GREEN DREAMS

Why Technology Can't Save the World

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Optimism is a counsel of despair, a cruel philosophy with a consoling name.

—Voltaire, *Candide*

At the approach of danger there are always two voices that speak with equal power in the human soul: one very reasonably tells a man to consider the nature of the danger and the means of escaping it; the other, still more reasonably, says that it is too depressing and painful to think of the danger since it is not in man's power to foresee everything and avert the general course of events, and it is therefore better to disregard what is painful till it comes, and to think about what is pleasant. In solitude a man generally listens to the first voice, but in society to the second.

—Leo Tolstoy, *War and Peace*

The world is nearly all parcelled out, and what there is left of it is being divided up, conquered and colonised. To think of these stars that you see overhead at night, these vast worlds which we can never reach. I would annex the planets if I could; I often think of that. It makes me sad to see them so clear and yet so far.

—Cecil John Rhodes,
The Last Will and Testament of Cecil John Rhodes

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INTRODUCTION: THE COMFORT OF SOLUTIONS

In October 2023, Silicon Valley was abuzz. Tech legend Marc Andreessen posted a call to arms on the home page of Andreessen Horowitz, the venture capital firm he co-founded in 2009. Andreessen's "Techno-Optimist Manifesto" offers a sharp challenge to all those opposed to technological progress.[1] Far too many, he argues, now feel that technology is both a problem and a threat. But they have it all wrong. Technology lies at the heart of civilization. It is how we have always jumped the hurdles facing humankind, especially the highest ones. It is what keeps the economy growing and money flowing. So there is no need, he assures us, to be fearful, angry, or bitter about technology. Instead of being pessimistic about the direction technology is taking us, Andreessen insists that it's time for us to embrace techno-optimism.

Most of the points Andreessen's makes are little more than blunt assertions about how the world is or should be. But that's not the problem with "The Techno-Optimist Manifesto"—after all, manifestos often are mishmashes of avowals and aphorisms, facts and fictions, and grandiose statements about the world. The problem is that technology today is far from being under threat from hordes of techno-pessimists banging at the gates of Silicon Valley. No one—or almost no one—believes that technology is ruining the world. On the contrary, just as has been the case for the past two centuries or more, and despite current anxieties about artificial intelligence (AI) or teens spending too

much time on TikTok, a lot of people continue to view technological innovation as the engine of the economy and the driver of history. Unlike our political systems, which feel stuck in place, technology still seems able to improve our lives, both quickly and efficiently.

In this book, we investigate techno-optimism, or society's belief in the power of technology to solve all manner of problems and move us to a better future. While other books have examined techno-optimism, *Green Dreams* focuses on a powerful new variant of this long-standing and evolving worldview, which we call "*green* techno-optimism." This is the belief that innovations in "green technology"—renewables, electrification, batteries, and carbon-removal schemes—will manage to solve the problems of climate change. There's little doubt that these and other technologies can help limit and mitigate the impact of climate change and ensure that we don't make it even worse. But green techno-optimism goes further. It doesn't treat technology as one of the ways in which we can and should address climate change. It treats it as the best way forward, confidently waging a bet on a single solution to an incredibly complex crisis.

In our own work on the environment, climate change, and technology over the past two decades, we've asked questions that challenge that confidence.[2] Knowing that one of the causes of climate change is the (still increasing) use of fossil fuels for energy, we have wanted to understand why our societies use energy in the ways that they do, to what ends, and to whose benefit. Energy fuels the growth of economies and the profit of companies, which in turn leads to the use of more of the planet's resources. Why, then, is continued growth imagined to be the best measure of human development and progress, since it intensifies climate change even while failing to address income inequality? Action has been slow on climate change despite knowledge of the existential threat it poses. Which is why we've asked: Who gets to make decisions about climate action and on what basis do they do so? These questions emerge from our recognition that climate change is not a problem that arrived from nowhere but is the cumulative outcome of how societies (or at least their key planners and decision-makers) have chosen to live on the planet. To believe that technology can answer these questions or allow us to avoid asking them in the first place simply raises more questions. Who decides which technologies are developed and on whose behalf? Why is it easier to imagine new technologies than new

forms of collective life? And what futures are rendered unthinkable when technological substitution becomes the primary horizon of climate action?

