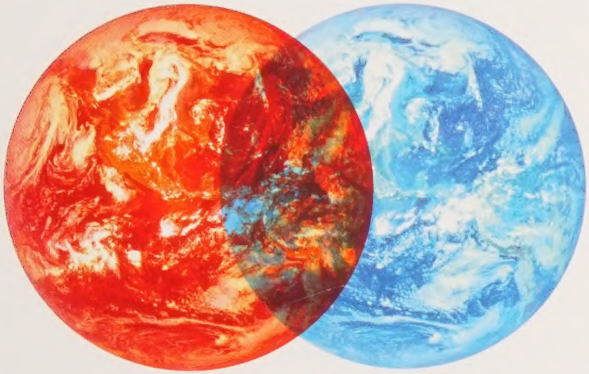
THE FUTURE WE CHOOSE



The Stubborn Optimist's Guide to the Climate Crisis

Christiana Figueres and
Tom Rivett-Carnac

Praise for Christiana Figueres and Tom Rivett-Carnac's

THE FUTURE WE CHOOSE

"A book that shepherds climate activism from changing mental states to changing the world. . . . The authors recommend a mindset for climate activism that rests on three attitudes: radical optimism, endless abundance, and radical regeneration." —*Forbes*

"Inspiring. . . . A practically minded manifesto for personal action in the face of climate change." —*Kirkus Reviews*

"The book takes a hard look at the frightening realities of climate change but concludes that humanity can still deal with this threat. Moreover, the book presents the existential challenge of climate change as a unique opportunity to build a more just world and to make ourselves better people. Most importantly, the book adopts a very practical approach and suggests ten concrete actions that each of us can take in order to create a better future for all the residents of planet Earth. I hope we all take this message to heart." —Yuval Noah Harari, bestselling author of *Sapiens* and *21 Lessons for the 21st Century*

"This could be the most important wake-up call of our times." —Klaus Schwab, CEO, World Economic Forum

Christiana Figueres
and Tom Rivett-Carnac

THE FUTURE WE CHOOSE

Christiana Figueres and Tom Rivett-Carnac are cohosts of the leading climate change podcast, *Outrage + Optimism*, and are cofounders of Global Optimism, an organization dedicated to changing narratives and beliefs and inspiring governments, companies, and citizens to protect what they love from the damages of the climate crisis. Figueres is the former executive secretary of the United Nations Framework Convention on Climate Change, where Rivett-Carnac served as her political strategist. They are known for a unique form of collaborative diplomacy, which led to the unanimous signing of the landmark Paris Agreement on climate change by 195 countries.

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and Tom Rivett-Carnac

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We dedicate this book to Christiana's daughters,

NAIMA AND YIHANA,

and Tom's daughter and son,

ZOË AND ARTHUR,

and to the generations who will inhabit the future we choose.

Let us not pray to be sheltered from dangers,
but to be fearless when facing them.

—RABINDRANATH TAGORE

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PART III TEN ACTIONS

INTRODUCTION TO THE VINTAGE BOOKS EDITION (2021)

The Critical Decade

We wrote this book before COVID-19 crashed into our world. In fact, we managed only the first three stops on a planned yearlong book tour before we rushed to our respective homes and into a global lockdown that has changed everything. Since then we have been shocked at how many aspects of both the dystopian and the desirable futures we describe in this book suddenly came into relief and stark contrast with each other.

More than ever, we are determined to play our part in ensuring our future is one that we deliberately choose, rather than one we stumble into blindly.

We have seen the world on fire, from the Amazon rain forest to California and from Australia to the Arctic. The hour is late, and the moment of consequence, so long delayed,

is now upon us. Do we watch the world burn, or do we choose to do what is necessary to achieve a different future?

Who we understand ourselves to be determines the choice we will make. That choice determines what will become of us. The choice is both simple and complex, but above all it is urgent. The next decade will be the most consequential in human history. We are choosing between two utterly contrasting futures, one to be feared and the other to be proud of. This book presents three mindsets that are essential for making the wiser choice. We can do this.

We remember a twelve-year-old girl marching with her friends down Sixteenth Street in Washington, D.C., at ten a.m. on a Friday, holding up a hand-painted sign of the Earth enveloped in red flames. In London, grown-up demonstrators dressed in black and wearing riot-police headgear form a human chain blocking traffic at Piccadilly Circus, as others glue themselves to the pavement in front of the headquarters of BP. In Seoul, South Korea, the streets teem with elementary schoolchildren sporting multicolored backpacks and carrying banners that say CLIMATE STRIKE—in English, for the benefit of the media. In Bangkok, hundreds of teenage students take to the streets. With firm resolve and heavy hearts, they walk behind their defiant leader, an eleven-year-old girl carrying a sign: THE OCEANS ARE RISING AND SO ARE WE.

All over the world, millions of young people—inspired by Greta Thunberg, the teenage girl who began a lone protest in front of the Swedish parliament—are engaging in

civil disobedience to draw attention to climate change. Students understand the scientific projections and are terrified about the diminished quality of life on their horizon. They demand decisive action now. They are helping to raise the level of outrage about the insufficiency of our efforts to address the crisis, and they have been joined by scientists, parents, and teachers. From the quest for independence in India to the civil rights movement in the United States, civil disobedience erupts when reigning injustice becomes intolerable, as we are now seeing with climate change. Unacceptable generational injustice and a deplorable lack of solidarity with the vulnerable have opened the floodgates of protest. Those who will be most affected have taken to the streets. Their anger is energy that we desperately need. It can propel a wave of defiance against the status quo and catalyze the ingenuity needed to realize new possibilities.

To protect what we love from danger is a natural human instinct that, when we feel a lack of agency, can easily transform into anger. Anger that sinks into despair is powerless to make change. Anger that evolves into conviction is unstoppable.

These protests should come as no surprise. We have known about the possibility of climate change since at least the 1930s and have been certain since 1960, when geochemist Charles Keeling measured CO_2 in Earth's atmosphere and detected an annual rise.[1]

Since then we have done little to counter climate change, the result being that greenhouse gas emissions, the cause

of climate change, are increasing. We continue to pursue economic growth through the unbridled extraction and burning of fossil fuels, with a fatal impact on our forests, oceans and rivers, soil, and air. We have failed to manage wisely the very ecosystems that sustain us. We have wreaked havoc on them, unintentionally perhaps, but relentlessly and decisively.

