly the case that people, and especially those in positions of influence, may relax in the expectation that things will turn out just fine. For all the scientific community can tell, some severe harms are likely to result from global warming below the Sahara, and professionals with education and power have some obligation to attend to them.

This view of obligation is particularly plausible in light of the communal ethic that is salient in the region. African moral norms are well known for imposing weighty duties to help others on those with know-how, responsibility, wealth and the like. Indeed, a characteristically African approach to ethics is plausibly understood not to include a category of supererogation, viz., not to morally permit one to do anything less than all one can to help others (e.g., Gyekye 1997: 69–75). Hence, in order to adequately develop their humanness, their *ubuntu*, medical professionals such as physicians and medical ethicists should identify with patients and the broader society and work towards preventing climate change, the harmful outcomes for health that are likely to result from it, and the failures to commune (if not instances of outright discord) that might occur consequent to such harms. In the conclusion I provide some guidance about such efforts to make, after discussing the expected condition of many Islamic countries in light of global warming.

## 9.4 Climate Change, Health and Islam in Northern Africa and the Middle East

On the face of it, there are substantial differences between the countries below the Sahara, on the one hand, and those above it and in the Middle East, on the other. In terms of culture, those in the sub-Saharan region are mainly indigenous black peoples who favour some form of animist Christianity, whereas those in northern Africa



and the Middle East tend to be of Arab descent (setting aside glaring exceptions such as Israel and Iran) and to practice Islam. The sub-Saharan countries do not feature nearly as much outright desert as do those in northern Africa and the Middle East. And the former emit among the lowest per capita greenhouse gas emissions in the world, whereas the latter emit among the highest, with Qatar, Saudi Arabia, Kuwait, the United Arab Emirates and Oman topping the list (World Bank 2012).

However, these sorts of distinctions make little difference when it comes to the likely effects of global warming on human health. With respect to this matter, the similarities between the regions are instead what is salient. Specifically, both parts of the world are ones in which the following are all very high: population growth, poverty, drylands and residence on coasts. What has made it sensible to have combined discussion of Africa as a whole and the Middle East in this chapter is that both exhibit large and growing numbers of people living substantially on ocean fronts, experiencing economically impoverished conditions, and lacking substantial access to clean fresh water. These commonalities make northern Africa and the Middle East, like sub-Saharan Africa, particularly vulnerable to global warming (e.g., Stern 2006: 63, 68, 108, 158; Sowers and Weinthal 2010: 12–16).

A survey of the literature on climate change in northern Africa and the Middle East (Pilifosova 1997; Boko 2007; Medany 2008; Brown and Crawford 2009; Sowers and Weinthal 2010) turns up the same negative outcomes with regard to health that I discussed in the previous section. That is, scientists and analysts expect this part of the world to be at great risk of: drought and heatwaves, flooding (especially on the coasts as a result of rising oceans), reduced agricultural output, migration and, as a result of these, poverty and conflict. The same concerns about malnutrition, dehydration, diseases and injuries are pertinent.

Even if the consequences are expected to be similar in both parts of the world, the ways they are morally interpreted will tend to differ in them. In particular, the Islamic tradition of northern Africa and the Middle East grounds certain approaches to bioethics that I now discuss in relation to global warming.

If a crude summary of one major swathe of ethical thought below the Sahara is summed up by ‘Honour communal relationships’, one similar in form with respect to that above the Sahara and in the Middle East would be ‘Obey Allah’. Central to Islam is the view that one’s basic duty in life should be to conform to God’s commands, viz., to avoid doing what He has forbidden and discouraged, and to do what He has required and encouraged, particularly as expressed in the *Qur’an*, but also as implied by Mohammed’s doings and sayings (*Hadith*). God is understood to have conferred a dignity on human life, and to have commanded people to treat one another justly and beneficently.

With regard to Islamic bioethics, a large majority of articles, books and other discussions focus on either relationships between doctors and patients, on the one hand, or sanctity of life matters such as abortion, euthanasia and biotechnology, on the other. However, some guidance from the Muslim tradition about how medical professionals should respond to more large-scale issues is found in two key documents.

First, there is the Oath of a Muslim Physician, which was developed to be an Islamic version of the Hippocratic Oath, and so, for instance, replaces talk of ‘gods’

in the latter with mention of ‘God’. The Oath of a Muslim Physician is found at the bottom of the second major source, namely, the Islamic Code of Medical Ethics, first drafted in 1981 by the Islamic Organization for Medical Sciences in Kuwait (IOMS 1981). IOMS has spearheaded efforts in the Muslim world to reflect collectively and systematically on bioethical issues, and it later, in consultation with the WHO and CIOMS, substantially revised the code, which is now known as the ‘Islamic Code of Medical and Health Ethics’ (IOMS 2004). Both the Oath and the Code address duties with respect to health at the social level.

By the Oath, a physician swears to ‘protect human life in all stages and under all circumstances’ and ‘to be, all the way, an instrument of God’s mercy, extending my medical care to the near and far’ (IOMS 1981). A straightforward reading of these commitments suggests that doctors, and presumably related practitioners in medicine and health, have some obligation to be concerned for the social determinants of health and their opposites of illness and injury.

Still more, the Code includes a section titled ‘Doctor and Society’, where one finds the explicit claims in the initial draft that the ‘Doctor’s mission exceeds the treatment of disease to taking all measures to prevent its occurrence’ and that the ‘combat and prevention of environmental pollution falls under this category’ (IOMS 1981). In addition, in the more recent draft of the Code, one finds statements such as these: ‘A physician should help society in dealing with elements of health enhancement, disease prevention, and protection of the natural and social environment’, and ‘A physician, particularly when holding an official position, should take an active part in setting regulations, drawing health policies, and solving health problems, thus serving the interests of the community’ (IOMS 2004: Articles 44, 47).

Surely, what goes for a physician applies to other professionals in the fields of medicine and health. From an Islamic perspective, then, in order to abide by God’s will, those in such professions must do what they reasonably can to prevent global warming and its negative effects on the dignity of human life. What this might plausibly involve I briefly discuss in the concluding section of this chapter.

## 9.5 Some Concluding Recommendations

It is interesting to see how the non-Western ethical perspectives addressed in this chapter straightforwardly entail social obligations of medical professionals with regard to global warming. These approaches differ in this respect from, say, the Four Principles and North American codes of medical ethics, which focus nearly exclusively on relationships between doctors/nurses and stakeholders such as patients, other doctors/nurses, insurance companies and the like. What, then, should physicians, hospital administrators, bioethicists, public health researchers and so on, particularly those living in Africa and the Middle East, do? Although the developed world clearly has the principal obligation to reduce global warming and to

compensate such regions for harms it has caused them, in the absence of such measures in the near term how can local actors help to mitigate the expected harms?

At the very least, medical professionals in developing countries could collect information about the apparent effects of global warming on health and related values. Knowing what is happening would help governments, NGOs and other agents such as the United Nations to respond where medical professionals themselves cannot.

In addition, medical professionals could help to develop guidelines for prioritizing and rationing the distribution of scarce resources. Knowing, for instance, that it would be cheaper to fight diarrhoea than malaria, supposing one could not afford to address both (Markandya and Chiabai 2009: 782), would help to save lives.

Somewhat more pro-actively, medical professionals could work to develop relevant vaccines, to contribute to mobile clinics, and to transfer medical skills to lay-people in local settings. They could also take an interest in working with other agents to try to prevent water-related harms by, say, promoting early warning systems, enabling communities to collect rainwater as opposed to relying so heavily on ground water, providing the tools and skills that would enable people to irrigate their crops instead of waiting for rain, and supporting reforestation projects (such approaches are commonly suggested in the literature, e.g., Besada and Sewankambo 2009; MDG 2013). Although these kinds of activities are beyond the normal remit of a medical professional, as has been discussed in this chapter neither *ubuntu* nor Islam restrict duties to narrow roles, and instead by and large instruct those who can to do.

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# Chapter 10

## Environmental Harms in Distant Polar Regions and Small Island Developing States

Cheryl C. Macpherson, Satesh Bidaisee, and Calum N.L. Macpherson

**Abstract** The Polar Regions (PR) and Small Island Developing States (SIDS) are distant and relatively undeveloped. They differ in cultures, socioeconomics, geographies, flora and fauna, and annual average temperatures. Despite their differences, they are similar in having small percentages of global population, limited economic and political influence, growing reliance on imported food and goods, and producing relatively small amounts of greenhouse gas emissions. The Arctic encompasses about four million people and 30 different Indigenous Peoples. There, warming has increased exposure to infectious, vector-borne, and mental illnesses; reduced food and water security; and displaced communities through scarcity, rising sea levels, and melting permafrost that damages infrastructure. Combined, the Small Island Developing States (SIDS) have over 60 million people. Their extensive and low lying coastal areas make them particularly vulnerable to sea level rise and extreme weather. Changes in temperatures and precipitation patterns in Caribbean SIDs contributed to outbreaks of infectious diseases including cholera in Haiti, malaria in Jamaica, and H1N1 influenza virus in Barbados. Previously confined to SIDS of the Indian Ocean, Chikungunya (CHIKV) appeared across Caribbean SIDS in 2013, causing significant morbidity. We review health impacts of climate change in the PR and SIDS, contrast the environmental contexts in which these are occurring, and discuss regional and global causes and consequences.

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The Polar Regions (PR), encompassing the Arctic and Antarctic, and the 39 widely dispersed nations comprising the world's Small Island Developing States (SIDS), differ markedly in their environments, cultures, socioeconomics, geographies and locations, flora and fauna, and annual average temperatures and precipitation. Despite these differences, they are similar in having small percentages of global population; limited economic and political influence within, and external to, their governmental affiliations; and growing reliance on imported food and goods. They also contribute relatively small amounts of the greenhouse gas emissions (referred to herein as 'emissions') that worsen climate change.

Climate change refers to long term changes in average annual temperatures, patterns of precipitation and seasonal weather, and other environmental conditions. Its manifestations include impacts on air quality that worsen respiratory illness, and on availability of water for consumption, hygiene, and agriculture. While many institutions, governments, and international bodies are attempting to mitigate, prevent, and adapt to manifestations of climate change, their efforts to do so are often counteracted by policies and practices that encourage consumption and economic growth. This chapter describes the natural environments of the PR and SIDS, reviews health impacts of climate change already affecting them, and discusses the local significance of those impacts. It also reflects on causes of rising emissions including socioeconomic growth and development and related movements of people and goods, and the health and economic consequences.

## 10.1 The Polar Regions (PR)

The PR encompasses the Arctic and Antarctic, north and south poles, and areas within about 60° latitude of each pole. Warming air and sea temperatures in northern and polar latitudes is causing species loss, as seen in northern New England which has 60 % fewer species of flora and fauna today than in the 1850s (Schor 2010). Warming also facilitates northward movement of pathogens and their vectors, as does tourism and exploration and exploitation of natural resources in PR. These and other factors that encourage movement of populations therein increase the proximity of indigenous human and animal populations to visitors, disease vectors, and various pathogens. This contributes to the emergence and transmission of new diseases and health threats. Zoonotic diseases, defined by the World Health Organization (WHO) as those transmitted between humans and vertebrate animals, are one such threat. Zoonoses include rabies, tuberculosis (TB), anthrax, *Salmonella* spp. and other less familiar bacterial, prion, and parasitic infections.

In the Antarctic, the history of human habitation is confined to tourism and scientific and other expeditions. All of these expose indigenous animal and plant species to bacteria, disease vectors, zoonoses, and other diseases not normally found there. In contrast, the Arctic (which this chapter focuses on) has a long history of human settlement and indigenous people. Sources on this history include the

Smithsonian's Arctic Studies Center (<http://www.mnh.si.edu/arctic/>) and popular accounts like Robert Michener's book *Alaska* (Michener 1989) which, grounded in geographic and anthropological research, recounts stories about real and imagined individuals in the Arctic from prehistoric times through the late twentieth century.

Increasing exposure of indigenous people and species to visitors, at closer range and with greater intensity than previously, increases the likelihood of zoonotic disease transmission and the extent and severity of the impacts. Arctic communities have limited medical resources so the introduction of zoonoses is a significant health threat that confronts local healthcare providers but is often overlooked by health officials, policymakers, and governments. Climate change disrupts environmental conditions in the Antarctic too, but we focus here on its impacts on human populations in the Arctic.

### ***10.1.1 Impacts of Climate Change in the Arctic***

The Arctic region covers more than 1/6 of the earth's landmass and is home to four million people including 30 different Indigenous Peoples with over a dozen different languages (Arctic Council 2012). Arctic impacts of climate change center on exposure of indigenous populations to infectious diseases and extreme weather; declining food and water security; and individual and community displacement due to food scarcity, rising sea levels, and melting permafrost (Ford 2012). Although specific vulnerabilities and health impacts in different regions are poorly characterized, it is clear that environmental changes are impeding traditional lifestyles and that the health status of indigenous Arctic populations is declining (Ford 2012).

Arctic populations are particularly affected because they "rely closely on the land for hunting, trapping, foraging, firewood, leisure, socio-cultural connections, and physical, mental, emotional, and spiritual health and well-being" (Wilcox et al. 2012). Up to 80 % of their diet comes from their immediate environment and involves fishing (Weinhold 2010). About 12,000 people harvest and process salmon in one specific area that supports commercial and subsistence fishing for about half the sockeye in the world and, as the economic backbone for many Arctic communities, salmon fishing is central to their sense of identity (Chythlook-Sifsof 2013). Describing his indigenous heritage as Yupik/Inupiat Eskimo, one author says "I was raised in an environment centered on salmon. Fishing is what every family does. It is who we are." (Chythlook-Sifsof 2013). While reducing food security and employment, climate related disruptions to Arctic fishing also challenge identities and undermine mental health.

By shifting patterns and stability of snow and ice, climate change also disrupts previously successful strategies for hunting, deprives communities of traditional diets, and causes food insecurity (Furgal and Seguin 2006). As these impacts persist, they increase incidences of infectious and chronic disease, and rates of suicide and addiction among indigenous, more so than non-indigenous, Canadians (Wilcox et al. 2012). This further harms Arctic populations that are already burdened by high



rates of ill health and poverty, and living in areas with limited access to healthcare and technological and institutional resources (Ford 2012).

As warming melts and softens permafrost, roads on its surface buckle resulting in major damage (EPA 2014). Melting permafrost, like increasingly frequent and severe weather, disrupts travel by road, air, sea, snowmobile, all terrain vehicle, and dog sled, and contributes to increasingly frequent and severe accidents (Wilcox et al. 2012). Changing composition and seasonal patterns of snow undermine foundations and stability of homes, hospitals, and other institutions, and force relocation of Arctic communities to refugee-like settings (State of Alaska 2011) that undermine physical and mental health and socioeconomic productivity. Warming also impacts local sporting events including the iconic Iditarod race in Alaska which has, in recent years, had significantly less snow than in its entire history and thereby become more dangerous and costly for mushers, dogs, and supporting veterinarians and physicians (Pilon 2013).

Other Arctic impacts are shortened winter ice seasons, increased coastal erosion, and altered distribution of wildlife and plant species (Furgal and Seguin 2006); greater exposure to ultraviolet rays that raise the risk of skin cancer, cataracts, and immune suppression (Oakley et al. 2013); and increased incidence of respiratory and cardiovascular diseases due to altered levels of air-borne pollen, spores, and contaminants (WHO 2014). Sea level rise has worsened coastal floods and erosion, decreased productivity of agricultural land and coastal fisheries, reduced food yields, and increased malnutrition (Costello et al. 2009); and contaminated fresh water and displaced entire communities (Black et al. 2008).

While the Arctic is rich in natural resources and governed by wealthy nations (Canada, Denmark, Finland, Iceland, Norway, the Russian Federation, Sweden, and the USA), its Indigenous Peoples, like Indigenous Peoples in other regions, typically live at or below poverty levels (World Bank 2010). In the Arctic, their health and wellbeing are marginalized in research and policy (Wilcox et al. 2012); and the 500,000 indigenous inhabitants of over 40 different groups of Indigenous People are represented by six Permanent Participants on the Arctic Council, a forum for political and scientific discussion of issues common to the eight Arctic governments (Arctic Council 2012).

### ***10.1.2 Changing Vector and Disease Distributions***

Arctic warming has facilitated the introduction and transmission of infectious diseases that were, until recently, constrained by temperature to other regions. A number of pathogens have expanded beyond their traditional geographical distributions and increased the incidence of human exposure to endemic zoonoses in the Arctic (Jenkins et al. 2013). These include *Diphyllobothrium* spp. (the broad tapeworm which outcompetes the human host for vitamin B12 and causes pernicious anemia) and *Trichinella* spp. (the larvae of which encyst in muscles of the host

and cause myalgia); water-borne protozoan zoonoses such as *Giardia* spp. and *Cryptosporidium* spp. (which both cause diarrhea); and *Toxoplasma gondii* (which can cause abortion, chorioretinitis, toxoplasmic encephalitis, and hydrocephalus) (Jenkins et al. 2013).

As the geographic ranges of parasites and their vectors expand, those with temperature-dependent environmental stages in their life cycles (including *Toxoplasma gondii*, *Toxocara canis*, *Diphyllobothrium* spp. and *Anisakis* spp.) will move further north, and their geographic expansion will be facilitated by migration of definitive host species such as the red fox (*Vulpes vulpes*) which is also expanding its range northward (Jenkins et al. 2013). When humans are infected with *Toxocara canis* through the ingestion of larvated eggs deposited in the environment by the red fox, or more commonly by the domestic dog *canis familiaris*, the larvae migrate throughout internal organs and may generate any of four syndromes including visceral, ocular, neurotoxocariasis, or covert toxicariasis which can result in severe morbidity requiring specialist diagnosis and treatment often unavailable in the Arctic and SIDS (Macpherson CNL 2013c).

Among other factors, climate change and warming are accelerated by global increases in trade, travel, and other activities that raise demand for consumer products and services and generate emissions during their production, packaging, transport, consumption, and disposal. These activities also facilitate the spread of zoonotic diseases because seal meat and skin, walrus tusks and meat (mainly for dogs), and beluga whale skin and blubber are increasingly exported from the Arctic, and traditional processing methods like drying and freezing are practiced more widely to meet market demand (Macpherson 2005). This increases exposure to *Trichinella* spp., *T. gondii* and *Diphyllobothrium* spp. (Kutz et al. 2009; Jenkins et al. 2011). The emergence of such parasites impacts hardest on the poor who are typically less educated, have less access to diagnostic tests and treatment, and are less likely to treat working, agricultural, or pet animals for zoonotic or other disease (Nelson 2013).

### 10.1.3 Causes and Consequences

Activities that generate large amounts of emissions in the Arctic typically begin, and are funded in, wealthy nations. Among others they include (i) exploration, extraction, processing, transport, and use of fossil fuels; (ii) mining, production, and transportation of natural resources for chemical, industrial, and other commercial purposes; (iii) agricultural practices including large scale farming of reindeer, caribou, and sheep; (iv) management, purification, and transportation of water for consumption and agriculture; and (v) production, transport, and use of electronic and digital technologies, and related materials and resources. Individuals, institutions, and governments determine the extent to which these activities are undertaken and regulated. Because they provide employment and socioeconomic growth, these

activities are typically encouraged both locally and elsewhere. Other means of generating employment and growth are seldom explored by those initiating or participating in development projects, although development projects that produce fewer emissions and burdens are possible.

Arctic environments and resources are exploited through deforestation, construction of dams, the cruise ship and tourist industry, and exploration and transport of minerals and fossil fuels. These generate economic benefits for Arctic populations and individuals, but pose harms from climate change that, once unforeseen, are now documented and well known. There is little media attention or public or policy dialog about the harms, however, or how they balance against the benefits. The harms include injustices to Indigenous Peoples and Arctic communities which receive little assistance for climate mitigation, preparedness, adaptation, or capacity building. The economic benefits to them are disproportionately small as they lose traditional cultures, identities, and food sources; receive no compensation for related losses; and have limited capacity to prepare, adapt, or recover. Such challenges to social justice receive little attention in the media and bioethics (Macpherson 2013a, b), and health policy (Wiley 2010; Singh 2012).

## 10.2 Small Island Developing States (SIDS)

The 39 politically independent small island developing states (SIDS) have diverse sizes, cultures, and locations around the world (AOSIS 2013; SIDSnet.org 2014; United Nations 2014). SIDS were officially recognized by the United Nations (UN) at its 1992 Conference on Environment and Development (UNCED), also called the Earth Summit, as a diverse group of island nations facing common challenges. These include their proportionally large and low lying coastal areas which make them particularly vulnerable to sea level rise, extreme weather, and other manifestations of climate change (SIDSnet.org 2014).

