A Case For Climate Engineering

A Case for Climate Engineering: Weighing the Risks and Rewards

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Summary: This guide presents a comprehensive case for climate engineering, acknowledging the inherent risks while highlighting the potential benefits in addressing the urgent threat of climate change. It explores various techniques, best practices for research and deployment, and crucial ethical and governance considerations. The article emphasizes the need for robust scientific understanding, transparent public discourse, and international cooperation to navigate the complex landscape of climate engineering.

1. Introduction: The Urgency of Climate Action and the Role of Climate Engineering

The escalating impacts of climate change demand urgent and comprehensive action. While emissions reduction remains paramount, the pace of decarbonization may be insufficient to prevent catastrophic warming. This presents a compelling case for climate engineering, or climate intervention – deliberate large-scale interventions in the Earth's climate system to counteract the effects of greenhouse gases. A case for climate engineering rests on the potential to rapidly reduce global temperatures and buy valuable time for emissions reductions, but this potential must be carefully weighed against significant risks and uncertainties.

2. Types of Climate Engineering: A Detailed Overview

Climate engineering broadly encompasses two categories:

Solar Radiation Management (SRM): Techniques that reflect a small amount of sunlight back into space, thereby cooling the planet. Examples include stratospheric aerosol injection (mimicking the cooling effect of volcanic eruptions) and marine cloud brightening. A case for SRM is often made based on its potential for rapid temperature reduction.

Carbon Dioxide Removal (CDR): Methods that actively remove CO2 from the atmosphere and store it elsewhere. This includes approaches like afforestation/reforestation, bioenergy with carbon capture and storage (BECCS), direct air capture (DAC), and ocean fertilization. A case for CDR is its potential to address the root cause of climate change by reducing atmospheric CO2 concentrations.

3. A Case for Climate Engineering: Potential Benefits and Applications

The potential benefits of climate engineering are significant, particularly in the context of avoiding catastrophic climate tipping points. These include:

Limiting global temperature rise: SRM techniques offer the potential for rapid temperature reduction, potentially averting the most severe impacts of climate change.
Buying time for emissions reductions: Climate engineering can provide breathing room for implementing deep decarbonization strategies.
Addressing regional climate impacts: Targeted interventions could mitigate specific climate risks in vulnerable regions.

4. The Risks and Uncertainties of Climate Engineering: A Critical Assessment

A case for climate engineering must acknowledge significant uncertainties and potential risks:

Unintended consequences: Interventions could have unforeseen and potentially harmful impacts on weather patterns, ecosystems, and human societies.
Moral hazard: The availability of climate engineering technologies could reduce the political will to pursue emissions reductions.
Governance challenges: The global deployment of climate engineering necessitates international cooperation and robust governance frameworks.
Equity concerns: The benefits and risks of climate engineering may not be distributed equally across the globe, raising ethical concerns.

5. Best Practices for Research and Deployment: Ensuring Responsible Innovation

Responsible development and deployment of climate engineering requires:

Rigorous scientific research: Thorough investigation of the potential impacts, both positive and negative, is crucial.
Open and transparent governance: International cooperation and public participation are essential to ensure accountability and ethical decision-making.
Adaptive management: A phased approach with continuous monitoring and evaluation is necessary to adapt strategies as new information emerges.

6. Ethical Considerations and Public Engagement: Navigating the Societal Implications

A robust case for climate engineering requires careful consideration of ethical implications, including:

Distributive justice: Ensuring equitable distribution of benefits and risks across countries and communities.
Intergenerational equity: Considering the long-term consequences of interventions for future generations.
Informed consent: Engaging the public in transparent discussions and decision-making processes.

7. International Cooperation and Governance: Establishing Global Frameworks

Effective governance of climate engineering requires:

International agreements: Establishing clear rules and regulations for research, development, and deployment.
Monitoring and verification mechanisms: Tracking the effectiveness and impacts of interventions.
Dispute resolution mechanisms: Addressing potential conflicts arising from the deployment of climate engineering technologies.

8. Conclusion: A Cautious but Necessary Approach

A case for climate engineering does not advocate for its immediate and widespread deployment. Rather, it argues for a cautious but proactive approach that prioritizes rigorous research, robust governance, and transparent public engagement. Climate engineering should be considered as a potential last resort or complementary strategy alongside ambitious emissions reductions, not as a replacement. The future of our planet depends on a multifaceted response to climate change, and climate engineering, if carefully managed, may play a vital role in averting the most catastrophic outcomes.

FAQs:

1. Is climate engineering a silver bullet for climate change? No, climate engineering is not a replacement for emissions reductions, but rather a potential complementary strategy to limit warming.
2. What are the biggest risks associated with climate engineering? Unintended consequences on weather patterns, ecosystems, and social equity are major concerns.
3. Who should decide whether to deploy climate engineering technologies? International cooperation and robust governance frameworks are crucial for decision-making.
4. How can the public be involved in decisions about climate engineering? Transparent communication, public consultations, and inclusive decision-making processes are essential.
5. What are the most promising climate engineering techniques? Research into both solar radiation management and carbon dioxide removal continues to advance, but no single technique is definitively superior.
6. How much would climate engineering cost? The costs vary widely depending on the specific technique and scale of deployment.
7. Is climate engineering ethical? Ethical considerations are paramount, requiring careful attention

to distributive justice, intergenerational equity, and informed consent.
8. What role does climate modeling play in assessing climate engineering? Climate models are crucial for simulating the potential impacts of interventions and assessing their effectiveness.
9. What are the legal implications of climate engineering? International law and national regulations are still developing in this area, requiring careful consideration.

