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Thanks For the Ride, Dinosaurs

Science, Politics, Growth, and Justice

We have had an amazing ride on the backs of dinosaurs for about 200 years now, but it's clearly time to say thanks and get off. Our addiction to fossil fuels is literally driving us down the road to species extinction—our own included. We need to put the brakes on *now*.

We can point to the development and use of fossil fuels—coal, oil, and gas—as the spark that launched the Industrial Revolution, modern growth and development. Fossil fuels helped our species advance and progress at a pace unseen previously in human history. They propelled the United States, Canada, and most European countries to positions of power and modernization that benefited their citizenry and helped drive advances in science, technology, and medicine, helping people the world over.

However, science is now helping us understand and see the invisible atmospheric and down-to-earth damages and destruction that our reliance on fossil fuels has caused. Continuing the use of these fuels, unchecked, will drive climate chaos forward with a speed and pace also unseen previously in human history, or in the history of our planet, period. Digging deep into our planet's surface, dredging and extracting what time and Mother Earth have successfully buried for eons, has proven to be a deadly problem—certainly not the long-term solution first imagined.

And yet, it seems we can't let go.

Many governments, banks, pension funds, and stock markets around the world are continuing to find ways to subsidize and fund new and innovative methods of extending the lifeline of fossil fuels, ensuring their continued dominance and further expansion. When conventional drilling seemed to have reached its peak around the early 2000s, new forms of fossil fuel extraction were developed, including horizontal fracturing, or fracking. Fracking is a method of extracting oil or gas that involves extensive drilling—sometimes vertical miles underground and then miles horizontally. Chemicals and fluids are then forced down these drill holes, under pressure, fracturing the shale deposits that hold small deposits of oil and gas. These dregs—buried deep underground—are pulled out so that they themselves, and the other *travelers*[1] that come to the surface with them, can poison our water, our air, and us. In 2005, the US government created exemptions under the Clean Air Act and the Clean Water Act for oil and gas companies so that the fracking boom could expand in earnest. If these companies actually had to *clean up their messes*—something we teach our children from a young age—they would no longer be in business.

Another interesting way to account for our current mess is to consider attribution: who is actually creating the mess in the first place? According to the Climate Accountability Institute (CAI), *nearly two-thirds of carbon dioxide emitted since the 1750s can be traced to just 90 companies* that hail primarily from the fossil fuel and cement industries. The CAI research aggregates historical emissions to "carbon-producing entities." Rather than attributing emissions to nations—or individuals like you or me—their work identifies the direct source.[2]

So, while we agonize over our use of a plastic straw, reducing our meat consumption, or taking one less trip to see our children living on the opposite coast—90 companies producing, using and extracting fossil fuels are primarily responsible for changing our atmosphere and perpetuating our climate emergency. Clearly, this attribution method is only one way of partitioning blame. We are all addicted to fossil fuels; getting rid of their use isn't going to be

simple or easy. Fossil fuels have permeated almost everything we do, and they are the building blocks of many of the items we use daily. However, if we can get even half of these 90 companies on board to work on climate solutions, cleaning up our mess seems that much more doable.

A 2019 report by the International Monetary Fund showed that worldwide subsidies for fossil fuels were in excess of $5.2 trillion—or over 6% of worldwide GDP.[3] The report states, "Efficient fossil fuel pricing in 2015 would have lowered global carbon emissions by 28 percent and fossil fuel air pollution deaths by 46 percent, and increased government revenue by 3.8 percent of GDP." This, as my kids used to say, "seems like a no brainer." If we just let the market dictate the price, the dominance of fossil fuels would begin a rapid decent. Yet fossil fuel subsidies actually *increased* from 2015 to 2017. Clearly, these large corporations don't have incentives to slow down or change what they are doing. Rather, *business as usual* is supported and encouraged.

The good news is that there is a direct role each of us can play in speeding up our transition to renewable energy and away from fossil fuels. For example, instead of voting for representatives who create incentives or subsidies that perpetuate our use of fossil fuels, or instead of putting your money in banks that fund or invest in fossil fuel development and its infrastructure, choose to support and elect representatives who are working on solutions to the climate crisis, and put your money into banks that are doing the same. Do your homework. Read your bank's annual report. Check your representatives' voting record, and ask them directly what their position is on fossil fuel use versus renewable energy. They need to have more than an opinion; they need to have a plan and a timetable for implementing it.

David Brower, founder of Friends of the Earth and co-founder of the League of Conservation Voters, is often called the father of the modern environmental movement. A New Year's Eve story he is credited with telling puts the history of our planet into just one short year. Reminding ourselves how fleeting our time on our planet

has actually been, and the terrifyingly destructive reality of our accomplishments—enacted in the blink of an eye—puts in perspective how truly precarious this tightrope we are walking really is:

> January 1st marks the origin of Earth. By the end of February, the first simple cells appear. All the way through the spring and early summer, simple plants enrich the atmosphere with oxygen.
>
> Around mid-August, complex cells emerge, and coral appears in the ocean. Beginning in mid-November, the oceans fill with multicellular life-forms. In the last few days of November, freshwater fish appear, and the first vascular plants begin to grow on land.
>
> About December 1st, amphibians venture onto dry land. The great swamps that formed today's rich coal beds existed between December 5th and 7th. On December 12th the largest of the Earth's mass extinctions wipes out 95% of all species.
>
> Life bounces back, and dinosaurs evolve on December 13th. Flowering plants come on the scene on December 20th. In another great extinction, the dinosaurs disappear shortly before midnight on December 26th, opening a space for modern mammals to emerge on the 27th.
>
> On the evening of December 31—about when you might gather with friends for the evening's celebration—the first hominids evolve in East Africa.
>
> At 10 minutes to midnight on December 31st—about when all the New Year's party-goers are really starting to watch the clock—Neanderthals spread throughout Europe.
>
> At one minute to midnight, agriculture is invented. The Roman Empire fills 5 seconds, and collapses at 11:59:50—the moment when the New Year's ball starts to slide down the pole at Times Square, and the great 10-second countdown begins.
>
> In the last 2 seconds before midnight, we enter the modern industrial era. In those last two seconds we find the explosive growth of the human population, the rise of complex

> technologies, and what we might call a globalized human culture."[4]

The entire history of the United States fits into the last second of this narrative. The "petroleum era" of cheap and plentiful energy is crammed into the last half of a second, as we're holding a deep breath, ready to shout our start-of-a-new-year greetings. The fireworks start as our dash through Earth's history brings us to the current moment.

