

Introduction

Lately the news about climate change hasn't been good.

Once upon a time, not long ago, the scientific consensus held that the northern polar ice cap, under the pressure of global warming, would melt eventually—"in the latter part of the 21st century."¹ That estimate, released in 2007, appeared around the same time as Al Gore's documentary, *An Inconvenient Truth*, and reaffirmed a widespread sense that if we did not act soon to curb our emissions of greenhouse gases, the worst effects of climate change could be dire indeed—but would transpire some decades into the future.² The threat from that ice melt, and from climate change more generally, was real but not absolutely imminent: we had time to fight for change through the familiar processes of public debate, the gradual formation of public opinion, the eventual forging of a coalition for Congressional action, and the patient negotiation of an international treaty.

That estimate turned out to be much too optimistic. Only two years later, new estimates suggested that the Arctic Ocean would be free of ice in the summer as soon as 2030 or 2040.³ Thanks in part to the blistering pace with which global economies were emitting greenhouse gases into the atmosphere, the climate was reacting far more quickly than most researchers had previously projected. That shift in the forecast—along with similar shifts all across climate science—had immense implications for anyone who hoped to preserve the biosphere in anything like its present state into the future. The threat no longer loomed far off, near the end of the century, but was only two or three decades away. In the wake of this and other developments, those following the science on climate change felt a greater sense of urgency, knowing the international community better act immediately to ward off severe changes to the global climate. That imperative strained against the limits of national and international political traditions, raising difficult questions. How could scientists bring this

news to bear on the thinking of leading politicians, who for the most part still used the estimates and targets set in the early 1990s? Furthermore, how could nations alter their fossil-fuel economies so dramatically in such a short period? What could possibly break through the impasse?

But as it now appears, even *that* estimate has turned out to be too optimistic in its turn. Three years later, the stunning melt of Arctic sea ice in the summer of 2012 prompted scientists to rethink those earlier studies and to propose instead that the Arctic might be ice-free in late summer before 2020. Peter Wadhams, head of the Polar Ocean Physics Group at the University of Cambridge, who researches the thickness of Arctic sea ice, now estimates that the Arctic will become ice-free in the summer well before the end of this decade, and perhaps as early as 2015 or 2016.⁴ So in five years, the threat of that dire event moved up from the last half of the *century* to the latter part of this *decade*, almost obliterating the opportunity for serious action. The year 2020, it seems, is the new 2100. So much for having time—even *minimal* time—to address this crisis. The questions instantly multiply: What are we supposed to do now?⁵ What political actions are even feasible? And how exactly are we to alter our economic systems to meet this challenge in time?

The news about the Arctic sea ice is bad enough: it tells us that a massive transformation in the climate of the northern hemisphere is well on its way. As the Arctic warms, the difference in temperature between the far northern zone and the temperate regions decreases, causing changes in the jet stream, which now moves more slowly and more often zig-zags on its course to the east. As a result, it might swing over Texas, then pull warm air straight north over the Dakotas, causing midwinter warm spells all across the Midwest, or pull Arctic cold down into the Carolinas or even Florida, freezing areas that in the past hardly experienced such frigid weather. Furthermore, because it is moving more slowly, it can stall over certain regions and cause them to be hit with weather over longer periods—leading to longer spells of rain or snow and thus to more flooding or harsher winter storms. The same situation applies all across the northern hemisphere. Such is the “new normal” of our time.⁶

But that is not all. Much worse news awaits. The melting of the Arctic sea ice will lead to substantially higher temperatures in the sea itself, high enough potentially to melt methane clathrates—frozen remains of

organic life—deposited on the seabed on the East Siberian Arctic Shelf and cause the resulting methane gas to escape through the sea and into the open air. Scientists have long known about these submerged deposits of clathrates, but since most such deposits around the world rest far beneath the ocean surface in cold waters, they were not overly concerned that climate change would cause them to melt any time soon. But the situation on that Arctic continental shelf is different: it is so shallow—often only around fifty meters below the surface—that the clathrates there are vulnerable to rising temperatures on the ocean’s surface. So it is not surprising that the warming in the Arctic has already triggered the initial stages of this process.