Our negligence has catapulted climate change from an existential challenge to the dire crisis it is now, as we rapidly approach limits beyond which Earth as we know it will cease to be. And yet for many, these depredations are invisible. Despite the increasing frequency and intensity of natural disasters, we still have not connected the dots between the ongoing destruction of our natural habitats and our future ability to ensure our children's safety, feed ourselves, inhabit coastlines, and uphold the integrity of our homes. If nothing else, the human tragedies of 2020 have shown us that our lives and livelihoods are entirely dependent on respecting nature. Moving beyond injustice, restoring nature, eliminating racism, and solving the climate crisis can only be achieved if we recognize that they are all fundamentally the same challenge of how humans live well together on this Earth.

Governments have taken incremental steps to address climate change, treating it as a singular issue when, in fact, it cuts across all the issues we need to tackle. The furthest-reaching effort is the Paris Agreement, which delineates a unified strategy for combating climate change. All govern-

ments of the world unanimously adopted it in December 2015, and most ratified it into law in record time. Since then many corporations, large and small, have set laudable emissions-reduction goals for themselves, many local governments have enacted effective policies, and numerous financial institutions have shifted significant capital from fossil fuels to alternative clean technologies. However, some governments have started to declare a climate emergency because, as essential as the current corrective actions are, taken together they still fall far short of what is necessary to stop the rise—and start the reduction—of emissions worldwide. Every day that passes is one day less that we have to stabilize our increasingly fragile planet, by now on its way to becoming uninhabitable for humans. We are running out of time. Once we hit critical thresholds, the damage to the environment, and consequently to our future on this planet, will be irreparable.

Over the years, public reactions to climate change have run the gamut. At one extreme are the climate deniers who say they don't "believe" in climate change. Denying climate change is tantamount to saying you don't believe in gravity. The science of climate change is not a belief, a religion, or a political ideology. It presents facts that are measurable and verifiable. Just as gravity exerts its force on all of us, whether we believe in it or not, climate change is already affecting us all no matter where we were born or where we live. The irre-

sponsibility of not "believing" in climate change is becoming more apparent with every new catastrophic event. Climate deniers are shamelessly protecting the short-term financial interests of the fossil fuel industry to the detriment of the long-term interests of their own descendants.

At the other extreme are those who acknowledge the validity of the science but are beginning to lose confidence that we can do anything to address climate change. People feel real grief over the unspeakable loss of ecosystems and biodiversity and over how much more we are about to lose, including the future of human life as we know it. Those who are enveloped in this grief may have lost all faith in our collective capacity to challenge the course of human history. Every new documentary, every new scientific study, every report of disaster deepens the pain. Grief can be a powerful, transformative experience for some, and arguably a major reason climate change has continued largely unchecked for so long is that we have failed to truly feel what it will mean. It is important that we all allow ourselves adequate time and space to deeply feel our grief and to openly express it. As we tune in to the raw emotion, many of us will undergo a dark, unsettling period of despair, but we cannot allow it to erode our capacity to courageously mobilize for transformation.

A larger group of people, between these two extremes, understands the science and acknowledges the evidence but takes no action because they don't know what to do or because it is far easier not to think about climate change. It's scary and overwhelming. To a large extent, many of us

stick our heads in the sand. Every time we see a report on extreme weather—hurricanes that used to occur once every five hundred years in a region now occur twice in a month, droughts that shrivel entire villages off the face of the Earth, heat waves that break record upon record, disasters that illustrate what is really going on—we feel a knot in our stomach. But then we turn off the news and distract ourselves with something likely to make us feel less hypocritical. Better to act as if nothing were happening or as if there were no way to stop it. That way we can delude ourselves that life will continue unimpeded. While this reaction is understandable, it is also a colossal mistake. Complacency now will lock us into a future of guaranteed scarcity, instability, and strife.

We are already too far down the road of destruction to be able to "solve" climate change. The atmosphere is by now too loaded with greenhouse gases and the biosphere too altered for us to be able to turn back the clock on global warming and its effects. We, and all our descendants, will live in a world with environmental conditions that are permanently altered. We cannot bring back the extinct species, the melted glaciers, the dead coral reefs, or the destroyed primary forests. The best we can do is keep the changes within a manageable range, staving off total calamity, preventing disaster that will result from the unchecked rise of emissions. This, at least, might usher us out of crisis mode. It is the bare minimum that we must do.

But we can also do much more.

By addressing the causes of climate change now, we can at once minimize risks and emerge stronger. Today we have the unique chance to create a future where matters not only stabilize but actually get better. We can have more efficient and cheaper transportation, resulting in less traffic; we can have cleaner air, supporting better health and enhancing the enjoyment of city life; and we can practice smarter use of natural resources, resulting in less pollution of land and water. Achieving the mindset needed to attain this improved environment would signal a maturation of humanity.

Without diminishing the enormity of what we are facing with climate change, we are capable of changing course, and no objective evidence says otherwise. Our societies have faced daunting challenges before—institutionalized slavery, the oppression and exclusion of women, the rise of fascism. To be sure, none of these challenges has disappeared, but when addressed collectively, we know they are surmountable. Climate change is even more complex because of the finality it portends for the human species, but we are well prepared to deal with it. We have already achieved a host of social and political successes; we have most, if not all, of the technologies we will need; we have the necessary capital; and we know which policies are most effective. This is a crisis of will, not of knowledge. The changes we need to make are significant but doable.

Whether you are complacent about climate change or

in pain or angry, this book is an invitation for you to take part in creating the future of humanity. We invite you to be stubbornly optimistic in the recognition that, despite the seemingly daunting nature of the challenge, collectively we have what it takes to address climate change now.

Those of us alive right now have the unique privilege of forging a healthy, bustling future through the steps we take today. Each of us can and must protect what we love.

This invitation requires your immediate response. Can we count you in?

Two dates should now be seared in everyone's mind: 2030 and 2050.

By 2050 at the latest, and ideally by 2040, we must have stopped emitting more greenhouse gases into the atmosphere than Earth can naturally absorb through its ecosystems (a balance known as net-zero emissions or carbon neutrality). In order to get to this scientifically established goal, our global greenhouse gas emissions must be clearly on the decline by the early 2020s and reduced by at least 50 percent by 2030.

The goal of halving global emissions by 2030 represents the absolute minimum we must achieve if we are to have at least a 50 percent chance of safeguarding humanity from the worst impacts. We are in the critical decade. It is no exaggeration to say that what we do regarding emissions reductions between now and 2030 will determine the quality of human life on this planet for hundreds of years to come, if not more. If we do not halve our emissions by 2030, we are

highly unlikely to be able to halve emissions every decade until we reach net zero by 2050.