Time flies.

Science

Climate crisis headlines, circa early 2000s:

- Giant African Baobab Trees Die Suddenly After Thousands of Years, Scientists Link to Climate Change
- The Great Barrier Reef Is Being Battered by Climate Change, More Than Half Has Bleached and Died
- Deaths in Puerto Rico from Hurricane Maria in 2017 Equal or Exceed Those That Died on 9/11
- Earth's 6th Mass Extinction of Species Has Begun, Also Threatening Global Food Supply
- Zika Spreads Silently Up and Down the Coasts of the United States
- The Growing Area for Coffee Beans Is Shrinking and the Coffee Plant's Existence Is Threatened
- Worldwide, Climate Scientists Agree That If Greenhouse Gas Emissions Are Not Dramatically Decreased by 2030, Irreversible and Catastrophic Changes to the Planet Will Be Locked into Place
- In 2019 US Midwest Farmers Lose Most of Their Crops to Unrelenting Rains; Food Security in Many Parts of the US and in Export Markets Around the World Faces Serious Challenges
- Beginning in 2019, Power Utilities in California Regularly Put in Place Rolling Brown Outs As Dry Conditions and Possible Electric Sparks Spread Fear of Devastating Wildfires

- More Than 600 Million Indians Are under Conditions of Extreme-Water Stress and 21 Indian Cities Are Predicted to Run out of Water by 2020

And these are just a few of the headlines I could list.

Scientists have known for more than 100 years, and fossil fuel companies have been aware for decades, about the linkages between the burning of fossil fuels and the creation of a chaotic climate system. When I inform students in my Climate Policy and World Sustainability classes that scientists began explaining the greenhouse effect almost 200 years ago, and that scientific analysis and early understanding of the impacts from human-created greenhouse gases goes back nearly as long, they are both surprised and shocked. They ask me if these facts are purposefully hidden. They question why this information is downplayed and kept out of the public consciousness. And they demand to know why, if we know what we know, we aren't taking drastic measures.

In 1965, Frank Ikard, then-president of the American Petroleum Institute, stated the following:

> One of the most important predictions of the report[5] is that carbon dioxide is being added to the Earth's atmosphere by the burning of coal, oil, and natural gas at such a rate that by the year 2000, the heat balance will be so modified as possibly to cause marked changes in climate beyond local or even national efforts.

Earth is sometimes called the *goldilocks* planet, or the *just right* planet. Our complex home is regulated and controlled by a climate system developed over billions of years that has fostered the growth and development of millions of amazing species, including our own. As of late, particularly over the past 200 years as we have begun amplifying nature's impacts by creating our own greenhouse gases, we have tipped this delicate balance, as more and more solar radiation is trapped within our atmosphere.

Notable scientific advancements leading to and explaining the linkages between climate change and human activities:

- **1824:** Joseph Fourier (France), mathematician, works on heat transfer; credited with earliest research and discovery of greenhouse effect.
- **1856:** Eunice Foote (US)[6] studies long-term changes in atmospheric carbon dioxide levels and their effect on temperature of the Earth. Her paper was presented at the 8th Annual Meeting of the American Association for the Advancement of Science.
- **1859:** John Tyndall (Ireland) conducts detailed experiments on radiative forces of certain gases. Shares proof with the world that greenhouse gases can impact the Earth's temperature. Tyndall is widely credited as the first to prove this theory.
- **1896:** Svante Arrhenius (Sweden) connects the dots between increases in carbon dioxide from human emissions in our atmosphere and climate change.
- **1938:** G.S. Callendar (England), engineer and inventor, links rising carbon dioxide to temperature rise and greenhouse effect, renewing scientific interest in connections to human impacts.
- **1957:** Roger Revelle (US) publishes paper that links increased carbon dioxide in the air to fossil fuel use. Dominant figure for many years on connecting these dots and recognizing their ramifications.
- **1958:** Charles David Keeling (US) developed and established recording instruments on the Hawaii Mauna Loa volcano, measuring CO_2 in the atmosphere. This remains the longest consecutive measurement of atmospheric CO_2, providing definitive proof of rising CO_2 levels.
- **1959:** Edward Teller (Hungary/US), physicist. In a speech at the 100th anniversary party of the American Oil industry, he stated,

> At present the carbon dioxide in the atmosphere has risen by 2 per cent over normal. By 1970 it will be perhaps 4 per cent, by 1980, 8 per cent, by 1990, 16 per cent [about 360 parts per million], if we keep on with our exponential rise in the use of purely conventional fuels. By that time, there will be a serious additional impediment for the radiation leaving the earth. Our planet will get a little warmer. It is

> hard to say whether it will be 2 degrees Fahrenheit or only one or 5. But when the temperature does rise by a few degrees over the whole globe, there is a possibility that the icecaps will start melting and the level of the oceans will begin to rise.[7]

