

FOREWORD

What could possibly distinguish yet another book on climate change from others? Notably, it is our stronger emphasis on the social sciences. Our book covers not only the associated earth sciences and not only the technical solutions, but also the political and economic obstacles that need to be overcome to solve civilization's biggest crisis ever. And just as some technical engineering (like **nuclear fusion power**) is impossible today, so it is with some social engineering.

Perhaps the best way to illustrate this point is with a simple analogy. Advocating that the world should stop burning fossil fuels and emitting greenhouse gases is like advocating that the world should stop spending on its armed forces. Even though we agree that disarmament would be wonderful from a collective perspective, it's simply not going to happen. This is because countries have primarily their own interests at heart, not the planet's. It does not pay each of the roughly 200 countries to make large sacrifices that (a) benefit the other 199 countries more than themselves, and (b) will take many decades of sacrifice before they will yield any noticeable benefits.

One may retort that there are politicians who have been signing treaties that are against their own self-interests. However, we believe this is illusory. If they or their successors were ever to attempt to execute meaningful reductions in living standards on behalf of the greater global good (and especially one that will occur only decades later), they would be quickly replaced by politicians who would instead offer higher local living standards sooner.

Climate-change is also not a problem that the West can solve even if it had an iron will. If the United States and Western Europe miraculously emitted no more CO₂ tomorrow, the rest of the world would still pump 30 Gigatonnes of CO₂ (GtCO₂) rather than 40 GtCO₂ into the atmosphere every year. (See Figure 2.3 on page 1.) And within five years, world emissions would likely be back to 40 GtCO₂. The central problem today is no longer one that the two billion people in rich countries can solve (alone). It is becoming a problem of the six (soon eight) billion people in poor countries who aspire to a higher standard of living. They won't accept avoidable delay.

Whether it is globally optimal to stop arming or to stop emitting greenhouse gases is unimportant. It simply won't happen.

TODAY'S ACTIVISM

In our view, much climate-change activism today seems performative — akin to a “personal wellness approach to climate change” — more feel-good than effective. The evidence in the air suggests that most climate-change activism has been wasted energy. Earth would probably be in roughly the same spot now if climate-change activism had never occurred in the first place.

Thinking Too Big



Much climate-change activism has centered on advocating for coordinated global action. We would love coordinated action, too, but in our opinion, this debate is like arguing about how many angels can dance on the head of a pin. The simple fact is that there is no global government that could enforce global coordinated action.

Treaties are no substitutes, either. In the real world, treaties that could force countries to make the large-scale changes necessary to fight climate change only have a chance when they are in the signers' self-interests or at least not greatly against them. Treaties are unlikely to be effective when they demand large sacrifices. Most of humanity is too poor to afford large payments for the common good, and the remainder would never be willing to pay, say, the equivalent of 1 to 3 months' rent (partly to cover the former's non-payment) in order to avoid a planetary calamity fifty years later. Whether you believe civilization should or should not take on large sacrifices doesn't matter. It simply won't happen.

Thinking Too Small



Naive environmentalists also often commit the opposite mistake: they do not think too big but too small. Versions of this stance come with slogans such as “every little bit counts,” “we have to start somewhere,” “we must do our fair share,” “we must set an example,” or “we must reduce our own carbon footprints.” These think-small approaches will not change the CO₂ concentration in the atmosphere. When solutions do not have a dynamic that will make them scale by themselves to billions of people, they will never move the needle in a meaningful way. It simply won't happen.

The only clean solutions that matter are those that scale to much of the planet. Even the elimination of all CO₂ emissions of the United States is of much less than importance than reducing the emissions of the remaining 7.5 billion people. If the goal is to truly bring down the CO₂ concentration in the atmosphere, keep the appropriate perspective: not only does your own carbon footprint not matter, even the United States' carbon footprint does not matter. Only the world's overall carbon footprint matters. You must think in global terms.

We are not against feel-good activism — unless it saps the energy from activism that could really matter. Rearranging the deck chairs on the Titanic is fine but only if it does not distract from readying the rescue boats.

VIABLE APPROACHES

We have written this book because we believe that human emissions — and the related phenomena of population growth and species extinction — are the most important issues confronting humanity today. We view ourselves as cool-headed environmentalists advocating for solutions that are technically viable, economically affordable, and politically feasible — though rarely ideal. We want humanity to do something about its problems sooner rather than later. We want humanity to *move the needle* now.

Despite the enormous magnitude of the problem, we remain cautiously optimistic. Yes, change will be difficult in an era with pandemics, global poverty, wealth inequality,¹ economic stagnation, high taxes and tax evasion, political, cultural and religious strife, and many oppressive and corrupt governments. These are all serious problems, but many of them are not as bad today as they have been in the past. (Our more novel twenty-first century challenges are a much larger human population, a bad head-start on environmental degradation, and pervasive misinformation.)