In March 2010, a team of Russian scientists led by Igor Semiletov and Natalia Shakhova published a study documenting a major clathrate melt on the East Siberian Arctic Shelf, a melt that is releasing quantities “on par with previous estimates of methane venting from the entire World Ocean.”⁷ Because methane is around twenty-six times more potent as a greenhouse gas than carbon dioxide, though much less short-lived in the atmosphere, and because there are enormous deposits of frozen methane crystals in that region of the sea, as in many of the world’s oceans, the National Science Foundation issued a press release stating, “Release of even a fraction of the methane stored in the shelf could trigger abrupt climate warming.”⁸ On returning to that region of the Arctic in summer 2011, the research team found much larger “torch-like structures” of escaping methane than before, some a kilometer across, suggesting that they may have to raise their estimates of the volume of the clathrate melt; the most recent rate of methane emissions astonished the very scientists who have long been researching this phenomenon.⁹

But even that is not all the bad news. The Arctic ice melt is driven in part by what scientists call a “positive feedback loop”: as the ice melts, open water appears, absorbing sunlight; as a result, it warms up, causing more ice to melt and repeating this process in a kind of death spiral. Now that the Arctic Ocean is melting rapidly, that process will build on itself no matter what we do. Such a vicious circle applies to the melting clathrates as well. The more clathrates melt, the more the global temperature rises, causing further warming in the Arctic and more clathrates to melt.¹⁰ In the Arctic, one positive feedback loop (the melting of the ice) may

eventually trigger another, and both, taken together, may trigger similar vicious circles elsewhere on the planet. Once these processes kick in for good, they will bring into play such powerful physical forces on such a wide scale that nothing human beings can do will make much difference.

One can thus entirely understand why a group of scientists formed the Arctic Methane Emergency Group to draw the world's attention to this situation and its potentially catastrophic consequences. In the wake of the huge ice melt in summer 2012, and Peter Wadhams's new estimate that a full summer melt will occur as soon as 2015, that group now states openly that without a huge geoengineering project to *increase* Arctic ice, global climate catastrophe is inevitable.¹¹ So far this is a minority view, albeit from those most directly involved in Arctic climate research. The scientific community as a whole has not yet endorsed those findings. Nevertheless, the fact that researchers closely attuned to this crucial region of the planet have arrived at such dire conclusions is a good sign that we've reached the final moments in which we might salvage a future for the biosphere we know.

The news about the Arctic is so bad that we must all be forgiven for asking two or three questions almost immediately.

Why didn't anyone tell us this was happening? Major media outlets have at times covered the astonishing ice melt in the Arctic, but they have seldom discussed its wider implications or its potential impact on the future of the planet. But their relative silence in this regard is not surprising. The national media in the United States, at least until the recent past, has pretended that there are "two sides" to a "debate" as to whether climate change is real and whether human activities are causing it—questions that have been settled in the scientific community for over twenty years. Their hesitant, half-hearted, and often inaccurate reporting on climate change is so notorious it has led scientists to issue firm, even resounding statements on the subject, to ponder at length how they might get the message out—and to throw up their hands in frustration that all their efforts in this regard have gone for naught.

Why has the situation changed so fast? Isn't climate change supposed to be a gradual process? The response of the biosphere can take many forms, not all of them gradual. But we could assume that at least *our* contributions to the problem might increase at a steady pace. As it turns out, however, that

assumption is wrong. A few years ago, we might reasonably have expected global greenhouse gas emissions to rise at a gradual pace. But as it turns out, those emissions have risen much more rapidly since the early 1990s than anyone expected. Scientists have been warning us for a long time to change our ways, but instead we have dramatically *worsened* the problem. Why should we be surprised when the biosphere responds accordingly?

What are we supposed to do now? Do we have time left to do anything at all? Anyone who tries to answer these questions is in a real dilemma. To say that we *do* have time is to endorse what might be a false optimism, supporting the belief that our usual approach to political problems—the slow, incremental task of building support and crafting a coalition for Congressional and international action—will work in time. Nothing could be less sure. In fact, given our deplorable track record in recent years and the enormity of the challenge, our chances for rising to this challenge in time seem ridiculously small. On the other hand, saying that we are truly out of time is to pretend to have a knowledge we don't actually possess. Things are not looking good for planet Earth, but we cannot yet be *certain* that all hope is lost. Our understanding of the clathrate melt in the Arctic, for example, is still at its beginning stages, as further comments from the primary researchers on that topic suggest.¹² Moreover, the global climate is so complex that certain geophysical patterns might be emerging of which we know even less. We can't claim to have mastered the situation. Without that mastery, it would be foolish to declare with some fanfare that we are truly out of time.