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1. "Solar Radiation Management: A Review of the Science and Governance Challenges": This article provides a comprehensive overview of SRM techniques, their potential impacts, and the governance challenges involved.
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3. "The Ethics of Climate Engineering: A Framework for Responsible Innovation": This article explores the key ethical considerations surrounding climate engineering and proposes a framework for responsible research and deployment.
4. "The Governance of Climate Engineering: International Cooperation and Institutional Design": This paper examines the need for international cooperation and the development of robust governance mechanisms.
5. "Climate Modeling and the Assessment of Climate Engineering Impacts": A detailed discussion of the role of climate models in evaluating the potential benefits and risks of climate interventions.
6. "The Potential for Climate Engineering to Mitigate Regional Climate Risks": This article focuses on the potential application of climate engineering to address specific regional climate impacts.
7. "Public Perceptions of Climate Engineering: A Review of Surveys and Public Opinion Polls": This study explores public attitudes towards climate engineering and the factors influencing public acceptance.
8. "A Comparative Analysis of Solar Radiation Management and Carbon Dioxide Removal Techniques": This article compares the relative advantages and disadvantages of different climate engineering approaches.
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a case for climate engineering: *A Case for Climate Engineering* David Keith, 2013-10-04 A leading scientist argues that we must consider deploying climate engineering technology to slow the pace of global warming. Climate engineering—which could slow the pace of global warming by injecting reflective particles into the upper atmosphere—has emerged in recent years as an extremely controversial technology. And for good reason: it carries unknown risks and it may undermine commitments to conserving energy. Some critics also view it as an immoral human breach of the natural world. The latter objection, David Keith argues in A Scientist's Case for Climate Engineering, is groundless; we have been using technology to alter our environment for years. But he agrees that there are large issues at stake. A leading scientist long concerned about climate change, Keith offers no naïve proposal for an easy fix to what is perhaps the most challenging question of our time; climate engineering is no silver bullet. But he argues that after decades during which very little progress has been made in reducing carbon emissions we must put this technology on the table and consider it responsibly. That doesn't mean we will deploy it, and it doesn't mean that we can abandon efforts to reduce greenhouse gas emissions. But we must understand fully what research needs to be done and how the technology might be designed and used. This book provides a clear and accessible overview of what the costs and risks might be, and

how climate engineering might fit into a larger program for managing climate change.

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a case for climate engineering: Climate Engineering and the Law Michael B. Gerrard, Tracy Hester, 2018-04-12 The first book to focus on the legal aspects of climate engineering, making recommendations for future laws and governance.

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a case for climate engineering: *Climate Engineering* Daniel Edward Callies, 2019-07-12 Climate Engineering: A Normative Perspective takes as its subject a prospective policy response to the urgent problem of climate change, one previously considered taboo. Climate engineering, the

“deliberate, large-scale manipulation of the planetary environment in order to counteract anthropogenic climate change,” encapsulates a wide array of technological proposals. Daniel Edward Callies here focuses on one proposal currently being researched—stratospheric aerosol injection—which would spray aerosol particles into the upper atmosphere to thus reflect a small portion of incoming sunlight and slightly cool the globe. This book asks important questions that should guide moral and political discussions of geoengineering. Does engaging in such research lead us towards inexorable deployment? Could this research draw us away from the more important tasks of mitigation and adaptation? Should we avoid risky interventions in the climate system altogether? What would legitimate governance of this technology look like? What would constitute a just distribution of the benefits and burdens associated with stratospheric aerosol injection? Who ought to be included in the decision-making process? Callies offers a normative perspective on these and other questions related to engineering the climate, ultimately arguing for research and regulation guided by norms of legitimacy, distributive justice, and procedural justice.

a case for climate engineering: Ethics Of Chemistry: From Poison Gas To Climate Engineering Joachim Schummer, Tom Borsen, 2021-02-08 'Overall, this collection of case studies provides an outstanding starting point for understanding the ethics of chemistry. It is an extremely important contribution to the study of chemical ethics … Ethics of Chemistry is a key resource for educators interested in integrating ethics instruction into their chemistry curricula … an important foundation for equipping students with the moral judgement and analytical skills necessary to contend with the ethical issues they are likely to face in their professional lives.'Nature Chemistry'… the book offers a general introduction to many relevant topics concerning the values, responsibilities, and judgements in (and of) chemistry. The volume could be helpful for university students and teachers or even general readers interested in the ethics of chemistry.' [Read Full Review]José Ramón Bertomeu-SánchezAmbixAlthough chemistry has been the target of numerous public moral debates for over a century, there is still no academic field of ethics of chemistry to develop an ethically balanced view of the discipline. And while ethics courses are increasingly demanded for science and engineering students in many countries, chemistry is still lagging behind because of a lack of appropriate teaching material. This volume fills both gaps by establishing the scope of ethics of chemistry and providing a cased-based approach to teaching, thereby also narrating a cultural history of chemistry.From poison gas in WWI to climate engineering of the future, this volume covers the most important historical cases of chemistry. It draws lesson from major disasters of the past, such as in Bhopal and Love Canal, or from thalidomide, Agent Orange, and DDT. It further introduces to ethical arguments pro and con by discussing issues about bisphenol-A, polyvinyl chloride, and rare earth elements; as well as of contested chemical projects such as human enhancement, the creation of artificial life, and patents on human DNA. Moreover, it illustrates chemical engagements in preventing hazards, from the prediction of ozone depletion, to Green Chemistry, and research in recycling, industrial substance substitution, and clean-up. Students also learn about codes of conduct and chemical regulations.An international team of experts narrate the historical cases and analyse their ethical dimensions. All cases are suitable for undergraduate teaching, either in classes of ethics, history of chemistry, or in chemistry classes proper.