SIDS vary in histories, geographies, weather patterns, cultures, political systems, and socioeconomic conditions. As noted above, their commonalities with each other (and Polar Regions) include their geographic isolation, small percentages of global population, limited global influence, increasing reliance on imported goods, and disproportionately small contribution to global emissions. SIDS aspire to sustainable development but are challenged by their small size and narrow range of resources; isolation from markets, reliance on imported goods and consequent high shipping costs; vulnerability to sea level rise because of their coastally concentrated populations, economic hubs, and infrastructure; and physical exposure to increasingly frequent and severe natural disasters such as droughts, floods, and hurricanes (SIDSnet.org 2014). Caribbean hurricane damage is not uncommon but in 2004 Caribbean SIDS including Grenada, which had last experienced a hurricane 50 years earlier, were devastated by Hurricane Ivan.

### ***10.2.1 Impacts of Climate Change in SIDS***

SIDS coastal regions directly expose their populations and infrastructure to sea level rise, storm surges, extreme weather, erosion, and other coastal hazards that contribute to loss of landmass and ecosystems, deterioration of fisheries and tourism, and declining fresh water and agricultural productivity. These challenges hinder SIDS attempts to maintain healthy populations and survive as nations (SIDSnet.org 2014).

Physicians and other health professionals perceive warming in SIDS as resulting in increased respiratory, infectious, and heat-related disease (Macpherson and Akpınar-Elci 2015). Areas geographically adjacent to SIDS are experiencing rises in annual average air temperatures and sea levels at rates that exceed average global rates (Nurse and Sem 2001). As a result, unique plant and bird species are disappearing along with once extensive coral reefs and mangroves that supported large populations of aquatic species and helped protect coastlines from encroaching seas and extreme weather (Nurse and Sem 2001). Simultaneously, rising atmospheric carbon levels are increasing the acidity of seas and oceans, and reducing viability of coral reefs and their protective value and species diversity (IPCC 2014). The economic and health consequences for SIDS are compounded by shoreline development and by limited capacity and infrastructure with which to respond (Nurse and Sem 2001).

### ***10.2.2 Changing Vector and Disease Distributions***

In addition to warming temperatures and changing seasonal patterns, increases in tourism and trade contribute to the movement of several billion people and animals annually (Robertson et al. 2014). This increases opportunities for the spread of infectious diseases in SIDS by dispersing viruses, bacteria, fungi, parasites, and vector species, and facilitating their establishment in new locations (Robertson et al. 2014). Some, such as helminth parasites, are introduced insidiously. Others involve epidemics of bacterial, viral or protozoan infections with enormous economic and health consequences for individuals and nations.

In 2010, Haiti's first outbreak of cholera in almost a century caused over 650,000 cases and over 8000 deaths (Ivers et al. 2013). Molecular studies revealed that the cholera strain in Haiti was the same as one found in southern parts of the Asian continent (Lantagne et al. 2014) and may have been introduced by aid workers visiting Haiti after its earthquake that year. This finding led to an extraordinary legal case that emphasizes the economic and public health implications of introduced pathogens (Kmietowicz 2013).

Outbreaks in Caribbean SIDS include the helminth *Angiostrongylus cantonensis* which causes symptoms similar to bacterial meningitis that can be severe and may cause death (Chikweto et al. 2009), and the reintroduction of malaria into

Jamaica in 2006 (Webster-Kerr et al. 2011) and H1N1 influenza virus into Barbados in 2009 (Sobers-Grannum et al. 2010). Vector-borne viral epidemics in SIDS include the gradual introduction of all four dengue serotypes into Grenada (Schioler and Macpherson 2009); epidemic dengue activity in SIDS of the Pacific Ocean (Steel et al. 2010); and repeated dengue introductions into Hawaii (Imrie et al. 2006) which shares SIDS geographies and climates.

Chikungunya (CHIKV), another vector borne viral infection transmitted by the same mosquito species as dengue, *Aedes aegypti* and *Ae. albopictus*, caused outbreaks of febrile polyarthrititis in 2005 in the Comoros Islands and rapidly spread to other SIDS in the Indian Ocean (Pialoux et al. 2007). Its symptoms resemble those of dengue fever but are more severe and prolonged, though cause less fatalities. The movement of infected people throughout the tropics and subtropics, and the ubiquitous distribution of the vectors in these regions, resulted in the rapid spread of CHIKV throughout Southeast Asia, and even into southern Europe (Nicoletti et al. 2007). CHIKV arrived in the Western hemisphere for the first time in the fall of 2013 and rapidly spread throughout the Caribbean region in 2014 where it resulted in well over 100,000 cases (Fischer and Staples 2014; CARPHA 2014). Increased travel, viral mutation, virus introduction into immunologically naive populations, and climate change are all thought to have contributed to this spread.

The mosquito vectors of CHIKV have adapted to live in manmade habitats, feed primarily on human blood, and breed in water storage containers which are common in SIDS because of water insecurity. They are day biting vectors, and a simple probe by an infected mosquito can transmit the virus. The increased frequency of rainfall throughout the year, rather than primarily during the once predictable annual rainy season, increases potential breeding opportunities for these vectors and makes them increasingly difficult to control with current technologies. Coupled with increasing numbers of buildings and water storage containers in SIDS, this increases the number of these domesticated vectors and their ability to transmit disease. Even before CHIKV reached the Caribbean, local health professionals perceived climate change as altering their seasonal weather patterns in ways that were increasing mosquito borne illness therein (Macpherson and Akpinar-Elci 2015).

The economic and public health costs of CHIKV include those associated with severe and chronic arthritis which occurs after the acute illness, and causes absenteeism from work for prolonged periods (Meason and Paterson 2014: 108). Arthritis contributed significantly to direct medical costs of a recent outbreak in La Réunion at US\$80–\$160 per patient, and to lost income in India in 2006 of about US\$5.5 million (Meason and Paterson 2014). News reports of the Caribbean CHIKV outbreak immediately reduced tourism from the USA to affected nations (Robles 2014), and raised the costs of increased fogging and other vector control efforts. Added to the costs of additional surveillance and diagnosis, these strain Ministry of Health budgets.

The laboratory diagnosis of CHIKV initially requires the amplification of viral RNA using real time PCR, but several days after onset of symptoms, the virus is overcome by the immune response and diagnosis must be based on identification of specific IGM antibodies by the enzyme linked immunoabsorbant assay (ELIZA). These tests require primers and antigens that are unavailable in SIDS and must be

performed in one of few specialized laboratories before an outbreak can be confirmed. Shipping of sera increases the cost, delays availability of and access to results, and delays implementation of control measures, thus increasing the number of cases and consequent economic impact (PAHO/CDC 2011).

### ***10.2.3 Causes and Consequences***

Like the Arctic, development in SIDS often stems from emissions-producing activities conceived and funded in wealthy nations. SIDS governments aspire to sustainable development but also support policies and activities that produce large amounts of emissions including exploration for, and extraction and use of, fossil fuels and minerals; importation and sale of motor vehicles, electrical items, and foods; and construction of roads and buildings—often in unspoiled areas that serve as carbon sinks to buffer the effects of emissions. Alternative approaches to development could be designed to reduce emissions while generating more sustainable economic growth and employment. SIDS governments and institutions could pursue and mandate carbon neutrality into their development by requiring ecological impact studies by qualified and objective professionals and adherence to their recommendations, and ecofriendly practices and materials in construction, exploration, and extraction of resources.

Similar efforts slowed deforestation in the Amazon enough to reduce Brazil's emissions by half over 8 years, and experts say that such efforts could stop Brazil's deforestation entirely while doubling its grain production (Porter 2014). Such successes suggest that carbon neutral approaches to international investment, capacity building, disaster preparedness, and others would provide economic and health benefits to SIDS, and beyond. Investors and SIDS governments, however, avidly pursue oil, gas, minerals, and industrial fisheries and agriculture, with little attention to the future harms to health, employment, and economic development. SIDS transitions from low, to middle, to high income nation status elevates their energy use and demand for motor vehicles, air conditioning, electrical devices, and imported foods. This raises emissions and exacerbates existing problems, as does increasing their flights, ports, cruise ship services, and tourist visits. The harms of these activities ought to be integrated into risk analyses and cost effectiveness calculations and incorporated into development strategies and policies. Institutions, industries, and governments ought to negotiate and implement reasonable constraints on these activities and hold accountable all who violate them.

## **10.3 Development and Emissions: The Global Context**

Health in SIDs, PR, and even wealthy nations is challenged by policies that promote socioeconomic growth at the expense of damaging or destroying environmental resources necessary to health. Those who doubt that these resources are

disappearing and emissions are rising with the pursuit of economic growth ought to examine the extensive and credible sources of evidence; and those in influential positions due to wealth, education, or other factors, have greater responsibility than others to obtain and examine such evidence. While relatively few understand the rationale or quantification of health indicator data, many accept that health indicators improve with economic development and are likely to perceive development and market forces as the way to rectify societal problems. Development creates other problems, however, by proportionately elevating emissions (UNEP/GRID-Arendal 2005). Policymakers and political leaders tend to lack understanding of such evidence, its implications, and what makes it credible. By helping to elucidate these features, bioethicists can perhaps increase their integration into policy (Jamieson 2014).

Even in wealthy nations, limited resources and capacities often impinge on the abilities of governing bodies to provide high quality healthcare and other services. Healthcare becomes a priority therein when scarcity renders their health systems less able to deliver expected services and standards. Similarly, food scarcity may shift policy priorities toward accessing, delivering, and producing foods. Encouraging employment and economic growth to reduce scarcity, without considering alternatives, neglects the harms of emissions produced in the process. Consequently, explains economist Juliet Schor, “most of the political action on climate has so far been directed at technology. It’s what the market does well, and it poses no political threat to business-as-usual. More far-reaching change, in growth aspirations, the basic structures of the economy, or the consumer culture, is barely under discussion” (Schor 2010: 86). Willingness to envision new approaches to business-as-usual requires creativity and courage.

To avoid the harms of emissions to health, economies, and other forms of self-interest, industries and nations must move from business-as-usual to other developmental goals (Macpherson 2016). Governments have human rights based obligations to protect health, particularly of disadvantaged and marginalized populations, from rising temperatures and seas and extreme weather (Meason and Paterson 2014). In low and middle income nations, these obligations may be fulfilled simply by requesting assistance from investors, organizations, and others, and negotiating alternative methods of development. Some States design and implement local mitigation and education campaigns to raise awareness of links between emissions and mosquito-borne diseases, but simultaneously fail to meet their obligations under the International Covenant on Economic, Social and Cultural Rights (Meason and Paterson 2014). Private investment may be profitable and helpful, and one such project conveys “hope and awareness of the plight of our oceans before it is too late” by installing underwater sculptures that act as artificial reefs and attract corals, increase biomass, and promote regeneration of marine life (Buxton 2014).

These benefits and harms of development need to be re-framed in ways that prompt nations and industries to shift priorities from economic growth and profit, to preservation of environmental resources essential to health and their own wellbeing. Conflicts between these values should be illuminated and central to deliberation about all forms of policy, and deliberation requires presentation of objective

evidence in ways that can be understood by diverse stakeholders (Goold et al. 2012). Instead of economic growth, priorities could center on promoting health and wellbeing in ways that governments and others will be able to fulfill generations into the future.

### 10.3.1 *Global Bioethics*

Decades ago, Van Rensselaer Potter described global bioethics as a means of understanding, valuing, and preserving health, and the natural environments that sustain health long into the future by communicating and working across disciplines (Potter 1999; ten Have 2012). Like governments and leaders, the discipline of bioethics should therefore expand its attention from individual autonomy and problems of wealthy nations, to health and the natural environments that sustain it (Macpherson 2016). Bioethicists might begin by partnering with disciplines including communications and media, parasitology, meteorology, economics, anthropology, sociology, or others to illuminate the complex and often conflicting values associated with emissions and development. Bioethicists established norms for patient autonomy in clinical and research settings, and given evidence about the causes and consequences of emissions, they ought to bring such influence to bear on regional health impacts of climate change.

The potential monetary value of different environmental resources may vary with their contributions to health, economies, and security over time; and with contextual factors that bear on their abundance, accessibility, and quality in different locations. In SIDS, one such resource is the unspoiled sandy beaches that support tourist economies. Sandy beaches, however, are shrinking around the world due to sand mining (Gillis 2014; Alvarez 2013) and being replaced by hotels, casinos, shopping malls, ports, oil rigs, and other commercial and domestic activities. As their beaches and natural resources diminish through such activities, their carbon sinks are depleted and their emissions rise (Macpherson and Akpinar-Elci 2015).

In the 1980s, media reports about pollution and ozone generated public outcry and resulted in effective restrictions against these in the USA and elsewhere. In the USA today, however, well financed partisan interests seem to influence what topics are covered by the news media and how these are framed. The media addresses health but is mostly silent about emissions and the environment. More balanced media attention to emissions would better inform governments, leaders, policymakers, and the public. It could galvanize assistance for sustainable development and disaster preparedness from organizations, and help preserve what remains of unique natural environments in SIDS, PR, and beyond.

The need for approaches grounded in global bioethics is clear given the complexities of globalization, population growth, and rising demand for products and services. In the USA, the *weight* of imported electronic products such as computers, cell phones, and televisions increased by 75 % between 1998 and 2007; and *units* of cell phones imported into the USA in those years grew from 14 million to



177 million (Schor 2010). That many of these goods are transported and exported repeatedly uses more fossil fuels and produces more emissions. The rare earth elements used to produce cell phones and other electronics are found only in a few unique locations where they are mined and cannot be replenished (Cornelius 2013). Improving fuel efficiency will not solve the problems because even marked improvements are counteracted by steadily growing demand. In the USA, for example, aviation fuel consumption per mile has fallen more than 40 % since 1975, but total fuel use has grown by 150 % due to increased travel, and fuel consumption for motor vehicles has a similar pattern (Schor 2010).

While the health sector is increasingly attentive to emissions, few political, industrial, or economic leaders seem concerned about short or long term costs, or incorporate these into risk assessments, policies, or business models. Relatively few of them see health or natural resources as public goods, or acknowledge that business-as-usual threatens these goods. The conflict between economic growth and natural environments warrants research and attention in bioethics and other realms. Bioethicists, along with the news media, meteorologists, and educators, should be informing students, colleagues, institutions, leaders, and the public about the present and long term consequences of rising emissions, business-as-usual approaches, and possible alternatives.

## 10.4 Conclusion

The authors of this chapter are from, or have lived for decades in, Caribbean SIDS where environmental resources include tropical rain forests, miles of undeveloped beaches, and mangroves and corals that facilitate fishing and tourism while helping protect against storms and sea level rise. Left intact, these resources support physical and mental health for Caribbean people and visitors, and Caribbean economies. These are unspoiled places for sports, recreation, relaxation, creativity, and spirituality, that also serve as carbon sinks. Once common on Caribbean beaches, baptisms, weddings, and informal cricket games, are seldom seen there today. Some speculate that this is due at least in part to receding shorelines and sea level rise.

The aesthetic beauty of SIDS attracts artists, writers, musicians, sailors, biologists, celebrities, and others from near and far. Greater understanding of the tradeoffs between development, health, and the preservation of their natural environments is overdue. These resources are valuable in promoting health and wellbeing in many ways. Paying nations and others to preserve and protect them has been effective in Brazilian rainforests and African wildlife reserves, and is likely to be useful in SIDS and PR.

Bioethics steadfast focus on individual autonomy prevents its pursuit of other opportunities to advance health and wellbeing for present and future generations, and its recognition of its own responsibilities in the face of climate change. It could

help to reframe human reliance on natural environments, and encourage appreciation for other living things. As Peter Singer explains,

“Wilderness is valued as something of immense beauty, as a reservoir of scientific knowledge still to be gained, for the recreational opportunities that it provides, and because many people just like to know that something natural is still there, relatively untouched by modern civilization. ... Arguments for preservation based on the beauty of wilderness are sometimes treated as if they were of little weight because there are ‘merely aesthetic’ ... It is difficult to imagine any economic gain that we would be prepared to accept as adequate compensation for, for instance, all the art in the Louvre. How should we compare the aesthetic value of wilderness with that of the art in the Louvre? Here, perhaps, judgment does become inescapably subjective” (Singer 2011: 243–244).

Such judgments may be subjective but bioethicists often make judgments based on evidence. Judgments that lead to acceptance of the exploitation of natural resources necessary to the survival of our children are poorly informed judgments. Understanding of, and responsiveness to, the emissions filling our atmosphere are overdue. Greater appreciation and protection of natural environments and ecosystems in SIDS and PR is essential to protect health and wellbeing today.

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**Part III**  
**Emissions and Policy**

# Chapter 11

## Beyond the Precautionary Principle: Protecting Public Health and the Environment in the Face of Uncertainty

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**Abstract** In this article, we scrutinize the ability of the Precautionary Principle to serve as a unifying principle for public health. Although most commonly invoked in environmental health regulatory debates, implicit and explicit invocations of the Principle have spread to other contexts. Here we seek to understand the potential uses of the Precautionary Principle for those concerned with population health by considering its invocation in five cases: vaccination, quarantine for SARS, needle exchange to prevent the spread of HIV/AIDS, e-cigarettes as an alternative to tobacco cigarettes, and climate change mitigation. We ask whether the Precautionary Principle offers a philosophical approach precise and sufficiently stringent to guide health policy in a range of circumstances where evidence may be less than definitive and the course of action contested. We find there are far more ambiguities in the Principle's application than might appear at first and conclude that it is best used in concert with other frameworks for guiding action in the face of uncertainty.

### 11.1 Introduction

The Precautionary Principle was first articulated in the context of pollution control, where planners in the former West Germany sought to address “forest death” in the 1970s (EEA 2001; Jordan and Riordan 1999). At its most basic, the Precautionary Principle—which argues that any activity that may threaten human or environmental health be forestalled until proven harmless, and that the proponent of a new

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activity bear the burden of proving it safe—is captured by aphorisms such as “better safe than sorry” or “when in doubt, don’t.” Proponents are particularly focused on preventing potentially irreversible harms, such as the release of chemicals or genetically modified organisms that cannot be recalled, and on protecting current and future generations.

In its strictest interpretation, known as “deep” or “deep green” precaution, the principle holds that any suspicion of harm should be sufficient to trigger precaution, even “in the absence of any scientific evidence” and “without regard to cost” (Jordan and Riordan 1999). The principle expresses skepticism about the adequacy of the scientific method to demonstrate long-term harm and provide a basis for timely action, challenges the dominance of experts over those with community experience, and rejects cost-benefit approaches that are seen as arbitrarily assigning monetary value to life or environmental integrity and are particularly biased against money spent in the present to safeguard the future (Ashford 1999).

Opponents, recently and preeminently Cass Sunstein, have referred to the Precautionary Principle as the “paralysis principle,” arguing that it substitutes intuitive fear for scientific proof and that its hostility to cost-benefit analysis hampers action in the name of uncertainty (Sunstein 1995). Despite this debate, precautionary logic—whether explicitly invoked or implicitly accepted—has increasingly shaped debates over public health policy. For example, prevention advocates have invoked precaution in discussions of lead poisoning, Agent Orange, pesticides, synthetic compounds, energy production, blood safety, groundwater contamination, and electric and magnetic fields, among others (Wilson and Ricketts 2004; Goldstein 2001; Stoto 2002).

A growing literature has analyzed multiple permutations of the Precautionary Principle and various conditions for its usage. These include the seriousness of a potential harm, evidence indicating a risk, and opportunity costs and potential consequences of a regulatory action. It is not our goal to add to this conceptual debate, which often occurs at a level far more abstruse than that found in typical real-world practice. Rather, we move to the recent history of public health and consider invocations of the Precautionary Principle in five lived contexts: vaccination, quarantine for SARS, needle exchange to prevent the spread of HIV/AIDS, e-cigarettes as an alternative to tobacco cigarettes, and climate change mitigation. We ask whether the Precautionary Principle offers a philosophical approach precise and sufficiently stringent to guide health policy in a range of circumstances where evidence may be less than definitive and the course of action contested.

While this might seem a dissonant pastiche of examples, in fact they all capture the central challenges of public health: How do we mitigate existing harms? What level of risk can be acceptably borne by the public and what is our standard of comparison? Do we compare risks to a theoretical pristine state or do we compare the risks of action (or inaction) to prevailing risks? How much evidence do we need to justify action and when? Who should bear the burden of uncertainty of action or inaction? What standards of equity should guide those determinations?



## 11.2 Vaccination: Small Risks, Big Benefits, and the Dual Uses of Precautionary Logic

Indicative of the extent to which precautionary thinking has been embraced by public health policy makers is the 1999 decision to remove the mercury-based preservative thimerosal from vaccines in light of fears that it might cause autism or other adverse effects in children. Although used for many decades, thimerosal's potential for harm came to light only in the late 1990s as a result of a review initiated by the FDA of mercury in biological products. In a joint statement, the U.S. Public Health Service and the American Academy of Pediatrics conceded that "the large risks of not vaccinating children far outweigh the unknown and probably much smaller risk, if any, of cumulative exposure to thimerosal-containing vaccines over the first six months of life." But in an implicit expression of the Precautionary Principle, the statement declared that "because any potential risk is of concern," thimerosal should be removed from use as soon as possible (CDC 1999).