- **1965:** Edward Lorenz (US), early computer model developer working at the intersection of math and meteorology. He developed early models that looked at the chaotic nature of the climate system and the possibility of sudden shifts.
- **1969:** Mikhail Budyko (Russia) and William Sellers (US) in separate studies presented models of catastrophic ice-albedo feedbacks. Sellers wrote, "The major conclusions of the analysis are that man's increasing industrial activities may eventually lead to the elimination of the ice caps and a global climate much warmer than today."[8]
- **1972:** Club of Rome report, *Limits to Growth* identified and measured global challenges facing humanity, including limits to natural resources and the environment.
- **1975:** Independent studies find that CFCs and also methane and ozone can make a serious contribution to the greenhouse effect.
- **1977:** Exxon's scientists report to top executive management committee that emerging science shows carbon dioxide levels were rising—likely driven by fossil fuel use—and that such increases would increase global temperatures, leading to widespread damage.
- **1979:** US National Academy of Sciences report finds it highly credible that doubling CO_2 will bring about 1.5–4.5°C of global warming.
- **1985:** Expert consensus is reached during a conference in Villach, Austria, on the expanding depletion of the ozone layer and the unprecedented increases in greenhouse gases. Villach is seen as the first cohesive scientific call for governments to consider international agreements to restrict emissions.
- **1987:** Montreal Protocol of the Vienna Convention imposes international restrictions on emission of ozone-destroying gases.

- **1988:** James Hansen (US), NASA scientist, testifies before US Congress that, with 99% certainty, warming of Earth's atmosphere and buildup of greenhouse effect is caused by the buildup of carbon dioxide and other human-created greenhouse gases in the Earth's atmosphere.
- **1990:** The first report of the United Nations International Panel on Climate Change (IPCC) states that the planet has been warming, and future warming seems likely. Industry lobbyists and some scientists dispute the tentative conclusions.
- **1992:** The United Nations Environment and Development Conference, or Earth Summit, was the largest world gathering to that date of heads of state on the environment. It established international mechanisms and bodies to monitor and discuss the ongoing climate crisis.

Fossil fuel companies had actual knowledge of the risks of their products and had taken proactive steps to conceal their knowledge and discredit climate science while at the same time taking steps to protect their own assets from the impacts of climate change… beginning as far back as 1959.

—Rhode Island Senator Sheldon Whitehouse, March 5, 2019

The science has been clear for decades. With each passing month and year, there are more and more peer-reviewed scientific studies that clearly put the blame for our climate crisis squarely on the shoulders of humankind. In the early decades of the 21st century, the definitive scientific proof seems to slowly have entered the wider public consciousness. At the same time, however, the crisis is accelerating with alarming speed.

Echoing my students, the question remains: "If we have had this knowledge for so long, why haven't we done something?" While this information can be found with ease now, it still remains largely ignored or simply not taught or reported. I remind my students that

the internet and the ease of sharing data and information certainly didn't exist 200 years ago—or even 30 years ago. Web searches also come with the ability to choose the news and the reality we want. We are seeing science and facts questioned on a regular basis. Scientific research is being threatened and tied to a false narrative that our climate crisis isn't as urgent or as present as it really is.

Time flies.

In late 2018, about a month after the release of the IPCC report *Global Warming of 1.5°C*, the "Fourth National Climate Assessment" (NCA) was released. This report was prepared by 13 federal US agencies that make up the US Global Climate Change Research Program. At the request of Congress, these agencies report to Congress and the president every four years on the climate crisis. What both the IPCC report and the NCA tell us, in no uncertain terms, is this: *We are living climate change. It's real, happening and caused by us. It is really bad, and it will get worse. However, if we take serious action, starting now, we can slow things down.*

In large part, because of the burning of fossil fuels, we have *loaded the dice*, setting the stage for storms and extreme weather events to be much worse than they would have been in the absence of human-caused greenhouse gases. We have already witnessed many wildfires, floods, droughts, and other extreme weather events that are much more catastrophic than they have been in the past.

Gaia is a tough bitch—a system that has worked
for over three billion years without people.
This planet's surface and its atmosphere and environment
will continue to evolve long after people
and prejudice are gone.

—Lynn Margulis, biologist and proponent of the Gaia Theory, which says that Earth is a living organism

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Now, when it rains, it pours; when fires burn, they burn hotter and with greater intensity; and when we have storms and hurricanes, they are stronger than storms were in the past.

Politics

Having worked at the United Nations for more than 13 years, I know the alphabet soup of acronyms for United Nations committees, conferences, departments and meetings. It's something you generally have to be inside the organization to fully grasp. Below, as reference and with brief explanations, is a summary of the main United Nations bodies established to oversee international work on climate policy.

The international process of managing and working toward a stable global climate system began in earnest at the United Nations Conference on Environment and Development (UNCED), sometimes also called the Rio Earth Summit, which was held in Brazil in 1992. The conference launched Agenda 21, a global action plan on sustainable development, and the Rio Declaration, which was created to clarify the rights and responsibilities of states on environment and development. In addition, the Statement of Forest Principles was adopted, creating a set of principles to guide the sustainable management of forests. This conference also formally established the United Nations Framework Convention on Climate Change (UNFCCC).[9] The primary goal of the UNFCCC is to prevent dangerous human interference with the climate system. Two other UN conventions were introduced at the 1992 Earth Summit, the Convention on Biological Diversity (CBD), and the Convention to Combat Desertification (CCD). All three of these bodies now have close to 200 national governments as members. Just as the Security Council was created as a forum where nations could come together to guard world peace and prevent war, these forums were created so that governments could come together to discuss critical issues impacting our planet.

The Conference of the Parties (COP) is the decision-making body of the UNFCCC; it meets annually. COP21, the 21st annual Conference of the Parties, was held in Paris, France, in late 2015.

