

PROLOGUE

‘Do you think we’re going to be okay?’

In the past, when I was asked what my profession was, I’d say: physicist. This might have prompted a host of fun questions: Does a person running in the rain get equally wet as someone walking in the rain? Do sinks really drain anticlockwise in the southern hemisphere? If I mentioned that my master’s degree was in astronomy, aliens would likely enter the conversation, or I might be asked why the solar system is flat, or if Libras are compatible with Capricorns. Communicating science has been a true joy: making complex concepts accessible to people (since the laws of physics aren’t exclusive – everyone obeys them!), exploring the implications for science and society, hopefully fostering and sharing some awe for the world we live in. Now that my work is focused on environmental science, however, I tend to be asked a far more daunting question: ‘Do you think we’re going to be okay?’

It’s a good question. But words always fail me. Should I assume the question relates to climate change, when they might mean another crisis, like species loss or microplastics? There is no straightforward answer to any of these problems. I could reframe the initial question: ‘How long have we got?’ I find the question so troubling that when others are arguing about it at the bar or over dinner, I sometimes try not to get involved. I overhear the all-too-familiar existential monsters: insect disappearances, plastic soups, massive wildfires, catastrophic floods, disappearing glaciers, tarmac-melting temperatures, antibiotic resistance. As we¹ live with intensifying environmental crises, these issues are inching towards the front of the newspapers. They are starting to become standard fare around the dinner table and in the media. Perhaps

not every dinner table or inside every newspaper, but give it time... We gloss over how unique this is. At what other point in human history would two strangers on a blind date, within five minutes of first meeting, seriously be discussing how humanity is walking, eyes wide open, into global civilizational collapse?

At the dinner table, this First World conversation plays out quite predictably, advancing to the what-can-be-done phase, unconsciously imitating the structure and flow of reports from various international institutions like the Intergovernmental Panel on Climate Change (IPCC). Solutions are contested: we all have to learn to consume less; corporations need to be regulated, as they don't have the next generation's interests at heart; we need to stop having babies; nuclear war could render this whole discussion moot. The conversation spirals, becoming either melancholic or histrionic until someone suggests that we're living in the best time in human history: that the average global life expectancy is now seventy; that child mortality rates are at an all-time low; that food, energy and commodities are more plentiful than ever. Perhaps, a little relieved, people concede that things are changing – that, yes, it will be a difficult few decades – but we'll figure it out. Look how far we've come in only a few hundred years. Solutions *will be discovered*. We are a resourceful species. The conversation lurches back and forth from pessimism to hope, winner to loser.

When people look to me for information, I'm painfully aware that giving misleading assurances is dangerous – and potentially catastrophic. So too is sending people to their cars and bikes in a state of despair. I face two big challenges in delivering this information. The first is that the problems humanity faces are *systems problems*: complex, vast and distributed (rather than the complicated but more linear problem-solving of, say, going to the moon). This means that conversations that start with environmental issues quickly veer off into tangents on economics, politics and society. The second challenge is that the reality of the situation can be overwhelming. It's hard to grasp and communicate the speed and scale of the changes humanity needs to make. The same is true for the speed and scale of the destruction and suffering if action is delayed. Although T.S. Eliot said, 'Humankind

cannot bear very much reality,'² it's important we do face up to this reality.

It's a big responsibility not to spoil the evening, as well as my friends' mental well-being... so I sketch out some of the grim realities. How humanity is past the point of prevention, that it's too late to avoid the suffering of millions, perhaps billions. I'm sure to note that these burdens are shouldered unequally around the world – that those in higher-income nations are beneficiaries of a system that has caused many of the problems which disproportionately fall on the poor (even though it wasn't necessarily anyone's personal decision to benefit in this way). I point out that serious alterations to the climate and ecosystems are all well under way, though the outcomes of this may take time for everyone to notice. I outline how scientists have been calling for action for decades, but that action hasn't been forthcoming. That the patterns of growth, resource exhaustion and the damage from our wastes – along with the social barriers, resistance of powerful interests and inequalities that let it happen – have led us into such a deep trap.