In the case of vaccines, however, the language of precaution has primarily been mobilized by those who have opposed mandatory public health immunization programs and, especially, school entry requirements. As new vaccines were developed in the twentieth century, they often went into wide use based on the results of trials that would not meet today's standards for evaluating safety and efficacy, and even in light of incidents in which improperly prepared vaccines caused illness and death (Baker 2000). The high toll of morbidity and mortality from diseases such as diphtheria, pertussis, and polio provided the warrant for sweeping public health action. Those who insisted that vaccines not be widely administered without better proof of their value remained politically marginal for most of the twentieth century. Public health officials generally held that the favorable effects of widespread vaccination were self-evident and far outweighed the isolated instances of illness and even death caused by vaccines. Highly publicized events that might have prompted a shift toward a more precautionary stance—such as the 1955 incident in which contaminated lots of Salk polio vaccine caused more than 200 cases of polio and eleven deaths—did not alter the policy in favor of deploying new vaccines on a wide scale (Brandt 1979).

More recently, a small group of vocal and politically astute activists has challenged the public health establishment to rethink its views of the risks and benefits of universal childhood immunization. The increasing visibility of anti-vaccination views has come, ironically, even as the technology for producing safe and effective vaccines has improved. The outlook of these activists implicitly embodies the Precautionary Principle, though they do not typically invoke it by name. They contend that the apparent rise in the incidence of chronic disorders such as autism is due to the effects of vaccines on a minority of children who, for unknown reasons, have biological susceptibilities to vaccine-related injury. While they do not recommend discontinuing the use of vaccines altogether, they reject current policies of mass immunization that do not allow parents to make choices about which vaccines their children receive. "Because so little research has been conducted on vaccine side

effects,” argues Barbara Loe Fisher, a leading opponent of mass vaccination, “no tests have been developed to identify and screen out vulnerable children....Public-health officials have taken a ‘one-size-fits-all’ approach” (Fisher 2000). In short, until the risks of vaccination can be eliminated, it is inappropriate to make the practice mandatory. Consistent with precautionary thinking, these activists have rejected the cost-benefit calculus that argues that *failure* to vaccinate poses a greater risk to the health of a child than does the vaccination itself: “when it’s your child, the risks are 100 %” (Gottstein 2002).

Against these claims, public health advocates have asserted that the demand for certitude represents an unacceptable standard, one that would eviscerate the possibility of serving the public good. Indeed, they have argued, that small, measurable risks are an acceptable price that we must be willing to pay for big public gains.

### 11.3 Quarantine for SARS: Risks, Liberty, and the Dual Uses of the Precautionary Claim

The Precautionary Principle was explicitly embraced as a core public health value during the worldwide outbreak of Sudden Acute Respiratory Syndrome (SARS) in 2002. In this instance, it was leveraged in support of broad quarantine practices (Gostin et al. 2003). In several respects, SARS tested the limits of scientific certainty, returning society to a pre-therapeutic era: a non-specific case definition, the absence of an assay that could distinguish between the infected and the merely exposed, and no effective vaccine or treatment (Gerberding 2003). Proposals to confine those who were potentially exposed thus raised questions about the level of risk that justified loss of liberty. Was suspicion of infectiousness or even exposure sufficient to detain?

Countries with diverse socio-political and constitutional traditions, ranging from China, Hong Kong, Vietnam, and Singapore to Canada answered these questions with precautionary logic and broad quarantine (Bloom 2003). In other words, with no means of knowing who amongst the exposed would actually spread the disease to others, precaution dictated that *all* of the exposed should be quarantined. Quarantine received a ringing endorsement from the World Health Organization (WHO): “At the beginning of an outbreak, it is sound public health policy to institute *maximum* control measures needed to prevent further spread” (WHO 2003). The CDC explained, “Applying quarantine too narrowly in the midst of an extensive outbreak can...blunt the efficacy of policy if missed cases result in additional generation of transmission” (CDC 2004). Set within a precautionary rubric, those exposed to SARS became equivalent to chemicals of uncertain toxicity, and authorities regulated their circulation until it was clear that no harm would be done by their release. In Canada, one of the epicenters of the epidemic, a consistent lay reaction to sweeping quarantine efforts was, quite literally, “better safe than sorry” (Editorial 2003; Goldstein 2003; Talaga and Powell 2003).

Strikingly, precautionary logic was also invoked by those who opposed the imposition of quarantine. For example, one infectious disease expert in Canada noted that quarantine was a “scary” measure to take for a disease with a case-fatality rate less than hospital-acquired pneumonia: “You don’t do that for a minor thing” (Singer 2003). Legal scholar George Annas, one of the most ardent defenders of civil liberties in the context of public health, has included quarantine among the excesses against which sound policy must guard. Without denying the role for quarantine in some situations, Annas rejects the presumption that “a trade-off between the protection of civil rights and effective public health measures” is essential or even productive. Civil liberties, rather, must be safeguarded in the absence of “empirical evidence” that quarantine measures are “necessary and effective” (Annas 2002). We may not trifle with civil liberties unless the risks are certain and compelling. In other words, quarantine is the “threat” that must be proven necessary and effective before its introduction.

These claims were given substance by what evidence ultimately revealed about the threat posed by SARS. By the Fall of 2003 it became clear that the isolation procedures used during the initial outbreak had been far too expansive. The CDC reported that individuals quarantined after contact with an asymptomatic SARS patient “had no detectable risk” of infection and that 66 % fewer people might have been quarantined without reducing the efficacy of the procedure (CDC 2003). The CDC accordingly modified its quarantine guidelines. Nonetheless, even if they proved overly restrictive, precautionary measures were largely credited with rapid control of SARS: the epidemic did not spread beyond its epicenters, and WHO explicitly advised application of precautionary quarantine for air-borne epidemics when it was “unclear whether human-to-human” transmission was occurring (WHO 2004).

#### **11.4 Needle Exchange: Precaution and the Competing Concept of Harm Reduction**

An outbreak of hepatitis B among injection drug users (IDUs) in Amsterdam in 1984 led to the first syringe exchange program (Oppenheimer 1993). Needle exchange provided IDUs with sterile injection equipment, thus eliminating the need to share potentially contaminated “works.” Recognition of the efficiency with which HIV was spread by contaminated needles and the overwhelming and relentless number of deaths from AIDS led to wide and rapid expansion of this intervention. Proponents justified needle exchange for those unwilling or unable to abstain from illicit drug use based on the fact that AIDS was almost invariably fatal and that, in the absence of action, further spread of the epidemic was certain. They were propelled by an emerging and contending philosophy of public health, that of harm reduction, which pragmatically accepts that drug use is inevitable but seeks to

minimize the public health and population level consequences. Like the Precautionary Principle, it values lay knowledge in the face of palpable threats.

In the United States, where temperance and neo-temperance movements, such as Nancy Reagan's "Just Say No" campaign, had long dominated drug policy, critics of needle exchange adopted a precautionary stance and warned that such programs might in fact entice more people to use heroin. Early in the epidemic, when the evidence regarding the efficacy of the intervention was scanty, the opponents of needle exchange were found not only among politicians and the public, but also public health officials. "Passing out tools of addiction," commentators in the Maryland Department of Health warned, "could condemn even larger numbers of citizens to wasted lives and others to a life of crime" (Silverman and Rusinko 1988). Others worried that collateral damages, such as needle stick injuries to schoolchildren or accidents and crime involving heroin addicts, would occur near needle exchange sites. Wrote one physician, "I am concerned that we may increase the risk of AIDS in the community at large by such distribution. With access to free sterile needles, what care should we expect in the disposal of used contaminated needles? A careless drop in a garbage can, on the street or in an alley could very well be the accidental source of infection (by needle prick) to a building superintendent, sanitation worker or child at play" (Hoskins 1986).

As increasing numbers of public health officials came to embrace needle exchange and evidence of its efficacy came to light, opponents of needle exchange drew particular attention to the risk that syringe distribution represented for future generations. Opposition, to be sure, was not based solely on lingering questions of scientific uncertainty. "Needle exchange programs send the wrong message to our children by condoning illegal drug use," insisted Governor Christine Todd Whitman of New Jersey in 1998. In keeping with precautionary rhetoric, the governor implied that the release of needles would steer a generation of children toward drug addiction, and would be exceedingly difficult or impossible to reverse (Richardson 1998).

The precautionary charge that needle exchange might directly or indirectly perpetuate heroin use and community problems held particular resonance for African American communities, where the prevalence of illicit drugs was seen as the consequence of "malignant neglect" by the government and public health entities (Kirp and Bayer 1993). In these arguments, not only illicit drugs but also clean needles were conceptually akin to potential toxins being introduced into the community. Coming after decades of failure to provide adequate drug treatment in African American communities, some saw needle exchange as a kind of malpractice neglect in keeping with the legacy of Tuskegee (Fairchild and Bayer 1999). The practice, then, could not be evaluated purely in terms of risk, but had to be set within a broader historical frame.

While a literature would begin to accumulate during the 1990s suggesting that syringe exchange programs did, in fact, reduce HIV infection and other harms associated with injection drug use without increasing such use, it has not proven decisive (Des Jarlais 2000; Moss 2000; Coutinho 2000). At the state level, resistance to needle exchange weakened in the face of evidence showing that it does not promote drug use and can reduce the spread of HIV. There were only 63 known needle

exchange programs operating by the mid-1990s; in 2000, there were 127 (Des Jarlais et al. 2004). The continued federal ban on funding of programs that provide sterile syringes, however, demonstrates the strong grip of precautionary thinking linked to a prohibitionist perspective on public health policy in this arena.

## 11.5 The Debate Over E-Cigarettes: Precaution as a Call for Restraint

E-cigarettes—battery operated nicotine delivery devices that vaporize and use propylene glycol to capture the look and feel of smoking—first appeared in European and American markets less than a decade ago (Noel et al. 2011). Sales have reached \$650 million a year in Europe and are estimated to reach \$1.7 billion in the US this year (Higgins and Richtel 2013; Mangan 2003). Though a fraction of cigarette sales, e-cigarettes represent a significant market achievement with some predictions that they may eventually eclipse tobacco cigarettes. On October 26, 2013 the *New York Times* business section devoted a cover story and two full pages to a discussion of the market share of this new product. The introduction of e-cigarettes, which, like their tobacco twins contain nicotine, an addictive but generally benign drug, generated controversy that has closely mirrored the pitched battles over needle exchange (Richtel 2013).

On one side of the dispute are the forces of tobacco control, determined to keep this product off the market until it has been proven safe and effective. Although not explicitly stated, opponents view e-cigarette through the lens of the Precautionary Principle, which requires proof of safety and efficacy in *advance* of allowing them onto the marketplace. They are haunted by the specter of e-cigarettes as a “gateway” or “bridge” product, eventually leading to an uptick in underage smoking (Cobb and Abrams 2013). Further, opponents put great weight on studies highlighting youth experimentation with e-cigarettes and those that suggested that adolescents who used e-cigarettes were less likely to have quit (Lee et al. 2013). Simon Chapman and Melanie Wakefield, two important figures in the tobacco control movement in Australia, warn that, whether amongst adults or youth, the goal of the industry is actually “dual use,” meaning e-cigarettes are not meant to serve as an alternative to tobacco cigarettes but rather are a means of ensuring that smokers don’t quit. “This,” they conclude, “could be a harm-increasing outcome when assessed against the status quo of ever-declining smoking prevalence” (Chapman and Wakefield 2013).

By contrast, as was the case with needle exchange, proponents of e-cigarettes assert that given the known risks of tobacco use and the vast public health consequences, a harm reduction model should inform policy in the face of uncertainty. Advocates cite surveys suggesting that the vast majority of those who use e-cigarettes treat them as smoking-cessation aides and self-report that they have been key to quitting (Etter and Bullen 2011; Etter 2010). They note as well that e-cigarettes help to reduce tobacco cigarette consumption, even for users who have no intention of

giving up tobacco cigarettes. Data, they argue, indicate that e-cigarettes are probably at least as effective at helping smokers quit as nicotine replacement therapies like the patch and nicotine gum (Siegel et al. 2011; Bullen et al. 2013; Caponnetto et al. 2013). Additionally, harm reduction advocates frame an abstinence-only stance as “moralistic,” even arguing that “it is nonsensical to dismiss an alternative” by demanding absolute safety (Sweanor et al. 2007). Further, for harm reduction advocates, not only e-cigarettes but also smokeless tobacco products hold “the potential to lead to one of the greatest public health breakthroughs in human history by fundamentally changing the forecast of a billion cigarette-caused deaths this century” (Sweanor et al. 2007).

The fundamental risk aversion of the Precautionary Principle is, in this case, brought head to head with harm reduction and its toleration for risk in lower doses as an alternative framework for thinking about trade offs in public health policy.

## **11.6 Climate Change: Precaution in the Face of a Certain Global Threat**

Climate change differs in many respects from the previous cases, above all in its scope and scale. Environmental health scientists, policymakers, and lay activists have increasingly embraced a rhetoric of crisis as they identify the public health ramifications of climate change, some already observed, some projected (Frumkin et al. 2008; Epstein and Ferber 2011). Fueling conflict over how to address the crisis are the unequal distribution of climate-change burdens and the intergenerational character of the consequences. Small low-lying nations without the protective infrastructure to sustain rapid ecological transformation will be hardest hit, while future generations will bear the biggest burden if no action is taken (Broome 2012). The cumulative gravity of the problem has led, in turn, to increasing calls for a strategy of primary prevention, as a number of bodies, most prominently the Intergovernmental Panel on Climate Change (IPCC), have called for drastic reductions in carbon emissions, as much as 60–80 % by 2050. Precautionary logic pervades these calls. Now, the general trends and causes of anthropogenic climate change are no longer in credible scientific dispute. Few advocate, at this point, waiting for even more precise evidence of harmful effects to accumulate before taking policy action. But debate centers on what forms this action will take and how to realize it politically. While the most prominent part of the debate has centered on cost-benefit questions, critical questions around precautionary rationales have also emerged.

The gravity of the problem persists when one switches analysis from the global aggregate to the regional level. There, concern has mounted over the potential health effects posed by dominant forms of energy production, particularly coal-generated electricity, one of the chief contributors to anthropogenic climate change. Recent high-profile policy critiques of coal have highlighted its broad environmental health impacts; documented threats to air and water quality in local ecosystems; identified its outsize role in carbon emissions; and have made preliminary attempts at assessing

the high external fiscal costs of these byproducts (Epstein et al. 2011; NRC 2010). Two recent catastrophic accidents related to coal—an ash spill in Tennessee in 2008 and leakage in West Virginia of a toxic chemical used to prepare coal for burning in 2014—have only heightened broader public concerns and put coal on the defensive. Although coal still accounts for a large percentage of electricity production in the United States—42 % in 2011—its usage has unexpectedly fallen in recent years, with natural gas replacing it for the first time as the United States’s primary source of electricity (EIA 2013). These trends occur as a number of environmental scientists and prominent panels have called for drastic decreases in coal-based energy and a move to large-scale, low-carbon energy production.

Recent policies, both enacted and proposed, range from the more conservative, such as emissions trading, to the more radical, such as new taxes on emissions, limits on certain modes of energy production, and major infrastructural investment in renewable energy experiments and public transportation by nation-states. In 2010, environmental scientists, writing in *Science*, went as far as suggesting a moratorium on the most ecologically disruptive of extractive methods—so-called the mountaintop removal (MTR)—because of potential health effects (Palmer et al. 2010). Here, as at the global level, these policy appeals are made *despite* evidentiary uncertainty on the exact causal pathways between human health consequences, on one hand, and resource extraction and greenhouse gas emissions, on the other.

With climate change, the Precautionary Principle’s invocation resembles its use in parallel debates over mass-produced products or compounds, where it has produced the most prescriptive clarity. In those instances, precautionary advocates have clearly asserted that public health concerns override various economic imperatives and patterns of consumption with which regulation might interfere. As in those cases, climate debate is about whether or not cost-benefit analysis and economic imperatives should trump precautionary thinking. Still, though the precautionary approach to climate change comes with fewer obvious ambiguities than do the previous cases, it is hardly free from issues. In particular, certain proposed medium-term solutions may introduce new harms. Critics of emissions trading, to date the most comprehensive framework developed to address climate change (with mixed results), have argued that, at worst, it simply provides a legitimating institutional edifice for continued carbon emissions (Lohmann 2012).

Another high-profile example of new solutions begetting potential harms comes from climate change scientists who argue for increased generation of baseload electricity from natural gas and nuclear power. But these proponents claim that the known health risks of the latter two sources are dwarfed by the demonstrable toll of predominant coal-based energy and its high attendant greenhouse gas emissions (Clapp 2005). Hydraulic fracturing for natural gas comes with its own set of risks, including unanswered questions about the toxicity of chemicals used in the process; safety of drinking water sources proximate to sites; its geological effects; and the amount of methane gas emitted in the process, which the Environmental Protection Agency is addressing in an ongoing assessment (EPA 2012; Wilder 2012). As for nuclear energy, in a recent and controversial open letter, climate scientists James Hansen, Kenneth Caldeira, Kerry Emanuel, and Tom Wigley made a precautionary

case for its increased use. Acknowledging the inherent risks, they write that “no energy system is without downsides.” The authors add, however, that “while it may be theoretically possible to stabilize the climate without nuclear power, in the real world there is no credible path to climate stabilization that does not include a substantial role for nuclear power.” The temporal urgency of mitigating climate change supercedes risks of possible solutions. In their words, “with the planet warming and carbon dioxide emissions rising faster than ever, we cannot afford to turn away from any technology that has the potential to displace a large fraction of our carbon emissions.” Although precautionary language is used here to bolster a case for nuclear energy, its invocation is far less clean-cut given the introduction of new risks (Caldeira et al. 2013).

## 11.7 Precaution: Ethic or Ethos?

Even if the Precautionary Principle does not paralyze, its actual implementation is much less straightforward than proponents sometimes presume. In some of the cases we have discussed, parties on opposite sides of a debate predicate their case on precaution. In other instances, precautionary logic competes with other values of contemporary public health practice, including harm reduction, evidence-based decision-making, and civil liberties concerns. All of this calls for more precise examination of the Precautionary Principle’s purview and the exact circumstances in which it can serve as an effective guide to policymaking.

Deep precaution as an *ethic* has the virtue of consistency, demanding and prohibiting certain courses of action when evidence is contested or unavailable. It has served as a trump argument: it is hostile to the notion of trade offs, seeing in them perilous compromise. The great strength of deep precaution, then, is its uncompromising stance. But this is also its inherent limitation.

That public health has among its seminal functions the duty to protect and, in so doing, enhance the wellbeing of populations is clear. It is because of that mission that it seemed almost uncontroversial that public health would seize upon the Precautionary Principle as an overarching framework for guiding policy. But because precaution is Janus-faced in the context of *competing* harms, the Precautionary Principle cannot serve as effectively as a unifying principle for public health policy in the way it has for debates over the introduction of toxic substances into the environment. It is not a coincidence, after all, that almost all the cases (some historical, some contemporary) in a recent handbook published by the European Union’s European Environmental Agency (EEA) on the Precautionary Principle deal with environmental health risks (EEA 2013). In that sphere, regulators and advocates have advanced precaution as a measure to forestall harms that have not yet occurred, thus privileging the status quo over a future made potentially more dangerous. In other domains of public health policy, there is a recognition that it is



the status quo itself that threatens, provoking debate about whether proposed interventions are themselves potentially more harmful than beneficial. In such circumstances we must always examine the costs of acting as well as failing to act.

In an effort to make it better suited to actions that address existing problems and weigh the consequences of inaction, long-time advocates of environmental protection have articulated “softer,” more flexible versions of the Precautionary Principle. Nick Ashford, for example, recommended “societal distribution of possible costs and benefits of policies and technologies” as a critical precautionary element. He offered “trade-off analysis” as a means of evaluating the benefits and burdens of different policy options within the precautionary framework (Ashford 1999). Ashford viewed this as a form of social justice that would have us distribute risks fairly. Others have argued that a precautionary stance must be balanced by the principle of proportionality, which would strike a balance between the nature of the threat or risk and the public health response (Jordan and Riordan 1999).