The agreements reached at this COP are colloquially known as the Paris Agreement. This Agreement is widely quoted and touted as a major international achievement on climate. The Paris Agreement was the first formal international agreement since 1992 with near-unanimous recognition that climate change is real, happening, and serious; and with new concrete plans to combat the climate crisis, and halt and reverse greenhouse emissions.

However, it is important to note that the Paris Agreement was (and remains) non-binding; moral suasion and public opinion are the only enforcement mechanisms. Each country came to Paris with its own plan on how it would reduce its national greenhouse gas emissions. Some countries also shared climate adaptation goals as well. Each country established its own plan, with no international input. This country plan, formally called an Intended National Contribution (INDC), was and is meant to be tightened every five years, by each individual country. There is no formal enforcement mechanism in place to make this happen. Currently, the United States, which did sign the Paris Agreement, is the only country to indicate it plans to pull out of the Paris Agreement.

The broad goal of the Paris Agreement is to keep world temperatures below a 2°C increase above pre-industrial levels, with an aspirational goal of 1.5°C degrees. It remains well recognized that even 1.5°C will render many small island states uninhabitable because of sea level rise and will wreak havoc on the shores of many countries, devastating many of the world's largest cities.

The first formal stocktaking of progress on country goals, or INDCs, will take place in 2023 and every five years thereafter. Each signatory country to the Paris Agreement has committed to tighten their goals regularly. The Paris commitments, established in 2015, are not stringent enough to keep temperatures below a 2°C increase; much greater and faster reductions are required if the 2°C goal is to be met. Only time will tell if countries are willing and able to make these commitments.

The Paris Agreement was the first collective attempt by each country in the world—developed and developing—to publicly commit to significant greenhouse gas reductions. Like most countries', the United State's commitments under the Paris Agreement were

modest, at best. President Obama knew he could not get a more significant agreement passed by Congress. President Trump has promised to remove the US from the Paris Agreement; immediately upon taking office, he began to roll back many of the Obama administration commitments under the Agreement. Formally, the US cannot leave the Paris Agreement until the day after the 2020 US elections. Interestingly enough, the US is on track to meet and even exceed its modest Paris commitments by the first stock taking in 2023. This is because many US states, cities, and corporations have stepped up to dramatically reduce their own emissions, keeping the US on the Paris commitment track.

Having spent many years at the United Nations, and now watching the US move to a more and more isolationist position, I clearly see the diminishing role and relevance of the United States on the world stage. Since the Second World War, the weight and power of the US as the world's first and most powerful superpower—both in military might and moral suasion—has been undeniable. But as the US, under President Trump, pulls our country into isolationist positions across many fronts, our control on the rudder and steering wheel of international climate policy is being overtaken by our own subnational governments and corporations, and by countries and regions beyond our borders. In the absence of strong US national leadership, this is a good thing. The world needs a strong international coalition to lead and prepare for what is ahead, a coalition led by national governments aggressively moving forward on climate goals and actions, where all parties are all in, with both feet.

From my vantage point as a new American (I became a US citizen in 2006), the hyper-partisan politics of the United States is more than a little overwhelming. Yet, when we look back into US history, hyper-partisanship isn't something new, nor is it something we should be surprised or shocked by. Democracies are fragile the world over, including in the United States. They need to be tended and cared for in strangely similar ways to how we would tend and care for a garden. Currently, in the United States we are not tending our garden, and it is becoming overgrown with weeds.

I didn't really understand how fragile the democracy in the US was or could be when I voted in my first presidential election in

2008. As I watched the first bi-racial president in US history come to power, I thought democracy ran deep and strong within the borders and boundaries of the United States of America. I listened intently to President Obama's inspiring and hopeful speeches, and anything and everything seemed possible, including finally addressing the climate crisis with the urgency that we knew was required.

Unless we free ourselves
from a dependence on these fossil fuels…
we are condemning future generations
to global catastrophe.

—Barack Obama, 44th president of the United States

President Obama used variations of this quote in numerous speeches in the lead-up to his election in 2008. He spoke regularly about our climate crisis and the need to solve it. President Obama definitely talked the talk. His 2008 campaign slogan was "Hope and Change." *If only* the slogan had been "Hope and *Climate* Change!" Had President Obama tackled our climate crisis directly—and during his first term—we might be in a different situation than the one we find ourselves facing today. Instead, he took on our climate crisis in earnest only in the last two years of his second term. It seemed to me he finally began to walk the walk only at that point—even as a divisive Congress held one hand behind his back.

If only.

We can't go backward; we can only go forward. We can't undo the mistakes we made, but we can commit to not making the same mistakes in the future. And we need to stop looking for one solution and one answer. There isn't just one; nor is there a linear way to move forward. The scope of our climate crisis is too deep and the impacts too powerful. Hope and change can and must rest on a million ripples.

A primary target to be forcefully reckoned with continues to be the powerful fossil fuel industry and lobby. Curtailing this industry

and then helping it, if possible, to see the light, so it can begin in earnest to transition to and help build up the renewable energy industry, also requires stopping the spread and growth of new fossil fuel infrastructure. This infrastructure fight came fully into national focus in the United States in 2011 with the No Keystone XL protests. The Keystone XL pipeline project is a proposal to build an oil pipeline from northern Alberta to the Gulf of Mexico. This pipeline would transport Canadian bitumen[10] from its source—the Alberta oil sands—to refineries in the southern US, where it would be processed and then sold on international markets, to be distributed around the world. This pipeline is still not completed.

The 2011 Keystone XL protests resulted in 1,253 arrests in front of the White House. I was one of those arrested. The challenge laid at the doorstep of President Obama was for him to take a stand and say no to this project. Public pressure worked, and President Obama did say no; or at least he said "stop"—for now. In 2011, the same year as these public protests, *National Geographic* ran a feature story titled "Anthropocene: Enter the Age of Man," and a few months later, the world surpassed an incredible milestone: 7 billion people. It seemed for a moment that people sat back, thought, and pondered what our huge human footprint on our planet actually meant.