To imagine, as green techno-optimists do, that technology is the panacea for climate change is to forget how often tech fails to solve the problems it targets. Indeed, it can introduce new, unanticipated ones. Solar-powered military drones don't make wars cleaner, just easier to wage, and they certainly don't bring wars to an end. Biotech might improve our health, but it doesn't ensure that governments have robust public health-care programs. Carbon and direct air capture might—and we stress *might*—manage to suck huge amounts of carbon dioxide out of the atmosphere, but it can't keep up with the ever-increasing levels of emissions from fossil fuel extraction and use. And while solar panels and lithium batteries—iconic symbols of the green transition—are necessary pieces of the puzzle of energy transition, they are also implicated in labor exploitation, the dispossession of Indigenous communities, and ecological destruction. Whatever its promises, technology cannot substitute for the political work of deciding collectively how we want to live on a changed planet. This is as true of green tech as it is of any other technology.

Why then has green techno-optimism become such a predominant and persuasive response to climate change? Part of the answer lies in the long-standing faith we have developed in the powers of technology and its key role in shaping historical change. Faith in technology may be the most powerful and widespread secular belief system of the modern world, capable of accommodating capitalism as easily as socialism. The power of green techno-optimism rests on the everyday force and presence of technology, which reinforces faith in tech as the path to salvation. Mobile phones and the internet have not only reorganized our social and economic lives with unimaginable speed but also play an intimate role in our private lives. Many of us spend more time with our phones than our loved ones (and certainly more time holding them close to our bodies), and we now turn to AI instead of friends for advice on our hopes and anxieties. We also live in an era of powerful, high-profile tech leaders who appear to be able to do anything: invent self-driving cars, launch personal starships into space, and even make it possible to live on Mars. Given these circumstances, as climate change intensifies, it would be surprising if we *didn't* turn to technology as the solution.

Fear also helps explain green techno-optimism's appeal. Climate change has moved beyond the pages of scientific papers and United Nations (UN) reports. It's no longer a distant abstraction, tracked in parts per million and fractions of a degree, but a lived reality of heat waves, typhoons and hurricanes, fires, and floods. In the face of widespread uncertainty about the future of a system now out of control, green techno-optimism offers reassurance. It tells us that technological innovation and expertise can manage even the worst conditions we might encounter—if not right away, then by means of technologies yet to be discovered or put into practice. Green techno-optimism is a comfort that lets us get on with living, even if our ways of living are precisely the problem.

This book isn't an example of the techno-pessimism Andreessen believes is threatening innovation and progress. It is a cautionary tale about what happens if we too quickly and easily embrace green techno-optimism without paying attention to its costs and limits, and who it benefits and who it hurts. New technologies don't appear spontaneously—an idea jarred loose by an apple falling on one's head, a light bulb flashing into existence in an "aha!" moment of inspiration. They are shaped by organizations and interest groups that determine what kinds of technology will be financed, researched, developed, and used, and by powerful elites who guide how and why we use tech, and even how we understand and perceive it.

Andreessen's manifesto is a case in point about how powerful actors try to shape our view of the place and importance of technology in society. He's not primarily worried that techno-pessimists are turning us against technology. His fear, evident in almost every one of the aphorisms, is that there are some who challenge the idea that markets are the be-all and end-all of a good life. When he names the "enemies" of what he calls the "techno-capitalist" regime, he has in mind those who try to put limits on markets through practices such as "sustainability," "environmental, social, and governance (ESG) investing," "Sustainable Development Goals (SDGs)," "social responsibility," and "stakeholder capitalism" (all named in the manifesto). Andreessen makes it clear that he believes that "technology is the solution to environmental degradation and crisis. A technologically advanced society improves the natural environment, a technologically stagnant society ruins it." What makes him not only a techno-optimist but also a green one is his claim that efforts to address

climate change that don't foreground market-driven technologies get in the way of getting things done.