For the last decade or two we have known that we live at the crossroads of history, charged with the task of deciding the fate of the Earth and thus of humanity. So far we have been incapable of resolute action, still caught within the tides of our traditions and habits, as if utterly disabled in the face of the task.

In the meantime, time is passing. The developments in the Arctic—and elsewhere—suggest that we may have already made our choice, that we are now venturing down the path of destruction. We can't be sure this event has taken place, but we certainly can't proceed with the confidence that we still have time. We are now caught in a surpassingly strange, horrific moment—a moment when we cannot help but think, is it too late? Do we still have a future?

Other books have described the physical realities of the climate. Others have reviewed the host of things we could do to reduce our greenhouse gas emissions and discontinue other practices that damage the biosphere. Still others have explained very well our options for using new technologies, converting to renewable energy, and adopting new policies on the national and international scales for making those transformations possible. All of these books and others have urged us to take action in time.

This book will take up those themes as well; it must do so to describe the basics of our present situation. Without question, we must grasp the essentials of the problem, the practical dimensions of the solution, and the implications of both for what we should do.

But the emphasis of this book ultimately lies elsewhere. If we stick only to the scientific, technical, and political questions, if we imagine that we can face this challenge as knowing and planning creatures, we neglect the implications of this moment for *every* level of our human being. Moreover, if we urge action now, as we must, and then stop there, we sidestep the wider implications of the possibility that, despite all the warnings and efforts of the past couple of decades, we will not take action in time. What if it is now too late? What if we now face a disappearing future?

Once we ask these questions, the entire conversation changes. We have long known what is at stake; no one aware of climate change has doubted that it threatens the viability of the world we know. Climate change is not just a crisis for the biosphere; it is a crisis for our very significance and purpose as human beings. It represents a stunning change in the climate of all human emotion. But now we face the possibility that we will not be able to avoid passing the point of no return—of triggering severe, irreversible climate change.

In the past those who have commented on climate change have warned us to act before reaching this point, drawing on this dire threat to motivate us. Nearly every book on climate change has ended on an optimistic note, explaining how this crisis is ultimately an opportunity, a chance to turn things around, to create an environmentally friendly economy and a newly responsible society. This way of thinking about the challenge corresponded well to the nature of the threat over most of the last

two decades, when we still had confidence we had time to make a difference. Over that period, it made sense that we could scarcely confront the dire realities of climate change without a certain optimism, without that shift from horror to the possibility of transformation. As a result, we have seldom if ever truly looked into the prospect of a disappearing future.

To some extent this way of thinking must still apply: after all, the demand for urgent action is now greater than ever and has, if anything, become a supreme ultimatum. Without question, we must do everything humanly possible to change our society and to avoid triggering ultimate calamity.

But if we are honest, we must admit that the events of the past few years undermine the prospects of a happy ending more than ever. Nearly all of the time for action has slipped by. It is thus time for us to face this crisis in a new way—not to abandon our efforts for change, not to forget the range of excellent initiatives for shifting our economies onto a new basis, but to contemplate, for the first time, what it means for us if we fail. Doing so will be difficult; it will require new resources of honesty, new capacities to endure dark thoughts, and new reserves of patience for the intolerable. It may ask more of us than we have to give.

If we continue to insist that we have time in the face of increasing evidence that it is running out, we would be less than honest: sticking with that familiar optimistic scenario to the exclusion of all else would commit us to a form of repression, defensiveness, willful blindness—indeed, to a version of denial itself.

This moment thus requires us to do something we seldom imagine: fighting for the planet *even if* it may be too late, sticking with all our efforts—and increasing them—precisely when we begin to admit that the cause may be lost. The developments of these recent years suggests that our whole way of imagining the crisis must change: these days we are stuck with the anguish of the last-ditch effort, the attempt to snatch victory out of the jaws of defeat—with that minimal, desperate slogan: never say die.

