

a geoengineering solution to combat climate change might involve

A Geoengineering Solution to Combat Climate Change Might Involve: A Comprehensive Guide

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Summary: This guide explores the multifaceted nature of geoengineering solutions to combat climate change. It delves into various proposed methods, including solar radiation management (SRM) and carbon dioxide removal (CDR), while critically assessing their potential benefits, risks, ethical considerations, and governance challenges. Best practices for research, development, and deployment, along with potential pitfalls to avoid, are comprehensively discussed. The guide emphasizes the importance of rigorous scientific evaluation, international cooperation, and informed public discourse to ensure responsible development and implementation of any geoengineering strategy.

Introduction: Exploring the Necessity of a Geoengineering Solution to Combat Climate Change

The escalating global climate crisis demands urgent and multifaceted solutions. While emissions reduction remains paramount, the increasing severity of climate change impacts has led to growing interest in geoengineering – deliberate large-scale interventions in the Earth's climate system. A geoengineering solution to combat climate change might involve a range of approaches, each with its own set of implications. This guide provides a thorough overview of these potential solutions, focusing on best practices and avoiding common pitfalls.

I. Solar Radiation Management (SRM): Reflecting Sunlight Away from Earth

A geoengineering solution to combat climate change might involve SRM techniques, aiming to reduce the amount of solar radiation reaching the Earth's surface. This can be achieved through methods such as:

Stratospheric Aerosol Injection (SAI): Mimicking the cooling effect of volcanic eruptions by injecting reflective aerosols into the stratosphere. This approach is relatively inexpensive but carries considerable uncertainty regarding regional climate impacts and potential ozone depletion. A geoengineering solution to combat climate change using SAI requires meticulous modeling and monitoring.

Marine Cloud Brightening (MCB): Increasing the reflectivity of marine clouds by spraying seawater into the atmosphere. This method is less explored but offers potential for regional climate control. However, the logistical challenges and potential marine ecosystem impacts are significant concerns.

Space-based Reflectors: Deploying large mirrors in space to deflect sunlight. While highly effective, this approach is exceptionally expensive and technologically challenging.

Best Practices for SRM:

Comprehensive climate modeling: Rigorous simulations are crucial to understand potential regional impacts and unintended consequences.

Incremental deployment: Starting with small-scale experiments to assess efficacy and potential risks before large-scale implementation.

International cooperation: Global governance mechanisms are essential to prevent unilateral actions and ensure equitable distribution of benefits and risks.

II. Carbon Dioxide Removal (CDR): Taking CO₂ Out of the Atmosphere

Another avenue that a geoengineering solution to combat climate change might involve is CDR, focused on directly removing CO₂ from the atmosphere. Methods include:

Bioenergy with Carbon Capture and Storage (BECCS): Growing biomass for energy, capturing the CO₂ emissions during combustion, and storing them underground. This method has the potential for negative emissions but requires vast land areas and raises concerns about food security and biodiversity.

Direct Air Capture (DAC): Using technology to directly capture CO₂ from the ambient air. While technologically feasible, this approach is energy-intensive and currently expensive.

Ocean fertilization: Stimulating phytoplankton growth to absorb CO₂ from the atmosphere. This method is controversial due to potential impacts on marine ecosystems.

Enhanced weathering: Accelerating the natural process of rock weathering to absorb CO₂. This method is relatively slow and requires large-scale deployment.

Best Practices for CDR:

Life cycle analysis: Thorough assessment of the environmental impact across the entire process, from resource extraction to final disposal.

Sustainable sourcing: Ensuring that biomass production doesn't compete with food production or damage ecosystems.

Safe and secure storage: Implementing robust monitoring and verification systems to ensure long-term CO₂ storage.

III. Common Pitfalls and Ethical Considerations

A geoengineering solution to combat climate change might involve significant risks and ethical challenges. These include:

Unintended consequences: The complexity of the Earth's climate system makes predicting all potential impacts difficult.

Moral hazard: The possibility that geoengineering could reduce the urgency of emissions reduction efforts.

Geopolitical implications: Potential for conflict and inequitable distribution of benefits and risks among nations.

Lack of public trust: Building public confidence through transparent communication and participatory governance is critical.

IV. Governance and International Cooperation

Effective governance structures are essential for the responsible development and implementation of any geoengineering strategy. International cooperation is crucial to prevent unilateral actions and ensure equitable distribution of benefits and risks. Transparency and public participation are vital to build trust and ensure informed decision-making. A geoengineering solution to combat climate change should prioritize global collaboration and scientific integrity.