Yet when we look back now, we know that President Obama saying no to Keystone XL at that point and in the manner it was done, was simply kicking the can down the road. During the Obama presidency, the US began the largest and most expansive period of oil and gas exploration and development in US history. Fracking, born under Bush and Cheney, expanded and spread like wildfire under President Obama. Fracking's deadly infrastructure tentacles, including interstate pipelines, gathering lines, compressor stations, power plants and metering stations, began in earnest to grasp, grab, and strangle neighborhoods and towns all across the country. The *all-of-the-above* energy policy pursued by the Obama administration under the guise of energy independence solidified the strength and power of the oil and gas industry—bringing us that much closer to the edge of the climate cliff.

Significant pressure from oil and gas companies was exerted on the Obama administration, and it continues to be exerted in Washington and in state houses across the country today. Many millionaires have been created as Wall Street pushed fracking and its infrastructure forward; money continues to be made. Some of the biggest banks in the world continue to invest heavily in fossil fuel exploration and development and fossil fuel infrastructure.[11] This has to stop. At the same time, fossil fuel companies and their lobbyists continue to push back on the growing scientific evidence about the damages that fracking, specifically, and fossil fuels, more broadly, are causing to our water, our air, and our health, and their role in accelerating our climate emergency.

Harnessing the energy from the sun, the waves, and the wind—in a way that is scalable and renewable—is within our grasp. But it will require decades of hard work to consciously and intentionally make this transition. Success will be defined by bringing along everyone; we can't succeed if winners are picked and losers are cast aside. If we use our brains and well thought-through policies, if we understand truly what is needed—success is eminently doable. Mother Nature already provides renewable energy—cost and pollution free.

Before and during the Obama era, the science generally (and, more specifically, the building body of research on the causes and the seriousness of our climate crisis) was accepted and acknowledged by the vast majority of governments around the world, even if most weren't acting with the urgency required. Our lives seem long, and the rapid changes to our planet still seem to be unfolding in slow motion. Yet our ability to change the future is quickly moving beyond our control.

A new and unanticipated roadblock to swift action on the climate emergency is the discounting of proven science by the Executive Office of the US presidency. In addition, numerous departments of the US national government, including the Environmental Protection Agency and the Departments of Interior, State, and Energy under the Trump presidency, regularly counter and sow doubt and confusion about accepted climate science. A glaring indication of

how science is being threatened was the issuance of a joint statement in June 2019,[12] by the US National Academies Presidents of Sciences, Medicine, and Engineering:

> We are speaking out to support the cumulative scientific evidence for climate change and the scientists who continue to advance our understanding. Scientists have known for some time, from multiple lines of evidence, that humans are changing Earth's climate, primarily through greenhouse gas emissions. The evidence on the impacts of climate change is also clear and growing. The atmosphere and the Earth's poles are warming, the magnitude and frequency of certain extreme events are increasing, and sea level is rising along our coasts.

These straightforward facts have been acknowledged and accepted for decades. Yet, the fact that Presidents of the United States National Academies of Science, Medicine, and Engineering felt concerned enough about the clouding of truth to issue this statement in 2019 speaks volumes about how the reality of our climate crisis has been politicized and is now being viewed through a partisan lens. It would seem impossible to be any more direct, clear, or unambiguous on the causes and impacts of climate change. We must break this cycle of climate denial, take back reality, and demand that everyone—regardless of political party—act on our climate crisis with the urgency it demands.

Growth

Our modern society is built on the model of upward growth—quarterly earnings, Gross Domestic Product (GDP) assessments, and a constant drumbeat that *if we aren't growing, we aren't succeeding*. This model, like fossil fuels and dinosaurs, had its place in our history, but it doesn't fit any more. Today, this model has contributed to massive income inequality, destruction and mismanagement of our natural resources, and the perpetuation of our climate emergency.

Wisdom often comes with the benefit of age, experience, and hindsight. Our current model for a healthy and productive society is

built on an equation that factors in only a nation's public consumption expenditures; gross private domestic investment; government consumption, expenditures, and investment; and the net export of goods and services. This GDP measurement relies on constant growth to signify improvement. Yet, as world population rapidly expands (with predictions of more than 9 billion people on the planet by 2050), we can no longer continue to use and abuse our planet's resources without significant consequences. Our current model is outdated and not sustainable.

English economist Kate Raworth has asked us to consider her theory of *doughnut economics*, whereby the doughnut is "based on the powerful framework of planetary boundaries but adds to it the demands of social justice—and so brings social and environmental concerns together in one single image and approach. It also sets a vision for an equitable and sustainable future, but is silent on the possible pathways for getting there, and so the doughnut acts as a convening space for debating alternative pathways forward."[13]

Raworth compares unending GDP growth to metastatic cancer. Cancer thrives on the constant growth and multiplying of cells that ultimately destroy their host. She reminds us that there is a growing school of economic thought that is studying the concept and demand for constant growth based on resource extractive industries that treat our planet as a 24/7 dollar store. This research is coalescing around the conclusion that the concept of constant growth is killing our planet and, by extension, us. Therefore, we need new, holistic, and broadly accepted sustainable developments models to follow, grow, and emulate across the globe.

An interesting model to keep an eye on is the 2019 New Zealand *well-being* budget. The budget requires that all new spending go toward five specific well-being goals:

- bolstering mental health
- reducing child poverty
- supporting indigenous peoples
- moving to a low-carbon-emission economy
- flourishing in a digital age

To measure progress toward these goals, New Zealand will use 61 indicators tracking everything from loneliness to trust in government institutions, alongside more traditional issues like water quality. These ideas build on the 1972 Club of Rome report *Limits to Growth*, which measured the use and abuse of natural resources and the environment. The report brought into focus the dangerous path that the world was traveling on, a path built on mass consumption and unending growth. The report made the prediction that our business-as-usual track would result in overshoot and global economic collapse by 2100. Today, almost 50 years later, many of the report's predictions ring true.