We cannot turn away from the new realities of this moment. We now face questions not simply about the scientific, technological, economic, or political dimensions of this crisis, although they remain crucial, but also about its *human* significance. If we cannot face them, we will have

lost something precious: our capacity to live with at least a minimal dose of integrity and truth.

These questions are among the toughest we will ever have to face. In some sense they are impossible to answer. But in this book, I will attempt to face them nevertheless—not to answer them, not to give the illusion we can truly know what we are doing under their pressure, but to explore what it is like to dwell with them, to live under their weight and darkness: What is the present for, if the future is on the verge of disappearing? How are we to live if that future is in doubt?

Those questions are supremely tough in part because they come to us *in addition to* the demands that our existing discussion of climate change impose on us. Those demands are already considerable; they have been so stark that we have scarcely been able to engage them well. Before taking up the core questions of this book, then, it may be wise to linger over these latter demands, familiar as they are.

Why have we been so stuck? What has made it so hard for us to face the current crisis as if we were actually sane and responsible people?

The honest answer, I think, is that this is an unprecedented crisis, posing challenges to us that we have never faced before and in response to which we are utterly at a loss.

First of all, if we are to tackle the fundamental aspects of climate change, nearly all of us are forced to examine realities well outside our expertise, to read, learn, and judge scientific findings for which we often have little preparation. Previous crises did not demand this task of us. For most of the modern era, people could read the newspaper or speak with friends to assess for themselves the state of public affairs; no special expertise was necessary. Even in the nuclear era, citizens did not have to learn the physics of the nuclear reaction to realize what had taken place at Hiroshima and Nagasaki: those events were real and the devastating effects of those weapons palpable.

In our era, however, we are asked to grapple with a phenomenon that is not a singular event, not a known threat, but the *context* for possible events—a context that we must learn about through the careful work of hundreds of scientists. Moreover, it is never obvious whom we can trust to mediate that work to us, to explain what the science has actually found: since so many participants in the debate deny that there is a problem,

or suggest that there is genuine disagreement between scientists about whether climate change is real, we are not sure whom to believe. For no previous crisis has a similar situation been the case.

Our hesitation in accepting the reality of the challenge arises as well from the tendency to trust our own experience. If our lives and environments feel mostly familiar to us, it is hard for us to accept that something is dramatically amiss. Intuitively, we hesitate to act on any claim that is not evident to us in our own experience, not visible to the naked eye, not confirmed by authorities we have already chosen. In this regard, climate change is truly unprecedented: it touches us right where we live, calls us to consider our moral responsibility to ourselves, to others, and to the future—without offering us any obvious confirmation. It asks us for a serious moral commitment without providing us with the foundations we usually ask for when taking that kind of step.

But that is not all. If we *do* accept the reality of climate change, and our responsibility for causing most of it, that realization is so wounding that we may not wish to grapple with it any further. The prospect that the planet's future is in danger is most likely to fill us with anger, horror, and desperate hope. Underneath all these responses lies a sense of great dread. And we have almost nothing to help us live with that dread.

There is little or no precedent for that emotion. Even at the height of the nuclear arms race, when people were forced to contemplate the possibility of global annihilation, at least they were aware that the conflagration could erupt from something *other* than the ordinary course of their lives. A nuclear war would be a devastating interruption of the way things were. Climate change is different: it threatens to transform our entire world if we stick to our *current* habits, founded as they are on the extravagant use of fossil fuels. Our way of living threatens *itself*. No previous generation of human beings has ever confronted that possibility—at least not on the planetary scale.

This shift from a singular horror to everyday disaster is hard for us to accept: somehow, a cataclysmic event is easier to understand than climate change. After all, such an event isn't that different from the thought of our own deaths. Most of us are quite aware that our lives might go horribly wrong at any moment. We know that a random accident could kill us, disfigure us, or change our personalities before we have any warning at

all. Even worse, a freak event could destroy all the people we love. That's just the way things are.

But climate change is different. Nowadays, *our everyday lives are the source of the problem*: everything we depend upon to live as we do—the energy we use to get around, to heat or cool our homes, to power the industry that produces the goods we use—is also pumping enough greenhouse gases into the atmosphere that eventually our climate will be transformed. The societies in which we live are causing events to take place that could directly threaten how we live. It's not that there is a *chance* something horrible might happen; this time, we *know* it will happen if we stay calm and carry on.