a case for climate engineering: Why Govern? Amitav Acharya, 2016-09 A timely and authoritative assessment of the crisis in global cooperation and prospects for its reform and transformation.

a case for climate engineering: Imagining Climate Engineering Jeroen Oomen, 2021-05-03 This book highlights the increasing attention for climate engineering, a set of speculative technologies aimed to counter global warming. What is the future of the global climate? And who gets to decide—or even design—this future? Imagining Climate Engineering explores how and why climate engineering became a potential approach to anthropogenic climate change. Specifically, it showcases how views on the future of climate change and climate engineering evolved by addressing the ways in which climate engineers view its respective physical, political, and moral

domains. Tracing the intellectual and political history of dreams to control the weather and climate as well as the discovery of climate change, Jeroen Oomen examines the imaginative parameters within which contemporary climate engineering research takes place. Introducing the analytical metaphor 'ways of seeing' to describe explicit or implicit visions, understandings, and foci that facilitate a particular understanding of what is at stake, Imagining Climate Engineering shows how visions on the knowability of climate tie into moral and political convictions about the possibility and desirability of engineering the climate. Marrying science and technology studies and the environmental humanities, Oomen provides crucial insights for the future of the climate change debate for scholars and students.

a case for climate engineering: Geoengineering Gernot Wagner, 2021-09-08 Stabilizing the world's climates means cutting carbon dioxide pollution. There's no way around it. But what if that's not enough? What if it's too difficult to accomplish in the time allotted or, worse, what if it's so late in the game that even cutting carbon emissions to zero, tomorrow, wouldn't do? Enter solar geoengineering. The principle is simple: attempt to cool Earth by reflecting more sunlight back into space. The primary mechanism, shooting particles into the upper atmosphere, implies more pollution, not less. If that doesn't sound scary, it should. There are lots of risks, unknowns, and unknowables. In Geoengineering: The Gamble, climate economist Gernot Wagner provides a balanced take on the possible benefits and all-too-real risks, especially the so-called "moral hazard" that researching or even just discussing (solar) geoengineering would undermine the push to cut carbon emissions in the first place. Despite those risks, he argues, solar geoengineering may only be a matter of time. Not if, but when. As the founding executive director of Harvard's Solar Geoengineering Research Program, Wagner explores scenarios of a geoengineered future, offering an inside-view of the research already under way and the actions the world must take to guide it in a productive direction.

a case for climate engineering: Climate Justice and Geoengineering Christopher J. Preston, 2016-09-21 It is already clear that climate engineering raises numerous troubling ethical issues. The pertinent question yet to be addressed is how the ethical issues raised by climate engineering compare to those raised by alternative proposals for tackling climate change. This volume is the first to put the ethical issues raised by climate engineering into a comprehensive, comparative context so that the key ethical challenges of these technologies can be better measured against those of alternative climate policies . Addressing the topic specifically through the lens of justice, contributors include both advocates of climate intervention research and its sceptics. The volume includes a helpful blend of the theoretical and the practical, with contributions from authors in philosophy, engineering, public policy, social science, geography, sustainable development studies, economics, and climate studies. This cross-disciplinary collection provides the start of an important and more contextualized "second generation" analysis of climate engineering and the difficult public policy decisions that lie ahead.

a case for climate engineering: After Geoengineering Holly Jean Buck, 2019-10-01 Climate engineering is a dystopian project. But as the human species hurtles ever faster towards its own extinction, geoengineering as a temporary fix, to buy time for carbon removal, is a seductive idea. We are right to fear that geoengineering will be used to maintain the status quo, but is there another possible future after geoengineering? Can these technologies and practices be used to bring carbon levels back down to pre-industrial levels? Are there possibilities for massive intentional intervention in the climate that are democratic, decentralised, or participatory? These questions are provocative, because they go against a binary that has become common sense: geoengineering is assumed to be on the side of industrial agriculture, inequality and ecomodernism, in opposition to degrowth, renewable energy, sustainable agriculture and climate justice. After Geoengineering rejects this binary, to ask: what if the people seized the means of climate production? Both critical and utopian, the book examines the possible futures after geoengineering. Rejecting the idea that geoengineering is some kind of easy work-around, Holly Buck outlines the kind of social transformation that would be necessary to enact a programme of geoengineering in the first place.

a case for climate engineering: *Storms of My Grandchildren* James Hansen, 2011-01-04 _____ 'When the history of the climate crisis is written, Hansen will be seen as the scientist with the most powerful and consistent voice calling for intelligent action to preserve our planet's environment' - Al Gore 'Few people know more about climate change than James Hansen ... This unnerving and fluently written book is the definitive one to read' - BBC Wildlife 'Anyone concerned about the world our children and grandchildren must inherit owes it to themselves to read this book' - Irish Times _____ An urgent and provocative call to action from the world's leading climate scientist Dr James Hansen, the world's leading scientist on climate issues, speaks out with the full truth about global warming: the planet is hurtling to a climatic point of no return. Hansen - whose climate predictions have come to pass again and again, beginning in the 1980s when he first warned US Congress about global warming - is the single most credible voice on the subject worldwide. He paints a devastating but all-too-realistic picture of what will happen if we continue to follow the course we're on. But he is also a hard-headed optimist, and shows that there is still time to take the urgent, strong action needed to save humanity. _____ 'James Hansen gives us the opportunity to watch a scientist who is sick of silence and compromise; a scientist at the breaking point - the point at which he is willing to sacrifice his credibility to make a stand to avert disaster' - LA Times

a case for climate engineering: *Ethical Aspects of Climate Engineering* Gregor Betz, Sebastian Cacean, 2012 This study investigates the ethical aspects of deploying and researching into so-called climate engineering methods, i.e. large-scale technical interventions in the climate system with the objective of offsetting anthropogenic climate change. The moral reasons in favour of and against R & D into and deployment of CE methods are analysed by means of argument maps. These argument maps provide an overview of the CE controversy and help to structure the complex debate.