Conclusion:

A geoengineering solution to combat climate change might involve a combination of SRM and CDR techniques, but only after rigorous scientific evaluation, robust risk assessment, and broad societal consensus. The development and deployment of geoengineering technologies must be guided by principles of transparency, accountability, and international cooperation. While geoengineering offers potential to mitigate some climate change impacts, it should not be seen as a replacement for urgent

and substantial emission reductions.

FAQs:

1. What are the biggest risks associated with geoengineering? Unintended consequences on regional climates, ozone depletion, ecosystem disruption, and moral hazard.
2. Is geoengineering a proven technology? No, most geoengineering technologies are still in the research and development phase.
3. Who should decide whether to deploy geoengineering? This requires international collaboration and transparent decision-making processes involving scientists, policymakers, and the public.
4. How much will geoengineering cost? Estimates vary widely depending on the specific technology and scale of deployment.
5. What are the ethical implications of geoengineering? Concerns about equitable distribution of benefits and risks, moral hazard, and potential for unintended consequences.
6. Could geoengineering lead to conflicts between nations? Yes, there's a potential for disputes over deployment, regional impacts, and resource allocation.
7. Are there any successful examples of geoengineering? Small-scale experiments have been conducted, but no large-scale deployments have been implemented.
8. What role does public opinion play in geoengineering decisions? Public engagement and acceptance are crucial for responsible development and deployment.
9. What are the alternatives to geoengineering? The most effective strategy is a combination of

rapid emission reductions and adaptation measures.

Related Articles:

1. "Stratospheric Aerosol Injection: A Critical Review": A detailed analysis of the potential benefits, risks, and feasibility of SAI.
2. "Bioenergy with Carbon Capture and Storage: A Pathway to Negative Emissions?": An exploration of BECCS technology and its challenges.
3. "Direct Air Capture: Technological Advancements and Economic Viability": An overview of DAC technology and its current limitations.
4. "Ocean Fertilization: A Controversial Approach to Carbon Dioxide Removal": A discussion of the potential benefits and risks of ocean fertilization.
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9. "Geoengineering and Biodiversity: Assessing the Risks to Ecosystems": Focuses on the impact of geoengineering on the planet's biodiversity.

a geoengineering solution to combat climate change might involve: 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 geoengineering solution to combat climate change might involve: *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.

a geoengineering solution to combat climate change might involve: 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 geoengineering solution to combat climate change might involve: Can Science Fix Climate Change? Mike Hulme, 2014-06-04 Climate change seems to be an insurmountable problem. Political solutions have so far had little impact. Some scientists are now advocating the so-called 'Plan B', a more direct way of reducing the rate of future warming by reflecting more sunlight back to space, creating a thermostat in the sky. In this book, Mike Hulme argues against this kind of hubristic techno-fix. Drawing upon a distinguished career studying the science, politics and ethics of climate change, he shows why using science to fix the global climate is undesirable, ungovernable and unattainable. Science and technology should instead serve the more pragmatic goals of increasing societal resilience to weather risks, improving regional air quality and driving forward an energy technology transition. Seeking to reset the planet's thermostat is not the answer.

a geoengineering solution to combat climate change might involve: The Planet Remade Oliver Morton, 2017-05-02 First published in Great Britain by Granta Books, 2015.

a geoengineering solution to combat climate change might involve: 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 geoengineering solution to combat climate change might involve: How to Cool the Planet Jeff Goodell, 2010-04-15 "Thoughtful, informative, and darkly entertaining. It's the best treatment of this important (and scary) topic you can find." —Elizabeth Kolbert Right now, a group of scientists is working on ways to minimize the catastrophic impact of global warming. But they're not designing hybrids or fuel cells or wind turbines. They're trying to lower the temperature of the entire planet. And they're doing it with huge contraptions that suck CO₂ from the air, machines that brighten clouds and deflect sunlight away from the earth, even artificial volcanoes that spray heat-reflecting particles into the atmosphere. This is the radical and controversial world of geoengineering, which only five years ago was considered to be "fringe." But as Jeff Goodell points out, the economic crisis, combined with global political realities, is making these ideas look sane, even inspired. Goodell himself started out as a skeptic, concerned about tinkering with the planet's thermostat. We can't even predict next week's weather, so how are we going to change the temperature of whole regions? What if a wealthy entrepreneur shoots particles into the stratosphere on his own? Who gets blamed if something goes terribly wrong? And perhaps most disturbing, what about wars waged with climate control as the primary weapon? There are certainly risks, but Goodell believes the alternatives could be worse. In the end, he persuades us that geoengineering may just be our last best hope—a Plan B for the environment. His compelling tale of scientific hubris and technical daring is sure to jump-start the next big debate about the future of life on earth. "Goodell explores with infectious curiosity and thoughtful narration this strange, promising, and untested suite of climate fixes." —BusinessWeek "A quick, enjoyable read through a complex, timely topic. And after you read it, you'll never look at the sky or the ocean—or Earth, really—in quite the same way again." —The Christian Science Monitor