Even worse, once we decide to confront this pain and take action, we realize that the task may be beyond our capacity. The most dire challenges of the past look easy in comparison to what we face. Consider the long drive to abolish slavery in the United States. Abolitionists fought for generations to eradicate that institution without success. Slaveholders, however moved by moral appeal, often felt incapable of liberating their slaves because in doing so they would lose too much “property”; to treat their slaves as free human beings would simply cost them too much. Most chose prudence over humanity, allowing financial considerations to trump ethical principles. The same thing is happening today: we in the developed nations are the equivalent of slaveholders, resting easy on the fierce subordination of the world's ecosystems (and more).

In the United States, it took a war to bring about abolition. That event came at a great cost and nearly tore the republic apart. Yet that fight could succeed in part because abolition sought to undo an institution that was closely linked to one region of the nation. Today, climate change arises from the actions of people throughout America and around the world. No force will wage war against us to force us to change. As a result, we in the United States and elsewhere will have to renounce our privilege *voluntarily*. We will have to call on all our ethical reserves to make a wholesale renunciation of privilege. There really is no historical precedent for our doing anything of the sort.

The problem is not that we are uniquely corrupt, hopelessly selfish; it is rather that history now confronts us with a challenge to which *no prior generation* has ever arisen. We're being asked to do the impossible.

No wonder we'd rather do virtually anything to evade the task. None of us really wants to believe it is happening. We almost automatically put up great resistance to accepting it. Even those of us who react with despair or anguish typically move on quite soon to the realities of ordinary life. On some level, *all* of us are in denial. Who would welcome the thought of such a profound transformation? Facing the facts is the *last* thing any of us might wish to do.

If that is the case, then the strangeness of our response to it begins to make sense. The prospect of climate change is so unwelcome that the widespread outcry against its reality seems virtually inevitable. Climate change is nothing less than an assault on who we think we are: it exposes the fact that the economies of the developed world are founded on a lie, that our way of life takes for granted the eventual destruction of the Earth, and that persisting with it makes us complicit in a great crime. Nobody wants to accept those realities. It is thus remarkably satisfying for many people to turn our instinctive denial into a full-fledged, explicit, and articulate claim that nothing is amiss.

It is quite obvious that in doing so, we would cease to function as sane and responsible adults. At this stage of the evidence, to embrace denial is ultimately to *choose* the destruction of the Earth. But it does not follow that doing the opposite—choosing a sane response—is welcome to us, for it asks us to transform the foundations of our lives. To overcome denial requires us to accept that we have been living a lie for many generations, that our entire civilization is on the course toward committing ecocide—a crime much greater than genocide, though intimately bound up with it—and that our most intimate assumptions are monstrous if not worse.

If we do manage to rise to this challenge, we will have accomplished a feat virtually unique in human history. If we do not, our failure will be understandable, even if it will make us uniquely horrific. Either way, our generation will be the only of its kind in the history of the species. No wonder this moment feels so strange.

But the difficulty of our situation is still greater. Even if we are entirely persuaded we must do something and we attempt to do so on our own, it's not as if any one of us, or even a large social movement, has the power to do enough. In our own lives, we might take many steps to do much less

to harm the biosphere, but those individual actions can never be enough as long as industrial and agricultural enterprises, and indeed entire nations, continue on with business as usual. As a result, we are caught in the contradiction between our willingness to act and the radical limits of our agency, between ethical principle and pragmatic reality. We might fight hard to push beyond that contradiction, to force the nations to change, but so far very little transformation has taken place; accordingly, we have little choice but to live within a social context still shaped by a denial we may not share, still caught up in habits we wish to break. Because we cannot produce the infrastructure of our society on our own, or manufacture the goods we use, we may end up inhabiting an economic system we deplore.

Faced with these seemingly impossible odds, we may resort to any number of plausible responses. We might, for example, simply throw up our hands in despair. In all bitterness, we may conclude that the task is too huge, the cost too great, the resistance so formidable, that it is impossible to worry about climate change any further. After all, we might argue, its worst effects won't happen until after we are dead: let later generations face them.