We don't agree with Andreessen. We don't believe that laissez-faire markets and the technologies that firms produce and distribute will all on their own make society better than before and save us from the global climate disaster. But we do think it's important to understand why green techno-optimists seem to think so, and to understand, too, what happens if we leave the fate of the planet to them.

Dreams, Consciousness, and Conscience

Andreessen's manifesto is an extreme version of a mainstream sensibility. Today, expressions of green techno-optimism saturate our global media and information environment; they are imagined, written, scripted, sent, read, watched, and received countless times a day in every country on Earth. Green techno-optimism appears in tech-bro manifestos, but also in policy speeches, press releases, glossy ad campaigns, and our ever-churning newsfeeds, promising that innovation will save the planet. Billionaires, corporations, politicians, and much of the mainstream media imagine technology—whether branded as "clean" or "green"—as the key to our species' adaptation to and mitigation of the impacts of climate change and as the engine of a global "green economy." Everyone has their part to play in this exciting win-win project in which profits and planet are stitched together. Investors watch their portfolios balloon with ESG-certified profits. CEOs rake in seven-figure bonuses and green leadership awards. Workers get good, clean jobs assembling EV batteries and wiring wind turbines. And consumers sip oat milk lattes from metal straws plunged into compostable cups while tracking their carbon footprints on the latest smartphone app.

Green techno-optimism is an inspiring sales pitch and easily digestible meme. It can be found in jubilant articles posted on the *World Economic Forum* blog, with titles such as "Why Digitization Is Our Best Shot at Saving the Planet" and "9 Ways AI Is Helping Tackle Climate Change."[3] It also surfaces in the pronouncements from leaders of very different political stripes, from former US President Joe Biden ("We have the technology to meet our climate goals") to Chinese

President Xi Jinping and Canadian Prime Minister Mark Carney.[4] A new cohort of tech billionaires "obsessed with climate change" (as a CNBC headline put it[5]) has also worked to position itself as a climate fixer, promoting the idea that green tech is the answer.[6] And international organizations, too, are leaning into green technologies, celebrating the way they can expand global markets and save the planet at the same time. The Organisation for Economic Co-operation and Development and the World Bank see technological innovation as key to "green growth,"[7] while the UN advocates for an "inclusive green economy"[8] and argues that "developing countries cannot afford to miss out on the green tech revolution."[9] This complex eco-system of actors, working individually and together, has profoundly shaped how we understand the relationship of technology to climate change. They are selling us the dream that green technology will be enough to save the Earth.

Dreams can express a genuine longing for a better world, a hopeful, anticipatory consciousness that cannot be fully extinguished, no matter how dystopic society becomes. But they can also be manufactured and manipulated in ways that lull us into a reverie from which we must eventually awake. Green techno-optimism sits uneasily between these two forms of dreaming, offering us hope for another world while reinforcing our compliance with this one. It invites us to imagine green technologies as tools and agents that move us toward a future society. By representing new technologies as our collective path toward a future in which economic growth and environmental sustainability peacefully coexist, green techno-optimism is a naïve but ultimately effective ideology, one that locks our dreams into the present social order rather than pointing beyond it. And by doing this, it reinforces the power of the very elites who benefit most from this vision, along with the systems of profit and privilege that produced the climate crisis in the first place.

What this book outlines is not a rejection of green technology. Nor is it a call to abandon innovation in the face of crisis. It is an attempt to slow down the rush to technological salvation by examining how green techno-optimism works as a way of seeing, valuing, and judging the world. In each chapter, we attend to how technologies are framed as solutions, how their costs are displaced or obscured, and how responsibility is shifted away from political and economic structures and onto devices, markets, and future breakthroughs. Our aim is to interrogate what green techno-optimism pushes us to focus on and

make visible what it teaches us not to see so that we can return technology to the dense web of social relations, power, and ecological limits from which it is so often deliberately abstracted.