That is our final limit. We cannot exceed it.

Why?

The effects of climate change do not proceed along a straight line. A bit more doesn't equate to a bit worse. Several parts of our planet are critically sensitive, such as the Arctic summer sea ice, the ice cover of Greenland, the boreal forests of Canada and Russia, and the tropical forest cover of the Amazon. They have been maintaining a stable temperature on Earth for millennia.[2] If those ecosystems were to go up in flames or be otherwise compromised, global temperature would rise precipitously, leading to irreparable worldwide damage. Think of this as an uncontrollable domino effect of devastation.[3]

Today's decisions on energy, transportation, and land use will all have direct and long-term effects on climate change because they lock in their respective emissions levels for decades, and cumulative emissions could push us over tipping points permanently and catastrophically.[4] (See the graph in the appendix, page 171.) There will be no putting the genie back into the bottle. The milestones of 2030 and 2050 are rooted in the latest science that tells us just how long we can go on doing little or nothing before disaster sets in.

Here's the good news.

We are still just barely inside a zone where we can stave off the worst and manage the remaining long-term effects.

But *only* if we do what is required of us in the short term. This is the last time in history when we will be able to do this.

Soon it will be too late.

We know what to do, and we have everything we need. Concern about climate change varies by country, but an increasing majority of people want their governments to address the issue.[5] So as not to put our children's future in jeopardy, we must connect the urgency of now to the reality of that future.

We tend to think of "saving the planet" as salvaging certain iconic ecological features: polar bears, humpback whales, or mountain glaciers. The prevailing logic is that nature is suffering, and humans are complicit, therefore we should act. While that sentiment is worthy in many ways, it can also leave us feeling that the problem is "out there" unrelated to our daily life.

Climate change has long been misunderstood as an environmental issue affecting the survival of the planet. The truth is, the planet will continue to evolve. It has done so for 4.5 billion years, going through dramatic transformations that for the most part did not support the existence of humankind. We currently enjoy unique environmental conditions that do support human life, but we forget that modern civilization as we know it is only about six thousand years old.[6]

The planet will survive, in changed form no doubt, but it will survive.

The question is whether we will be here to witness it.

That's why climate change is the mother of all issues.

This crisis both dwarfs and encompasses any other issue we may care about. Climate change should be of concern to all who care about social justice. It affects the poor in every country disproportionately—not only because they are often more exposed and invariably more vulnerable to climate-related shocks, but also because they have fewer resources with which to respond to disaster.

Climate change should be of concern to all who care about health. The burning of fossil fuels releases the greenhouse gas emissions that are responsible for climate change. But the burning of the very same fossil fuels (coal for industrial heat or electricity generation and diesel or gasoline for transportation) also pollutes the local ambient air with particulate matter. Microscopic pollutants in the air slip past our body's defenses, penetrating deep into our respiratory and circulatory systems, damaging our lungs, hearts, and brains. They are so pernicious to human health that more than 7 million people die from air pollution each year.[7]

Climate change should be of concern to all who care about economic stability and investment value.[8] It is no secret that coal has lost its financial viability in most parts of the world because it can no longer compete with cheaper and cleaner renewable energy options such as solar.[9] Coal mines and coal plants are closing, and there is increasing momentum

in the coal divestment movement, likely to be followed by divestment from other fossil fuels.[10] Central banks around the world are assessing the macroeconomic risk of trillions of dollars invested in those high-carbon assets. The consensus is growing that we need to shift smoothly but decisively into clean energy assets that will more safely keep their value over the long term.[11]

Finally, and fundamentally, climate change should be of concern to all who care about intergenerational justice—which should be every one of us. If we fail to act as we should, future generations will be powerless to undo the inexorable consequences of our failure. Hence our profound moral responsibility to them. Failure to make hard choices now will rob our children and grandchildren of their rightful future.

Some believe we are hardwired to react to threats only if they are immediate. The threats from climate change are now immediate. Superstorms, cyclones, wildfires, droughts, and floods everywhere give us ample evidence of climate change, and those disasters will increase in frequency, scale, and location. We cannot deny or ignore climate change any longer. We now need to let go of half-hearted attempts and instead act in proportion to the magnitude of the challenge.

PART I

TWO WORLDS

CHAPTER 1

Choosing Our Future

Geological time is long and slow. Or at least it used to be. Ice ages, during which vast glaciers covered much of the northern continents, have sluggishly come and gone throughout the history of our planet. The last ice age lasted about 2.6 million years. With very gradual warming resulting from natural influences on Earth's climate, we slowly left that ice age and entered the Holocene epoch, which stretched out over twelve thousand years—until the twentieth century—under relatively stable temperatures, fluctuating only 1 degree Celsius above or below the average.[1]

Throughout that geological period, temperatures, precipitation patterns, and terrestrial and ocean ecosystems settled into a "sweet spot" of natural conditions conducive to human propagation and well-being. That environmental stability allowed the human species of approximately ten

thousand people living in small tribes to start a sedentary life, evolve into agricultural farmers and settlers, and eventually develop cities, supported by industry and machine manufacturing. It allowed humans to thrive and the population to grow to the current 7.7 billion.[2]

During the Holocene, "life created the conditions conducive to life."[3] And we could have continued in that geological era. But we didn't.[4]

Over the past fifty years, we have severely undermined the environmental integrity of our Blue Marble and threatened our continued life here. Our post–Industrial Revolution lifestyles have caused massive damage to all our natural systems. Mainly because of the unbridled use of fossil fuels and vast deforestation, the concentration of greenhouse gases in the atmosphere today exceeds anything we have had since well before the last ice age,[5] resulting in extreme weather events of increasing frequency and intensity all over the world: floods, heat waves, droughts, wildfires, and hurricanes. Half the world's tropical forests have been cleared, and every year about 12 million more hectares are lost. In about forty years, at the current rate, 1 billion hectares could be gone—a land mass equivalent to Europe.[6] In the last fifty years, the populations of mammals, birds, fish, reptiles, and amphibians have, on average, declined by 60 percent. Some suggest we are already living through the sixth mass extinction.[7] According to the latest research, 12 percent of all surviving species are currently threatened, and climate breakdown will significantly amplify that threat.[8] Oceans

have absorbed more than 90 percent of the extra heat we have produced over the last fifty years.[9] As a result, half the world's coral reefs are already dead,[10] and the Arctic summer sea ice, whose reflective capacity helps to regulate temperatures all over the world, is shrinking rapidly.[11] The melt from land glaciers has already caused sea levels to rise more than twenty centimeters, leading to major salt intrusion in many aquifers, worsening storm surges and existential threats to low-lying islands.[12] In short, in just the last fifty years we have catapulted humanity and the planet out of the previous benevolent Holocene epoch and into the Anthropocene, a new geological period where biogeochemical conditions are dominated not by natural processes but by the palpable impact of human activity. Humans are for the first time ever the prime driver of large-scale climate change on the planet.[13]

All studies you may read about the Anthropocene epoch point to the unprecedented levels of destruction that we have caused in just five decades.[14] The underlying assumption in those analyses is that we have irretrievably cast our die and that increasing destruction will be the leitmotif of the entire geological era.