But here again, climate change won't let us pass it by. True enough, the idea that those effects will take place well into the future is surprisingly familiar across the political spectrum. Many people evidently assume that climate change will really come down hard on someone *else*, probably their grandchildren. Even James Hansen, one of those who first brought the concept of global warming to the attention of Congress and an advocate for greatly decreasing our greenhouse gas emissions, titled his recent book *Storms of My Grandchildren*. And James Garvey, in his excellent book, *The Ethics of Climate Change*, bases his analysis on our ethical obligation to others, especially to those in future generations.¹³

But do we really think that what happens to later generations is only a matter of our ethical obligation to them? The attitude we display as we carry out most of our activities tells us otherwise. If we build a city, don't we want it to endure? If we enjoy our local traditions, don't we want them to retain their charm? If we educate the young, don't we want them to flourish? If we bring about a medical breakthrough, don't we want it to help people live long and healthy lives? If we create a work of art, don't

we want it to be enjoyed by posterity? If we write a book, don't we want it to be read? If we cherish the great cultural and historical achievements of the past, don't we want to pass them down to others after us? In short, what actions do we take that do *not* imply a relation to the future? What would be the point of our lives if the future were to disappear?

The future is never just for the people of the future; without that future, what we do now loses its force. Without a future, there is no present and not much of a past. Climate change isn't just about our obligation to others. It's about our *own* lives, too.

If we give up on climate change, we cancel the present. We choose to make all of our ordinary activities meaningless, as if we want to become shadows of ourselves, or as if we want to float forever in a world without foundations. None of us would choose such a fate. Yet choosing the opposite—a radical change in who we are—is immensely difficult as well. One option is horrific, the other impossible. But no other options are available.

At every turn, climate change puts us in new situations. It is truly unprecedented, not just as a material reality, but in its impact on our ordinary lives, our ability to understand it, our willingness to face its implications, and our capacity to discuss those implications for our societies. If it throws us off, if it inspires odd reactions in us or others, we shouldn't be surprised. Climate change is intrusive, insidious, anonymous, implacable. Yet it won't let us turn away. Endlessly, ruthlessly, climate change *interrupts* us, throws us off, and asks of us what we barely know how to give.

To take the full measure of that challenge, this book must of course bring into view the practical realities of our time. But the purpose in doing so is always to ponder their further dimensions, to *think* about their implications for all that we are.

In the chapters that follow, the first key step is to assess our current situation as honestly as possible, confronting it without denial and without reserve. Only on this basis can we begin to ponder the full implications of our dilemma. The task is not simply to review the facts but to allow them to sink in, to speak to us where we live, and to overcome our resistance to their full implications. Accordingly, I will first go back to the basics and grapple with climate change itself—to understand its impact on any one of us where we live. The next step, equally essential, is to consider what

we can do to remove the causes of climate change and to ask whether we can take action in time to make a difference. The third step, key to any understanding of our present dilemma, is to consider why we are so hesitant to take action on the scale required—and whether, given our enormous population as human beings on a small planet, doing so will finally solve our environmental crisis. These initial steps will be the concerns of chapters one through five.

After exploring the physical and political realities as directly as possible, the book will then take up its core challenge of thinking about the human implications of the dilemma before us and to delve into their ultimate consequences. It will ask, what is it like to be alive at this strange moment? What is the present for, if the future is disappearing? How can we respond, if the point of our lives is dissolving, yet we live on? In exploring these questions from chapters six through eight, the book will bring forward the impact of the environmental crisis on our own lives, sketching the outline of an intimate disarray we are now beginning to experience in full force.

Having considered these tough, harrowing questions, the book will then seek a way through that disarray to a basis for living with integrity even in the midst of the ruins. What can anchor our actions on behalf of others and for the sake of all living things if the damage to the Earth is nearly irreversible, if the prospects for warding off disaster are dimming? How might we respond to natural forces with respect if they now threaten us with greater violence than before? Here the book will propose that our best option is to own disaster, to accept responsibility for what humanity has done to the biosphere, and thus commit ourselves to making reparation—and on that basis, to take concrete ethical actions in our own lives no matter what others may do. It will suggest as well that we may greet the ferocity of the whirlwind with awe, accepting at last our limited place within the biosphere and finding a renewed foundation for enduring whatever may come.