I do counter with many of the positive changes we're seeing, both in behaviour, like the turn to plant-based diets, and in technology, like the incredible drop in the cost of solar energy – developments that may presage a change fast enough and deep enough to confound the more pessimistic projections. I try to describe what everyday experience might look like if societies were able to make the needed changes – what a world that *thrives* might look like rather than a world that simply *survives*. I know that some listeners will interpret *thrive* as being able to eat sushi and buy a new wardrobe every year and to fly between countries regularly. What I mean by *thrive* is something very different. Thriving is a world full of nature, of clean air, water and soils, of increasing human rights, of higher levels of human fulfilment and meaning. Conversely, *simply surviving* could imply the cataclysmic collapse of society as we know it; the loss of human cultures, cities, landscapes and societies. I don't clarify *survive* at dinner parties, as I value having friends.

It's a balancing act to sustain hope while being clear about the profound problems we face. I usually sum up this little overview with

something placatory: ‘We have almost all the solutions we need, but we may not have the time – or will – to implement them to avoid a global catastrophe. It’s a race between social change and environmental change.’ But these issues shouldn’t come down to a quick summary. The debate about our environmental future intersects with our jobs, food, energy, shelter, our morality... our everything. Any book about our environmental future is a book about our future.³ Our environmental problems are *everything problems*. This debate should be taking place prominently, in the media, in the workplace, in schools and in politics. It’s the single biggest challenge of our time. It involves some of the most important and difficult choices to be made and actions to be taken by our species, ever.

WHERE WE STAND

In less than 200 years, humans have completely transformed the planet’s land, oceans and air through processes that will continue to impact on the environment for tens of thousands of years, *even if* we all were to disappear this very minute.⁴ Some of these transformations we understand; others we don’t. Already in 2005 we harnessed an astonishing 40% of global renewable fresh water, 72% of ice-free land, and more than 25% of the entire biological productivity of the planet’s land (known by scientists as *human appropriation of net primary production*).⁵ The things we buy influence others thousands of miles away and children who are yet to be born. Without a doubt, we have overdrawn on our natural inheritance, eliminating resources which took aeons to accrue and converting them into low-quality waste. Some of us have robbed the future in order to party in the present. How will these excesses catch up with us? Is it a question of holding out hope for dramatic technological breakthroughs (accepting the suffering that’s already being experienced), or must we revolutionize the way we live? What happens if we change nothing and settle for adapting to our increasingly degraded environment and mounting deaths on the conscience of rich nations? This book will expose what these scenarios look like in reality.

To counter these arguments, the optimist will argue that this was all for a reason: that, on average, we have lives that would have been unimaginable to previous generations. The welfare of the average person alive today would have seemed absurd to the richest a century ago. No longer are people struck down by smallpox or plague. Journeys that would have taken months now take hours. We hold more information on the phones in our pockets than what would have been available to all the world's leaders two decades ago. We have made huge strides in improving the lifespan and health of billions around the world, and have begun what are likely to be massive revolutions in genomics, automation and artificial intelligence. We may debate whether happiness overall has actually improved and we can argue about what constitutes happiness, but for human beings, the last few decades have objectively been among the best to be alive in. Lifespan, education, access to healthcare and safety from conflict have all, on average, improved. This is not to excuse the serious, deep and unconscionable injustices around the world, or to gloss over the suffering and exploitation suffered by many. Rather, it is to point out that if a time machine were invented, it's safe to say that it would be more dangerous to travel to the past than to remain in the present.

As to whether or not the future would be safe to visit... pessimists would bring up data suggesting that the present has already begun to retrogress. Global hunger is now increasing, up from 700 million in 2013 to 821 million by 2017 (in part due to climate damage); average life expectancies in the US and UK have been dropping; modern inequality is more acute than ever; anti-scientific movements such as the anti-vaxxer campaign and climate change denial have already consigned many to suffering.⁶ There is a strong sense that humans have cashed in nature (and possibly humanity's long-term future) for a short-term rush of consumption. Eco-anxiety has never been higher as temperatures break records year-on-year, wildfires break out and water sources dry up. Even if people are not keeping up with events, many *feel* deep down that this progress was always a Faustian bargain. Some scientists in particular have a sense of impending doom, declaring it too late, claiming that the changes wrought are happening much faster than predicted and that

they are potentially irreversible; that our hope now is *deep adaptation*: a philosophy of resilience and regeneration in the face of ecological and civilizational collapse.⁷