Confronting the dreams of green techno-optimism requires sharp critical strategies for reading its claims, comforts, and silences. For us, this means developing and practicing what we call a *green tech consciousness*—an awareness that the tools, processes, and systems marketed to save the planet are rooted in nature and carry ecological and social consequences. It also means cultivating a *green tech conscience*—the moral compass required to judge whether green tech truly aligns with environmental sustainability and climate action goals, or whether it's just business as usual.

The chapters that follow highlight the appeals and follies of green techno-optimism and point to the gap between the dream of technology delivering a better future and the ecological, economic, geopolitical, and cultural realities that prevent it from doing so. We begin in Chapter 1, "The EV Illusion," by investigating one of the most celebrated and visible green technologies: the electric vehicle (EV). EVs function as a paradigmatic expression of the green dream—a techno-fix that promises transformation without sacrifice, a guilt-free way to save the planet without altering core habits or systems. One of the most common criticisms of EVs is that their production relies on resource extraction, environmental degradation, and labor exploitation, particularly in the Global South. Even if greener than internal combustion automobiles, EVs still require vast infrastructure and material inputs that perpetuate socioeconomic inequalities and contribute to climate change. But as we show, there's a deeper problem with EVs that points to the contradictions and ideological investments that underwrite green techno-optimism. EVs *reinforce* rather than challenge car-centric life, expanding roads, justifying sprawl, and cementing auto dependency. Environmental salvation won't come from greener, cleaner cars, but from unraveling automobility itself.

The EV does not simply replace one kind of machine with another; it extends a centuries-old worldview built on the promise that better machines will inevitably produce better futures. To understand why this belief remains so resilient—and why greener cars so easily stand in for real change—we turn to the historical roots of techno-optimism and to the thinkers who first challenged it. Chapter 2, "Inventing Techno-Optimism,"

examines the antecedents of green techno-optimism, exploring the historical origins of humanity's faith in technology's unique power to push us toward better futures. Techno-optimism is deeply rooted in Western Enlightenment thought, industrial capitalism, and modern statecraft. It is an outlook on the world most fully embraced in the United States but now globally ubiquitous. We look at the criticisms of techno-optimism by writers and thinkers following the Second World War. These thinkers—figures such as Lewis Mumford, Leo Marx, and E. F. Schumacher—drew attention to the social and ecological harms of industrial technologies and the flawed measures of progress that contemporary techno-optimism deployed.

These criticisms created a critical language that is still used to challenge the presumptions and limits of techno-optimism today. Even so, it is important to recognize that postwar attention to techno-optimism had an unexpected outcome: it helped create the vocabulary of a new variant of techno-optimism. In Chapter 3, "California Dreamin'," we trace the growth of techno-optimism in Silicon Valley across the 1970s, 1980s, and 1990s and examine its green twist. The rise of what has been called the "Californian Ideology" and its subsequent development into what we describe as a "Silicon Valley Ideology" produced the language and ideas through which ecomodernists and liberal environmentalists sought to reconcile global economic growth with environmental sustainability. This vision resulted in a green techno-optimism that was both part and product of a new green tech industry. We demonstrate how this ideology operates, scrutinizing green techno-solutionist projects such as plastic waste cleanup, carbon and direct air capture, recycling, clean tech, and geoengineering. By situating today's version of green techno-optimism in historical and critical contexts, we show how the long-standing belief that tech will save the world came to be greened.

Chapter 4, "Code Green," explores how Alphabet (Google), Apple, Meta (Facebook), Amazon, and Microsoft, the world's largest publicly traded tech corporations and owners of major global internet properties and most social media platforms, came to frame themselves as climate leaders. Their green tech solutionism is shaped by dreams of the digital heralding post-industrial "weightlessness," "immateriality," and "virtuality." These Silicon Valley companies—what we call "Big Tech"—circulate glossy sustainability reports that highlight renewable

energy investments, net-zero emissions pledges, and green AI, but their business operations, hardware, and software all fall short of being genuine catalysts of the renewable energy transition and models of environmental sustainability. We offer an analysis of the structural, economic, and ideological reasons behind the failure of Big Tech to live up to the climate leadership role they have assigned themselves. Given the unparalleled reach, wealth, and cultural authority these firms command, their inability, or unwillingness, to meet their own claims to climate leadership has outsized consequences, shaping global expectations of what is possible and delaying the systemic transformations on which a livable future depends.