An early United Nations metric that set the stage for new measurements for growth was the 1990 United Nations Human Development report. It was revolutionary for its time, showcasing ways for "expanding the richness of human life, rather than simply the richness of the economy in which human beings live." It was and is an approach that focuses on people and their opportunities and choice.

Following along from these earlier metrics, in 2009, the Stockholm Resilience Centre, in cooperation with a team of international scientists, launched the concept of nine planetary boundaries within which managed growth could happen. The premise is that as long as humans remain within these boundaries, life on Earth will continue to function. However, passing through even a few of these nine boundaries could put the planet out of balance, and, in the worst case, create an unsustainable home for human beings.[14]

Other examples of thinking outside the GDP-growth-model include

- Bhutan's Gross National Happiness (GNH) Index[15]
- The 2011 OECD member state well-being report: "How's Life"[16]
- The United Nations annual "World Happiness Report"

One of the newest models for sustainable growth that is attracting a lot of international attention is the United Nations Sustainable Development Goals. Adopted in 2015, these 17 goals "provide a

shared blueprint for peace and prosperity for people and the planet, now and into the future. They recognize that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth—all while tackling climate change and working to preserve our oceans and forests."

Throughout human history, human advancement has been brought forward through change; the constant in our lives and our history is that things don't stay the same. For many people the world over, the idea of constant growth and change equates to increased wealth. But we are now hearing from scientists across a wide range of disciplines, Indigenous peoples from around the world, and religious leaders and ethicists, all of whom are reminding us of a similar prediction: money on a dead planet is just paper and metal. Money will not save or help anyone, and, unless we change our current predominate GDP model of growth, our planet will no longer be able to sustain us.

Corporate Control

We can't minimize the urgency with which we must act. Clearly, we must do everything and do it with extreme haste. Yet, emphasis on personal actions alone is at best naïve, and, to me, it seems to have been embedded in our lives—with sinister intent. The weight of the world is being placed unfairly and squarely on our shoulders, often by the very companies and government officials that could and should be taking on these massive problems directly and urgently themselves. Instead, they are perversely placing these heavy loads on us. They call for actions by individuals that are too much to bear and impossible to achieve given the immensity and urgency of the crisis we face.

In 1953, the Keep America Beautiful (KAB) campaign was launched in the United States to encourage people to *promote a national cleanliness ethic*, based largely on taking personal responsibility for waste. Reduce, Reuse and Recycle become the mantra—one that is still repeated widely and loudly today. Many of the KAB campaign's original corporate founders were from the beverage

and packaged goods industries: Philip Morris, PepsiCo, Anheuser-Busch, and Coca Cola. Today, the board of directors of KAB includes many of these same companies, including executives from Keurig, Dr. Pepper, McDonalds, Coca-Cola, Dow, Mars Wrigley, and the American Chemistry Council.

Think about this for a moment.

Beverage and packaging companies began to expand globally just as plastics entered the scene, causing costs to go down as manufacturers transitioned from recyclable and reusable glass and aluminum containers to cheap, single-use plastic containers. Marketing teams arrived at a creative and powerful way to keep costs low—pass on the disposal and recycling of these items to the consumer. Clearly a genius idea, it put the onus on the consumer and made them think it's not only their responsibility but their patriotic and ethical duty to keep the country tidy and clean.

The cost of recovering, reusing, and recycling single-use plastic isn't ordinarily factored into their price. This is how single-use items are kept cheap and accessible. For more than 60 years, the ad campaigns encouraging us to "Keep America Beautiful" have been widely successful. Purchaser beware. You aren't just getting a minute of hydration from that plastic bottle of water; that package in your hand is now *your* responsibility. Find a place to recycle it, or throw that container in the garbage and feel guilty—it's up to you. As it now turns out, facilities to recycle single-use plastics are few and becoming fewer. In 2018, many of our normal recycling venues—plants that had been moved not only out of sight but across the oceans to China, Vietnam, and other Asian countries—stopped taking recyclables from most developed countries. These Asian countries put up *closed* signs and suggested we clean up our own mess. As Canada, the United States, and many European countries scramble to figure out new outlets and economical ways to recycle, Asian and African countries are saying with increasing authority: *stop sending us your garbage!*

In a similar way and with similar ad campaigns, we have been convinced by fossil fuel companies that it's okay if they produce products that cause immense global pollution impacting our health

and our planet's health. We have accepted, consciously or subconsciously, that the onus to reduce, reuse, and clean up the messes their products cause has been transferred to us.

The use and burning of coal, oil, and gas creates greenhouse gases and pollutes air and water; this is a fact. For a variety of reasons, however, the responsibility for addressing the damages these gases generate, including the health impacts of hospital visits and the treatment of chronic diseases like asthma, certain forms of cancer and even epigenetic changes (changes to our DNA), are not apportioned; they are just accepted. CO_2 and methane are two of the most damaging greenhouse gases to our atmosphere. Yet, we have allowed our atmosphere to be treated as if it were a giant open sewer, with no collection fees attached. New studies are linking exposures to various types of pollution and stresses, including air pollution and extreme weather, to in vitro damages. Even the place where we consider our children safest is no longer so safe.[17]

Human-created gases have been accumulating in large quantities in our atmosphere, many since the dawn of the Industrial Revolution, and many will linger there for decades and even centuries. For the most part they are odorless and colorless, and their impacts seem dispersed and diffused—out of sight, out of mind. Perhaps, if we colored them pink or purple…?