While “light” precautionary efforts that try to forge a more balanced approach are responsive to the realities of public health practice, softening the Precautionary Principle too much presents a baby-bathwater dilemma. Light precaution can quickly become difficult to distinguish from risk-benefit analyses to which deep precaution is ostensibly opposed. Blurring the boundary with risk- and cost-benefit analyses, in turn, hamstring the principle’s ability to assert boldly the public’s health and safety as a paramount value. In the case of climate change, to take just one example, risk- and cost-benefit approaches open the door for opponents to charge that mitigation efforts require too much sacrifice or change on the part of private firms and therefore threaten short-term economic growth, arguments with particular rhetorical resonance in an era when much of the global economy remains stagnant in the wake of the 2008 fiscal crisis.

Ironically, to preserve the Precautionary Principle, it is necessary to save it from itself. In cases involving public health challenges where it can be usefully called upon, precaution cannot automatically trump other values like harm reduction, civil and human rights frameworks, equity, or cost-benefit analyses. In combination with these other frameworks for guiding action in the face of uncertainty, calling on precaution does help to illuminate the fundamental ethical tensions at stake. It serves as a powerful guide to assessing action: given the scale, timing, and severity of a population health threat, precaution tells us that something must be done and waiting for certainty or demanding that action have no measurable costs is not an option.

Thus even in those cases where the Precautionary Principle cannot provide an overarching framework for public health policy, *precaution as an ethos* provides a framework for debating the moral obligation to act collectively to advance the public good. When we give inadequate attention to long-term risks; when we do not ask who will benefit and who will suffer as a result of our decisions; when we ignore the voices of those most likely to bear the consequences; when our vigilant, on-going assessment of the balance of risks and benefits lapses, we fail to meet the ethical challenges of public health.

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# Chapter 12

## Value Judgments in Environmental Risk Assessments

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**Abstract** Risk assessments play an important role in decisions about how to regulate environmental pollutants that contribute to climate change as well as to other human and environmental health threats. While the process of risk assessment is often considered to be a narrowly scientific endeavor (in contrast to risk management, which explicitly incorporates economic and political considerations), in practice it is extremely difficult to eliminate ethical and political judgments from risk assessments. As a result, bioethicists have important opportunities to clarify the role of value judgments in these assessments and to help make these judgments in a more transparent and justifiable manner.

### 12.1 Introduction

Risk assessments play a very significant role in current environmental policy. Decisions about how to handle technological innovations and environmental threats have increasingly come to be framed as decisions about how to assess and manage risks (Wynne 2005). Classic descriptions of risk assessment describe it as a fundamentally scientific endeavor that should be insulated from the ethical and political values associated with particular risk decisions (NRC 1983). Nevertheless, subsequent commentators have argued that the process of risk assessment is permeated with value judgments in at least two senses (see e.g., Douglas 2009; Elliott 2011; Shrader-Frechette 1991). First, risk assessors frequently have to make difficult decisions under uncertainty that require weighing the importance of multiple desiderata. Second, depending on how these decisions are made, they can have significant ramifications for public health, well-being, and development. As a result, bioethicists can have a valuable impact on environmental policy by

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collaborating with natural and social scientists in order to identify crucial judgments, elucidate ethical considerations that should inform these decisions, and promote deliberation about them.

This chapter approaches these issues by highlighting the value judgments involved in risk assessments of environmental pollutants. These risk assessments are significant for thinking about the ethics of climate change for at least three reasons. First, some pollutants, such as carbon dioxide and methane, directly contribute to climate change. Second, many pollutants contribute to health problems that are likely to be exacerbated either directly or indirectly by climate change (e.g., asthma and immunological deficiencies). Third, some of the activities that contribute to climate change (e.g., electricity generation via coal-burning power plants) generate other environmental pollutants as well (such as mercury and particulate matter). This is significant, because it is often easier to argue against these activities by appealing to these other environmental risks rather than by appealing directly to climate change. The next section briefly highlights some of the major value judgments associated with risk assessments, and the following section sketches some ways for bioethicists to help address these judgments in a more ethically justifiable fashion.

## 12.2 Value Judgments in Risk Assessment

Value judgments occur during at least four steps in the process of assessing risks from environmental pollutants: (1) hazard identification; (2) dose-response assessment; (3) exposure assessment; and (4) risk characterization. These four steps are elucidated in a classic overview of risk assessment formulated by the National Research Council in a report that is commonly called the “Red Book” (NRC 1983). In hazard identification, chemicals that cause harmful effects are identified. In dose-response assessment, researchers determine how the harmful effects of chemicals vary at different exposure levels. The process of exposure assessment determines the doses of chemicals to which people are actually exposed. And in risk characterization, all this information is synthesized into a summary of the health effects that people are likely to experience.

In hazard identification, value judgments often arise because different forms of evidence suggest different conclusions about whether a particular substance is actually harmful. For example, a chemical may appear to cause cancer in studies performed with one species of animals, whereas it may not appear to cause cancer in studies with other species. Moreover, epidemiological studies of humans may fail to show harmful effects of the chemical in humans, but there may be doubts about whether those studies are sensitive enough to show effects even if they exist. Therefore, researchers and policy makers are often faced with difficult choices about how to weigh conflicting evidence. These decisions require a complex mixture of scientific reasoning (e.g., about which forms of evidence are most convincing) as well as value-laden judgments about how much evidence to demand in order to infer that a substance is hazardous (Douglas 2009, 2012).

Deciding how to make these judgments has important real-world consequences. For example, a group of scientists recently criticized U.S. and European regulatory

authorities for failing to give adequate weight to a number of academic research studies indicating that the chemical bisphenol A (BPA) could have significant adverse health effects for humans (Myers et al. 2009). This chemical, which is ubiquitous in plastic bottles, can liners, and receipts, has been the subject of significant debate. One of the central issues facing regulators has been deciding how much evidence to demand before taking action and how to weigh conflicting studies coming from industry and academic labs.

Numerous value judgments arise in dose-response assessment as well, because researchers have to decide what models to use for extrapolating the high-dose chemical effects that they observe in animal studies down to the low-dose effects that chemicals are likely to have in humans. Researchers frequently debate how to perform this extrapolation, and the available evidence is not sufficient to settle these debates. For example, in the case of chemicals that disrupt the endocrine system, some scientists think that the chemicals could be harmful even at very low doses, whereas other scientists argue that there is likely to be some dose level below which the substances cease to be harmful (Cressey 2013; Elliott 2011). Decisions about whether to choose a model that is more likely to overestimate the harmful effects of a chemical or to choose one that is more likely to underestimate the effects of the chemical have significant ethical and political ramifications, insofar as they determine the levels at which the chemical is deemed safe for human exposure. Altering that estimated dose level by a few parts per million can have a major financial impact on regulated companies as well as serious health impacts on vulnerable human communities.

When it comes to assessing the levels of various substances to which people are actually exposed, numerous value judgments arise because of the difficult modeling choices and assumptions that researchers have to make. These choices and assumptions incorporate further value judgments. For example, some critics have argued that risk assessors are likely to misinterpret the behaviors of marginalized or minority groups that they do not understand well. Maria Powell and Jim Powell (2011) provide an excellent example in their discussion of the pollution risks faced by African-American and East Asian subsistence anglers in Madison, Wisconsin. They show that these anglers eat greater quantities of fish and different parts of fish than regulatory agencies assume, resulting in official underestimates of the risks to which they are actually exposed.

Finally, the process of risk characterization is affected by numerous value judgments related to the ways that the overall risk situation is framed, the specific questions that are asked and answered, and the ways that the risk assessment is communicated to decision makers. I have previously pointed out that even the terminology used by toxicologists can incorporate socially significant assumptions and judgments (Elliott 2009, 2011). For example, in a major report on endocrine disrupting chemicals (i.e., chemicals that can interfere with the hormonal system), the authors chose to speak of “hormonally active agents” instead of “endocrine disruptors.” They worried that the term “endocrine disruption” was “fraught with emotional overtones and was tantamount to a prejudgment of potential outcomes” (NRC 1999, 21). Similarly, scientists have fought over the appropriateness of the term “multiple chemical sensitivity,” which is often used to describe a family of disorders (including “Gulf



War Syndrome”) in which people experience various health problems after exposure to low levels of common chemicals. Some scientists claim that it is not clear that the chemicals genuinely cause the associated health problems, and so other terms would cause less confusion, but opposing scientists claim that the available alternative terminology has problems of its own (Elliott 2011, 163).

In response to these sorts of concerns about the value judgments embedded in risk characterization, the National Research Council (1996) argued in its “Orange Book” that the process of risk characterization should involve analytic-deliberative processes. In other words, risk characterization should incorporate not only the narrowly scientific/analytic work traditionally associated with risk assessments but also venues in which other academics, stakeholders, and concerned citizens can deliberate about the subtle value judgments associated with these analyses. These venues can include science advisory committees, workshops, consensus conferences, interactive technology-based approaches, and citizen advisory committees.

Regulatory agencies such as the U.S. Environmental Protection Agency (EPA) have typically opted for relatively simple methods of deliberation, such as public comment periods during which citizens can submit written responses to proposed risk assessments or regulatory policies. However, there are notable examples in which much more extensive venues for deliberation have been developed (see Elliott 2011; Kleinman 2000). For example, a highly contentious risk assessment of the Alaskan oil trade in Prince William Sound received widespread support because a major local citizens’ group (the Regional Citizens’ Advisory Council or RCAC) collaborated in the creation of the risk assessment with the oil industry (Busenberg 1999). Similarly, after evidence emerged that pollen from Bt corn plants might be harmful to monarch butterflies, the US Department of Agriculture (USDA) helped organize a collaborative research effort guided by individuals from industry, academia, environmental groups, and government. This collaborative effort helped to generate widely respected research that could inform subsequent risk assessments (Pew Initiative on Food and Biotechnology 2002). One important task for bioethicists is to identify citizen groups that have unique needs and concerns and to help make their voices heard in these sorts of deliberative forums (see e.g., Powell and Powell 2011).

### 12.3 Roles for Bioethicists

Bioethicists can help to make the value-laden judgments associated with environmental risk assessments more justifiable and ethically defensible by engaging in at least three activities: (1) highlighting significant value judgments that merit discussion; (2) elucidating crucial ethical considerations that should factor into making value judgments; and (3) helping to create effective venues for stakeholders to deliberate about these judgments. The first activity, identifying value judgments, is important because these judgments are often tightly intertwined with scientific reasoning, so their social and ethical significance can easily go unnoticed. A number of figures have recently argued that in order to effectively address these judgments that

are embedded in scientific research we need to find creative ways to bring humanists and social scientists together with natural scientists in order to couple ethical analyses with scientific analyses (see e.g., Tuana et al. 2012). For example, the STIR (Socio-Technical Integration Research) Project led by Erik Fisher at Arizona State University has been working in recent years to place humanists in scientific research labs around the world, with the goal of informing the humanists about crucial scientific issues while making scientists more reflective about the social ramifications of their work (Schuurbiens and Fisher 2009).

Once crucial value judgments have been identified, bioethicists are in a particularly valuable position to elucidate the ethical considerations that should inform these decisions. The value judgments embedded in risk assessments frequently generate winners and losers. Bioethicists can highlight these tradeoffs and suggest ways of responding to them in a just fashion. They can also identify the broader social impacts of value judgments and highlight the unique needs and concerns of disadvantaged or marginalized groups. They can even suggest new ways of framing debates about risks and propose ethical questions that might otherwise go unasked. One powerful way for bioethicists to make their voices heard is for them to seek appointments on the science advisory boards created by government agencies such as the Environmental Protection Agency (EPA) and the Food and Drug Administration (FDA). But even without seeking or attaining such influential positions, they can work with NGOs and citizen groups to highlight important ethical issues and also develop collaborative relationships with scientists working on risk issues (Elliott 2013b; Powell and Powell 2011; Schuurbiens and Fisher 2009).

Finally, bioethicists can help to create venues for broadly based deliberation about the value judgments associated with environmental risk assessments. Some figures have conceptualized this role in terms of being “architects of moral space” (Robert 2008; Walker 1993). According to this image, bioethicists are called to “create and maintain literal and figurative spaces for moral discussion and debate” (Robert 2008, 237). In some cases, this might involve communicating with members of the public or public-health professionals about important value judgments in order to stimulate needed discussions. In other cases, it might involve collaborating with social scientists to create formal deliberative forums in which citizens can ask questions and express their perspectives on crucial judgments. For example, a variety of scholars have recently worked together to create a National Citizens’ Technology Forum in the US and to create similar venues in the European Union so that citizens can debate ethical issues surrounding the introduction of nanotechnologies (see e.g., Elliott 2013a; Philbrick and Barandiaran 2009).

## 12.4 Conclusion

This paper has elucidated some of the crucial value judgments embedded in risk assessments of environmental pollutants. It showed how each stage of risk assessment (hazard identification, dose-response assessment, exposure assessment, and risk characterization) incorporates crucial decisions that can have significant social

ramifications. Bioethicists can help to make these judgments more justifiable and ethically defensible by helping to identify them, by elucidating ethical considerations that should inform these decisions, and by promoting broadly based deliberation about them. This chapter has cited a number of examples that illustrate how bioethicists can make their voices heard. They can work in labs with natural scientists, collaborate with NGOs and citizen groups, and help to create citizen forums for discussing ethical issues that impinge on risk assessments. By engaging in these activities, they can help to promote ethical reasoning about subtle issues at the science-policy interface that can ultimately make a significant difference in addressing climate change and other environmental threats.

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# Chapter 13

## The Politics of Global Warming in the U.S.

Michael K. Gusmano

**Abstract** The response of the U.S. government to evidence of global warming has been limited and fragmented. Several theories from political science shed light on why it is difficult to shift the focus of policy makers away from economic development and undermine support for environmental protection. Some of the same political forces that limit collective action on the issue of carbon emissions and global warming within the U.S. also offer insights into the challenges of bringing about international cooperation in this arena. The power of coal, gas and oil companies to block change and the bias of a market based political economy to place economic development over other social goals are both challenges faced by governments throughout the world. The U.S. is notorious for fragmented institutions with strong veto points that block changes even when they are favored by a majority of the population, but the institutional challenge of enforcing global agreements among autonomous nation states is even greater than the challenge of overcoming barriers to collective action within the U.S.

### 13.1 Introduction

The first study to suggest that the increase of carbon dioxide in the atmosphere could lead to global warming was published in the late nineteenth century (Arrhenius 1896). By the late 1950s scientists argued that the use of fossil fuels was contributing significantly to concentrations of carbon dioxide in the atmosphere (Revelle and Suess 1957). By the late twentieth century there was a consensus among the scientific community that additions of carbon dioxide and other greenhouse gases from human activity had produced global warming (Soroos 2005). At the 2002 United Nations Framework Convention on Climate Change in Rio de Janeiro, Brazil, the international community acknowledged global warming as “an urgent responsibility” (Jamieson 2013). Climate models suggest that global warming attributed to human activity will produce the most significant change in the earth’s climate in

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10,000 years (Orr 2006). Policy makers have focused on a combination of carbon emission standards for industry and vehicles, energy conservation, and the development of alternative fuels, including nuclear energy, solar, hydro-electric and biofuels, including the more recent possibility of investing in synthetic biofuels.

Global warming has been described as a “super wicked problem” because “time is running out; those who cause the problem also seek to provide a solution; the central authority needed to address them is weak or non-existent; and irrational discounting occurs that pushes responses into the future” (Levin et al. 2012: 123). The solution to global warming will require coordinated efforts by every nation, but as one of the largest contributors of carbon emissions the solution to this problem is impossible without a comprehensive effort by the U.S. The U.S. accounts for “nearly 25 % of global GHG emissions. Furthermore, on a per capita basis, American emissions are among the highest in the world and roughly double those of many of the other developed countries” (Soroos 2005).

The response by federal policy makers in the U.S. has been limited and fragmented. The U.S. did not ratify the 1997 Kyoto Protocol, an international agreement that commits signatories to binding emission reduction targets. Instead, the Bush administration “offered a proposal that depends heavily on voluntary corporate initiatives” (Soroos 2005). Although recent debates about climate change in the U.S. have been highly partisan, a bipartisan proposal—the Climate Stewardship Act (CSA)—was introduced by Senators John McCain (R-AZ) and Joseph Lieberman (D-CT) in 2003 and again in 2005 and 2007. CSA is a so-called cap and trade proposal. It would have placed overall limits on greenhouse gases and the government would distribute “allowances” that would be submitted to the Environmental Protection Agency (EPA) for each ton of greenhouse gas emitted into the atmosphere. These allowances could then be traded on an open market. The overall limit on greenhouse gases would be reduced each year (Pizer and Kopp 2003). Like the Kyoto Protocol, these proposals failed to be adopted by the U.S. Senate.

During the 2008 presidential campaign, both Barack Obama and John McCain made a commitment to adopting more aggressive carbon emissions standards. On June 26, 2009, the U.S. House of representatives passed the American Clean Energy and Security Act of 2009, the first time a bill that would have limited greenhouse gases had been adopted by either house of Congress (Broder 2009). Yet again, however, the bill failed to be adopted by the U.S. Congress (Brewer 2011).

Given the failure of Congress to enact new legislation to address global warming, there have been efforts to regulate greenhouse gases using the *Clean Air Act*. Proponents argue that by adopting new regulations authorized by the *Clean Air Act*, the Environmental Protection Agency (EPA) could reduce carbon emissions by 10 % by 2020 (Burtraw et al. 2011). The extent to which this is possible, however, depends on “the stringency of standards and the flexibility allowed” (Burtraw et al. 2011). Whether this will happen is unclear because members of Congress in states that rely heavily on the fossil fuel industry have worked to limit these efforts (Kahn and Mansur 2013; Kronlund 2013).

Environmental groups have lobbied, not only for carbon emission standards and energy efficiency, but the development of more sustainable and cleaner sources of energy, including wind and solar (Friends of the Earth 2010). Objections from environmental organizations, however, have limited support for the development of some alternative sources of energy. Advocates of nuclear power, for example, claim that the more extensive use of nuclear power could provide a sustainable source of energy (IAEA 2009). Along with other concerns about safety and security, opponents argue that nuclear power is incapable of reducing carbon emissions by more than a small percentage while increasing the risk of contaminating the water supply and food chain if radioactive waste leaks into the environment (Tsuji et al. 2012).

More recently, environmental groups have expressed concerns about efforts to use developments in “synthetic biology,” which promise to bring together engineering and biology for the purpose of developing new biological organisms or changing the features of existing organisms (Kaebnick et al. 2014). These include the development of synthetic biofuels or the production of “high-value” molecules that, because they are structurally similar to fuels, can be produced by similarly modified microorganisms. Another possible application in synthetic biology is the development of synthetic biofuels that absorb, as well as emit, (Watts 2010). To date, the research in synthetic biology has not produced commercially viable alternatives to fossil fuels, but this has not stopped some environmental groups, including Friends of the Earth and the ETC Group, from raising strong objections to the development of synthetic biology (ETC Group 2008; Friends of the Earth 2010).

In this chapter I focus on explaining the limits U.S. federal policy to reduce carbon emissions. In particular, I will review how different theories from political science shed light on why it is difficult to shift the focus of policy makers away from economic development and how this can undermine support for environmental protection. Some of the same political forces that limit collective action on the issue of carbon emissions and global warming within the U.S. also offer insights into the challenges of bringing about international cooperation in this arena. The power of coal, gas and oil companies to block change and the bias of a market based political economy to place economic development over other social goals are both challenges faced by governments throughout the world. The U.S. is notorious for fragmented institutions with strong veto points that block changes even when they are favored by a majority of the population, but the institutional challenge of enforcing global agreements among autonomous nation states is even greater than the challenge of overcoming barriers to collective action within the U.S.

After discussing the political challenge of addressing global warming in the U.S., I assess the capacity of formal policy analysis to help us “get around” the political forces that make change difficult. Although some of the early advocates for policy analysis techniques like risk benefit analysis and cost-effectiveness analysis hoped that they would offer value-neutral, scientific basis for making collective decisions, the tools of formal policy analysis are inherently political. Many recent critiques of modern policy analysis acknowledge that, not only aren’t the tools of modern policy analysis value-neutral, they often fail to reflect goals that are valued

by the public. Addressing the potential biases inherent in modern policy analysis requires an explicit deliberation about values.

## 13.2 Powerful Interests

Group theories of politics have always held a special place in American political thought. Beginning with Madison's focus of factions in the *Federalist Papers*, students of American politics have sought to understand political power and the control of government decision making in terms of relative group power. These accounts usually fall into one of two categories: pluralist or powerful group theory (Banfield 1961; Dahl 1961; Hunter 1953; Mills 1956; Stone 1989). Pluralists argue that the polyarchy—the competition of all these many interests—prevents the domination of policy by a minority (Dahl 1961; Truman 1951). Thus, the populace can control the political system not only through elections, but also through competition among political parties, interest groups, and individual citizens (Dahl 1956).