Also casting itself in the role of climate leadership is Hollywood, which is in the process of rebranding itself as a global green superhero. In Chapter 5, "The Dream Machine," we look at how the entertainment industry has powered itself up with new renewable energy technologies and storytelling techniques to communicate climate problems and solutions. We track the novelty of this shift by looking at Hollywood's oil-drenched origins and its current climate failure. Hollywood's major studios, professional associations, nongovernmental organizations (NGOs), lobbies, and guilds believe the industry's operations and storytelling practices play a unique role in bringing about a sustainable future. Hollywood does play a distinctive role, but less by solving climate change than by teaching audiences to experience its own products and production practices as solutions.

In Chapter 6, "Power Plays," we look at how wider economic, geopolitical, and cultural conditions impose major roadblocks to the universal and rapid diffusion of green technologies. Many assume that once green tech exists, it will be adopted quickly everywhere. This is the most optimistic and most faulty view of how green tech works. Despite its availability and falling costs—there's no question that clean energy is now cheaper than the dirty stuff[10]—green tech faces significant economic, political, and civic barriers to swift adoption. These barriers are only getting higher in an era of increased rivalry between warring elite energy blocs and the return of Donald Trump and fossil capital to the White House. In the end, whether green tech becomes central or remains peripheral to the global energy system will depend not only on the capacities of the technology itself but also on the outcome of the battle between fossil capital and green capital. Green techno-optimism

exists in part because it seems to be an easier way to address climate change than having to pull down the economic and political walls standing in the way of climate action. By avoiding the hard work of confronting these barriers, green techno-optimism looks like a plan. It is in fact an alibi, a promise that the future is being carefully managed, while the hard work of change is deferred indefinitely.

The book's conclusion, "Exit Strategies," turns to the political terrain on which green techno-optimism operates today. It charts the rise of Silicon Valley's new right-wing tech elite, showing how autocratic and illiberal billionaires such as Peter Thiel and David Sacks seek to break with Big Tech's "tech for good" liberalism in ways that sabotage the energy transition and environmental sustainability. We situate these developments within a shifting global context, including the growing role of China in shaping green technological futures and geopolitical competition over transition pathways. Against this backdrop, we consider alternative green dreams emerging beyond elite centers of power, from eco-socialist demands for systemic transformation to community-based counter-technologies and grassroots and justice-centered movements envisioning other futures. We end by asking what a meaningful exit from green techno-optimist fantasy would require, and whether technologies can be used for climate change once the promises insulating them from a political reckoning are finally stripped away.

In the book's "Coda," we sharpen this distinction between green techno-optimism and the forms of thought that might genuinely support action toward a truly sustainable future by returning to Barry Commoner's famous four ecological laws. Commoner helps us name the structural contradictions that persist even when technologies are imagined as "solutions," showing why environmental harms appear across supply chains, waste streams, and planetary systems. We add five additional laws that identify the limits and unintended consequences of today's green technologies. Together, these nine laws anchor our central argument that technological innovation cannot save the world unless it is coupled with deeper economic, political, and cultural change.

This book is an exercise in cultivating green tech consciousness and green tech conscience as habits of thought rather than abstract ideals. Green tech consciousness asks us to see technologies not as detached fixes or neutral instruments, but as material systems embedded in energy regimes, labor relations, ecological limits, and political struggles.

Green tech conscience presses further, insisting that we evaluate these technologies in terms of responsibility, justice, and the kinds of futures they authorize or foreclose. Practiced together, consciousness and conscience disrupt the comfort of green techno-optimism without lapsing into despair. They open space for thinking about technology in climate politics more directly and collectively, attuned to both its possibilities and its limits.