a case for climate engineering: The Planet Remade Oliver Morton, 2017-05-02 First published in Great Britain by Granta Books, 2015.

a case for climate engineering: How Culture Shapes the Climate Change Debate Andrew J. Hoffman, 2015-03-11 Though the scientific community largely agrees that climate change is underway, debates about this issue remain fiercely polarized. These conversations have become a rhetorical contest, one where opposing sides try to achieve victory through playing on fear, distrust, and intolerance. At its heart, this split no longer concerns carbon dioxide, greenhouse gases, or climate modeling; rather, it is the product of contrasting, deeply entrenched worldviews. This brief examines what causes people to reject or accept the scientific consensus on climate change. Synthesizing evidence from sociology, psychology, and political science, Andrew J. Hoffman lays bare the opposing cultural lenses through which science is interpreted. He then extracts lessons from major cultural shifts in the past to engender a better understanding of the problem and motivate the public to take action. How Culture Shapes the Climate Change Debate makes a powerful case for a more scientifically literate public, a more socially engaged scientific community, and a more thoughtful mode of public discourse.

a case for climate engineering: How to Avoid a Climate Disaster Bill Gates, 2021-02-16 NEW YORK TIMES BESTSELLER NATIONAL BESTSELLER In this urgent, singularly authoritative book, Bill Gates sets out a wide-ranging, practical--and accessible--plan for how the world can get to zero greenhouse gas emissions in time to avoid an irreversible climate catastrophe. Bill Gates has spent a decade investigating the causes and effects of climate change. With the help and guidance of experts in the fields of physics, chemistry, biology, engineering, political science and finance, he has focused on exactly what must be done in order to stop the planet's slide toward certain environmental disaster. In this book, he not only gathers together all the information we need to fully grasp how important it is that we work toward net-zero emissions of greenhouse gases but also details exactly what we need to do to achieve this profoundly important goal. He gives us a clear-eyed description of the challenges we face. He describes the areas in which technology is already helping to reduce emissions; where and how the current technology can be made to function

more effectively; where breakthrough technologies are needed, and who is working on these essential innovations. Finally, he lays out a concrete plan for achieving the goal of zero emissions--suggesting not only policies that governments should adopt, but what we as individuals can do to keep our government, our employers and ourselves accountable in this crucial enterprise. As Bill Gates makes clear, achieving zero emissions will not be simple or easy to do, but by following the guidelines he sets out here, it is a goal firmly within our reach.

a case for climate engineering: The Case for a Carbon Tax Shi-Ling Hsu, 2012-06-22 There's a simple, straightforward way to cut carbon emissions and prevent the most disastrous effects of climate change-and we're rejecting it because of irrational political fears. That's the central argument of The Case for a Carbon Tax, a clear-eyed, sophisticated analysis of climate change policy. Shi-Ling Hsu examines the four major approaches to curbing CO2: cap-and-trade; command and control regulation; government subsidies of alternative energy; and carbon taxes. Weighing the economic, social, administrative, and political merits of each, he demonstrates why a tax is currently the most effective policy. Hsu does not claim that a tax is the perfect or only solution-but that unlike the alternatives, it can be implemented immediately and paired effectively with other approaches. In fact, the only real barrier is psychological. While politicians can present subsidies and cap-and-trade as win-win solutions, the costs of a tax are immediately apparent. Hsu deftly explores the social and political factors that prevent us from embracing this commonsense approach. And he shows why we must get past our hang-ups if we are to avert a global crisis.

a case for climate engineering: *Climate Intervention* National Research Council, Division on Earth and Life Studies, Ocean Studies Board, Board on Atmospheric Sciences and Climate, Committee on Geoengineering Climate: Technical Evaluation and Discussion of Impacts, 2015-06-23 The growing problem of changing environmental conditions caused by climate destabilization is well recognized as one of the defining issues of our time. The root problem is greenhouse gas emissions, and the fundamental solution is curbing those emissions. Climate geoengineering has often been considered to be a last-ditch response to climate change, to be used only if climate change damage should produce extreme hardship. Although the likelihood of eventually needing to resort to these efforts grows with every year of inaction on emissions control, there is a lack of information on these ways of potentially intervening in the climate system. As one of a two-book report, this volume of Climate Intervention discusses albedo modification - changing the fraction of incoming solar radiation that reaches the surface. This approach would deliberately modify the energy budget of Earth to produce a cooling designed to compensate for some of the effects of warming associated with greenhouse gas increases. The prospect of large-scale albedo modification raises political and governance issues at national and global levels, as well as ethical concerns. Climate Intervention: Reflecting Sunlight to Cool Earth discusses some of the social, political, and legal issues surrounding these proposed techniques. It is far easier to modify Earth's albedo than to determine whether it should be done or what the consequences might be of such an action. One serious concern is that such an action could be unilaterally undertaken by a small nation or smaller entity for its own benefit without international sanction and regardless of international consequences. Transparency in discussing this subject is critical. In the spirit of that transparency, Climate Intervention: Reflecting Sunlight to Cool Earth was based on peer-reviewed literature and the judgments of the authoring committee; no new research was done as part of this study and all data and information used are from entirely open sources. By helping to bring light to this topic area, this book will help leaders to be far more knowledgeable about the consequences of albedo modification approaches before they face a decision whether or not to use them.