We take a radically different view.

We argue that devastation is admittedly a growing possibility but not yet our inevitable fate. While the beginning of this period of human history has been indelibly and painfully marked, the full story has not been written. We still hold the pen. In fact, we hold it more firmly now than ever

before. And we can choose to write a story of regeneration of both nature and the human spirit. But we have to choose.

In deciding what kind of world we and future generations will live in, we don't have many options; we have in fact only two, both of which are set out in the Paris Agreement, and both of which we present here for your consideration. Keep in mind that we have already warmed the planet by 0.9 degrees Celsius more than the average temperature before the Industrial Revolution. Under the Paris Agreement, all nations committed to collectively limit warming to "well under 2 degrees Celsius," and ideally no more than 1.5 degrees Celsius (2.7 degrees Fahrenheit), through national emissions-reduction efforts that substantially increase every five years. To start the process, in 2015, 184 countries registered details of what they would do in the first five years and agreed to come back every five years to make stronger commitments, since the first round of commitments was only the first step toward achieving the long-term goal of net-zero emissions.

We present two scenarios. One or the other will become our reality.

The world we are now creating, leading to warming of more than 3 degrees.[15] The first scenario we set out illustrates the very dangerous trajectory we are on right now. If governments, corporations, and individuals make no further efforts than those registered in 2015, we will go to a warming of at least

3.7 degrees Celsius by 2100. Worse yet, if they do not fulfill even the registered commitments, we can expect warming of 4 or 5 degrees. (See the appendix, page 172.) Be forewarned, this picture is dark. Even though many of the worst-case scenarios might not be realized until the second half of the century, it is clear that by midcentury human misery would be high, biodiversity would be decimated, and that we and our children would live in a world that is constantly deteriorating with no possible recuperation.

The world we must create, limiting warming to no more than 1.5 degrees Celsius.[16] We cannot turn back the clock on past emissions. However, even at this late stage, we can strive for and achieve a better world in which nature and the human family will not only survive but thrive together. Scientists have been extremely clear that the 1.5-degree-Celsius-warmer scenario is still attainable but that the window is rapidly closing. To have at least a 50 percent chance of success (which in itself is an unacceptably high level of risk), we must cut global emissions to half their current levels by 2030, half again by 2040, and finally to net zero by 2050 at the very latest.[17] A change of this magnitude would require major transformations in almost every area of life and work, from massive reforestation to new agricultural practices; from the cessation of coal production by 2020 and of oil and gas extraction soon thereafter to the abandonment of fossil fuels and even the internal combustion engine.

Precisely what we need to do is detailed later in the book, but for now, we have to wake up to the fact that we can choose our future and collectively create it. Our collective responsibility is to ensure that a better future is not only possible but probable, and then not only probable but foreseeable.

The great baseball player Yogi Berra famously said that predictions are hard to make, especially about the future. In constructing these scenarios, we are aware that making predictions about the world in thirty years' time is to some degree an imaginative enterprise. However, everything we set out in these scenarios is predicted or expected by the best science.[18] Indeed, much of what science has foretold is already happening. Read each scenario not as a prediction of the future but as a warning of what may come and what we still have a chance to change.

CHAPTER 2

The World We Are Creating

It is 2050. Beyond the emissions reductions registered in 2015, no further efforts were made to control emissions. We are heading for a world that will be more than 3 degrees warmer by 2100.

The first thing that hits you is the air.

In many places around the world, the air is hot, heavy, and depending on the day, clogged with particulate pollution. Your eyes often water. Your cough never seems to disappear. You think about some countries in Asia, where out of consideration sick people used to wear white masks to protect others from airborne infection. Now you often wear a mask to protect yourself from air pollution. You can no longer simply walk out your front door and breathe fresh air: there might not be any. Instead, before opening

doors or windows in the morning, you check your phone to see what the air quality will be. Everything might look fine—sunny and clear—but you know better. When storms and heat waves overlap and cluster, the air pollution and intensified surface ozone levels can make it dangerous to go outside without a specially designed face mask (which only some can afford).[1]

Southeast Asia and Central Africa lose more lives to filthy air than do Europe or the United States.[2] There fewer people work outdoors, and even indoors the air can taste slightly acidic, sometimes making you feel nauseated. The last coal furnaces closed ten years ago, but that hasn't made much difference in air quality around the world because you are still breathing dangerous exhaust fumes from millions of cars and buses everywhere. Some countries have experimented with seeding rain clouds—the process of artificially inducing rain—hoping to wash pollution out of the sky, but results are mixed. Seeding clouds to artificially create more rain is difficult and unreliable, and even the wealthiest countries cannot achieve consistent results.[3] In Europe and Asia, the practice has triggered international incidents because even the most skilled experts can't control where the rain will fall, never mind that acid rain is deleterious to crops, wreaking havoc on food supply.[4] As a result, crops are increasingly grown under cover, a trend that will only increase.[5]

Our world is getting hotter. Over the next two decades, projections tell us that temperatures in some areas of the

globe will rise even higher, an irreversible development now utterly beyond our control. Oceans, forests, plants, trees, and soil had for many years absorbed half the carbon dioxide we spewed out. Now there are few forests left, most of them either logged or consumed by wildfire, and the permafrost is belching greenhouse gases into an already overburdened atmosphere.[6]

The increasing heat of the Earth is suffocating us, and in five to ten years, vast swaths of the planet will be increasingly inhospitable to humans. We don't know how habitable the regions of Australia, North Africa, and the western United States will be by 2100. No one knows what the future holds for their children and grandchildren: tipping point after tipping point is being reached, casting doubt on the form of future civilization. Some say that humans will be cast to the winds again, gathering in small tribes, hunkered down and living on whatever patch of land might sustain them.[7]