One striking facet of the pluralist argument is the assumption that interest groups of any stripe can simply spring into existence at will. There is no acknowledgment that it may be extremely difficult or even impossible for certain disadvantaged interests to come to the fore. Pluralism, as David Held argues, “cannot begin to explain a world in which there may be systematic imbalances in the distribution of power, influence, and resources” (Held 2013: 60). Pluralists were naive in their assumption that there are no barriers to entry for interest groups, particularly those without corporate or business ties who simply do not have the minimum amount of resources—political and financial—necessary to organize. Not all interests with constituencies automatically come to the fore. People with common interests do not necessarily undertake collective action to promote that interest. Instead, groups are often subject to free riding (Frohlich and Oppenheimer 1978; Mueller 1989; Olson 1965). People and groups may often seek to restrict the scope of conflict on a given issue by reinforcing existing barriers to participation by other groups and individuals. Even if those people left out of the decision making process could force their way into the interest group process, there is no reason to suspect that government, parties, or other interest groups would automatically agree to listen to what the disadvantaged consider to be the most important issues, or take action on them.

Even some of the early champions of pluralism argument have become sensitive to the flaws in this theory. Robert Dahl, for example, argues that the great threat today comes not from ever increasing demands for equality (as DeTocqueville said it would), but from discrepancies in the capacity to organize—discrepancies borne of what Dahl calls “the liberty to accumulate unlimited economic resources and to organize economic activity into hierarchically governed enterprises” (Dahl 1985).

In contrast to pluralism, the powerful group explanations have held a central place in the environmental policy literature (Bang 2010; Layzer 2007; Newell and Paterson 2010; Star 2012). These scholars argue that environmental policy is dominated by groups who enjoy organizational and other slack—or “spare”—resources.



These groups face concentrated costs or benefits as a result of government action, further enhancing their ability to organize and lobby effectively (Bang 2010; Star 2012). The energy industry has often worked to create public confusion and make the costs of fossil fuel regulation seem “concrete and personal” and therefore undermining support for policies designed to address global warming (Layzer 2007).

In addition to substantial lobbying on the part of individual fossil fuel companies, they have worked through industry associations, including “the American Petroleum Institute, Western Fuels Association and Edison Electric Institute” (Dunlap and McCright 2011: 148). These organizations have been particularly aggressive at attacking mainstream climate science (Dunlap and McCright 2011). The energy industry has also “formed a number of umbrella groups, most notably the Global Climate Coalition (GCC) and the Climate Council (CC). They present their interests as those of capital in general. The core membership of these groups, particularly the GCC and the CC, are coal and oil companies, particularly from the United States, though chemical and car companies are also well represented” (Newell and Paterson 2010). Along with the fossil fuel industry itself, a number of other industries that depend heavily on fossil fuels, including the automotive, forestry, mining, steel industries have lobbied Congress to kill or weaken carbon emissions legislation (Dunlap and McCright 2011).

Despite the power of industry to block environmental regulation, the environmental movement has been a potent political force in the U.S. and can point to a number of key victories. The adoption of the *Clean Air Act* in 1963, the establishment of the EPA under the Nixon administration in 1970, and the inclusion of environmental provisions in the North American Free Trade Agreement (NAFTA) in 1994 are three important examples (Audley 1997; Prechel 2011). This does not imply that the distribution of power among groups is unimportant. It merely implies that group power alone does not tell the whole story. Powerful interest group theories of environmental policy are limited, not only because powerful groups occasionally lose, but because they ignore the role of institutions. Institutions shape the parameters in which groups are forced to operate and their role must be understood within the context of the political and economic institutions that shape society.

### **13.3 The “Privileged Position” of Business and the Dominance of Economic Development**

Drawing on institutional or “structuralist” theories of political economy, the power of energy companies to influence environmental policy stems from the fact that government officials must always be concerned with how to induce business performance, not that they represent a unified voice of authority. In capitalist systems a large category of decisions, including what is to be produced, the allocation of labor, and all other aspects of production and distribution are decided by those who control capital. Business, therefore, has the power to influence the standard of living for everyone in the society. The government, in order to maintain power, cannot be

indifferent to how business performs their tasks, but instead must induce business to perform well.

Why must business be induced? Unlike other groups in society, business has a choice. People with capital do not have to take risks and invest capital unless they perceive the climate as favorable. This choice to perform exists as long as the government enforces property rights.

What is important to note about the “privileged position of businesses”, is that they are more than just a powerful interest group. Business can influence the decisions of government without expending any resources at all, simply because it has the power of exit (Hirschman 1970). Of course, business also has slack resources, and the power to organize and lobby effectively for its positions (Stone 1989). In fact, there are many examples in which business use these sources of power together to block environmental policy. In the Netherlands, oil companies and other representatives of industry successfully blocked a proposal for an energy levy by threatening to relocate (Newell and Paterson 2010). Lobbying, however, is not the primary source of business power. Political decision makers must accord the interests of business special consideration. As Lindblom puts it:

I want to stress that the privileged position of business in government arises because government officials understand that they must, at peril to themselves, meet business needs and not because businessmen enter into interest-group and party politics. But businessmen do in addition do so (Lindblom 1977: 127).

Other groups in the society, including national environmental advocacy organizations like the Friends of the Earth, the National Wildlife Fund or the Sierra Club may have the ability to mobilize their constituents in an effort to counter the organizational and financial resources of business, but little can be done to fight the influence that is won by virtue of the privileged position. No other group in society has an analogous source of power. From this perspective, understanding the politics of global warming requires an understanding of how the “structural power of capital...has enabled fossil fuel lobbies to limit the scope of state responses to the problem of global warming” (Newell and Paterson 1998). Environmental groups can organize and lobby to put their concerns on the policy agenda, but unless policy makers view environmental pollution as a factor that diminishes economic performance, this is not an issue that appears on the policy agenda *automatically*.

The existence of systemic bias is crucial for our understanding of environmental politics because as Elkin argues, “political struggles in supposedly non-economic domains can turn surprisingly quickly into contests in which the central question becomes: what effect will the various options have on promoting business performance” (Elkin 1991: 8). “A well-understood connection [between economic performance and a particular policy question]... will make [public officials] more receptive to the approaches of business spokesmen” (Elkin 1985). Once this connection is made, the dynamics of a policy issue can transform rapidly. Once the policy choice has been redefined as one in which the performance of the economy is at stake, “vital contests between equally matched interest groups, can turn into a discussion dominated by a concern with the interests of business” (Elkin 1985).

Questions about environmental protection are often discussed in terms of their impact on business performance and the health of the economy. Even those who do not accept the “privileged position” argument forwarded by Lindblom and other so-called “structuralists” recognize that business plays an important role in shaping public policy (Kingdon 1995; Vogel 1989). A large body of literature, from a range of theoretical perspectives, supports the notion that elected officials pay close attention to the performance of business, and often try to anticipate their response to policy decisions in the hope of influencing their behavior (Kingdon 1995; Tufte 1978; Vogel 1989).

### 13.4 Institutions and Veto Points

Political scientists who study U.S. political institutions offer an even simpler explanation for why the U.S. has not adopted stronger legislation to curb carbon emissions or ratify international agreements like the Kyoto Protocol. From the perspective of those who study institutions and the policy process, the U.S. political system was designed to fail (Steinmo and Watts 1995). Rather than express surprise when the U.S. Congress fails to address major social or economic problems, we should do so when it manages to act! The political system was designed to limit major policy change. Our “government of separated institutions sharing powers” (Neustadt 1960), bicameral legislature, equal representation of states within the Senate, committee system in Congress, and the need for a supermajority to overcome the threat of filibuster in the U.S. Senate, are all potential veto points that make it difficult to enact major policy change (Peterson 1992; Steinmo and Watts 1995). In the case of global warming policy, the power of the U.S. Senate to block international agreements, coupled with the failure to generate a sufficient majority to overcome the threat of a filibuster, has made it difficult to adopt a comprehensive energy bill.

The formal institutional barriers to policy change are particularly challenging in an era of partisan division—and environmental policy has become a highly partisan issue. The Tea Party emerged in 2009 following CNBC commentator Rick Santelli’s on-air complaints against President Obama’s plan to address the mortgage crisis. Santelli claimed that “the government is rewarding bad behavior!” and argued that the administration’s policies would “subsidize the losers’ mortgages.” He called for a “Chicago Tea Party” to protest the administration’s housing policy. Santelli’s language was picked up by conservative activists around the country. By the summer of 2009, fueled by money from business conservatives and promoted by the Fox News Channel, the movement grew into a significant force. Its members, who represent only a small portion of the American public, waged an effective grass roots campaign to defeat the Democrats and repeal President Obama’s policies and “the issue of climate change has become deeply embedded within this broader partisan divide” (Brewer 2011).

### 13.5 Can Policy Analysis Help Us Escape “Politics”?

For decades, advocates of professional policy analysis have hoped to develop tools that could inform collective decision making and offer a scientific, “value neutral” alternative to the political forces that have influenced the policy process. And “while there is powerful evidence that efforts to ‘get around’ politics is futile, they never seem to lose their popularity” (Brown and Gusmano 2013). In this section, I review debates about the role of values in policy analysis and discuss how the values that are embedded in many popular policy analytic techniques may ignore concerns about liberty and equity when evaluating environmental policy alternatives.

The debate about *whether* values should be part of impact assessment stems from the fact that the formal methods commonly employed for this task in the United States—risk assessment (RA) to estimate the probability and severity of potential harms and cost benefit analysis (CBA) to compare economic analyses of estimated costs and benefits—ostensibly were developed precisely as a means to ensure that the assessment of outcomes is not biased by the interests of any special in-power group but would instead reflect the broader interests of the public. These methods therefore aim for analytic clarity and repeatability, achieved through the employment of quantitative models—what Deborah Stone calls the “rationality project” (Stone 2011). RA provides tools for determining whether a causal relationship exists between an entity or project and hazards to human health or the environment, the strength of the relationship, the extent of exposure to the hazard, and the probability and consequence (National Research Council 1983). CBA is a way of deciding whether to *proceed* with a project by estimating in monetary terms the costs and benefits of the project (Sunstein 2002; 2005). By looking to revealed preference, understood as a matter of market choice and averaged across a community, CBA aims to reflect the dominant values of a community and allow CBA practitioners to model decision-making in a way that is value-neutral and objective.

Criticisms of these tools include concerns about the plausibility of an objective, analytic method for assessing potential outcomes. A number of commentators hold that the critical steps in RA, for example—the identification of risk and the gauging of severity—depend partly on nonanalytic and emotional aspects of human judgment and are significantly shaped by culture and perspective (Slovic et al. 2004; Kahan et al. 2009). What counts as a “risk”? Is risk appropriately viewed as an aggregate measure (or is it necessarily connected to the perspectives of particular individuals) (Finkel 2008)? To what degree should the “size” of a risk be considered instead of qualitative features about the risk (the number of deaths, for example, rather than the manner of death) (Kysar 2006; Maclean 2009). Why is risk commonly represented as the “product” of likelihood and severity?

Like RA, CBA has been charged with focusing on outcomes that can be measured easily, which may not adequately reflect what people care about most. CBA represents individuals’ values by representing them as a single unit of measure, as reflected in monetized market choices, which critics hold tends to distort individuals’ values (Maclean 1998). When costs or benefits involve human health, for

example, there is little agreement among economists about what standard should be used to establish the statistical value of a life year (Becker et al. 2007; Robinson 1986; Viscusi and Aldy 2003). There are similar disagreements about how to value environmental and other kinds of outcomes (Kysar 2010). Each of these decisions depends on value judgments, charge the critics, and may be shaped by the availability of information.

CBA has also been charged with failing to account adequately for all benefits and costs. For example, by measuring costs in terms of future wage losses, CBA may ignore a “wide range of public health and environmental costs” associated with environmental pollution (Prechel 2012). CBA may also fail to account adequately for benefits and costs that will not surface for many years or that may affect only distant people or nonhuman forms of life (Mandel and Gathii 2006). In the case of carbon emissions, for example, there is disagreement about how to weight the more immediate harms that may be associated with slowing economic growth in developing countries by imposing more stringent standards. Addressing this question not only requires contested information about the relationship between emissions and economic development, it involves value choices about how heavily to discount the future and how to define a “fair” allocation of global benefits and burdens (Baer et al. 2000).

These problems suggest that CBA may distort or omit important considerations important for public policy. Critics also maintain that RA and CBA address uncertainty poorly; how to appropriately respond to uncertainty may itself be a significant value question. Beyond the limitations associated with inadequately measuring or weighting costs and benefits, the philosophical premise of these techniques, derived from welfare economics and based on paretian criteria, values a particular form of efficiency and ignores distribution and liberty.

Policy analytic techniques like CBA depend on a version of pareto efficiency. The paretian criteria, developed by Italian economist and sociologist Vilfredo Pareto (1848–1923), are useful tools for making institutional judgments and choices. An alternative is pareto optimal if and only if there is no other alternative in which no one is made worse off and at least one person is made better off (Barry and Hardin 1982, p.142). More frequently, the paretian criteria are expressed as a social choice rule. A paretian move is one which is taken by parties of their own “free will.” When paretian criteria are thought of as social choice rules, the concept becomes dynamic.

...the economic notion of Pareto optimality, or Pareto efficiency, is a coarse grained one, of limited practical use to policy analysts. This is because the attainment of optimality is viewed in binary terms. Optimality is either obtained, or not, but, many different states may be optimal. To deal with this problem economists often attempt to use the ideal of optimality in a dynamic sense. Optimality is used as an attractor, so that one can discuss Paretian moves, or moves which are unambiguously toward Pareto optimality (Frohlich and Oppenheimer 1992: 4).

There are two versions of Pareto efficiency as a social choice rule, strong and weak: (1) Pareto Efficiency (strong version): A move that leaves everyone better off. It is preferred by everyone in the group (“the group”, as Oppenheimer suggests, usually includes everyone in the society, but the concept can also be used to evaluate alternatives from the perspective of a subset of the society). (2) Pareto Efficiency

(weak version): a move that leaves no one worse off, and at least one person better off.  $X$  is pareto superior if and only if at least one person prefers  $X$  to  $Y$  and no one prefers  $Y$  to  $X$ .

The pareto criteria are used by welfare economists and public policy analysts because they focus our attention on the welfare of individuals in the society. The assumption behind the paretian criteria is that the welfare of society depends *only* on the welfare of the individuals that make up that society (Mueller 1983; Stokey and Zeckhauser 1978). Economists argue that the proper unit of analysis for evaluating collective decisions is the welfare of individuals. Alternative policies and institutional arrangements, it is argued, ought to be judged on the basis of their effect on individual welfare.

The focus on individual welfare implicit in the use of pareto has a long tradition in political economy and political theory. Virtually all democratic theorists, including Locke, Rousseau, and Madison, express concern for the welfare of individuals within society.<sup>1</sup> According to Locke, the legitimate power of government “can never be supposed to extend farther than the common good” (Locke 1980: 77). For Locke, the common good is clearly related to the ability of individuals in the society to achieve a comfortable, safe and peaceable life in which they can secure the enjoyment of their property (Locke 1980: 58). Locke insists that the actions of government should make the members of society at least as well off as they were in the state of nature.

The arguments of Locke are often echoed by modern day democratic theorists. Robert Dahl has argued that, “the condition of popular sovereignty is satisfied if and only if it is the case that whenever policy choices are perceived to exist, the alternatives selected and enforced as governmental policy are the alternative most preferred by the members” (Dahl 1956: 37). While the pareto criteria’s exclusive concern with individual welfare may go too far, it is difficult to imagine a definition of popular sovereignty that is not concerned with the relationship between social choice and individual welfare. This implies that if we aspire to be a popular regime, the paretian criteria must play at least some role in our normative evaluation of social institutions. The precise nature of that role can only be determined after considering the limits of the paretian concept.

A fundamental criticism of the paretian criteria, however, is their inability to provide a complete ranking of all social states. They do not, for example, differentiate among pareto optimal outcomes. Similarly, the paretian criteria is also incapable of making comparisons among many suboptimal alternatives. As Stokey and Zeckhauser point out, “the Pareto criterion will not help us when some individuals are better off in one state and some another” (Stokey et al. p. 272). This criticism of the paretian criteria hints at its major shortcoming—they are focused exclusively on

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<sup>1</sup>This statement is not meant to imply that all or even most democratic theorists agree with economists that social welfare should depend *only* on the welfare levels of individual citizens. Stephen Elkin has argued, for example, that “Madison believed that a central task of those making the laws of the republic should be more than simply to aggregate interests” (Elkin Stephen 1991, p. 24). It is equally clear that most democratic theorists, Madison included, believe that any legitimate social institution must promote the welfare of its citizens.

maximizing individual welfare and are indifferent to the distribution of societal resources. As Amartya Sen explained, some states of pareto optimality are “perfectly disgusting” because these decision rules would allow all of societal resources to go to a small number of people as long as aggregate individual welfare is increasing and resources are not being taken away from anyone (Sen 1970b).

Critics attack the implicit assumption that greater economic efficiency is the only goal of society. In addition to the fact that some pareto efficient solutions may be highly inequitable, under certain circumstances, there may also be tradeoffs between the goals of liberty and efficiency. The dilemma of the so-called paretian liberal was discovered by Sen during his attempt to “get around” Arrow’s general impossibility theorem by allowing each individual in society to be a dictator over at least one decision, for example, what color to paint your house (Meuller, p. 400). Sen demonstrates that a social choice rule that allows each individual in the society to be decisive for one pair of alternatives combined with unrestricted domain and the Pareto principle are enough to cause a cycle in which no solution is stable (Sen 1970a). The liberal paradox turns on the question of “meddlesome preferences” (Sen 1970a).

Sen shows that if individuals have nosey preferences, and are sufficiently concerned about the behavior of others, liberalism is inconsistent with the Pareto principle. This dilemma was illustrated by Sen with a very simple example regarding the access to *Lady Chatterley’s Lover* in a particular society (Sen 1970a). In his example there are two individuals with meddlesome preference structures and three possible scenarios. The three possible decisions are: (a) Person 1 reads *Lady Chatterley’s Lover*, and Person 2 does not; (b) Person 2 reads *Lady Chatterley’s Lover*, and Person 1 does not; or (c) Neither reads it.

Person 1 prefers that no one reads it, but if someone must read it he prefers that he reads it rather than Person 2. Thus Person 1’s preference structure is: cPaPb. Person 2 prefers that Person 1 read the book, but prefers to read it himself rather than the “neither reads it” option. Person 2’s preference structure is: aPbPc. This is a situation in which both individuals have meddlesome preferences. Person 1 is affected more by the actions of Person 2 than he is by his own, and vice versa.

The liberal principle would result in bPc for Person 2, and it would result in cPa, for Person 1. Yet, both individuals prefer a over b, so by invoking the Pareto principle, the social choice should be aPb. It is clear that this situation results in an intransitivity. If bPc and cPa, by transitivity bPa, but this is not the case. When individuals have meddlesome preferences and the liberal principle is enforced, Pareto optimality is overturned. This exercise demonstrates that the pareto principle cannot be used exclusively to evaluate alternate social states if we care about liberty as well as efficiency. The concern about the tension between pareto efficiency and liberty is particularly relevant to the debate about global warming. It is likely that residents in many countries of the world are more concerned with the behavior of China and the U.S. than they are with their own.

Sen argues the liberal paradox should be solved by placing greater weight on liberal values (Sen 1970a). In the context of carbon emissions, for example, this solution would suggest that individuals should always have the liberty to pollute—or that governments should always have the liberty to consume fuels with high carbon emissions, even if it would not be Pareto optimal do so. Clearly, this would

eliminate the paradox, but it is not clear that it is a feasible solution to the problem. It assumes that individuals would agree to place greater weight on liberal values and if individual preferences are meddlesome, they may never agree to an arrangement. This highlights main difficulty, not only with Sen's solution to the liberal paradox, but with an exclusive application of the pareto criteria when evaluating social choices. It is not clear that it is appropriate, desirable, or even possible to impose a universal criterion on all issues and across all societies. The extent to which either liberal rights or pareto efficiency concerns should triumph is, fundamentally, a political question.

The liberal paradox highlights the importance of the most central constitutional question faced by every political system: What choices should be left to the individual and what choices should be made collectively? As a society, we may place a high value on liberty and wish to secure a fairly large sphere in which liberal values triumph over meddlesome preferences and the pareto principle. When the issue at hand is global in nature, this makes the solution even more challenging because different countries may reach radically different conclusions about how to balance these competing goals.

A related and final objection to the paretian criteria is offered by both Karol Soltan and Stephen Elkin. These authors criticize Pareto because it is strictly a consequentialist based criteria (Soltan 1986; Elkin 1982). They argue that institutions should not be judged only on their consequences. Some institutions and policies ought to be preferred because they have intrinsic value. The right to self government, for example, may be preferred regardless of its consequences for the distribution of income or its ability to reach decisions quickly...etc. The process of negotiating international treaties to control carbon emissions is certainly slow and, to date, has enjoyed limited success. It is plausible, however, to make the case that the long, difficult process of multilateral negotiation is preferable, regardless of the outcome, to the imposition of a solution by a country or countries with greater economic or military strength.