Notes

1. See the Fourth Report of the Intergovernmental Panel on Climate Change (the IPCC), Working Group I: The Physical Science Basis, Chapter Ten: Global Climate Projections, Executive Summary, on Snow and Ice, http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch10s10-es-4-precipitation-extremes.html - 10-es-5-snow-and.
2. I will use “climate change” more often than “global warming” throughout this book, not because “climate change” is a less offensive term but because it is more accurate. While “global warming” inevitably suggests that what we face is largely a matter of rising temperatures, “climate change” indicates that such warming has a wide array of varying consequences over time—including unusually cold snaps, large rain or snowstorms, and general transformations of regional climate systems. In short, “climate change” captures the big picture much better.
3. See Richard Kerr, “Arctic Summer Sea Ice Could Vanish Soon But Not Suddenly,” *Science*, volume 323, number 5922 (March 27, 2009), 1655, doi:10.1126/science.323.5922.1655 and Bill McKibben, *Eaarth: Making a Life on a Tough New Planet* (New York: Times Books, 2010), 4.
4. See Fen Montaigne, “Arctic Tipping Point: A North Pole Without Ice,” Yale360, August 30, 2012, http://e360.yale.edu/feature/tipping_point_arctic_heads_to_ice_free_summers/2567/ and David Spratt, “Big call: Cambridge prof. predicts Arctic summer sea ice ‘all gone by 2015,’” Climate Code Red, August 30, 2012, <http://www.climatecodedred.org/2012/08/big-call-cambridge-prof-predicts-arctic.html>.
5. I will use “we” throughout the book in describing most activities and choices to reflect the fact that all those alive today face the core dilemmas and will live with the consequences as well. In the context of climate change, many differences between people melt away. Typically, when describing how “we” must act, my emphasis will fall on those who live in developed nations, especially the United States, whose possibility for action will provide the context for many discussions to follow. Although people in nations around the world by no means have equal impact on the climate or an equal voice in advocating for change—for on the contrary, they suffer from a continuing structural inequality—they nevertheless have the responsibility to act as they can in their own circumstances to ward off the harm that will befall them and thus must also be included in the term.

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6. See Andrew Freedman, “Arctic Warming is Altering Weather Patterns, Study Shows,” Climate Central, April 3, 2012, <http://www.climatecentral.org/news/arctic-warming-is-altering-weather-patterns-study-shows> and the underlying study, Jennifer A. Francis and Stephen J. Vavrus, “Evidence linking Arctic amplification to extreme weather in mid-latitudes,” *Geophysical Research Letters*, Volume 39, issue 6 (March 2012), L06801, doi:10.1029/2012GL051000.
7. Natalia Shakhova and others, “Extensive Methane Venting to the Atmosphere from Sediments of the East Siberian Arctic Shelf,” *Science*, volume 327, number 5970 (March 5, 2010), 1246–1250, doi:10.1126/science.1182221.
8. “Methane Releases From Arctic Shelf May Be Much Larger and Faster Than Anticipated,” National Science Foundation, March 4, 2010, http://www.nsf.gov/news/news_summ.jsp?cntn_id=116532.
9. Steve Connor, “Vast methane 'plumes' seen in Arctic ocean as sea ice retreats,” *The Independent*, December 13, 2011, <http://www.independent.co.uk/news/science/vast-methane-plumes-seen-in-arctic-ocean-as-sea-ice-retreats-6276278.html>. For more information about the Arctic clathrate melting process and its implications, see Sam Carana, “The potential for methane releases in the Arctic to cause runaway global warming,” *Arctic News*, December 20, 2011, updated January 29, 2012, <http://arctic-news.blogspot.com/p/potential-for-methane-release.html>.
10. On the interplay between these feedback loops, see Peter Wadhams, “Imminent collapse of Arctic sea ice drives danger of accelerated methane thaw,” *Arctic News*, March 7, 2012, <http://arctic-news.blogspot.com/2012/03/rebuttal-imminent-collapse-of-arctic.html>.
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13. James Hansen, *Storms of My Grandchildren: The Truth About the Coming Climate Catastrophe and Our Last Chance to Save Humanity* (New York: Bloomsbury, 2009) and James Garvey, *The Ethics of Climate Change: Right and Wrong in a Warming World* (New York: Continuum, 2008). For an instructive and amusing discussion of how often speakers associate climate change with their grandchildren, see Bill McKibben, *Eaarth*, 11–13.