Think for a moment, about how the emissions emitted from a car ride you took with your grandpa and grandma when you were little are still trapped in our atmosphere, heating up our planet. Like most of us, you probably never gave a second thought to the fact that these gases were being released in the first place, or if you did, it didn't seem like something you had any control over, anyway.

If you have traveled on a river or the ocean for any length of time, you may be familiar with the mantra: *The solution to pollution is dilution*. But at what point does the river, ocean, or our atmosphere reach its saturation point, where dilution can no longer solve or hide a growing and dangerous problem? This point has been reached by our atmosphere, and, as a result, our planet is decidedly out of balance. Oil and gas companies have been working covertly, behind the scenes, and directly in front of you, to keep these facts hidden. Campaigns that put that guilt and responsibility on your shoulders are

everywhere: Eat less meat! Use less electricity! Drive less! Fly less! The guilt and burden of greenhouse gas accumulation has become yours to carry.

We must change this.

Putting the onus on each one of us, while hiding the fact that our planet is seriously out of balance and close to spinning out of control, is not just the message of oil and gas companies. Many individuals, corporations, and government officials (for a variety of reasons and beliefs) are working against the inevitable renewable energy transition. They are working overtime to keep things the same—maintaining the status quo—and slowing progress on climate action for as long as they can. Along the lines of the Keep America Beautiful campaign, the concept of shaming or blaming individuals for their personal actions is alive and well.

This blame and shame sometimes comes from the people you might least expect it from, including those deeply involved in the climate movement. Those actively fighting the climate crisis subtly and sometimes overtly place a kind of purity test on one another—pointing fingers at their peers for flying in airplanes, for driving cars, for eating meat, and by doing so, for being less committed than they *should or could be*.

I keep this uncredited post I read some years ago on a friend's Facebook page handy:

> I always have the same internal response, and I usually keep the snarkier parts to myself. But, it goes something like this: "How about I stop breathing air as long as it is dirty? Or maybe I should refuse to go to school or vote or obey traffic lights or pay the electric bill because all of those things are wrapped up in systems of oppression that hurt other people even when they help me."
>
> Here's the thing I often actually say: "I am stuck in this system just as deeply as anybody else, and I could spend all my own time and resources (at whatever levels I have those things) making myself as pure as the driven snow—personally free from the taint of reliance on fossil fuels on almost every part of my life." And by the time I have finished such work,

> I will have wasted months or years of my life trying to make myself above reproach, and everybody else who was stuck in those systems will still be stuck. I will not have developed any power to shift those systems in a meaningful way for a meaningful number of people.
>
> Call me a hypocrite if you want, but I am interested in dismantling the business as usual fossil fuel economy that permeates our lives and tells us that it is useless to imagine another way. I am not interested in achieving my own near perfection so I can look down my nose at you for not coming with me or not having the resources to do the same. This isn't about opting out. This is about building an equitable and livable future.
>
> So, I will do my best to consume less. And you can keep calling me a hypocrite if it makes you feel better. I am about culture-shifting because there is a lot we need to change in the name of justice.

This constantly reminds me that—while doing our best to walk the walk, setting examples for ourselves and others as we reduce our personal footprint—no one is or can be perfect. We need system change at a grand scale. Who has the right or authority to be the judge defining what is the perfect example of individual bests? Having a zero ecological footprint is at odds with being a part of society and living amongst and with community—let's work to make this the norm but recognize, too, that it isn't currently possible in 99% of towns and cities. The problems we face are now so large we desperately need systemic change, and we need this urgently. Lowering our own ecological footprint is clearly something each of us should work toward; however, working for perfection is another thing entirely.

From where I sit, my message on this is: definitely continue to teach your children to recycle, to tread lightly on our planet, and to measure and reduce their personal and your family footprint; this is, and should be, part of our parental responsibilities. However, because society didn't act soon enough, our climate crisis is already

reaching tipping points and points of no return. Bringing our planet back to a state of balance will require collective and societal actions on a global scale. We need policies and laws that will impact us all and move all of us in these directions. We also need laws that require corporations to clean up their own messes rather than pass on their messes to us. At our current individual pace, we will not get to where we need to be in time. But this doesn't mean we should throw up our hands and do nothing. We must and can lead by example. Individual responsibility—changing our habits and reducing our personal footprint—is important. We can all be part of the solution.

Most recently, we've been talking a lot about how the planet has limited resources and how it is the responsibility of us all to use these resources wisely. This can be difficult in practice because it goes against many of the social norms in our community. It means not buying all of the toys that he wants, not distributing goodie bags at the end of birthday parties, and not purchasing plastic bottles in stores. Sometimes I feel like a Scrooge, but I want him to grow up with a realistic picture of what I believe the world will look like in the future. A world where resources are valued and protected, where we will buy less, buy used, and where sharing and repairing are common practices. I don't want him to look back at this age as the time when he had everything and then one day it all disappeared. Instead, I want him to learn to appreciate what he has, but also value time, friendships, family, public spaces, and nature. I want him to learn that life can be meaningful and rich without so many material items.

—Jill Kubit

These nuanced concepts are ones that for many of our children will be difficult and perhaps impossible to fully explain. For many of us,

they are hard to come to grips with. So do continue to teach and model by setting positive examples. Talk about climate change as you show your children you are taking steps to reduce your family's footprint; and work actively on explaining, activating and demanding transformational, societal change.

Justice

A just path forward, climate, and environmental justice—these are words used and heard often. What do they actually mean? According to the Climate Justice Alliance, a just transition is "a vision-led, unifying and place-based set of principles, processes and practices that build economic and political power to shift from an extractive economy to a regenerative economy. This means approaching production and consumption cycles holistically and waste free. The transition itself must be just and equitable; redressing past harms and creating new relationships of power for the future through reparations. If the process of transition is not just, the outcome will never be. A just transition describes both where we are going and how we get there."[18]

Climate justice connects environmental justice—including the right to clean air, clean water, a healthy environment and food security—to human rights. It recognizes institutionalized and historical injustices that perpetuate and exacerbate poverty through global—national, regional, and local—actions that have local implications. Our climate emergency is not color blind; nor is it an equal opportunity crisis.