Naturally, optimists would say that this mindset always existed, especially among scientists, about plagues and diseases, world wars, famines, the ozone layer, nuclear weapons and more. Many can remember the anxiety and brinkmanship of the Cold War, which didn't end in global destruction. Is it not the same for the environment? (And, for that matter, murderous artificial intelligence, antibiotic resistance, biological war and flu pandemics?) It isn't appropriate to project from the past to the future in the way many scientists do, they argue. Even the most optimistic researchers didn't predict the precipitous decline in solar energy costs we've witnessed these past few years. We will continue to innovate and – yes – there will be bumps along the way, but we are *resourceful*, and some combination of technologies and ideas will be the solution. What's more, surely we shouldn't be fearing artificial intelligence, but using it to monitor the environment and to implement better resource use.⁸ This is, after all, an information-rich world in which 90% of the data humans have ever produced has been generated in the previous two years.⁹ Machine learning and automation can be used to free humans from labour, living lives full of friendship, hobbies, leisure, passions and fulfilment, all the while reducing humanity's environmental impact. Yes, this needs huge amounts of energy, but renewable technologies are already absurdly cheap. If we consider the pace of technological advancement in information and automation – which some call the second machine age¹⁰ – perhaps this is not a race to environmental catastrophe but to a future very different and unfathomable to us as yet. Far from scarcity, the optimist might argue, we are moving to a marvellous post-scarcity society; to a world of abundance, beyond earthly constraints of energy and labour.¹¹

Pessimists would counter that the problems we're facing are categorically different. We are all miniengineers of the environment. Simply eating food, switching on lights and travelling to work alters the atmosphere, oceans and the very ground beneath our feet. Given that there are billions of us, our individual miniengineering has amounted to *global*

geoengineering: a planetary force in and of itself. It is not a question of technological prowess. Why are we discussing whether or not artificial intelligence will take over, or if philanthrocapitalists can get to Mars, when environmental breakdown is here, *now*? We have to focus all our energies on the deep problem of how we live our lives. We can't enjoy the luxury of failing fast and failing often, like a Silicon Valley enterprise. There is no reset button on the planet. No new investors to refuel our bank accounts. We don't get to 'clean up' after the fact, as high-income nations did with urban smog during the Industrial Revolution, acid rain, or the perforated ozone layer – which will be in the recovery room for another century at least. Unfortunately, we are incompetent, immoral engineers, aware that we have severely altered Earth's ability to host life but refusing to take responsibility for the consequences or the redesign required. While we disagree on how to fix the situation, our global experiment to drastically transform our lived reality continues unchecked.

Optimists may take this and run with it, exclaiming with pride that we are geoengineers! Humankind's ingenuity knows no bounds; the fact that we have avoided the apocalypse in the past means that we *will* overcome our future challenges. We are capable of working together to effect seismic shifts. All we need do is take responsibility for this role and commit to it – to manage nature more deeply and broadly. We might even end up elevating ourselves to planetary managers, calculatedly altering the atmosphere to counteract our impact and buy ourselves time for more technology to come to the rescue.¹²

This back and forth will continue, the rhetoric between the two camps becoming ever more extreme. The optimists are naive know-nothings, relying on unlikely and harmful technological fixes. The pessimists are dour, puritanical preachers who want to pour cold water on development and prosperity, taking us back centuries, committing those who are already poor to future penury. The pessimists are convinced human civilization as we know it is approaching its end. The optimists think that we are only a few decades away from a utopia of abundance. Unfortunately, the optimists and pessimists are often so extreme that each side ignores the other, using separate data sets to bolster their claims.

BALANCING DESPAIR AND HOPE

We mustn't shy away from the reality of the path we are on, nor downplay the *enormous* work we have to do if we want a liveable future. This book is not an attempt to settle this debate between pessimists and optimists. Instead, it will present readers with two very different and *possible* trajectories – one unflinchingly (but realistically) bleak, the other hopeful – without protecting readers from understanding the all too real, radically different futures that are ahead of us. In so doing, this book will address crucial questions: What changes must be made? Where and how must they be made? What are the consequences if we do not act?

To avoid a diluting of each scenario with numerous counterarguments, the pessimistic and hopeful perspectives are separated into paired chapters on key challenges: population and progress; energy; food; climate change; and the economy. Ethical, cultural, corporate and geopolitical factors are woven throughout since, as we shall see, their dysfunctions are directly related to our ecological problems and blockades. The structure of alternating pessimistic and hopeful chapters will allow us to fathom the scale of the problems faced and the urgency of the changes required.¹³

There is fervent discussion in the scientific literature about responsible ways of discussing pessimism and hope at this unique moment in human history.¹⁴ Some vehemently reject too much doom and gloom, calling out a tendency to cherry-pick the worst scientific studies. Those people also argue that negativity can be disempowering to people: instead of taking action, citizens will resign to a 'time's up' nihilism. Others maintain that we cannot possibly prompt the massive social upheaval needed without first scaring citizens into action. At the moment, there is no scientific consensus on which is a better approach, if the desired outcome is for change rather than conveying information. The response we have to such messages is likely to depend more on the type of reader than the message itself. In my view, the dangers don't need exaggeration. Even middle-of-the-road estimates are deeply frightening. Equally, the world we can build if we are to tackle these dangers is truly hopeful. I will deliver the information with no specific ulterior motive to push you towards

action, although both the pessimistic and hopeful chapters may have you shifting in your seat.