Passing tipping points has already been painful. First was the vanishing of coral reefs. Some of us still remember diving amid majestic coral reefs, brimming with multicolored fish of all shapes and sizes. Corals are now almost gone. The Great Barrier Reef in Australia is the largest aquatic cemetery in the world. Efforts have been made to grow artificial corals farther north and south from the equator where the water is a bit cooler, but these efforts have largely failed, and marine life has not returned. Soon there will be no reefs anywhere—it is only a matter of a few years before the last 10 percent dies off.[8]

The second tipping point was the melting of the ice sheets in the Arctic. There is no summer Arctic sea ice anymore because warming is worse at the poles—between 6 and 8 degrees higher than other areas. The melting happened silently in that cold place far north of most of the inhabited world, but its effects were soon noticed. The Great Melting was an accelerant of further global warming. The white ice used to reflect the sun's heat, but now it's gone, so the dark sea water absorbs more heat, expanding the mass of water and pushing sea levels even higher.[9]

More moisture in the air and higher sea surface temperatures have caused a surge in extreme hurricanes and tropical storms. Recently, coastal cities in Bangladesh, Mexico, the United States, and elsewhere have suffered brutal infrastructure destruction and extreme flooding, killing many thousands and displacing millions. This happens with increasing frequency now.[10] Every day, because of rising water levels, some part of the world must evacuate to higher ground. Every day the news shows images of mothers with babies strapped to their backs, wading through floodwaters, and homes ripped apart by vicious currents that resemble mountain rivers. News stories tell of people living in houses with water up to their ankles because they have nowhere else to go, their children coughing and wheezing because of the mold growing in their beds, insurance companies declaring bankruptcy leaving survivors without resources to rebuild their lives. Contaminated water supplies, sea salt intrusions, and agricultural runoff are the order of the day. Because

multiple disasters are often happening simultaneously, it can take weeks or even months for basic food and water relief to reach areas pummeled by extreme floods. Diseases such as malaria, dengue, cholera, respiratory illnesses, and malnutrition are rampant.[11]

Now all eyes are on the western Antarctic ice sheet.[12] If it did ever disappear, it would release a deluge of fresh water into the oceans, potentially raising sea levels by over five meters. If that were to happen, cities like Miami, Shanghai, and Dhaka would be uninhabitable—ghostly Atlantises dotting the coasts of each continent, their skyscrapers jutting out of the water, their people evacuated or dead.

Those around the world who chose to remain on the coast because it had always been their home have more to deal with than rising water and floods—they must now witness the demise of a way of life based on fishing. As oceans have absorbed carbon dioxide, the water has become more acidic, and the pH levels are now so hostile to marine life that all but a few countries have banned fishing, even in international waters.[13] Many people insist that the few fish that are left should be enjoyed while they last—an argument, hard to fault in many parts of the world, that applies to so much that is vanishing.

As devastating as rising oceans have been, droughts and heat waves inland have created a special hell. Vast regions have succumbed to severe aridification sometimes followed by desertification,[14] and wildlife there has become a distant memory.[15] These places can barely support human life; their

aquifers have dried up. Cities such as Marrakech and Volgograd are on the verge of becoming deserts. Hong Kong, Barcelona, Abu Dhabi, and many others have been desalinating seawater for years, desperately trying to keep up with the constant wave of immigration from areas that have gone completely dry.

Extreme heat is on the march. If you live in Paris, you endure summer temperatures that regularly rise to 44 degrees Celsius (111 degrees Fahrenheit). This is no longer the headline-grabbing event it would have been thirty years ago. Everyone stays inside, drinks water, and dreams of air-conditioning. You lie on your couch, a cold, wet towel over your face, and try to rest without dwelling on the poor farmers on the outskirts of town who, despite recurrent droughts and wildfires, are still trying to grow grapes, olives, or soy—luxuries for the rich, not for you.

You try not to think about the 2 billion people who live in the hottest parts of the world, where, for upward of forty-five days per year, temperatures skyrocket to 60 degrees Celsius (140 degrees Fahrenheit)—a point at which the human body cannot be outside for longer than about six hours because it loses the ability to cool itself down. Places such as central India are becoming increasingly challenging to inhabit. For a while people tried to carry on, but when you can't work outside, when you can fall asleep only at four a.m. for a couple of hours because that's the coolest part of the day, there's not much you can do but leave. Mass migrations to less hot rural areas are beset by a host of refu-

gee problems, civil unrest, and bloodshed over diminished water availability.[16]

Inland glaciers around the world are quickly disappearing. The millions who depended on the Himalayan, Alpine, and Andean glaciers to regulate water availability throughout the year are in a state of constant emergency: there is little snow turning to ice atop mountains in the winter, so there is no more gradual melting for the spring and summer. Now there are either torrential rains leading to flooding or prolonged droughts. The most vulnerable communities with the least resources have already seen what can ensue when water is scarce: sectarian violence, mass migration, and death.

Even in some parts of the United States, there are fiery conflicts over water, battles between the rich who are willing to pay for as much water as they want and everyone else demanding equal access to the life-enabling resource. The taps in nearly all public facilities are locked, and those in restrooms are coin-operated. At the federal level, Congress is in an uproar over water redistribution: states with less water demand what they see as their fair share from states that have more. Government leaders have been stymied on the issue for years, and with every passing month the Colorado River and the Rio Grande shrink further.[17] Looming on the horizon are conflicts with Mexico, no longer able to guarantee deliveries of water from the depleted Rio Conchos and Rio Grande.[18] Similar disputes have arisen in Peru, China, Russia, and many other countries.

Food production swings wildly from month to month, season to season, depending on where you live. More people are starving than ever before. Climate zones have shifted, so some new areas have become available for agriculture (Alaska, the Arctic),[19] while others have dried up (Mexico, California). Still others are unstable because of the extreme heat, never mind flooding, wildfire, and tornadoes. This makes the food supply in general highly unpredictable. One thing hasn't changed, though—if you have money, you have access. Global trade has slowed as countries such as China stop exporting and seek to hold on to their own resources. Disasters and wars rage, choking off trade routes. The tyranny of supply and demand is now unforgiving; because of its increasing scarcity, food can now be wildly expensive. Income inequality has always existed, but it has never been this stark or this dangerous.