a case for climate engineering: Climate Code Red David Spratt, Philip Sutton, 2008-06-30 This meticulously documented call-to-action reveals extensive scientific evidence that the global warming crisis is far worse than officially indicated — and that we’re almost at the point of no return. Serious climate-change impacts are already happening: large ice-sheets are disintegrating, sea-level rises will reach 5 metres this century, and we are seeing devastating species loss. It is no longer a case of how much more we can ‘safely’ emit, but whether we can stop emissions and

produce a deliberate cooling before the Earth's climate system reaches a point beyond any hope of human restoration. These imperatives are incompatible with 'politics as usual' and 'business as usual' — we face a sustainability emergency that urgently requires a clear break from the politics of failure-inducing compromise.

a case for climate engineering: *Climate Change (A Ladybird Expert Book)* HRH The Prince of Wales, Tony Juniper, Emily Shuckburgh, 2017-01-26 What is climate change? How does it work? Learn from the experts in the ALL-NEW LADYBIRD EXPERT SERIES Learn about one of the most important issues facing our world today in this clear, simple and enlightening introduction. From HRH The Prince of Wales, environmentalist Tony Juniper and climate scientist Dr Emily Shuckburgh, it explains the history, dangers and challenges of global warming and explores possible solutions with which to reduce its impact. You'll learn about . . . - The causes and consequences of climate disruption - Heatwaves, floods and other extreme weather - Disappearing wildlife - Acid oceans - The benefits of limiting warming - Sustainable farming - New, clean technologies - The circular economy Learn about other topics in the Ladybird Experts series including Gravity, Quantum Physics, Climate Change and Evolution. Written by the leading lights and most outstanding communicators in their fields, the Ladybird Expert books provide clear, accessible and authoritative introductions to subjects drawn from science, history and culture. For an adult readership, the Ladybird Expert series is produced in the same iconic small hardback format pioneered by the original Ladybirds. Each beautifully illustrated book features the first new illustrations produced in the original Ladybird style for nearly forty years.

a case for climate engineering: Hack the Planet Eli Kintisch, 2010-03-25 An inside tour of the incredible—and probably dangerous—plans to counteract the effects of climate change through experiments that range from the plausible to the fantastic David Battisti had arrived in Cambridge expecting a bloodbath. So had many of the other scientists who had joined him for an invitation-only workshop on climate science in 2007, with geoengineering at the top of the agenda. We can't take deliberately altering the atmosphere seriously, he thought, because there's no way we'll ever know enough to control it. But by the second day, with bad climate news piling on bad climate news, he was having second thoughts. When the scientists voted in a straw poll on whether to support geoengineering research, Battisti, filled with fear about the future, voted in favor. While the pernicious effects of global warming are clear, efforts to reduce the carbon emissions that cause it have fallen far short of what's needed. Some scientists have started exploring more direct and radical ways to cool the planet, such as: Pouring reflective pollution into the upper atmosphere Making clouds brighter Growing enormous blooms of algae in the ocean Schemes that were science fiction just a few years ago have become earnest plans being studied by alarmed scientists, determined to avoid a climate catastrophe. In Hack the Planet, Science magazine reporter Eli Kintisch looks more closely at this array of ideas and characters, asking if these risky schemes will work, and just how geoengineering is changing the world. Scientists are developing geoengineering techniques for worst-case scenarios. But what would those desperate times look like? Kintisch outlines four circumstances: collapsing ice sheets, megadroughts, a catastrophic methane release, and slowing of the global ocean conveyor belt. As incredible and outlandish as many of these plans may seem, could they soon become our only hope for avoiding calamity? Or will the plans of brilliant and well-intentioned scientists cause unforeseeable disasters as they play out in the real world? And does the advent of geoengineering mean that humanity has failed in its role as steward of the planet—or taken on a new responsibility? Kintisch lays out the possibilities and dangers of geoengineering in a time of planetary tipping points. His investigation is required reading as the debate over global warming shifts to whether humanity should Hack the Planet.

a case for climate engineering: Climate Shock Gernot Wagner, Martin L. Weitzman, 2016-04-19 How knowing the extreme risks of climate change can help us prepare for an uncertain future If you had a 10 percent chance of having a fatal car accident, you'd take necessary precautions. If your finances had a 10 percent chance of suffering a severe loss, you'd reevaluate your assets. So if we know the world is warming and there's a 10 percent chance this might

eventually lead to a catastrophe beyond anything we could imagine, why aren't we doing more about climate change right now? We insure our lives against an uncertain future—why not our planet? In Climate Shock, Gernot Wagner and Martin Weitzman explore in lively, clear terms the likely repercussions of a hotter planet, drawing on and expanding from work previously unavailable to general audiences. They show that the longer we wait to act, the more likely an extreme event will happen. A city might go underwater. A rogue nation might shoot particles into the Earth's atmosphere, geoengineering cooler temperatures. Zeroing in on the unknown extreme risks that may yet dwarf all else, the authors look at how economic forces that make sensible climate policies difficult to enact, make radical would-be fixes like geoengineering all the more probable. What we know about climate change is alarming enough. What we don't know about the extreme risks could be far more dangerous. Wagner and Weitzman help readers understand that we need to think about climate change in the same way that we think about insurance—as a risk management problem, only here on a global scale. With a new preface addressing recent developments Wagner and Weitzman demonstrate that climate change can and should be dealt with—and what could happen if we don't do so—tackling the defining environmental and public policy issue of our time.