## 13.6 Conclusions

Powerful interests, the "privileged position of business" and fragmented institutions—all operating in the context of an increasing polarized political environment—have blocked comprehensive reform to address global warming in the U.S. Although advocates often point hopefully to the formal tools of policy analysis as a way to avoid political stalemate, it is important to recognize that these tools reflect the value assumptions that are at the core of political conflict. Critics believe that a failure to understand the normative assumptions in formal impact assessment mechanisms leads to three distortions: a failure to identify all outcomes worth assessing, an epistemological bias in what counts as evidence for outcomes, and errors in the assignment of weights to potential outcomes. These substantive criticisms feed misunderstanding and distrust about the policy-making process in which



impact assessment is used. If RA and CBA incorporate values only quietly, as assumptions buried within technical and sometimes arcane terminology, then the public confusion and antipathy could be exacerbated. RA and CBA could be seen as arrogating to experts and closed-door discussions issues that are properly the domain of the overall public, and therefore as protecting the interests of the powerful.

Many defenders of RA and CBA now recognize that these tools make normative assumptions—that the tools are not objective in the sense of being entirely “value-free” (Orr 2007; Cothorn 2010). Still, there can be debate about whether they *incorporate* values objectively—where “objective” can mean either that no one (“subjective”) value perspective is privileged above others or that only rational, justifiable values are given weight. Here, the rich literature on risk perception has provided grounds for recognizing both the need to consider the public’s views about risk thoughtfully, given the complexity of risk, and the need somehow to correct or refine the public’s views about risk, given the great difficulty humans have in thinking about risk clearly (Slovic 1987).

Analogously, the complexity of the public’s perceptions of risk give grounds both for depending on technical expertise for outcomes assessment and for actively engaging the public in some form of democratic deliberation about outcomes (National Research Council 1996). Exposés of the human foibles in comprehending risk can seem to suggest that the public’s views need more correction than respectful attention, and that experts are more to be listened to than the general public. If all risk perception depends at bottom on subjective perspectives, however, balancing these competing assessments of the public’s risk perceptions might be preferable. Clarifying the credentials necessary to offer an “expert” opinion about possible outcomes may also be helpful.

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# Chapter 14

## Health Governance and Policy

**John Coggon**

**Abstract** This chapter explores how the growth of public health ethics has brought to bioethics a reinvigorated interest in political theory, and examines the potential utility of such an interest in the context of examining climate change. The salience of an ethically informed political approach to climate change is obvious. However, climate change clearly also presents complex challenges as it is a global problem that requires globally coordinated responses. Working through two parts, the chapter therefore looks at what might be learned about regulation and climate change from scholars interested in the ethics of health governance and policy. This chapter's first part entails a critical overview of the expansion of public health ethics, and its relationship to bioethics both narrowly conceived and conceived in the context of environmental ethics. Once the political components of this bioethics are made clear, the chapter moves in its second part to consider the potential scope and limitations of a political framing within a global context. The apparent need for reconceptualisations of what it means to describe things as 'public' sheds light on analytical and strategic methods in bioethical debates concerning both health and the environment.

### 14.1 Introduction

The relationships between ethics and policy are a central concern to many working in bioethics. This has become particularly so in the growing field of public health ethics. The current chapter aims to consider how we might approach and view questions concerning climate change through a lens of health governance and policy. It begins with reflections on the emphases brought by assuming a public health ethics approach. This entails a consideration of what may be seen as distinctive about public health ethics, and an analysis of the impact of environmental ethics on public health ethics discourse. It is seen that there is much potential for reciprocal lessons between those interested in health and those interested in environmental policy. The approach that I outline is of particular importance because although it is normative, it relates to political rather than purely moral philosophy. As such, it seeks to equip

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itself as a means of actually effecting change at a macro-level. The chapter moves from this to an examination of how a public health ethics approach might apply to, or assist in, our analysis and activism concerning global problems (such as climate change). I argue that scholarship in global health ethics and governance teaches us that to make global problems public—to make them the concern of everyone, with the potential to be addressed effectively—we must reconceptualise the very nature of what ‘public’ means. This is important both from an analytical viewpoint, and in regard to strategy for advocacy and activism.

## **14.2 Public Health Ethics and a Changing Emphasis in Bioethics**

As the ranging works in this edited collection make clear, bioethics can be conceived in various ways, including: as its own academic discipline; as a field of intellectual inquiry spanning across disciplines; as a practical source of governance, for example in ethical codes and committees that guide and regulate health care practitioners; and as a source of public advocacy and even activism. In this chapter, I will come to consider bioethics in its regulatory and public discourse roles. However, in a book directed at the inclusion of values and insights from bioethics into analysis of challenges associated with climate change, it is instructive to begin with theoretical bioethics. Given my own areas of study (health law and policy, and public health ethics), I will focus in particular on the emphases and points of focus from a public health ethics perspective and their impact on and relationship with our study of law and regulation.

### ***14.2.1 Public Health Ethics: A Distinctive Face of Bioethics?***

The term ‘public health’ connotes a range of different practices, governmental concerns, and philosophical ideas and ideals (Coggon 2012, Chap. 3). Whilst these have for a long time been the subject of deep and sustained critical bioethical analysis (see e.g. the works of Dan Beauchamp, such as Beauchamp 1975, 1976, 1980, 1983, 1985, 1989), across the last 10–15 years there has been a marked increase in bioethical literature about public health (e.g. Beauchamp and Steinbock 1999; Gostin 2002, 2010; Bayer et al. 2006a; Freeman 2010). The contemporary field of public health ethics has typically been distinguished from ‘traditional’ bioethics with portrayals of the latter as reducible largely to clinical ethics (Dawson 2010). In this sense, public health ethics has been characterised as broadening the remit of bioethics. Although (as we will see) some may find reason to dispute this characterisation, at least heuristically it proves quite useful.

The characterisation’s utility comes first of all because the emphatically wider bioethical focus speaks to an increased practical application. Bioethics as clinical

ethics looks at narrow and theoretically isolated ‘bio’ questions, generally limited to matters within the context of health care, such as the level of information that patients should be given about medical treatment that they might receive, or to very individualised moral matters, such as whether voluntary euthanasia can be ethically justified. Public health ethics invites analysis of more socially grounded, as well as more diffuse, and also more politically and institutionally situated ‘bio’ questions, such as: rights and responsibilities in the context of vaccination programmes or given worries about the sustainability of antibiotic effectiveness; freedoms and obligations concerning ‘lifestyle’ and health, for example in regard to smoking tobacco, consuming fatty foods, or engaging in risky behaviour; or questions regarding the physical and social environments, for example concerning the health implications of the built environment or of correspondences between socio-economic status and health status. In this regard, there is considerable attention to ‘upstream’ and long-term causes of harm, measured through studies of populations, as opposed to acute causes of ill-health (Rose 1985).

Naturally, then, this apparently broadened bioethics can bring a great deal to debates on climate change. Part of its capacity to do so comes in the analytical insights afforded by the expansion on which it distinguishes itself. The idea here is captured well in the editors’ introduction to one of the leading collections on public health ethics, which says:

Because of the individualistic orientation of medical ethics, the concepts of autonomy and negative rights of the person (the right not to be harmed) have tended to predominate in that field. In public health ethics, by the very nature of the problems and policies with which it deals, there will tend to be more emphasis on the interests and health of groups, the social justice of the distribution of social resources, and the positive or social/human rights of individuals. When social interests and the interests of individuals come into conflict, then there will be a conflict between medical ethics and public health ethics. (Bayer et al. 2006b, p. 4)

As Bruce Jennings indicates, a developed body of philosophical work on public health requires, and brings, an extended critical and conceptual vocabulary (Jennings 2003). This vocabulary allows analysis of political and professional institutions, and consideration of the nature of different groups (be they defined socially, by age or sex, by health status, or otherwise). It also highlights questions of justice between members of a given society, between different societies, and between generations (*c.f.e.g.* Daniels 2006, 2008).

I have argued elsewhere that public health ethics thus requires a normative analysis that sits within political philosophy; that a purely moral critique, which may be quite suited to some aspects of bioethics, is not sufficient for an understanding of imperatives and evaluations concerning public health (Coggon 2012). Rather, our ethical theories need to be able to account for limitations to, and the potential power of, political actors. I shall return to this point shortly, as a crucial aspect of normative debates concerning climate change will be their relevance and applicability within a political framing (at least if it is hoped that they will effect some sort of difference for the better (Hayward 2012)). Leading to that discussion, I will present an interesting synergy between public health ethics and environmental ethics.

### 14.2.2 *Finding the Basis of Ethical Policy-Making: Environmental Ethics and Bioethical Discourse*

Although I did not make reference to it in the preceding section, a further—highly important—broad understanding of bioethics covers ethical concerns as they relate to the *whole* of the biosphere (*cf* Comstock 2002, p. xv). As such, environmental ethics may be viewed as a (perhaps understated) part of bioethics. With the development of public health ethics, both in the public domain (World Health Organisation 2000; Jochelson 2005; Nuffield Council on Bioethics 2007) and within academic scholarship (Brownsword 2011; Walton and Mengwasser 2012), the idea of *stewardship*, which derives from theories in theology and environmental ethics (Holm 2011; Hayward 2012), has had explicit influence on the search for an appropriate critical model that might be used to articulate a sound, meaningful, and applicable public health ethics.

The introduction of stewardship as a framework for public health ethics—whilst something of which I am substantively quite critical (Coggon 2008, 2011)—represents an important contribution to our understanding of the nature of bioethics for various reasons. From an analytical perspective, we may note especially that the arguments for stewardship relate to *political, economic, social, and institutional* responsibilities (Nuffield Council on Bioethics 2007; Saltman and Ferroussier-Davis 2000). In ways echoed in my own work, the focus is given primarily to normativity within the political sphere. It is recognised that relevant actors go beyond individual moral agents (a doctor, a nurse, a patient, and so on), and that institutional and political frameworks and realities reflect both sources of constraint and the capacity to implement and assure action. I do not wish here to rehearse my own criticisms of the substance of stewardship. From an analytical perspective, it is sufficient to point out the importance of the focus it gives to drawing from political rather than purely moral theory, and to the way it highlights targeting ethical mandates at political and institutional actors.

Further to this analytical point, there are telling synergies between environmental and public health policy in academic literatures on regulatory strategy and shape, well beyond those that speak about stewardship. In his analysis of the development of a Framework Convention on Global Health, for example, Lawrence Gostin argues in favour of drawing inspiration from international environmental regulation, saying: “Although far from perfect, international environmental treaties offer innovative approaches to global governance” (Gostin 2008a, p. 387). These synergies are only heightened when we recognise that scholarship regarding public health governance assumes the broad scope outlined above in relation to public health ethics, so itself includes concerns about matters such as climate change. Belinda Bennett and colleagues, for example, write that:

Public health governance entails direct regulation of businesses (inspections, nuisance abatements, and occupational health and safety) and of individuals (seatbelts, motorcycle helmets, quarantine). And it encompasses indirect regulation through the tort system (tobacco, firearms, toxic substances). Finally, given the complexity of many public health threats and challenges—from global warming, to obesity, to pandemic influenza—governance also has an ‘inward dimension’ that relates to the organisational structures,



agencies and legal mandates through which governments exercise their own public health regulatory functions. (Bennett et al. 2009, p. 207)

Given, on this understanding, the breadth of public health's 'jurisdiction,' it is unsurprising that scholars and activists with a background in health policy and practice push for a 'health in all policies' approach (see Bennett et al. 2009; *cf* also Charles-Edward A. Winslow's definition of public health (Winslow 1920), and Lawrence Gostin's definition of public health law (Gostin 2008b)). The assumption of such an approach can be seen to have value from ethical, rhetorical, and practical angles (all of which are important in public bioethics (Montgomery 2013)). In regard to ethics, some theorists push for the fundamentality of health to human flourishing, and thus would naturally want health to be a guiding concept across government activity (e.g. Gostin 2008a; Ruger 2010). Equally, a great many theorists at least rank health as one amongst several important values, and thus something worthy of special protection (e.g. Powers and Faden 2006; Wolff and de-Shalit 2007). In either case, a commitment to health places ethically necessary side-constraints on activities that do or may lead to ill-health. In regard to rhetoric, the importance comes in the connotations of the term 'health' itself. Whilst some theorists argue that we can have a practically useful but non-normative concept of health (e.g. Boorse 1975, 1997; Daniels 2008), there are good reasons to doubt this (Kingma 2007; Coggon 2012, Chap. 1). If health is seen as something that is of necessity good, the *prima facie* implications of a policy that harms health are necessarily negative.

Following from these two points, there is the clear practical political advantage that claims regarding health will likely have strong purchase on individuals and policy-makers. Bolstered by arguments concerning, for example, the economic benefits of maintaining people's health (Gostin 2008a), we have in health a concept that may effectively be deployed in political argument. This is particularly noteworthy for two reasons: first, it allows potential constraints on the widest range of activities, provided some (possible) negative health implication can be found in them; and second, it allows health experts and governance bodies to claim authority to speak to all of governmental policy. A public health ethics strategy can allow health experts to claim expertise not just in health policy narrowly conceived, but also a right to speak to fiscal policy, education, town-planning, environmental regulation, family life, religious practices, and so on (see also Singh 2012).

The final thing to take in this section from a bioethical focus on politics is that there are important roles for public discourse and a commitment to allowing ethics to inform practical policy-making (policy here being broadly understood to include both governmental policy, and practices and regulation of other key, non-governmental 'stakeholders,' such as large corporations) (see also Macpherson 2013a). So even those who would reject, for example, the *content* of the popularised stewardship model might learn a great deal about what it draws from environmental ethics in terms of framing morally-informed practice. And from an environmental ethics and policy standpoint, we can also, when thinking about concerns regarding the natural and human environment, learn a lot about the way stewardship and other ethically-based regulatory frameworks have been developed, deployed, and received in academic and public literatures, and by public authorities and large institutions.

As Lindsay Wiley argues, the synergies between environmental and health sectors need to be enhanced and developed: a mutually informing dialogue between them is required, with each learning from the other (and each accounting sufficiently for the important concerns of the other) (Wiley 2010; see also Macpherson 2013b).

### 14.3 Policy, Globalisation, and Public Ethics

The discussion so far suggests strongly that philosophical public health ethics will naturally lead to analyses and practical frameworks that can—and may well—guide policy. It will speak to practical obligations placed directly on the State and governmental bodies, and, in regard to other actors such as persons and corporations, to obligations that are mediated, encouraged, and enforced through the State and other governmental bodies. My approach to analysing these matters is through asking the question “what makes health public?” (Coggon 2012). By doing this, we invite examination not just of whether health (amongst other things) is important, or of whether an *individual* might be well advised to choose to act according to some moral theory. We go much further and explore when, why, and how one person’s health or health-affecting behaviour is the concern of others in such a way that it gives rise to political freedoms, rights, or obligations. If, for example, we wish to institute a legitimate, enforceable ban on smoking tobacco in public spaces, we need to establish first that one person’s smoking is the concern of others, and further to that to establish why it should be the concern of the State and properly made the subject of law and regulation. We do not, in the case of tobacco, just make bare claims about the ethics of smoking: we make claims about the ethics of *controlling* people’s freedom to smoke (*cf* Coggon 2013). Having made clear the political nature of public health ethics, let us now turn to how such an approach might apply in the context of climate change.

#### 14.3.1 *Public Health Ethics and Its Application to Climate Change*

In the remainder of this chapter, I aim to spell out and elaborate on how the mode of analysis described above can apply to questions of ethics and climate change. As I have outlined, with a public health ethics approach we would not simply need to establish whether and why climate change gives rise to *moral* questions. We would need also to establish whether and why climate change gives rise to obligations that can be imposed politically on people, governments, and other actors, so that even if they reject the idea of a moral imperative to modify their behaviour, activity, lifestyle, and so on, they may nevertheless be encouraged or required to do so. Our work here needs to address all relevant ‘stakeholders’. This includes leaders and policy-makers within public and corporate institutional bodies; philanthropies,

activists, and thought-leaders; and individuals and members of professions. And the point I would wish to emphasise again is that our focus needs to be on establishing political obligations, and accessing means of political leverage: we need to establish obligations that subject the actors to (weaker or stronger) governance mechanisms.

Regarding climate change, both analytically and practically we face a great difficulty, even if we take for granted the strength of scientific argument regarding humankind's role both in causing, and potentially limiting, it. The problem is this. Within the confines of domestic State policy, it is relatively easy to frame arguments about political obligation. Both in analysis, and in reality, we have a central government on which political constraints can be imposed, and through which political mandates can be filtered. We can conceive in theory and see in practice an accountable executive and the further organs of the State that (at least in principle) afford a legitimate mandate for interference with our actions. In jurisprudential terms, we are operating within a 'central case of law' (see Hart 1994). Climate change, though, is a global problem requiring global responses if it is to be addressed satisfactorily. There exist, of course, inter- and supra-national governance regimes, such as the United Nations and the European Union. But in the context of such organisations, political ideals such as accountability and legitimacy, and practical political constraints that can effectively assure that political obligations are met, are not straightforwardly reflective of what is found within any individual State system (see also Fidler 2008).

From a bioethical perspective, these complexities are compounded because of fundamental moral disagreements on the very legitimacy of having an international order. Broadly speaking, we can see two camps of theorists. On the one hand, there are those who argue in favour of a system of separate, sovereign, Nation States (Rawls 1999). On this view, there is a radical distinction between, first, the obligations owed by citizens of a particular jurisdiction to each other (and to their government and it to them), and second, between citizens and governments of different jurisdictions. Any duties naturally owed to other States and their people are very tightly limited. Although at the level of principle, such a statist view does not preclude concerted joint action by nations, it can only provide a very weak *mandate* to suggest that concerted action is obligatory. And then in contrast with the statist view, we find cosmopolitan ethical viewpoints (Beitz 1979). On this view, citizenship of a particular country is not of itself important; everyone in the world matters, and our obligations are no weaker by virtue of differing geopolitical identity. My obligations to other people in the United Kingdom (where I live) are no less than my obligations to people anywhere else in the world.

In the global health ethics literature, there are many examples of scholars who try to bridge these two extremes, for example because of a concession that whilst a 'one world' ethic is more robust, practical forces stand in the way of a global super-State (*cf* e.g. Singer 2004). I would argue that ethical argument that speaks to political obligation must account for political realities. I do not believe that political philosophy has no place for moral considerations (*cf* Geuss 2008), but do acknowledge that ethical aspirations in the political sphere must be able to account for real politics (*cf* Wolff 2011). This is informative too in relation to climate change and global ethics. Moral considerations will motivate arguments and the development of ideas.

Equally, normative tools such as the human right to health (WHO 2007), whilst conceptually problematic, afford means of implementing ethically informed governance (Wolff 2012). Those who would wish to push a strong agenda in global governance to improve the environments in which we live (with a view to health, and to other matters), must be able to respond to real world limitations on their aims. These should not lead to pessimism or resignation. Rather, they are necessarily addressed if the best possible results are to be achieved.

It is against this complex background, which requires concessions to political realities about what people and States will in fact do, and concessions to conceptual and analytical constraints regarding a political system with no centralised organs of government, that we need to ask the difficult question: is it possible to make global problems, such as climate change, public in a way that will afford the potential to address them? Our analysis needs to accommodate problematic practical realities, especially in regard to the nature of ‘law’ at a global level. How can we find a successful, legitimate, coordinating force on the global stage? And our analysis needs to account for the radical divides in normative perspectives, granting that many scholars (and others) reject the proposition that obligations are rightly shared regardless of nationality and geography.

### ***14.3.2 Making Global Problems Public***

I noted above that public health permits of many meanings. Equally, the term ‘public’ does not have a single, settled definition (Coggon 2012, Chap. 2). As a noun, for example, it can refer to everyone, or a sub-population (say citizens of a country, inhabitants of a particular area, members of a specific profession, and so on). As an adjective, public might refer to questions concerning government (public activities and bodies). Equally, it might refer to physical places (when things happen ‘in public’), to the sharing of abstracts (for example legal rights), or to the aspects of a person’s life that may be controlled or examined by others (in contrast with private life).