Entire regions suffer from epidemics of stunting and malnutrition. Reproduction has slowed overall, but most acutely in those countries where food scarcity is dire. Infant mortality has rocketed, and international aid has proven to be politically impossible to defend in light of mass poverty. Countries with enough food are resolute about holding on to it.

In some places, the inability to gain access to such basics as wheat, rice, or sorghum has led to economic collapse and civil unrest more quickly than even the most pessimistic experts had previously imagined. Scientists tried to develop

varieties of staples that could stand up to drought, temperature fluctuations, and salt, but there was only so much we could do. Now there simply aren't enough resilient varieties to feed the population. As a result, food riots, coups, and civil wars are throwing the world's most vulnerable from the frying pan into the fire. As developed countries seek to seal their borders from mass migration, they too feel the consequences. Stock markets are crashing, currencies are wildly fluctuating, and the European Union has disbanded.[20]

As committed as nations are to keeping wealth and resources within their borders, they're determined to keep people out. Most countries' armies are now just highly militarized border patrols. Lockdown is the goal, but it hasn't been a total success. Desperate people will always find a way. Some countries have been better global Good Samaritans than others, but even they have now effectively shut their borders, their wallets, and their eyes.[21]

Ever since the equatorial belt started to become difficult to inhabit, an unending stream of migrants has been moving north from Central America toward Mexico and the United States. Others are moving south toward the tips of Chile and Argentina. The same scenes are playing out across Europe and Asia. Enormous political pressure is being placed on northern and southern countries to either welcome migrants or keep them out. Some countries are letting people in, but only under conditions approaching indentured servitude. It will be years before the stranded

migrants are able to find asylum or settle into new refugee cities that have formed along the borders.

Even if you live in areas with more temperate climates such as Canada and Scandinavia, you are still extremely vulnerable. Severe tornadoes, flash floods, wildfires, mudslides, and blizzards are often in the back of your mind. Depending on where you live, you have a fully stocked storm cellar, an emergency go-bag in your car, or a six-foot fire moat around your house. People are glued to weather forecasts. Only the foolhardy shut their phones off at night. If an emergency hits, you may only have minutes to respond. The alert systems set up by the government are basic and subject to glitches and irregularities depending on access to technology. The rich, who subscribe to private, reliable satellite-based alert systems, sleep better.

The weather is unavoidable, but lately the news about what's going on at the borders has become too much for most people to endure. Because of the alarming spike in suicides, and under increasing pressure from public health officials, news organizations have decreased the number of stories devoted to genocide, slave trading, and refugee virus outbreaks. You can no longer trust the news. Social media, long the grim source of live feeds and disaster reporting, is brimming with conspiracy theories and doctored videos. Overall, the news has taken a strange, seemingly controlled turn toward distorting reality and spinning a falsely positive narrative.

Those living within stable countries may be safe, yes, but the psychological toll is mounting. With each new tipping point passed, they feel hope slipping away. There is no chance of stopping the runaway warming of our planet, and no doubt we are slowly but surely heading toward some kind of collapse. And not just because it's too hot. Melting permafrost is also releasing ancient microbes that today's humans have never been exposed to—and as a result have no resistance to.[22] Diseases spread by mosquitoes and ticks are rampant as these species flourish in the changed climate, spreading to previously safe parts of the planet, increasingly overwhelming us. Worse still, the public health crisis of antibiotic resistance has only intensified as the population has grown denser in inhabitable areas and temperatures continue to rise.[23]

The demise of the human species is being discussed more and more. For many, the only uncertainty is how long we'll last, how many more generations will see the light of day. Suicides are the most obvious manifestation of the prevailing despair, but there are other indications: a sense of bottomless loss, unbearable guilt, and fierce resentment at previous generations who didn't do what was necessary to ward off this unstoppable calamity.

CHAPTER 3

The World We Must Create

It is 2050. We have been successful at halving emissions every decade since 2020. We are heading for a world that will be no more than 1.5 degrees Celsius warmer by 2100.

In most places in the world, the air is moist and fresh, even in cities. It feels a lot like walking through a forest, and very likely this is exactly what you are doing. The air is cleaner than it has been since before the Industrial Revolution.

We have trees to thank for that. They are everywhere.[1]

It wasn't the single solution we required, but the proliferation of trees bought us the time we needed to vanquish carbon emissions. Corporate donations and public money funded the biggest tree-planting campaign in history. When we started, it was purely practical, a tactic to combat climate change by relocating the carbon: the trees took carbon diox-

ide out of the air, released oxygen, and put the carbon back where it belongs, in the soil. This of course helped to diminish climate change, but the benefits were even greater. On every sensory level, the ambient feeling of living on what has again become a green planet has been transformative, especially in cities. Cities have never been better places to live. With many more trees and far fewer cars, it has been possible to reclaim whole streets for urban agriculture and for children's play. Every vacant lot, every grimy unused alley, has been repurposed and turned into a shady grove. Every rooftop has been converted to either a vegetable or a floral garden. Windowless buildings that were once scrawled with graffiti are instead carpeted with verdant vines.

The greening movement in Spain began as an effort to combat rising temperatures. Because of Madrid's latitude, it is one of the driest cities in Europe. And even though the city now has a grip on its emissions, it was previously at risk of desertification. Because of the "heat island" effect of cities—buildings trap warmth and dark, paved surfaces absorb heat from the sun—Madrid, home to more than 6 million people, was several degrees warmer than the countryside just a few miles away. In addition, air pollution was leading to a rising incidence of premature births,[2] and a spike in deaths was linked to cardiovascular and respiratory illnesses. With a health-care system already strained by the arrival of subtropical diseases like dengue fever and malaria, government officials and citizens rallied. Madrid made dramatic efforts to reduce the number of vehicles and create a

"green envelope" around the city to help with cooling, oxygenating, and filtering pollution. Plazas were repaved with porous material to capture rainwater; all black roofs were painted white; and plants were omnipresent. The plants cut noise, released oxygen, insulated south-facing walls, shaded pavements, and released water vapor into the air. The massive effort was a huge success and was replicated all over the world. Madrid's economy boomed as its expertise put it on the cutting edge of a new industry.

Most cities found that lower temperatures raised the standard of living. There are still slums, but the trees, largely responsible for countering the temperature rise in most places, have made things far more bearable for all.