a case for climate engineering: Climate Intervention National Research Council, Division on Earth and Life Studies, Ocean Studies Board, Board on Atmospheric Sciences and Climate, Committee on Geoengineering Climate: Technical Evaluation and Discussion of Impacts, 2015-06-17 The signals are everywhere that our planet is experiencing significant climate change. It is clear that we need to reduce the emissions of carbon dioxide and other greenhouse gases from our atmosphere if we want to avoid greatly increased risk of damage from climate change. Aggressively pursuing a program of emissions abatement or mitigation will show results over a timescale of many decades. How do we actively remove carbon dioxide from the atmosphere to make a bigger difference more quickly? As one of a two-book report, this volume of Climate Intervention discusses CDR, the carbon dioxide removal of greenhouse gas emissions from the atmosphere and sequestration of it in perpetuity. Climate Intervention: Carbon Dioxide Removal and Reliable Sequestration introduces possible CDR approaches and then discusses them in depth. Land management practices, such as low-till agriculture, reforestation and afforestation, ocean iron fertilization, and land-and-ocean-based accelerated weathering, could amplify the rates of processes that are already occurring as part of the natural carbon cycle. Other CDR approaches, such as bioenergy with carbon capture and sequestration, direct air capture and sequestration, and traditional carbon capture and sequestration, seek to capture CO2 from the atmosphere and dispose of it by pumping it underground at high pressure. This book looks at the pros and cons of these options and estimates possible rates of removal and total amounts that might be removed via these methods. With whatever portfolio of technologies the transition is achieved, eliminating the carbon dioxide emissions from the global energy and transportation systems will pose an enormous technical, economic, and social challenge that will likely take decades of concerted effort to achieve. Climate Intervention: Carbon Dioxide Removal and Reliable Sequestration will help to better understand the potential cost and performance of CDR strategies to inform debate and decision making as we work to stabilize and reduce atmospheric concentrations of carbon dioxide.

a case for climate engineering: *Earthmasters* Clive Hamilton, 2013-04-22 Looks at the effects climate change will have on Earth by the end of this century, focusing on a collaboration between scientists and big business to develop advances in geoengineering so that humans can fight global warming.

a case for climate engineering: Has It Come to This? J.P. Sapinski, Holly Jean Buck, Andreas Malm, 2020-11-13 Geoengineering is the deliberate and large-scale intervention in the Earth's climate system in an attempt to mitigate the adverse effects of global warming. Now that a climate emergency is upon us, claims that geoengineering is inevitable are rapidly proliferating. How did we get into this? What options make it onto the table? Which are left out? Whom does geoengineering serve? These are some of the questions that the thinkers contributing to this volume are exploring.

a case for climate engineering: Engineering the Climate Christopher J. Preston, 2012-06-28 Engineering the Climate: The Ethics of Solar Radiation Management discusses the ethical issues associated with deliberately engineering a cooler climate to combat global warming. Climate engineering (also known as geoengineering) has recently experienced a surge of interest given the growing likelihood that the global community will fail to limit the temperature increases associated with greenhouse gases to safe levels. Deliberate manipulation of solar radiation to combat climate change is an exciting and hopeful technical prospect, promising great benefits to those who are in line to suffer most through climate change. At the same time, the prospect of geoengineering creates huge controversy. Taking intentional control of earth's climate would be an unprecedented step in environmental management, raising a number of difficult ethical questions. One particular form of geoengineering, solar radiation management (SRM), is known to be relatively cheap and capable of bringing down global temperatures very rapidly. However, the complexity of the climate system creates considerable uncertainty about the precise nature of SRM's effects in different regions. The ethical issues raised by the prospect of SRM are both complex and thorny. They include: 1) the uncertainty of SRM's effects on precipitation patterns, 2) the challenge of proper global participation in decision-making, 3) the legitimacy of intentionally manipulating the global climate system in the first place, 4) the potential to sidestep the issue of dealing with greenhouse gas emissions, and, 5) the lasting effects on future generations. It has been widely acknowledged that a sustained and scholarly treatment of the ethics of SRM is necessary before it will be possible to make fair and just decisions about whether (or how) to proceed. This book, including essays by 13 experts in the field of ethics of geoengineering, is intended to go some distance towards providing that treatment.

a case for climate engineering: Advancing the Science of Climate Change National Research Council, Division on Earth and Life Studies, Board on Atmospheric Sciences and Climate, America's Climate Choices: Panel on Advancing the Science of Climate Change, 2011-01-10 Climate change is occurring, is caused largely by human activities, and poses significant risks for-and in many cases is already affecting-a broad range of human and natural systems. The compelling case for these conclusions is provided in Advancing the Science of Climate Change, part of a congressionally requested suite of studies known as America's Climate Choices. While noting that there is always more to learn and that the scientific process is never closed, the book shows that hypotheses about climate change are supported by multiple lines of evidence and have stood firm in the face of serious debate and careful evaluation of alternative explanations. As decision makers respond to these risks, the nation's scientific enterprise can contribute through research that improves understanding of the causes and consequences of climate change and also is useful to decision makers at the local, regional, national, and international levels. The book identifies decisions being made in 12 sectors, ranging from agriculture to transportation, to identify decisions being made in response to climate change. Advancing the Science of Climate Change calls for a single federal entity or program to coordinate a national, multidisciplinary research effort aimed at improving both understanding and responses to climate change. Seven cross-cutting research themes are identified to support this scientific enterprise. In addition, leaders of federal climate research should redouble efforts to deploy a comprehensive climate observing system, improve climate models and other analytical tools, invest in human capital, and improve linkages between research and decisions by forming partnerships with action-oriented programs.