Human ingenuity is already inventing technologies that give civilization a fighting chance to solve the environmental problems. We cannot be complacent, but we should also not be despondent. We can nudge the very big ship that is Earth and that contains all of humanity in the right direction, even if the ship turns much slower than we would wish. This is why we wrote this book.

Because we think it is irrelevant, we do not need to get involved in the debate about exactly how bad the situation is. We take it as given that it is bad. Humanity is burning way too much fossil fuel (resulting in terrible local health effects), and it will almost surely emit more *very soon*. We can thus dispense with the most heated arguments among politicians and climate scientists over how quickly humanity must wean off fossil fuels — 10 years, 30 years, or 100 years. Frankly, this debate is as divisive as it is irrelevant. Instead, we think everyone should be focusing on how we can start moving aggressively in the right direction. What actions can *move the needle* now? And fortunately there are many such actions. Most importantly, if the energy storage problem (explained in Chapter 9) can be solved, it will be lights out for fossil fuels.

Of course, many readers will think we are going too far, and many others will think that we are not going far enough. We are fine with this dichotomy of opinion. However, we hope that all our readers will appreciate the honesty of our presentation and analysis, whether they agree with us or not.

Grant me the serenity to accept the things I cannot
change, the courage to change the things I can, and
the wisdom to know the difference.

— Reinhold Niebuhr

¹This is not just a problem across rich and poor countries, and across rich and poor within the same country. The rich in poor countries are much richer than the poor in rich countries.

THE EDUCATIONAL COMPONENT

Our book has a strong educational component. Our book is written for interested students at any level — from our teenage kids to our political leaders. The reader should come away with a clear understanding of the problems and tradeoffs. We will try to keep the book brief and to the point, self-contained, and easy to understand.

One problem in learning about energy, emissions, climate change, economics, and technology is not a lack of information. Instead, there is too much information (often biased and false) all over the Internet.

Our book's first task is thus organizing and distilling information into a form that does not miss the forest for the trees. Although many concerned people have read about global warming, most do not fully understand it. (Admittedly, though interested, we did not either until we wrote this book.) Most people have only glimpses of **parts of the elephant**. And this elephant is large. It includes the earth-science aspects of the problems (energy, emissions, planetary changes); the social-science aspects (public goods, cost economics, social costs of carbon, coordination); the engineering aspects (the viability of potential technologies); and the overview of feasible large-scale potential solutions. For example, batteries work well for cell phones — but could they really power the needs of eight billion people?

We want to present information in a fair and unbiased way. Both climate advocates and climate skeptics sometimes share a penchant to suppress **inconvenient truths**. Many environmentalists do not like contrary arguments, because they are afraid that their airing could reduce the alarm and poison the determination of the faithful. Many climate-change skeptics are in a worse predicament, because they have to disavow much of the scientific evidence. The vitriol on both sides is, at times, stunning.

Our goal is to air all reasonable and important arguments — even if we disagree with them — and to do so with appropriate respect. We do not want to discourage our readers from forming their own points of view and disagreeing with us. However, we do want our reader to understand why answers may not be as obvious as they might imagine. In many cases, smart people can come to different conclusions.

ABOUT THE AUTHORS

We are not earth scientists; we are not engineers; we are economists. We are not even among those economists who have dedicated their lives to studying energy or climate change. We think that our background offers both advantages and disadvantages. On the positive side, being “generic” economists allows us to see more forest than trees and we have no horse in any race. We can present what we consider to be a fair and objective perspective on the evidence. On the negative side, our knowledge is not as deep as that of our fellow scientists. We are not producers but intelligent consumers of the research we present. We have fact-checked the information we are presenting with great care, but we always welcome corrections and clarifications.

We are not claiming originality for the many ideas in this book. Our impression is that most good ideas have occurred many times to many people, often independently. Thus, our book should not be viewed as an original research treatise. Its only originality is in the packaging of the information in our own peculiar way.

PS: We also want to go on record that neither of us has ever been supported by lobbies, either environmentalist or fossil-fuel. We are not shills for anyone.

PPS: The book contains cartoons and jokes. Jokes are exactly that — not to be taken seriously, although the subject matter is deadly serious.

potential quote

Ridicule is man’s most potent weapon. It is almost impossible to counteract ridicule.
— Saul Alinsky, 1971.

All cartoons are from cartoonstock.com. Highly recommended. We have not yet decided which cartoons to include in the book. The ones included in this draft are good candidates, but they may be replaced by others. When we have firmed up our choices, we will pay the licensing fees. This is both a legal and an ethical imperative. Therefore, please do not distribute further.