Reimagining and restructuring cities was crucial to solving the climate challenge puzzle. But further steps had to be taken, which meant that global rewilding efforts had to reach well beyond the cities. The forest cover worldwide is now 50 percent, and agriculture has evolved to become more tree-based.[3] The result is that many countries are unrecognizable, in a good way. No one seems to miss wide-open plains or monocultures. Now we have shady groves of nut and fruit orchards, timberland interspersed with grazing, parkland areas that spread for miles, new havens for our regenerated population of pollinators.[4]

Luckily for the 75 percent of the population who live in cities, new electric railways crisscross interior landscapes. In the United States, high-speed rail networks on the East and West Coasts have replaced the vast majority

of domestic flights, with East Coast connectors to Atlanta and Chicago. Because flight speeds have slowed down to increase planes' fuel efficiency, passenger bullet trains make some journeys even faster and with no emissions whatsoever.[5] The U.S. Train Initiative was a monumental public project that sparked the economy for a decade. Replacing miles and miles of interstate highways with a new transportation system created millions of jobs—for train technology experts, engineers, and construction workers who designed and built raised rail tracks to circumvent floodplains. This massive effort helped to reeducate and retrain many of those displaced by the dying fossil fuel economy. It also introduced a new generation of workers to the excitement and innovation of the new climate economy.

Running parallel to this mega public works effort was an increasingly confident race to harness the power of renewable sources of energy. A major part of the shift to net-zero emissions was a focus on electricity; achieving the goal required not only an overhaul of existing infrastructure but also a structural shift. In some ways, breaking up grids and decentralizing power proved easy. We no longer burn fossil fuels. There is some nuclear energy in those countries that can afford the expensive technology,[6] but most of our energy now comes from renewable sources like wind, solar, geothermal, and hydro. All homes and buildings produce their own electricity—every available surface is covered with solar paint that contains millions of nanoparticles, which harvest energy from the sunlight,[7] and every windy spot has

a wind turbine. If you live on a particularly sunny or windy hill, your house might harvest more energy than it can use, in which case the energy will simply flow back to the smart grid. Because there is no combustion cost, energy is basically free. It is also more abundant and more efficiently used than ever.

Smart tech prevents unnecessary energy consumption, as artificial intelligence units switch off appliances and machines when not in use. The efficiency of the system means that, with a few exceptions, our quality of life has not suffered. In many respects, it has improved.

For the developed world, the wide-ranging transition to renewable energy was at times uncomfortable, as it often involved retrofitting old infrastructure and doing things in new ways. But for the developing world, it was the dawn of a new era. Most of the infrastructure that it needed for economic growth and poverty alleviation was built according to the new standards: low carbon emissions and high resilience. In remote areas, the billion people who had no electricity at the start of the twenty-first century now have energy generated by their own rooftop solar modules or by wind-powered minigrids in their communities. This new access opened the door to so much more. Entire populations have leaped forward with improved sanitation, education, and health care. People who had struggled to get clean water can now provide it to their families. Children can study at night. Remote health clinics can operate effectively.

Homes and buildings all over the world are becoming self-

sustaining far beyond their electrical needs. For example, all buildings now collect rainwater and manage their own water use. Renewable sources of electricity made possible localized desalination, which means clean drinking water can now be produced on demand anywhere in the world. We also use it to irrigate hydroponic gardens, flush toilets, and shower.[8] Overall, we've successfully rebuilt, reorganized, and restructured our lives to live in a more localized way. Although energy prices have dropped dramatically, we are choosing local life over long commutes. Due to greater connectivity, many people work from home, allowing for more flexibility and more time to call their own.

We are making communities stronger. As a child, you might have seen your neighbors only in passing. But now, to make things cheaper, cleaner, and more sustainable, your orientation in every part of your life is more local. Things that used to be done individually are now done communally—growing vegetables, capturing rainwater, and composting. Resources and responsibilities are shared now. At first you resisted this *togetherness*—you were used to doing things individually and in the privacy of your own home. But pretty quickly the camaraderie and unexpected new network of support started to feel good, something to be prized. For most people, the new way has turned out to be a better recipe for happiness.

Food production and procurement are a big part of the communal effort. When it became clear we needed to revolutionize industrialized farming, we transitioned quickly to

regenerative farming practices, mixing perennial crops, sustainable grazing, and improved crop rotation on large-scale farms, with increased community reliance on small farms.[9] Instead of going to a big grocery store for food flown in from hundreds, if not thousands, of miles away, you buy most of your food from small local farmers and producers. Buildings, neighborhoods, and even large extended families form a food purchase group, which is how most people buy their food now. As a unit they sign up for a weekly drop-off, then distribute the food among the group members. Distribution, coordination, and management are everyone's responsibility, which means you might be partnered with a downstairs neighbor for distribution one week and your upstairs neighbor the next.

While this community approach to food production makes things more sustainable, food is still expensive, consuming up to 30 percent of household budgets, which is why growing your own is such a necessity.[10] In community gardens, on rooftops, at schools, and even hanging from vertical gardens on balconies, food sometimes seems to be growing everywhere.

We've come to realize, by growing our own, that food is expensive because it *should* be expensive—it takes valuable resources to grow it, after all. Water. Soil. Sweat. Time.[11] For that reason, the most resource-depleting foods of all—animal protein and dairy products—have practically disappeared from our diets.[12] But the plant-based replacements are so good that most of us don't notice the absence

of meat and dairy. Most young children cannot believe we used to kill any animals for food. Fish is still available, but it is farmed and yields are better managed by improved technology.[13]

We make smarter choices about bad foods, which have become an ever-diminishing part of our diets. Government taxes on processed meats, sugars, and fatty foods helped us reduce the carbon emissions from farming. The biggest boon of all was to our collective health. Thanks to a reduced number of cancers, heart attacks, and strokes, people are living longer, and health services around the world cost less and less. In fact, a huge portion of the costs of combating climate change were recuperated by governments' savings on public health.[14]

Along with outrageous spending on health care, gasoline and diesel cars are also anachronisms. Most countries banned their manufacture in 2030,[15] but it took another fifteen years to get internal combustion engines off the road completely. Now they are seen only in transport museums or at special rallies where classic car owners pay an offset fee to drive a few short miles around the track. And, of course, they are all hauled in on the backs of huge electric trucks.

When it came to making the switch, some countries were already ahead of the curve. Technology-driven countries such as Norway and bicycle-friendly nations like the Netherlands managed to impose a moratorium on cars much earlier. Unsurprisingly, the United States had the hardest

time of all. First, it restricted their sale, and then it banned them from certain parts of cities—Ultra Low Emission Zones.[16] Then came the breakthrough in the battery storage capacity of electric vehicles,[17] the cost reductions that came from finding alternative materials for manufacture, and finally the complete overhaul of the charging and parking infrastructure.[18] This allowed people easier access to cheap power for their electric vehicles. Even better, car batteries are now bidirectionally connected with the electric grid, so they can either charge from the grid or provide power to the grid when they aren't being driven. This helps back up the smart grid that is running on renewable energy.