QUALIFYING PESSIMISM

The pessimistic chapters in this book relate how we got to this point, documenting the changes in society over time. They examine what will happen to ecosystems and the environment if current rates of change remain constant. Essentially, the pessimist's scenario is what is beginning to play out already and what will happen to Earth and the human species through insufficient action; this includes deep, *structural problems* such as political barriers, inequality and nationalism, but also *natural uncertainties* such as critical transitions (more commonly termed *tipping points*).

Every future scenario must include the grim provision that it takes many years for the impacts of our activity to be noticed by enough people to provoke change. For example, many of the fastest changes are seen in the Arctic, a region which for most is out of sight, out of mind. Also, it takes around a decade for a molecule of carbon released today to have its full impact on atmospheric temperatures.¹⁵ These sorts of blind spots, combined with active disinformation campaigns, constitute a significant delay before the warning sirens sound in society. Scientists have been shocked by how much faster the impacts of climate change have been in the last few years. And things *will* get worse. This delay in the signal that things need to change can be catastrophic in complex systems like society and nature. By the time societies get a strong enough signal to react – for *enough* people to believe the signs – it may already be too late to save organized civilization as it struggles to maintain civic order under food and water shortages driven by environmental damage.

QUALIFYING HOPE

The hopeful chapters in this book are not necessarily optimistic. Optimism doesn't cut it. As David Orr puts it, 'Optimism has this

confident look, feet up on the table. Hope is a verb with its sleeves rolled up.¹⁶ There is no chance that we will thrive without massive, unprecedented *effort*, technologically and socially. So rather than the usual dichotomy of balancing techno-optimistic solutions against social behaviour change, pessimism will be pitted against *hope*, implying a more active set of decisions to be made, technologies to be deployed, systems to be developed and action to be taken. Importantly, the hope chapters will offer a picture of a better world for humans altogether – one with less pollution, more equality, more chances for meaningful fulfilment in life, better health and stronger ethics.

There is a danger of expressing hope by overstating one-off prototypes or gimmicks that can't possibly scale to the level needed to avert the worst.¹⁷ A classic example is fusion power, the joke being that it's always just a few decades away. Given the scale of our problems and the fact that we need to act immediately, hope should be largely based on solutions available today, or almost certainly available in the very near future. Still other solutions need to be excluded on the basis of physical or social limits (e.g. crops used as biofuels or self-imposed national rationing). Another reason to avoid too many one-off examples is the fact that the problems we are facing relate to systems – economic, natural, social and more. Systems problems should largely be fought with a systems-thinking approach.

Another danger is the temptation to embrace a *qualified* hope, which conceals a deeper despair. 'If only we can find the will to ban fossil fuels,' for example. When 'finding the will' is invoked, it's clear there is no mechanism by which to make it happen. This is not hope but blind optimism, and blind optimism is dangerous. 'Finding the will' typically implies that government and business leaders have to make the 'right' decision, to conjure up the leadership that the public will follow – a public that is implied to have no agency. This citizen versus government action is a false dichotomy, as we shall see. Where businesses wait and see, politics acts. And politics only acts deeply enough in the interests of environmental hope once existing barriers to change are dismantled by public and legal contestation.

LOOKING FORWARD AS A SCIENTIST: SCENARIOS AND PREDICTIONS

At this stage, you may wonder how pessimism and hope might fit into the scenarios and forecasts produced by scientists. You may wonder how scientists think about the future in the first place: is it any more sophisticated than a guessing game?

Scientists try to avoid the word *prediction* because it implies too much certainty in a highly complex world. I can't predict what I'll want for dinner next Thursday, or how many solar panels will sit on my office rooftop next year. But I can make reasonable dinner-based *scenarios*, given the food I like and what I'm capable of cooking (there's a high probability of beans on toast). Similarly, I can say with reasonably high confidence that solar and wind will make up the majority of renewable energy supplies over the coming decades – not because I have insider knowledge about solar gadgetry, but due to the physics of the situation, the known limits. (I will expand on this in the 'Energy' chapters.) Rather than this counting as prediction or forecasting, scientists tend to extrapolate – or model – the future based on constraining assumptions. But as we have heard, much comes down to the pace of change. We can split future scenarios into pessimistic and hopeful by the rate of positive change we might see.