a case for climate engineering: *Green Engineering* David T. Allen, David R. Shonnard, 2001-09-06 A chemical engineer's guide to managing and minimizing environmental impact. Chemical processes are invaluable to modern society, yet they generate substantial quantities of wastes and emissions, and safely managing these wastes costs tens of millions of dollars annually. Green Engineering is a complete professional's guide to the cost-effective design, commercialization, and use of chemical processes in ways that minimize pollution at the source, and reduce impact on health and the environment. This book also offers powerful new insights into environmental risk-based considerations in design of processes and products. First conceived by the staff of the

U.S. Environmental Protection Agency, Green Engineering draws on contributions from many leaders in the field and introduces advanced risk-based techniques including some currently in use at the EPA. Coverage includes: Engineering chemical processes, products, and systems to reduce environmental impacts Approaches for evaluating emissions and hazards of chemicals and processes Defining effective environmental performance targets Advanced approaches and tools for evaluating environmental fate Early-stage design and development techniques that minimize costs and environmental impacts In-depth coverage of unit operation and flowsheet analysis The economics of environmental improvement projects Integration of chemical processes with other material processing operations Lifecycle assessments: beyond the boundaries of the plant Increasingly, chemical engineers are faced with the challenge of integrating environmental objectives into design decisions. Green Engineering gives them the technical tools they need to do so.

a case for climate engineering: The Climate Caper Garth W. Paltridge, 2010-06-16 So you think the theory of disastrous climate change has been proven? You believe scientists are united in their efforts to affect a reduction in carbon emissions? You trust that scientists are far too professional to overstate their case? Maybe we should all think again. In The Climate Caper, written with a light touch and a readable manner, Garth Paltridge shows that the case for action against climate change is not nearly so clear cut after all. He leads us through the inherent problems of the climate modeling process, as well as the uncertainties associated with economic forecasts of climatic doom. Paltridge uncovers the conscious and subconscious forces that hide skepticism within the scientific community from the public eye and submit governments to a scientific and technological elite-an elite that achieves its ends by manipulating the public through fear of climate change, creating the world's greatest example of a religion for the politically correct.

a case for climate engineering: Climate Variations, Climate Change, and Water Resources Engineering Jürgen Garbrecht, Thomas Christopher Piechota, 2006 This report provides a broad overview of the interaction between climate variations and water resources engineering.

a case for climate engineering: Drawdown Paul Hawken, 2017-04-18 • New York Times bestseller • The 100 most substantive solutions to reverse global warming, based on meticulous research by leading scientists and policymakers around the world “At this point in time, the Drawdown book is exactly what is needed; a credible, conservative solution-by-solution narrative that we can do it. Reading it is an effective inoculation against the widespread perception of doom that humanity cannot and will not solve the climate crisis. Reported by-effects include increased determination and a sense of grounded hope.” —Per Espen Stoknes, Author, What We Think About When We Try Not To Think About Global Warming “There’s been no real way for ordinary people to get an understanding of what they can do and what impact it can have. There remains no single, comprehensive, reliable compendium of carbon-reduction solutions across sectors. At least until now. . . . The public is hungry for this kind of practical wisdom.” —David Roberts, Vox “This is the ideal environmental sciences textbook—only it is too interesting and inspiring to be called a textbook.” —Peter Kareiva, Director of the Institute of the Environment and Sustainability, UCLA In the face of widespread fear and apathy, an international coalition of researchers, professionals, and scientists have come together to offer a set of realistic and bold solutions to climate change. One hundred techniques and practices are described here—some are well known; some you may have never heard of. They range from clean energy to educating girls in lower-income countries to land use practices that pull carbon out of the air. The solutions exist, are economically viable, and communities throughout the world are currently enacting them with skill and determination. If deployed collectively on a global scale over the next thirty years, they represent a credible path forward, not just to slow the earth’s warming but to reach drawdown, that point in time when greenhouse gases in the atmosphere peak and begin to decline. These measures promise cascading benefits to human health, security, prosperity, and well-being—giving us every reason to see this planetary crisis as an opportunity to create a just and livable world.

a case for climate engineering: Climate Change: A Wicked Problem Frank P. Incropera, 2016 A pragmatic, no-holds-barred assessment of climate change, for anyone wishing to be fully

informed on the topic.

a case for climate engineering: Climate Change Mike Hulme, 2021-07-27 Written by a leading geographer of climate, this book offers a unique guide to students and general readers alike for making sense of this profound, far-reaching, and contested idea. It presents climate change as an idea with a past, a present, and a future. In ten carefully crafted chapters, Climate Change offers a synoptic and inter-disciplinary understanding of the idea of climate change from its varied historical and cultural origins; to its construction more recently through scientific endeavour; to the multiple ways in which political, social, and cultural movements in today's world seek to make sense of and act upon it; to the possible futures of climate, however it may be governed and imagined. The central claim of the book is that the full breadth and power of the idea of climate change can only be grasped from a vantage point that embraces the social sciences, humanities, and natural sciences. This vantage point is what the book offers, written from the perspective of a geographer whose career work on climate change has drawn across the full range of academic disciplines. The book highlights the work of leading geographers in relation to climate change; examples, illustrations, and case study boxes are drawn from different cultures around the world, and questions are posed for use in class discussions. The book is written as a student text, suitable for disciplinary and inter-disciplinary undergraduate and graduate courses that embrace climate change from within social science and humanities disciplines. Science students studying climate change on inter-disciplinary programmes will also benefit from reading it, as too will the general reader looking for a fresh and distinctive account of climate change.