Just as Black Lives Matter is not the same as All Lives Matter, the impacts of the climate crisis, and the need to ensure a just transition, remain critical to our ability to successfully address the crisis at hand. Yes, climate change is happening all around us and impacting us all. Yet, those who can afford to protect themselves from the direct impacts of our growing crisis are still often able to and for the most part, do so. Those who can't, are already—and, often, deeply—reeling and suffering the consequences.

Why is it that in the United States of America, African Americans are almost *three times more likely* to die from asthma-related causes

than white Americans?[19] Could there be a correlation between the fact that the vast majority of air-polluting infrastructure, such as power plants, cement and chemical processing plants, and incinerators, are more likely to be sited in low-income neighborhoods that have historically not been able to gather the community support or the political attention to stop their construction? In fact, a 2016 study by the University of Michigan found that *hazardous waste sites are often built in neighborhoods where whites have already been moving out, and poor minority residents have been moving in, for a decade or two before the project arrived*. This follows on the seminal 2007 report, "Toxic Waste and Race at Twenty"[20] that found that more than half of all the people in the US living within two miles of a hazardous waste site, were people of color.

So, as we talk about a range of climate solutions, about jobs in the new green economy, and about infrastructure and public transportation, who gets those jobs and where that new infrastructure is to be built needs careful consideration, thought, and planning. As the economic gulf between rich and poor is exacerbated, how we work to close this gap as we build a new and hopeful future—one that isn't built on resource-extractive, polluting industries—will be key to helping everyone participate and benefit in this new future.

How, too, do our moral and ethical responsibilities stack up with the practical implications of the growing and destructive impacts multiplying *over there*? Where actually is *over there*? We must open our eyes to the reality that over there is just as likely to be across town or down the block than it is to be in a country across the ocean. A big question to ponder is, Are we willing and able to reconcile the importance of addressing climate justice along each step of our journey?

The impartiality of the climate crisis will only grow stronger, yet the fact remains that many black, brown, and low-income communities are the ones that are the least resilient, those least responsible for our climate crisis, and those hit first and worst. These communities cannot easily *pick up the pieces*. Maybe they can't do it at all. Many families in Puerto Rico and in parts of Texas and in Florida are still reeling from Hurricane Maria's 2017 destructive forces;

I have rearranged my life to center climate action with a social justice lens, and I am now a community-supported organizer. This work has taken a significant financial toll on my family as existing institutions have proven ill-suited to address the problem at scale, or acknowledge the root causes of it. In the past it was easy to include my wife and son Trevor in climate actions, but now it is more difficult with two additional children. Also, the work that I believe we need to be doing now involves less protesting, and more direct actions and community building. As a result, I haven't been able to include them as much in the work. I am not interested in showing them that I've 'got this,' as I don't think any of us can really say that we do. But I would concede that it is important to be able to say that we did everything we could when we knew.

—Derek Hoshiko, organizer, For the People, Clinton, Washington

recovery isn't equal or just. When a tragic fire struck Notre Dame Cathedral in 2019, billions of dollars were committed to help rebuild it within days of the tragedy. Yet, when Mozambique was struck with devastating cyclones, leaving hundreds of thousands homeless and without food or water, also in 2019, many around the world watched, and most looked away. Resources commensurate with the disaster at hand were not given or even promised. Why?

This reality plays out across the US on a regular basis. Louisiana, Puerto Rico, Florida, Nebraska, North Carolina, and other parts of the US south and Midwest continue to be hit harder and harder with each passing climate-exacerbated disaster. Yet we continue to *hide* the impacts of climate disasters in North America, even as people suffer daily and recover more slowly, if at all. Conveniently, media attention comes and goes quickly. Building the resiliency needed to protect from our coming storms also isn't being done in a just

manner, even as it is beginning to be put in place in wealthier communities and cities.

All over the African continent, in the Middle East and in Central and South America, if we open our eyes, we can see that climate-induced famines, droughts, and wars have created situations in which people are regularly—and with increasing frequency—displaced from their homes. Daily, people are starving; they are living in war-torn areas, often without access to clean water, health care or safe havens. We must remember and remind our children that focusing our lens through justice demands that there be no sacrifice.

Each of us deserves to be treated with dignity, respect, and care. This isn't, however, the world we live in. Our world is unjust, unfair and unequal—and it is becoming more so. Being born into a certain zip code, town or country shouldn't define your chance at an education or your job success; nor should it be a marker of your ability to be able to be resilient in the face of our climate crisis. However, where you are born more often than not does define these outcomes, in disproportionate, unfair, and unjust ways.

This small section of this one chapter cannot hope to, nor does it even attempt to, do justice to a discussion on climate justice. Hopefully, it does raise questions for you. Do seek out more information and more resources so you can have thoughtful conversations with your children about how climate justice is an integral and critical part of all successful climate solutions. Check out the resource section at the end of the book for places to start.

As John Muir said back in 1869,

> When we try to pick out anything by itself we find that it is bound fast—by a thousand invisible cords that cannot be broken—to everything in the universe.

We are finding ways to cut these invisible cords that the planet has carefully crafted over millennium. As quickly as we have appeared on planet Earth, we could disappear too. The planet will heal. The

question is, Will it do so with or without us? Depending in large part on what we do and how we react today, we can still have a hand in creating and shaping our future. It isn't predetermined. We don't have to go down the devastating rabbit hole in front of us. But we need to begin now.