Since we know that the rate of change today is not enough to avoid catastrophic environmental changes, the pessimistic perspectives many scientists consider are 'no policy change' scenarios. 'No policy change' assumes a rate of change similar to today – a change that is too slow to prevent irreversible damage to the planet's life-support systems. The consequences of following these pathways are unfathomably terrifying, resulting in natural and civilizational ruin. Some scientists contend that we are currently suffering the early stages of just this. Although 'no policy change' might sound like the most *likely* scenario, it isn't. By definition, this is a picture of the future in which we continue behaving as we are today but with gradual changes built in. But we won't do that. Large changes are a certainty. In fact, changes continue to accelerate. We live in a period of dizzying transformation and, although we are

uncertain about many things, one thing we can be certain about is that deep change is on the horizon.

If the pessimistic chapters steer closer towards ‘no policy change’, *change* animates the hopeful chapters. Serendipitously, many of the things we need to do to fix our environmental problems are also on our to-do list for improving equality, well-being and general welfare. For example, redesigning urban centres improves the environment, health and communities. Systemically, improving the education and well-being of the poorest around the world will alleviate suffering and reduce environmental pressures way into the future. Perhaps the hardest thing on the to-do list, the task easiest to postpone, is shifting the structure of the economy itself. There is no escaping it: we have to create a new definition of value, one not based on endless consumption or described by flawed statistics like Gross Domestic Product (GDP) – a statistic that omits many of the most important things in life like environmental and social health. Lest you think this is some tree-hugging ideology whose ulterior political motives pervade this book, even the International Monetary Fund (IMF) – hardly known for its extreme environmental views – argues that our global economy must change.¹⁸

In short, the hopeful perspective holds that not only must we address the issues with the planet, we must transform society for the better too. For reasons we’ll explore, we simply will not survive in this unequal world where wealthy individuals and powerful institutions are insulated from the suffering and damage their actions inflict. They must have skin in the game. We shall see that the economy and equality are intrinsically intertwined with the environmental catastrophe we are experiencing. This is why hope for the future includes a vision of humanity as a whole thriving.

PREDICTION IS HARD, ESPECIALLY ABOUT THE FUTURE¹⁹

Scientists see many of our problems as emerging from the unprecedented interactions of two complex systems: society and nature. Complex systems

are not only complicated in that they have many parts, but these parts interact in a way that is incredibly difficult to predict. The whole is greater than the sum of the parts. For instance, society and culture are *emergent* from the unpredictable ways humans interact together – you’d have been hard-pressed to predict that ‘Gangnam Style’ would go viral or that Donald Trump would become president. Complex systems can flip from one state to another: just two years before the fall of the Berlin Wall, many experts thought it was as permanent a European fixture as the Alps²⁰... until it wasn’t. The climate system can also flip. Scientists call these flips *critical transitions*,²¹ but they’re more popularly known as *tipping points*. Tipping points often begin with feedbacks. A good example is Arctic ice melt. As the Arctic warms, the ice recedes and the region changes from reflective white to darker blue, thereby absorbing even more heat and melting more ice. As the general region continues to warm via this feedback, it may trigger other phenomena – further warming the frozen lands surrounding the Arctic, which releases more greenhouse gases, resulting in yet more warming. With more warming, other systems may also flip, resulting in a cascade. The dominoes may all be lined up behind one another so that the entire planet eventually ends up in a very different state.²²

There are tipping points in society too. At the start of his term, President Obama said no to gay marriage.²³ Two years later, it was nationally protected. Equally, many people in the 1940s couldn’t have imagined the successes of the civil rights movement in the 1950s.

This is not to say that these sorts of beneficial tipping points come easily, or that they are the end of the story. Rights are fought for over many decades as a response to injustices or suffering. People around the world are getting the signal that the environment is changing rapidly. Are we on the cusp of a social tipping point to something far more sustainable? A more active participation in developing a philosophy for the long term? A hopeful perspective may say: look at the success of Extinction Rebellion, of school strikes and of legal actions against fossil fuel companies.