a case for climate engineering: *Handbook of Climate Change Mitigation* Wei-Yin Chen, John Seiner, Toshio Suzuki, Maximilian Lackner, 2012-02-13 There is a mounting consensus that human behavior is changing the global climate and its consequence could be catastrophic. Reducing the 24 billion metric tons of carbon dioxide emissions from stationary and mobile sources is a gigantic task involving both technological challenges and monumental financial and societal costs. The pursuit of sustainable energy resources, environment, and economy has become a complex issue of global scale that affects the daily life of every citizen of the world. The present mitigation activities range from energy conservation, carbon-neutral energy conversions, carbon advanced combustion process that produce no greenhouse gases and that enable carbon capture and sequestion, to other advanced technologies. From its causes and impacts to its solutions, the issues surrounding climate change involve multidisciplinary science and technology. This handbook will provide a single source of this information. The book will be divided into the following sections: Scientific Evidence of Climate Change and Societal Issues, Impacts of Climate Change, Energy Conservation, Alternative Energies, Advanced Combustion, Advanced Technologies, and Education and Outreach.

a case for climate engineering: Evidence-Based Climate Science Don Easterbrook, 2011-08-25 Global warming and human-induced climate change are perhaps the most important scientific issues of our time. These issues continue to be debated in the scientific community and in the media without true consensus about the role of greenhouse gas emissions as a contributing factor. Evidence-Based Climate Science: Data opposing CO2 emissions as the primary source of global warming objectively gathers and analyzes scientific data concerning patterns of past climate changes, influences of changes in ocean temperatures, the effect of solar variation on global climate, and the effect of CO2 on global climate to clearly and objectively present counter-global-warming evidence not embraced by proponents of CO2. - An unbiased, evidence-based analysis of the scientific data concerning climate change and global warming - Authored by 8 of the world's leading climate scientists, each with more than 25 years of experience in the field - Extensive analysis of the physics of CO2 as a greenhouse gas and its role in global warming - Comprehensive citations, references, and bibliography - Adaptation strategies are presented as alternative reactions to greenhouse gas emission reductions

a case for climate engineering: Interpretive Approaches to Global Climate Governance Chris Methmann, Delf Rothe, Benjamin Stephan, 2013-06-03 Global climate change is perceived to be one of the biggest challenges for international politics in the 21st century. This work seeks to fuse

a global governance perspective together with different interpretive approaches, offering a novel way of looking at international climate politics. Equipped with a common interpretive tool-kit, the authors examine different issue-areas and excavate the contours of an overall pattern – the depoliticisation of climate governance. It is this concept which represents the overarching theme connecting the different contributions, addressing issues such as how the securitization of climate change conceals its socio-economic roots; how highly political decisions and value-judgements are couched in the terms of science; how the reframing of climate change as a matter of economic calculation and investment narrows the scope of political action; and how the prevailing concentration on technological solutions to climate change turns it into a mere administrative issue to be tackled by experts. Highlighting the depoliticisation of highly political issues provides a means to bring the political back into one of the most important issue areas of 21st century world politics. The editors have assembled a series of 14 interpretive inquiries into discourses of global climate governance which aim to flesh out an interpretive methodology, demonstrating the value it offers to those seeking to achieve a better understanding of global climate governance. This work will be of great interest to students and scholars of environmental politics, political theory and climate change.

a case for climate engineering: The Fourth Industrial Revolution Klaus Schwab, 2017-01-03 World-renowned economist Klaus Schwab, Founder and Executive Chairman of the World Economic Forum, explains that we have an opportunity to shape the fourth industrial revolution, which will fundamentally alter how we live and work. Schwab argues that this revolution is different in scale, scope and complexity from any that have come before. Characterized by a range of new technologies that are fusing the physical, digital and biological worlds, the developments are affecting all disciplines, economies, industries and governments, and even challenging ideas about what it means to be human. Artificial intelligence is already all around us, from supercomputers, drones and virtual assistants to 3D printing, DNA sequencing, smart thermostats, wearable sensors and microchips smaller than a grain of sand. But this is just the beginning: nanomaterials 200 times stronger than steel and a million times thinner than a strand of hair and the first transplant of a 3D printed liver are already in development. Imagine “smart factories” in which global systems of manufacturing are coordinated virtually, or implantable mobile phones made of biosynthetic materials. The fourth industrial revolution, says Schwab, is more significant, and its ramifications more profound, than in any prior period of human history. He outlines the key technologies driving this revolution and discusses the major impacts expected on government, business, civil society and individuals. Schwab also offers bold ideas on how to harness these changes and shape a better future—one in which technology empowers people rather than replaces them; progress serves society rather than disrupts it; and in which innovators respect moral and ethical boundaries rather than cross them. We all have the opportunity to contribute to developing new frameworks that advance progress.

a case for climate engineering: The Citizen's Guide to Climate Success Mark Jaccard, 2020-02-06 Shows readers how we can all help solve the climate crisis by focusing on a few key, achievable actions.

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