The ubiquity and ease of electric vehicles were alluring, but satisfaction of our appetite for speed finally did the trick.[19] Supposedly, to stop a bad habit you have to replace it with one that is more salubrious or at least as enjoyable. At first China dominated the manufacture of electric vehicles, but soon U.S. companies started making vehicles that were more desirable than ever before. Even some classic cars got an upgrade, switching from combustion to electric engines that could go from zero to sixty mph in 3.5 seconds.[20] What's strange is that it took us so long to realize that the electric motor is simply a better way of powering vehicles. It gives you more torque, more speed when you need it, and the ability to recapture energy when you brake, and it requires dramatically less maintenance.

As people from rural areas moved to the cities, they had less need even for electric vehicles.[21] In cities it's now easy to

get around—transportation is frictionless. When you take the electric train, you don't have to fumble around for a metro card or wait in line to pay—the system tracks your location, so it knows where you got on and where you got off, and it deducts money from your account accordingly. We also share cars without thinking twice. In fact, regulating and ensuring the safety of driverless ride sharing was the biggest transportation hurdle for cities to overcome. The goal has been to eliminate private ownership of vehicles by 2050 in major metropolitan areas.[22] We're not quite there yet, but we're making progress.

We have also reduced land transport needs. Three-dimensional (3D) printers are readily available, cutting down on what people need to purchase away from home.[23] Drones organized along aerial corridors are now delivering packages, further reducing the need for vehicles.[24] Thus we are currently narrowing roads, eliminating parking spaces, and investing in urban planning projects that make it easier to walk and bike in the city. Parking garages are used only for ride sharing, electric vehicle charging, and storage—those ugly concrete stacking systems and edifices of yore are now enveloped in green. Cities now seem designed for the coexistence of people and nature.

International air travel has been transformed. Biofuels have replaced jet fuel. Communications technology has advanced so much that we can participate virtually in meetings anywhere in the world without traveling. Air travel still exists, but it is used more sparingly and is extremely

costly. Because work is now increasingly decentralized and can often be done from anywhere, people save and plan for "slow-cations"—international trips that last weeks or months instead of days. If you live in the United States and want to visit Europe, you might plan to stay there for several months or more, working your way across the continent using local, zero-emissions transportation.[25]

While we may have successfully reduced carbon emissions, we're still dealing with the aftereffects of record levels of carbon dioxide in the atmosphere. The long-living greenhouse gases have nowhere to go other than the already-loaded atmosphere, so they are still causing increasingly extreme weather—though it's less extreme than it would have been had we continued to burn fossil fuels. Glaciers and Arctic ice are still melting, and the sea is still rising. Severe droughts and desertification are occurring in the western United States, the Mediterranean, and parts of China. Ongoing extreme weather and resource degradation continue to multiply existing disparities in income, public health, food security, and water availability. But now governments have recognized climate change factors for the threat multipliers that they are. That awareness allows us to predict downstream problems and head them off before they become humanitarian crises.[26] So while many people remain at risk every day, the situation is not as drastic or chaotic as it might have been.[27] Economies in developing nations are strong, and unexpected global coalitions have formed with a renewed sense of trust. Now when a popula-

tion is in need of aid, the political will and resources are available to meet that need.

The ongoing refugee situation has been escalating for decades, and it is still a major source of strife and discord. But around fifteen years ago, we stopped calling it a crisis. Countries agreed on guidelines for managing refugee influxes—how to smoothly assimilate populations, how to distribute aid and resources, and how to share the tasks within particular regions. These agreements work well most of the time, but things get thrown off balance occasionally when a country flirts with fascism for an election cycle or two.

Technology and business sectors stepped up, too, seizing the opportunity of government contracts to provide large-scale solutions for distributing food and providing shelter for the newly displaced. One company invented a giant robot that could autonomously build a four-person dwelling within days.[28] Automation and 3D printing have made it possible to quickly and affordably construct high-quality housing for refugees. The private sector has innovated with water transportation technology and sanitation solutions. Fewer tent cities and housing shortages have led to less cholera.

Everyone understands that we are all in this together. A disaster that occurs in one country is likely to occur in another in only a matter of years. It took us a while to realize that if we worked out how to save the Pacific Islands from rising sea levels this year, then we might find a way

to save Rotterdam in another five years. It is in the interest of every country to bring all its resources to bear on problems across the world. For one thing, creating innovative solutions to climate challenges and beta testing them years ahead of using them is just plain smart. For another, we're nurturing goodwill; when we need help, we know we will be able to count on others to step up.

The zeitgeist has shifted profoundly. How we feel about the world has changed, deeply. And unexpectedly, so has how we feel about one another.

When the alarm bells rang in 2020, thanks in large part to the youth movement, we realized that we suffered from too much consumption, competition, and greedy self-interest. Our commitment to these values and our drive for profit and status had led us to steamroll our environment. As a species we were out of control, and the result was the near-collapse of our world. We could no longer avoid seeing on a tangible, geophysical level that when you spurn regeneration, collaboration, and community, the consequence is impending devastation.

Extricating ourselves from self-destruction would have been impossible if we hadn't changed our mindset and our priorities, if we hadn't realized that doing what is good for humanity goes hand in hand with doing what is good for the Earth. The most fundamental change was that collectively—as citizens, corporations, and governments—we began adhering to a new bottom line: "Is it good for humanity whether profit is made or not?"

The climate change crisis of the beginning of the century jolted us out of our stupor. As we worked to rebuild and care for our environment, it was only natural that we also turned to each other with greater care and concern. We realized that the perpetuation of our species was about far more than saving ourselves from extreme weather. It was about being good stewards of the land *and* of one another. When we began the fight for the fate of humanity, we were thinking only about the species' survival, but at some point, we understood that it was as much about the fate of *our humanity*. We emerged from the climate crisis as more mature members of the community of life, capable not only of restoring ecosystems but also of unfolding our dormant potentials of human strength and discernment. Humanity was only ever as doomed as it believed itself to be. Vanquishing that belief was our true legacy.

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You are our past, our present, and our future.

NOTES

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1. CHOOSING OUR FUTURE

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