As we noted at the outset, this book is far from the first to challenge the belief that technology alone can solve the problem of climate change.[11] What sets it apart is its focus on the ideology of green techno-optimism and how it gets in the way of green dreams becoming real. In halls of power and across boardrooms, think tanks, NGOs, and media platforms, a green dream has emerged that casts technology as the planet's savior. Even if the world collectively embraced these technologies overnight, could they in fact save us from climate change? The answer unfolds in the pages ahead.

What Is Green Tech?

One last word. We can't conclude an introduction to a book about why technology can't save the world without clarifying what we mean by technology, and green technology in particular.

Most of us likely imagine technology as a physical object we can buy online or at a big-box store—something full of wires, encased in metal, and designed by scientists or engineers at some earlier stage in its life. Add "green" to this idea of technology, and we simply swap in different objects: solar panels, EVs, or Wi-Fi-equipped fridges that use less energy than their older counterparts. Pointing to objects we can pick up at the mall or order on Amazon captures part of what technology is, but only a small part, because technologies are never just discrete things or objects. They emerge from a long history of organizational, social, cultural, and environmental relations. One way to think about "green tech" is thus as the scientific knowledge required to design tools, machines, and systems meant to have some environmental benefit, as well as the objects and artifacts that are used to bring about that benefit. Solar panels are illustrative. As scientific knowledge, solar panels rest on the physics of photovoltaics, that is, how sunlight excites electrons

in semiconductor materials to generate an electric current. As tools, they're the "dragonscale" of glassy panels Google installed on the roof of its headquarters at its Mountain View campus, or the panels spanning a 400-kilometer "Solar Great Wall" in the Kubuqi Desert of China.

The growing variety and volume of green tech consumer products and industrial goods in the market invite another way of thinking about green tech: as part of capitalism. Green tech is a massively financialized and transnational industry of publicly traded corporations and start-ups backed by venture capital that research, develop, manufacture, and market patented or copyrighted "clean" or "green" technological products and services. In this register, green tech connotes corporations investing in the production and sale of solar, wind, hydro, geothermal, and biomass technologies, EVs and solar-powered bikes, precision agriculture (e.g., data-driven farms and vertical greenhouses), and carbon capture technologies. This market-facing sense is now normalized in corporate explainer literature, as when IBM's *Think* article "What Is Green Technology?" defines green tech as the "technologies that minimize the negative impacts of human activities on the environment and society" and that include a "wide range of products, services and practices that support a more sustainable future."[12]

But technology encompasses more than the imperatives of big science and the logics of big business. Green tech is also imbued with socially and culturally significant meanings—signs, symbols, and stories—created both by their makers and by wider society. It is written about, talked about, and represented through statements, claims, and images by a wide range of actors. These communicative practices give green tech meaning—what it is, what it does (or fails to do), and why it should matter in the first place. For example, a recent *Guardian* feature on floating offshore wind farms framed the technology as a "new wave" for Britain's renewable energy, folding infrastructural complexity into a story of national progress.[13] In popular culture, green tech is often used to reassure us about the future. Billionaires such as Michael Bloomberg and companies like Google and Apple frame their businesses as "green," while activists across the political spectrum—from eco-socialist to eco-fascists—invoke technology as essential to the futures they imagine.

In *Green Dreams*, we define green tech in these three interconnected ways. First, green tech is scientific knowledge and its applied

outcomes: the artifacts, systems, and processes through which research is materialized. Second, green tech is a global industry of large, midsize, and small corporations, publicly traded and privately owned, that pursue profit and produce, market, and sell technologies they claim will reduce environmental harm or deliver ecological benefits. Third, green tech consists of representations—the communicative practices, statements, and claims that construct its meaning and frame, depict, and symbolize it socially and culturally. Taken together, green technology is simultaneously science, industry, and cultural discourse—a complex set of ideas and beliefs stitched together by competing dreams of greener futures.

Notes

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