Whilst within a national framework many of these ideas of public are evident, fewer—particularly those concerning political institutions—find obvious form in a global framing (Fidler 2008). This is reflected sharply in the growing ethical, legal, and regulatory literature concerning global health (see e.g. Gostin and Taylor 2008; Benatar and Upshur 2011). In that context, we see how real-world practical constraints have led to an interesting definitional evolution (Coggon 2014). Whilst definitions of public health within a national frame place very heavy emphasis on the role of government, definitions of global health can be seen to stipulate a mission (broadly to assure conditions in which people can be healthy), but then looks to achieving this mission by engaging a great variety of more or less externally unaccountable actors (*including* government, rather than under the ‘stewardship’ of government). It is instructive here to consider Lawrence Gostin’s new definition of Global Health Law:

*Global health law* is the study and practice of international law—both hard law (e.g., treaties that bind states) and soft instruments (e.g., codes of practice negotiated by states)—that shapes norms, processes and institutions to attain the highest attainable standard of physical and mental health for the world’s population. Normatively, the field seeks innovative ways to mobilize resources, set priorities, coordinate activities, monitor progress, create incentives, and ensure accountability among a proliferation of global health actors. The value of social justice infuses the field, striving for health equity for the world’s most disadvantaged. To be effective, global health law must foster collective action, facilitating partnerships among state and nonstate actors and across public and private spheres. (Gostin 2014, pp. 59–60)

It is striking here that the idea of law is explicitly given a very broad, and in some aspects ‘thin’, meaning. As well as binding legal instruments, the term is given to softer mechanisms. This derives from Gostin’s wider commitment to Global Governance for Health. As well as considering straightforwardly public actors and agencies outside of the health sector, he explains the importance of governance tools and activities of non-State actors. Global activity regarding health, as in the case of environmental issues, assumes significant roles for influential actors that are not formally law-makers or governments, but which hold responsibility (both causal and moral) for impacts and influences on people’s well-being. Whilst accepting their significant roles, there are obvious concerns about effective governance; particularly in relation to coordination and accountability.

Allowing, therefore, as Gostin does, for the weaknesses and imperfections within actual and potential global governance for health we nevertheless find a practical concept of law that allows us to attempt to institute ethically-informed mandates to improve global governance. Although it relates to an earlier, slightly different, definition of Global Health Law, it is also useful here to note Lawrence Gostin and Allyn Taylor’s summary of five “salient features” of global health law:

[I]ts: *mission*—ensuring the conditions for the public’s health (meeting ‘basic survival needs’); *key participants*—states, international organizations, private and charitable organizations and civil society; *sources*—public international law; *structure*—innovative mechanisms for global health governance; and *moral foundations*—the values of social justice, which call for the fair distribution of health benefits to the world’s most impoverished and least healthy populations. (Gostin and Taylor 2008, p. 55)

This approach to developing a concept of Global Health Law aims to account for inevitable legal, political, and regulatory effects of and on globalisation. As A Claire Cutler argues (2012), in the context of global governance a rethink of the very concept of ‘public’ is needed. In her argument, big, non-governmental players and the roles given to experts both fall short of general concerns regarding power, authority, and governance. These ‘private’ transnational actors, she argues, escape political governance roles because of misplaced paradigms that distinguish public and private international law. Taking her argument into the context of health policy (Coggon 2014), we need to recognise, for example, non-governmental organisations, industry, and philanthropies as in important senses *public* actors with *public* responsibilities. Doing so, however, without a developed regulatory system is where one of the greatest challenges lies for those in bioethics who have an interest in global health (see also Wiley 2010; Hayward 2012). The reflections on Gostin’s development of

the idea of Global Health Law demonstrate the complexities here if health—or climate change—are to be ‘made public’. Yet they also hint at a way forward. The works of scholars such as Gostin demonstrate that whilst perfect solutions are not available, meaningful political obligation at a global level is not an impossibility. And as outlined above, just as the public health literature has benefited from works in environmental ethics, so might public health ethics bring insights to debates on climate change ethics.

## 14.4 Conclusion

I end this chapter with a very brief reflection on different strategies for global health governance that have been developed by scholars in bioethics. Although we see varying levels of ambition (and in some senses even radicalism) (*cf* e.g. Singer 2004; Pogge 2008; Gostin 2008a, 2014; Ruger 2009, 2012), there is a common recognition of the importance of political bioethics. Political bioethics is, I would argue, the most useful for scholars and activists interested in climate change. For strategic and analytical reasons, we see the theoretical and normative question “what makes health public?” becomes a more urgent and tactical one: “how can we make health public?” (Coggon 2014). To make health a global public concern requires reconceptualisations and advocacy. The same is true in relation to rights and responsibilities regarding climate change. Motivating such reconceptualisation is a transnational challenge, and will be hard to sell to the world’s most wealthy and powerful.

Scholarship in public health ethics, and particularly as it relates to questions in global health, suggests some useful answers to the difficult questions that the world faces. In this chapter, I have outlined the importance of various features of this argument. In particular, it is important that our theories here, whether they are considered as being in bioethics or environmental ethics, accommodate a vast range of actors and their rights, freedoms, and responsibilities: individuals, populations, corporations, institutions, NGOs, philanthropies, governments, international public bodies, and others. In relation to these, I have been emphatic about the need to ground political obligations. This involves an understanding of obligations that are not purely moral, but sit within an institutional context of governance that allows for formal mechanisms that encourage or enforce compliance. And in a global context, it also requires a developed, and in some senses thinner, concept of law; one which includes agencies and actors that are not archetypically ‘public’, and is responsive to means of effecting the best possible regulation in regard to them.

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# Chapter 15

## Why Bioethics Should Address Climate Change and How It Might Do So

Cheryl C. Macpherson

*Music and art and philosophy are ultimately based on the premise that this man on his tractor, and these pigs, and the swarms of bees that fertilise the crops, will all continue to do what they do. And every philosopher, no matter how brilliant his or her insights, needs a portion of the field—how much? Half an acre?—to support him if he is to survive.*

(Alexander McCall Smith 2011, 158)

**Abstract** The production of even small quantities of greenhouse gas emissions worsens climate change and accentuates the unequal, and often unfair, distribution of emission-associated benefits and harms. The relative inattention of bioethics to climate change is surprising given its roots and concern with health, wellbeing, and autonomy. Bioethics could improve understanding among policymakers and others that autonomy is expressed and health is experienced within natural environments and ecosystems. Such understanding could strengthen efforts to reduce emissions and help make Western lifestyles more accessible globally. Processes of globalization and socioeconomic development sometimes improve health determinants and indicators, but simultaneously increase production of emissions that harm health. Bioethicists have the capacity, influence, and responsibility to deepen understanding that emissions harm health, health systems, and natural resources on which these rely; and to inform related analyses and policies.

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## 15.1 Bioethicists Are Stakeholders

Regardless of where and how we live, the evidence is clear that climate change threatens health and ways of life on land and sea around the world (Pugh 2014). Mainstream news agencies increasingly report climate-related shortages of food, water, and clean air, even in wealthy nations (Associated Press 2014; Harris 2014; Ghosh 2014; Erdbrink 2013; Dreibus et al. 2012). All individuals and nations are stakeholders in the dilemmas posed by climate change. The inattention of bioethicists and bioethics is surprising given their dedication to, and history of interest in, health and wellbeing (Macpherson 2013a, b).

Dan Callahan, a founding bioethicist, describes bioethics as an interdisciplinary field that drew initially from philosophy, law, and medicine (Callahan 2012). He perceives the range of disciplines within bioethics as having dropped since the 1970s, and a need for greater inclusion of social sciences to improve bioethics ability to offer sound judgments about right and wrong (Callahan 2012). Such judgments are needed, he says, because principlism, a dominant approach in bioethics, encourages the protection of individual autonomy without offering guidance about “what counts as a good exercise of autonomy. The right to make a choice is regularly confused with the goodness of a choice” (Callahan 2012, 19), and offering sound judgments could enable bioethics to better inform “political and social decisions about which choices will, and will not, be good for us as a community, and about the moral principles, rules, and virtues that ought to superintend the introduction of new technologies into the societal mainstream” (54). Before making and offering such judgments, however, bioethicists must determine what issues to pursue, and develop imagination and insight with which to vigorously pursue them (Callahan 2012).

In addition to new technologies, this perspective is applicable to policies and practices that permit the production of greenhouse gas emissions (referred to herein as emissions) which worsen climate change. This chapter discusses i) why emissions-producing activities warrant judgments from bioethicists; ii) the complexity of self-interests that pervade individual and collective willingness to make judgements, and often deter responsiveness; and iii) links between self-interests, globalization and climate change. Finally, it supports the suggestion (Jennings 2016; Doan and Sherwin 2016) that shifting bioethics emphasis from individual autonomy to relational autonomy and solidarity will highlight dependencies between individuals, populations, and natural environments that support health and wellbeing, and do so in ways that render bioethicists and others more willing and able to offer sound judgments regarding climate change.

Given today’s high atmospheric carbon levels (Scripps Institute of Oceanography 2014), the production of even small quantities of emissions worsen climate change and its repercussions. This is a problem because emissions are produced faster than they can dissipate. The unequal and often unfair distribution of benefits and harms that accrue from emissions-producing activities and policies challenges distributive, procedural, social, and intergenerational justice, and raises questions about the related responsibilities of different individuals, institutions, governments, and other entities. These significant problems seem sidelined in bioethics by attention to

North American conceptions of independence and autonomy, and to advances in medical technologies. Bioethicists ought to probe more deeply into health, the goals of healthcare systems and health research, and their interdependence with natural environments (Whitehouse 2002).

Many describe environmental bioethics, environmental ethics, public health ethics, and climate ethics as specialties of bioethics, but the relationships and distinctions between these and other bioethics ‘specialties’ are poorly defined. These specialties are often erroneously assumed to focus on ethics pertaining to health impacts of climate change, but none specifically do so. Moreover, such work is seldom integrated into leading bioethics journals, conferences, or curricula (Macpherson 2013a). Despite obvious connections between environment, climate, and health, many working in these areas do not identify themselves as bioethicists. Accordingly, they rarely submit their work to mainstream bioethics journals or conferences; and the relevance of the causes and impacts of emissions to medical and research ethics tends to be masked by editors and reviewers who discount their readers and participants interest in environmental considerations.

Bioethicists should address climate change because it harms health and “is the most complex and significant ethical issue of our time”; to meaningfully do so they must examine it through a global lens, become more discerning about related political and economic influences, and begin to reflect on their own individual and collective roles in the social structures that permit emissions to rise (Jennings 2016, 2). As individuals and collectively, bioethicists and other professionals are situated to inform policy choices and other activities that affect emissions, and encourage others to do so. They can integrate related behaviors and issues into their practice, teaching, research, and policy work; and initiate institutional and public dialog about the reliance of health on the natural environment, and about choices and policies that damage environments, sometimes irreparably. Forging partnerships with educators, policymakers, social marketers, the media, and leaders from a range of sectors would increase the likelihood that ethical, cost effective, and socially acceptable interventions will be identified and implemented before the harms of emissions, and costs of responses, worsen significantly.

Many believe that there are individual and collective duties to respond to climate change. To identify grounds for, and demandingness of, these duties, some turn to respect for nature and others to institutions or governments; regardless of approach, these duties require individual and collective responses to questions centered on (i) what the global community needs “to do to create a morally adequate outcome”; (ii) how to apportion responsibility, in an ideal world, for bearing the burden of responding; and (iii) how single actors in a non-ideal world should try to ensure that climate change is reduced or controlled (Kingston 2014). These questions can be answered from a range of positions and used to inform the ethics and practicality of responses to emissions (Kingston 2014). Bioethics can help to answer these questions and delineate others with the potential to constructively guide individual and collective responses.

The capacity of nations, industries, and institutions to employ technologies and policies to reduce emissions (and thereby reduce societal and individual costs and harms of emissions) is one factor underlying collective duties to reduce, and make

efforts to reduce, emissions. These responsibilities may be discharged through practical, scholarly, or policy-oriented work. It is important to be cognizant, however, that even the conduct of this work produces emissions by using energy for transportation; temperature control; electric lights and laptops; and equipment, products, medications, and services. Even something as seemingly innocuous as the production and use of latex gloves in medical practice and research generates significant emissions (Pierce and Kerby 1999).

From the perspective of justice, the extent of responsibilities to respond weighs more heavily on those with more influence and resources than others. Because most nations, industries, and institutions have more influence and resources than individuals, they have greater responsibility to reduce emissions than individuals, and should be held more accountable. Individuals, however, comprise the leadership of these and other collective bodies, so individuals too share in the responsibilities.

## 15.2 Bioethicists Have Responsibilities

As individuals, bioethicists have at least some influence on the knowledge, skills, and concerns of their students, readers, and clinical and other colleagues. Bioethicists have ensured that Western conceptions of individual autonomy are integrated even into non-Western medicine, research, education, and policy, and this suggests that they can re-position other concerns (like the harms of emissions) within these realms. Their reluctance to do so regarding emissions involves their tendency to value individual autonomy more greatly than interdependencies that make health, wellbeing, and human relationships possible, enjoyable, and fruitful (Gopichandran and Dawson 2016; Macpherson and Akpinar-Elci 2015; Macpherson 2013a, b; Dawson 2010).

Decades ago, Van Rensselaer Potter proposed that bioethics applies not only to medical practice and research, but to populations, natural environments, ecosystems, and social conditions that affect health (ten Have 2012). Potter's construct of 'global bioethics' emphasizes the relationships of social and environmental conditions to health and medicine; the interdependency between human, plant, and animal worlds; and the roles of partnerships between bioethics, sciences, and other disciplines in preserving the health and wellbeing of future generations and survival of the human species (Potter 1971; ten Have 2012). These considerations have an important place in health, medicine, and medical education, and bioethicists have a responsibility to highlight them.

Potter accurately predicted the intensification over time of communication, travel, and economic growth (ten Have 2012), each of which increase emissions. Arguably, governments and institutions have responsibilities to restrict further intensification and thereby produce fewer harms, and more short and long term benefits. Fulfilling those responsibilities, like sustaining environments in which future generations can thrive, may be best done through interdisciplinary partnerships (ten Have 2012). Given its interdisciplinary nature, bioethics is well placed to participate in such partnerships. Its success in thoroughly integrating autonomy and introducing medical humanities into routine medical education and practice sug-

gests that bioethics could equally well partner with medicine, public health, and others to inform governments, industries, and the public about the pressing need to reduce emissions, and the responsibilities of different stakeholders.

Potter described a need to overcome divides between humans and nature, and more greatly value their interdependencies (ten Have 2012). Health has many interdependent components including some from both human and veterinary medicine. The ‘One Health One Medicine’ (OHOM) movement embodies these interdependencies and is increasingly integrated into medical and veterinary curricula, conferences, and publications. It’s concern with environmental conditions in which vectors and diseases undermine human and animal health helped diagnose and manage the 1999 West Nile virus outbreak in New York that killed birds and horses, and caused paralysis, meningoencephalitis, and deaths among previously healthy people (Shomaker et al. 2013). Bioethics and OHOM share the aim of promoting health and wellbeing. Partnerships between them could enrich responses to emissions and the health impacts of climate change.

Bioethics has made Western conceptions of individual autonomy central to medical practice, research, and education; public health; and health systems and policy, even in non-Western settings. It could (and should) similarly integrate relational conceptions of autonomy into these realms to generate deeper appreciation for interdependencies such as human connectedness with, and reliance on, the natural environment (Jennings 2016; Doan and Sherwin 2016). Relational autonomy emphasizes relationships within, and between, individuals, groups, ecosystems, and other living creatures, and may extend to interplanetary systems in which Earth exists. Greater emphasis on relational autonomy, interconnections, and solidarity might also encourage implementation of policies, and governance, that more strongly value and protect natural environments and ecosystems.

Addressing the global need to reduce emissions requires international cooperation (Resnik 2016) but even in different nations, different cultural and social norms can, from different motivations, encourage local bioethicists and others to work toward such cooperation (Metz 2016). All nations, institutions, and individuals are stakeholders in the present and future wellbeing of humanity. Their capacities to respond vary with resources, education, values, and priorities. Responsiveness to climate change, and efforts to reduce emissions, are restrained at least partly by considerations noted above, and also by conflicts of interest and other forms of self-interest.

### **15.3 Self-interests Are Complex**

Socioeconomic, cultural, geographic, generational, and other factors affect how groups, and individuals, determine what is in their respective self interest. Self interest underlies most human behaviors but behaviors and choices taken in self interest do not always provide the anticipated benefits, and are sometimes taken with a goal of benefitting others. That individuals sometimes prioritize a collective interest over an individual interest is evident when they sacrifice something to benefit their family, nation, or other group.

Choosing to enlist in military service when doing so is not compulsory involves giving up some personal safety and freedoms. Individuals sometimes do so to gain employment, status, or a career path. They may simultaneously do so for an altruistic reason such as to provide national security (a collective benefit) to their nation or family. Choosing to provide military service may also be in one's own self interest because doing so supports the military and may make their nation, and allied nations, safer places in which to pursue their own individual health and wellbeing. There are psychological benefits from acting consistently with one's values, so individuals who value altruism and choose military service for altruistic reasons benefit by acting in accordance with their own values, even if they have additional motivations.

Individual and collective self interests are complex, subjective, and vary with context. One individual's self interest may conflict with another of their self interests, or with the collective interest of a nation or group to which they belong. Similarly, a collective interest may conflict with an individual self interest. All individuals belong to a variety of groups such as being residents of a neighborhood, citizens of a nation, employees or alumni of an institution, members of a family, faith, or place of worship, etc. Membership in these groups may, or may not, involve interactions with members of other groups like fans of a particular sports team, author, celebrity, television program, or genre of books. Individual identity and self interest is defined somewhat by the family, community, nation, and other groups that one is born into, and also by the groups that one actively or passively becomes a member of. Regardless of how one enters a group, or what type of group it is, group members share a sense of solidarity with others in that group, and perhaps less so, with those who partner with that group. The strength of individual and group feelings of solidarity will vary with circumstance.

Solidarity may be a useful supplement to altruism, justice, and other ethical concepts in that it can strengthen cooperation, foster the ability to achieve collective goals, and help ensure adherence to a given policy (Illingworth and Parmet 2012). Actions that demonstrate solidarity within a group enable group members to bond and perpetuate the group's existence and status. Jennings (2016) describes levels of solidarity involving willingness to stand up (i) *beside* an individual or group, (ii) *for* an individual or group, and (iii) *with* an individual or group. Understood this way, solidarity is not a conceptual ideal but a form of practice that causes intentions to form, possibilities to be discovered, and moral principles to be made meaningful (Jennings 2016).

Because all individuals and groups are stakeholders in the future of their families, communities, nations, and the human species, it is in their self interest to help reduce emissions. Individually and collectively, bioethicists have greater capacity, resources, and skills than many others, and therefore greater responsibilities with which to do. Means of fulfilling this responsibility include more thoroughly integrating relational conceptions of autonomy into their routine work; helping to redefine ecosystems and natural environments as place we live *within* rather than resources to use and use up; and exposing self interests and conflicts of interest that bias understanding and responsiveness to the harms of emissions. (Jennings 2016; Doan and Sherwin 2016).

### ***15.3.1 Globalization Shapes Self Interests***

Self-interests may be defined differently by different individuals and groups, and the same individuals and groups may define them differently when they find themselves in different circumstances. Self-interests tend to change over time as needs, priorities, and contexts shift. Globalization influences self-interests by making Western news, lifestyles, products, and norms highly visible and desirable, even in low and middle income nations. Self-interests drive individual and collective pursuit of these things, but emissions that arise in their pursuit and attainment cause harms to those individuals and groups. The global scale of such activities significantly raises demand for, and production, use, and disposal of products, and is elevating global emissions at alarming rates. The value and duration of the benefits of emissions-producing activities are not adequately balanced against the severity and duration of the burdens, and are not adequately illuminated for the public, policy-makers, or political leaders.

Globalization involves the marketing of Western products and lifestyles. Widely used marketing practices encourage the public to consume more of just about everything, and often, to do so immediately. Such marketing tends to promote instant gratification by encouraging consumption, for example, of rapidly obtainable food to eat on the go rather than investment of time and effort into planning, grocery shopping, cooking, and cleaning up. It suggests that happiness and fulfillment come from consuming branded foods, soft drinks, and medications; driving branded cars; wearing branded clothes; and communicating electronically via branded technology and networks.

The glamorization of branded products may be shifting what individuals and groups perceive as in their self-interest, and as socially acceptable. Creating desire for technologies with faster speeds and greater resolutions may fuel impatience and encourage multitasking which, contrary to popular opinion is inefficient, and undermines the ability to focus on one thing at a time and the pleasure of doing so (Rosen 2008). The intensification of information about products forces more choices on consumers about what information to assimilate, and whether and how to respond to it. The ability to choose is a benefit of freedom and autonomy, but having too many choices is burdensome and can cloud objectivity about which choices are actually in our self-interest in the short and long term.