Even in the face of increasing levels of stress and damage, collapse – which is more generally thought of as a loss of complexity – doesn’t

have to be cataclysmic. It needn't be a downward turn towards violence and despair. No matter how bad things get, the vast majority of hopeful solutions we need to enact can give us more time to adapt, and to build resilience for the future. Even in the grip of collapse, there is a very real race between natural and social tipping points.

THE ANTHROPOCENE AND THE NEW ABNORMAL

To understand how tipping points apply on a planetary scale, it's important to grasp just how different the present day is to any other moment in our species' history. Human civilizations were born in the Holocene, a period beginning around 10,000 BCE of unprecedented hospitality for life: a stable climate, relatively minor natural disasters and abundant resources across much of the land and oceans. Before the Holocene, humans were a marginal species in the ecosystem. Now, we are among the most dominant forces on the planet. The human footprint is observable everywhere on Earth, and will be for millions of years. Our influence runs so deep and wide that geologists suggest we have exited the Holocene entirely and are now in the Anthropocene.²⁴ The official use of the Anthropocene is still debated, as is the political context in which it is defined. This is because different sets of scientific evidence can be corralled, but also because the choice would tell very different stories about humanity, progress and power. If 1950 is chosen for the nuclear isotopes detectable across the planet after nuclear testing, the Anthropocene might be a story born of technological development and of nuclear war. If 1610 is chosen for the altered chemical composition of the atmosphere as a result of mass human death across the Americas, it is a story of colonialism, violence and disease.²⁵

Whichever decision is made, the period we once thought of as the Holocene is over. Human emissions have altered the composition of the air, delaying the next glacial period; nuclear tests deposited traces of elements detectable in soil and sediments worldwide and can be used to age human brain cells;²⁶ human-manufactured plastics have found their way into every crevice, even in the deepest trenches of the ocean.²⁷ In

the Anthropocene, many human activities become so large they are hard to fathom. In the Anthropocene, enough plastic has been made that were it cling film it could wrap around the Earth completely.²⁸ In the Anthropocene, each litre of petrol burnt in a car melts over a tonne of glacial ice.²⁹ In the Anthropocene, humans move more material each year than all the planet's natural processes – like rivers – combined.³⁰ In the Anthropocene, an average European emits so much carbon dioxide each year that if you were to draw a column going from their shoulders up into the sky, right to the edge of the atmosphere, you would need to make ten such columns to contain their annual carbon emissions.³¹ In the Anthropocene, humans have made enough concrete to cover the entire surface of Earth in a layer two millimetres thick.³² In the Anthropocene, there are (probably) more mini LEGO humans than actual humans – their hardened plastic will outlast any person alive today.³³ *Homo sapiens* has become a geobiological superpower, and superpowers are often self-destructive.

What's true for the scale and longevity of our impact in the Anthropocene is also true for the speed of change. We are at a point where deep geological time has accelerated to the lifespan of a single human. With the planetary-scale consequences of this in mind, perhaps we shouldn't flatter ourselves as being so significant as to augur a new geological epoch. Perhaps the Anthropocene is just a *boundary event* – a transition period not unlike the asteroid that hit Earth 66 million years ago – less of a long-lasting period indicating a new reality of human dominance than a fleeting signature in a thin band of rock indicating the expansion and collapse of a peculiarly self-destructive species.

In either eventuality, the Anthropocene requires new philosophies, both in order to reform the systems that led us to this point and to account for the degree of the response. For civilization to thrive, humanity will require philosophies not yet conceived of and governance systems as yet undeveloped. With so much changing so quickly, there are a number of discussions taking place in science and the humanities that have important ramifications for the future of civilization. It's crucial that we all become aware of these discussions and what they mean for our future. Some of the solutions scientists and policymakers are considering will

change the way the world looks in the very short term. These discussions have yet to reach general awareness, even though their outcome will dictate what happens to life on the planet.

Climate change and ecosystem collapse will increasingly overshadow daily life. Having once amounted to niggling worries in the back of humanity's mind, they are intensifying like a devastating storm cloud. They reveal many of today's political struggles to be the equivalent of moving deckchairs around on the *Titanic*. It will be a long period of upheaval, during which many will look back on the Holocene with fondness.

As this book will reveal, human civilization has never faced such large-scale and enduring problems. The environmental crisis is the ultimate test of humanity's ability to work together, problem-solve and adapt. Incremental changes and moderate policies will no longer do the job. But what will? It is long past time to map out our options across the multitude of viewpoints and systems, examine what the best and worst cases really look like, and understand what it will take to keep as many people as possible above water.