Many perceive the attainment of a particular brand computer, cell phone, car, food, etc as in their self-interest. Although they may not know, meet, or communicate with each other, consumers who prefer a particular brand or product constitute a group. They are likely to feel a sense of privilege in preferring and owning their brand, and a sense of being better or smarter than others whose circumstances or preferences make them unable to appreciate that brand and belong to that group. Globalization may thereby promote solidarity among groups of consumers in ways that protect the existence and popularity of a branded product or service, rather than the stability of a nation, population, or community. Investigations of the benefits and burdens that derive from different types and expressions of solidarity are needed, particularly those associated with changing consumption patterns and values.



In the year 2000, material consumption of goods in the USA averaged over 360 pounds per person per day of oil, sand, grain, iron ore, coal, and wood, an amount that is ethically indefensible and strategically unwise given global population growth (Schor 2010). This level of consumption is exacerbated by industrial policies that encourage the production and use of disposables, and their replacement with newer models. Such policies contrast with those of decades ago that marketed products on the basis of quality and longevity, and supported employment for those replacing materials and making repairs.

Marketing policies today create demand for disposables and further raise energy consumption and emissions by increasing production, packaging, transportation, and disposal of products often over great distances and requiring refrigeration. This marketing and demand is portrayed as being in the interest of individuals, businesses, nations, and other entities because they provide employment and income, at least in the short term, for some. It also seems to alter values and social norms by encouraging expectations of instant gratification; and discouraging appreciation for long lasting hand-me-downs from family and friends, and reuse and recycling of consumables.

The preference for disposables falsely presumes that the resources necessary for their production and distribution will remain plentiful. This presumption may support the short term financial interests of those who produce, transport, and sell disposables, but it threatens their long term interests and the long term interests of everyone else. Strip malls that trade in disposables and fast food are now ubiquitous, even in poor nations. Whether thriving or empty and run-down, they have replaced what likely amounts to thousands of miles of once natural environments within and surrounding urban areas. On a larger scale, industrial agriculture, deforestation, and the extraction of oil, gas, and minerals have obliterated once pristine environments. These activities are typically conducted in remote and less visible locations than strip malls so the damage and destruction are unseen by most consumers, and even by many who profit from these industries. Illuminating these realities might generate private, public, and political will to seek less harmful approaches to production, packaging, transportation, trade, consumption, and disposal of goods.

Governments, industries, policymakers, executives, leaders, and consumers contribute to globalization and the massive scale of environmental destruction it imposes on rich and poor nations. Individuals have less capacity to change this than industries and governments. Entities that choose to continue such destruction undermine their own long term self-interest. Doing so embodies disrespect for, and rejection of, nature, and may explain why the phrase 'Mother Nature' is seldom heard today despite its widespread use during the twentieth century.

Global population growth raises the number of global consumers. This supports the forces of globalization and further depletes environmental resources, raises emissions, and challenges the preservation of natural environments. Unless the rate at which emissions are produced drops significantly and quickly, even wealth and influence will not ensure regular access to safe air, water, food, or land. Many mainstream news reports already document such circumstances in India, China, and the Middle East. It is thus in the self-interest of all individuals, groups, and nations to shift lifestyles, products, and policies in ways that reduce emissions. This should be of particular concern to nations and multinational bodies including corporations

because long term changes in temperature and precipitation increase the spread of infectious diseases into new locations, cause inequitable disease burdens, and lead to competition for scarce resources that generates political unrest (Macpherson et al 2016; Zamrozik and Selgelid 2016).

By exposing these sorts of competing self-interests, and partnering with other disciplines and sectors, bioethicists can help to envision the policies and practices that Dwyer (2016) suggests are needed to identify socially acceptable alternatives to globalization and the levels of emissions it generates today. First, in line with Callahan (2012), bioethicists must make judgments about emissions and the imminence and severity of the threats these pose. To be reliable and integrated constructively into public and policy deliberations, such judgments must be based on scientific and other types of evidence, and framed by an appreciation for relationships and interdependencies between health, wellbeing, and environments. It may be helpful to emphasize the harms of emissions that are occurring now, rather than those likely to occur in 50 or more years.

### ***15.3.2 Public Deliberation Is in Our Self Interest***

Like globalization, the development of medical and other technologies advance a variety of self interests. Many benefit from using technologies. Some benefit from the fame, influence, prestige, or money attained in their design, production, marketing, transportation, installation, sale, etc. Technologies, however, require extraction of natural resources, disruption of natural environments, and production of emissions, all of which cause harms that must be measured against the benefits. Consider hydraulic fracturing (fracking) for natural gas. Fracking reduces oil dependence and oil-related emissions but uses large amounts of toxic chemicals, water, and energy, creates risks of seismic effects and contamination of water sources, releases methane gas emissions, and devastates landscapes (Chowkwanyun et al. 2016; Freyman and Hampton 2014; Fischetti 2013; Brantley and Meyendorff 2013; Frosch 2012; Hurdle 2012; Urbina 2011). Factors that bear on whether and to what extent fracking is in the public's interest include the severity, extent, and duration of these harms to individuals and populations therein; and also on the significance and duration of public benefits. After a 4 year moratorium on fracking, the state of New York banned it entirely on the grounds that fracking is not in its interest (New York Times Editorial Board 2014).

Self-interest ought to encourage governments, industries, and leaders to look for alternatives to, and less harmful methods of, fracking. Doing so may raise costs but financial profits can continue to be made by passing some of the costs to consumers, and by capping executive salaries which are many times greater than those of average white collar workers. In the long term, implementing less harmful methods of fracking supports the industry's interest in perpetuating itself and its profits, and simultaneously benefits the public. Doing so might involve both self-interest and altruistic motivations. Supporters of fracking, however, tend to provide misinformation about its safety and proclaim that the benefits outweigh the harms. Continuing

to use existing methods and oppose regulation ignores the consequent emissions, pollution, and unhealthy and unsightly damages to communities and natural environments. The public and policymakers would be better informed, and probably make different choices, if they understood their self-interests in light of such considerations. Such understanding is consistent with Potter's construct of global bioethics, and bioethicists and others can integrate it into their own work and institutions.

Self-interests are inherently subjective, and sometimes based on inaccurate and incomplete information. These factors influence the objectivity of risk-benefit and cost analyses, and involve value judgments about what variables to consider and how to weigh them (Jamieson 2014; Elliot 2016). Exposing such methodological weaknesses might encourage development and standardization of more objective methods, and improve the accuracy of related analyses. One means of exposing these weaknesses and strengthening grounds on which determinations about individual and collective self-interests are made is public deliberation.

Public deliberation is a democratic process that requires the provision of balanced and accurate information in ways that improve participant's knowledge of relevant issues; its design ensures the inclusion of diverse participants and perspectives, exposes conflicting views and interests, and provides opportunities to challenge and test competing claims (Blacksher et al. 2012). When constructed transparently and in a non-partisan manner, public deliberation identifies stakeholder values and priorities; and can make controversial policies and actions more acceptable to participants, constituents, and the public by including them in the process itself (Goold et al. 2012). Among its other outcomes, the deliberative process can lend legitimacy to policy decisions about controversial and high stakes problems, and influence choices of individuals about whether or not to comply with policies that, for example, may restrict freedoms in efforts to limit disease spread (Abelson et al. 2012).

Public deliberation could similarly elucidate health and policy aspects of emissions. If designed as outlined above, it would likely expose opportunities for and means of reducing emissions without significantly compromising lifestyles or profits, and facilitate public and private acceptance of associated changes. Public deliberation requires resources such as adequate infrastructure, space, time, and staff to compile and convey relevant information objectively and meaningfully to diverse stakeholders. It is in the self-interest of institutions, governments, and the public to facilitate and support such deliberation by providing these resources because doing so upholds democratic values and contributes to health and wellbeing.

Deterrents to public deliberation include resource limitations; the non-democratic view that it is unnecessary or threatens self-interest; and feelings of exhaustion, frustration, or burn out that erode good citizenship, professionalism, and motivation. These deterrents are compounded by amorphous definitions and conceptions of what constitute communities and ecosystems, and the imprecision of these definitions challenges the ability to design, justify, and implement protections (Sagoff 2006; Jamieson 2014). A single policy can be designed to protect a fishery yield and the yield can be defined and measured, for example, but a single policy cannot readily be designed to protect a coastal ecosystem because these are comprised of many less measurable elements and interdependencies (Sagoff 2006). Through public deliberation and other ways, bioethicists might help to redefine concepts of

community and ecosystem in ways that are more practical for policymaking; and show that these concepts influence determinations about “the quality of life that we might attain through a commitment to conservation rather than consumption” and the right to be “free of the coercion implicit in pollution” (Sagoff 2006, 145).

Public deliberation might also help to elucidate how and when the precautionary principle is applicable to policies that affect emissions. This principle calls for reasonable and proportional actions to prevent significant harms, even when there is uncertainty about whether or when those harms will occur. Some argue that despite its theoretical and practical weaknesses, the principle supports efforts to reduce emissions (Powell 2010; Costello et al. 2009). Others emphasize its competing applications to policy responses to climate change, infectious disease, and other health problems (Chowkwanyun et al. 2016). During the 2014 Ebola outbreak, some embraced the precautionary principle by supporting quarantine of individuals suspected of being infected. Based on statistical, scientific, or clinical evidence, others rejected quarantine as ineffective and overly cautious, and favored less restrictive or other types of measures geared to a specific setting. In part, the diverse public responses reflect an inadequately informed news media and public. In the USA, the media portrayed Ebola as an immediate and dire threat despite the minute statistical probability of contracting or dying from Ebola in most of the world. This influenced individual and institutional perceptions of respective self-interests, and to some extent, their responses. It encouraged overly zealous responses, and even the rich and powerful perhaps feared the impacts of Ebola on themselves, their families, and their investments. With a nuanced discussion of such concerns, Chowkwanyun et al. (2016) conclude that precaution, as an ethos rather than a principle, grounds moral obligations to collectively reduce emissions.

It is in the interest of everyone to encourage and facilitate public deliberation about emissions. Bioethics is highly respected in academic, clinical, research, and policy settings for its roles in exposing, analyzing, and helping to resolve competing interests. The 2014 Ebola outbreak, and the readiness of health systems to respond, generated extensive dialog among bioethicists about ethics associated with quarantine and duty to treat. In contrast, there is little discussion in bioethics about the severe, global, and documented harms of emissions, or related ethical concerns. This may be due partly to institutional structures that hinder risk assessments and genuine deliberation about highly politicized problems (Gusmano 2016).

## 15.4 What Should Bioethicists Do?

### 15.4.1 *Recognize Self-interests*

In 2001, several essays in the *Hastings Center Report* explored the potential of financial and other interests to influence the work of bioethicists and bioethics centers. Concern centered on the extent to which funding from pharmaceutical, biotechnology, and other profit-making entities might affect their willingness to investigate ethical questions involving those funders, and sway their methods and

conclusions. Dan Callahan (2001) observed therein that money is central to Western lifestyles and affects both personal and professional actions, and that actions and policies often aid and abet corrupting influences even when the associated motivations and policies are not themselves corrupt.

Laurie Zoloth (2001) reminded readers that the agenda of paid consultants is guided by the needs and questions of the client, and highlighted non-financial interests such as the prestige and influence earned through academic publications, awards, speaking invitations, and opportunities to serve on advisory boards. She cautioned that bioethicists cannot adequately assess claims about the harmlessness of, or lack of alternatives to, an action or product without first unpacking related interests and the contexts in which they occur; and that financial and other self-interests challenge willingness and ability to do this thoroughly and with integrity (Zoloth 2001). Zoloth's and Callahan's views are relevant to self-interests within, and beyond, bioethics, and may bear on responsiveness to emissions.

As a discipline, bioethics also has an interest in maintaining its position and influence in academic, clinical, and public arenas. Pursuing this interest may subtly deter bioethics scrutiny of the consequences of scientific and technological advances, and the dynamics of institutional, political, or economic power in ways that may threaten the establishment (Jennings 2016). Conversely, this sort of self-interest may contribute to the prudence that enables bioethics to function within, and as part of, institutions and society; and may incline bioethics to direct resources toward issues like individual autonomy rather than relational autonomy, populations, emissions, and other conditions that affect health and wellbeing.

In 2011, some bioethics journals published reflections on bioethics history and future. With the exception of an essay by Susan Sherwin (2011), these reflections all but ignored global bioethics, environmental concerns, and climate change. It is surprising in bioethics that the magnitude and extent of the harms of emissions hasn't catalyzed efforts to (i) explore the ethics associated with their causes and impacts, and the rationales for strengthening related policy and governance; (ii) partner with educators, politicians, and the media to better inform the public about emissions; and (iii) encourage and facilitate public deliberation about emissions, the value of natural environments, the implications of citizenship, and self-interests. Re-visiting its own identity and self-interests today might make bioethics more amenable to such work.

### ***15.4.2 Embrace Relational Understandings of Autonomy***

Given their capacities, resources, and positions, bioethicists have a responsibility to develop rationales and justifications for policies that reduce global emissions. They can fulfill this responsibility and facilitate related dialog, Jennings says (2011), by helping bioethics to "broaden its conceptual range" through rigorous discourse about the interdependencies between nature, culture, and humanity. Moving beyond its dogmatic focus on Western conceptions of individual autonomy (Dawson 2010)

would help to broaden bioethics' scope of interest from medical technologies situated in impersonal rooms without windows, to natural and other environments. This might balance conceptual disconnections between medical technologies and the natural resources and environments essential to their production and use. To broaden bioethics, Jennings (2016) explains, bioethicists must re-conceptualize natural environments as places *we live within* rather than things *we live off of*, and re-define communities and ecosystems in ways that are conducive to public appreciation, policymaking, and governance.

Relational autonomy involves recognition that individual autonomy is expressed through relationships and within groups. In democratic states, the sense of belonging, cohesion, and solidarity that result supports national security (Brooks 2014). Michael Doan and Susan Sherwin (2016) recognize the importance of individual autonomy while highlighting the centrality of relational autonomy to individual and collective interests. Relational autonomy instills a responsibility to build trusting relationships, and these strengthen social cohesion and generate appreciation for connection-making (Doan and Sherwin 2016). Individual autonomy is valuable in providing individuals with freedoms and choices but it is incapable of providing grounds for evaluating the ethics of a given choice, and as an expression of liberal individualism, it is ideologically biased (Callahan 2012).

A balanced and informed dialog about the ethics of autonomous choices should include the rich and powerful who, when they come to understand that emissions threaten their own self interests and those of groups they belong to, may become strong catalysts for collaboratively orchestrated change (Doan and Sherwin 2016). As leaders, they have the capacity and responsibility to bring change, and their efforts will have greater impact than those of individuals with fewer resources, influence, and skills (Doan and Sherwin 2016). Individuals have different access to opportunities for reducing emissions so expecting everyone to take equal action tends to sideline concern for social justice and leave governments to shoulder the burdens (Doan and Sherwin 2016; Dwyer 2016). To be effective and fair, efforts to reduce emissions must be sensitive to differences in power and privilege, and ensure the substantive participation of the disadvantaged in related decision-making (Doan and Sherwin 2016).

### ***15.4.3 Illuminate Social Values and Inform Policy***

Bioethics could enrich its societal value by embracing population and environmental health, and could do so without neglecting medicine, research, education, or policy. Helping to illuminate causes, impacts, and potential responses to emissions would enhance health, wellbeing, and social justice, and help to protect natural environments and ecosystems. Bioethics is rich in theoretical work on social justice but less willing to investigate, or advance applications of such work to, injustices that harm health and wellbeing of real people and populations. The global distribution of the burdens and benefits of emission-producing policies is one such injustice.

James Dwyer (2016) discusses the different levels and types of risk that emissions pose in different geographic, temporal, and socioeconomic contexts, and links these to social justice by highlighting related vulnerabilities. The physical and economic status of the elderly, very young, chronically ill, and physical laborers, for example, tend to make them more vulnerable to heat waves than other groups; similarly, low income nations are more vulnerable than wealthy and well governed nations because they have less capacity and resources, and are less concerned with equitable use of resources and stakeholder priorities (Dwyer 2016). Wealthy nations are better placed than others to respond to emissions, and it is in their self interest to encourage the re-design of technologies, institutions, economies, and practices in ways that more fairly and sustainably support health (Dwyer 2016). Without changes in infrastructures, technologies, institutions, and preconditions that permit global emissions to rise, it is not possible to make meaningful reductions in global emissions (Dwyer 2016). These changes require industrial, corporate, and political leaders to accept at least some responsibility for emissions; reflect on why it is in their interest to promote justice and solidarity; and explore alternatives to their current practices and policies (Dwyer 2016).

Given its interests, responsibilities, and interdisciplinary history, bioethics should inform and promote deliberation about emissions. To protect social justice and avoid imposing further damage on the most vulnerable, bioethicists should initiate multi-disciplinary and multisectoral partnerships aimed at reducing emissions (Dwyer 2016; Nielsen 2016; Macpherson 2013a, b). These should explore, among other things, applications of relational autonomy and social justice to the causes and impacts of emissions. Health is a useful concept in bioethics because it has intrinsic value, is central to the functioning of individuals and nations, and can be promoted and protected by governments (Coggon 2016; Gostin and Stone 2007). These features imply that members of society have obligations to each other to defend against health threats, and that the benefits of living in a society that values health and reduces health risks can outweigh other competing self-interests (Gostin and Stone 2007).

John Coggon (2016) suggests that deploying the concept of health in political arenas could lead to justifications for the imposition of constraints that protect health, and provide grounds for investigating and responding to policies that affect health, including those that fail to restrict emissions directly, or indirectly through globalization. Driving a health agenda within a global governance framework exposes political limitations, and raises the question of whether it is possible to make global problems like climate change *public* in ways that can meaningfully be specified and addressed by governments, institutions, or others (Coggon 2016). Having a strong regulatory system, and institutional mechanisms with which to encourage compliance, might lead to understandings of industries and corporations as public actors with public responsibilities for public health and healthcare, and make emissions and health public in this sense (Coggon 2016).

Governments have influence over environmental and social determinants of health, and political analysis helps to establish which determinants are political concerns (Coggon 2016; Gusmano 2016). That governments vary in how they balance competing goals challenges solutions to global problems like emissions; and choices

about whether to impose stringent emissions standards involve value judgments about contested information like the impacts on economic growth (Gusmano 2016). It is not evident that stringent regulations reduce economic growth in any condition or context, or that reducing economic growth is problematic or wrong. The Clean Air Act of 1970 in the USA cost billions of dollars but caused a 66 % reduction in carbon monoxide in 18 large cities between 1976 and 1981, and reduced sulfur dioxide and particulate matter respectively by 40 % and 30 % in that time frame (Imperato and Mitchell 1985. 214). Analyses of related healthcare costs would show enormous savings, and subsequent expansion of this Act through bipartisan efforts led to effective protections against acid rain and grounded actions against emissions in 2014 (Davenport 2014).

Bioethicists could advance health, and understandings of the causes and impacts of emissions and associated responsibilities, by helping to shift the focus on health to tactical and practical questions like ‘how can we make health public’ (Coggon 2016). Efforts to expose and enhance synergies between bioethics, environmental ethics, and public health ethics, and to re-conceptualize health as a public good, would help justify the imposition of regulatory constraints to reduce emissions (Coggon 2016). Expanding bioethics and public perceptions in ways that appreciate relationships and interdependencies would make this more possible.

## 15.5 Conclusion

Broadening their own conceptions of health and autonomy would better equip bioethicists to make judgments about the causes and impacts of emissions. Such judgments could advance effective responses to global emissions at various levels. Bioethicists could also expose self-interests that bias responses to emissions, hinder objective determinations about when and where to impose constraints, and skew determinations about what forms of constraints are appropriate, practical, and socially acceptable in a given context. They could encourage, facilitate, and participate in public deliberation on issues linked to health and natural resources and environments in diverse geographic, socioeconomic, and governmental contexts.

Individual and collective contributions to global population growth and globalization raise global energy use and emissions, often unintentionally. Bioethicists can help individuals, institutions, governments, and other entities understand health and natural environments as public goods that warrant protections, and that rapid reductions in global emissions will protect these goods, and potentially make Western lifestyles more equitably available to the less privileged while improving economies and social conditions. Re-framing related evidence, as discussed above, could expose biases and other obstacles to policies and practices that reduce global emissions, and improve abilities to navigate around these obstacles.

The harms of emissions are documented, visible, and worsening. Doing little or nothing speeds the rate at which health is harmed, natural environments and species disappear, resource shortages occur, economic growth dwindles, and disparities



cause conflicts and threaten national security. Bioethicists and other influential stakeholders have a responsibility to initiate interdisciplinary partnerships aimed at informing the public, policymakers, and governments about the value of natural environments, and their inability to indefinitely supply all of humanity with safe water, food, air, land, and energy. Hopefully, these responsibilities will be accepted in time to preserve the health and wellbeing of present and future populations.

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