a geoengineering solution to combat climate change might involve: Geoengineering the Climate Royal Society (Great Britain), The Royal Society (London)., John Shepherd (geolog.), 2009 The Royal Society has published the findings of a major study into geoengineering the climate. The

study, chaired by Professor John Shepherd FRS, was researched and written over a period of twelve months by twelve leading academics representing science, economics, law and social science. Man-made climate change is happening and its impacts and costs will be large, serious and unevenly spread. The impacts may be reduced by adaptation and moderated by mitigation, especially by reducing emissions of greenhouse gases. However, global efforts to reduce emissions have not yet been sufficiently successful to provide confidence that the reductions needed to avoid dangerous climate change will be achieved. This has led to growing interest in geoengineering, defined here as the deliberate large-scale manipulation of the planetary environment to counteract anthropogenic climate change. However, despite this interest, there has been a lack of accessible, high quality information on the proposed geoengineering techniques which remain unproven and potentially dangerous. This study provides a detailed assessment of the various methods and considers the potential efficiency and unintended consequences they may pose. It divides geoengineering methods into two basic categories: 1. Carbon Dioxide Removal (CDR) techniques, which remove CO₂ from the atmosphere. As they address the root cause of climate change, rising CO₂ concentrations, they have relatively low uncertainties and risks. However, these techniques work slowly to reduce global temperatures. 2. Solar Radiation Management (SRM) techniques, which reflect a small percentage of the sun's light and heat back into space. These methods act quickly, and so may represent the only way to lower global temperatures quickly in the event of a climate crisis. However, they only reduce some, but not all, effects of climate change, while possibly creating other problems. They also do not affect CO₂ levels and therefore fail to address the wider effects of rising CO₂, including ocean acidification. The report recommends: Parties to the UNFCCC should make increased efforts towards mitigating and adapting to climate change and in particular to agreeing to global emissions reductions of at least 50% on 1990 levels by 2050 and more thereafter; CDR and SRM geoengineering methods should only be considered as part of a wider package of options for addressing climate change. CDR methods should be regarded as preferable to SRM methods. Relevant UK government departments, in association with the UK Research Councils, should together fund a 10 year geoengineering research programme at a level of the order of £10M per annum. The Royal Society, in collaboration with international science partners, should develop a code of practice for geoengineering research and provide recommendations to the international scientific community for a voluntary research governance framework. The Royal Society issued a call for submissions and convened a small ethics workshop as part of the evidence gathering process. More information is available in the main report.

a geoengineering solution to combat climate change might involve: All Over the Map Betsy Mason, Greg L. Miller, 2018 Created for map lovers by map lovers, this rich book explores the intriguing stories behind maps across history and illuminates how the art of cartography thrives today. In this visually stunning book, award-winning journalists Betsy Mason and Greg Miller--authors of the National Geographic cartography blog All Over the Map--explore the intriguing stories behind maps from a wide variety of cultures, civilizations, and time periods. Based on interviews with scores of leading cartographers, curators, historians, and scholars, this is a remarkable selection of fascinating and unusual maps. This diverse compendium includes ancient maps of dragon-filled seas, elaborate graphics picturing unseen concepts and forces from inside Earth to outer space, devious maps created by spies, and maps from pop culture such as the schematics to the Death Star and a map of Westeros from Game of Thrones. If your brain craves maps--and Mason and Miller would say it does, whether you know it or not--this eye-opening visual feast will inspire and delight.

a geoengineering solution to combat climate change might involve: A Case for Climate Engineering David Keith, 2013-09-20 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.

a geoengineering solution to combat climate change might involve: *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 geoengineering solution to combat climate change might involve: Comprehensive Remote Sensing Shunlin Liang, 2017-11-08 *Comprehensive Remote Sensing, Nine Volume Set* covers all aspects of the topic, with each volume edited by well-known scientists and contributed to by frontier researchers. It is a comprehensive resource that will benefit both students and researchers who want to further their understanding in this discipline. The field of remote sensing has quadrupled in size in the past two decades, and increasingly draws in individuals working in a diverse set of disciplines ranging from geographers, oceanographers, and meteorologists, to physicists and computer scientists. Researchers from a variety of backgrounds are now accessing remote sensing data, creating an urgent need for a one-stop reference work that can comprehensively document the development of remote sensing, from the basic principles, modeling and practical algorithms, to various applications. Fully comprehensive coverage of this rapidly growing discipline, giving readers a detailed overview of all aspects of Remote Sensing principles and applications Contains 'Layered content', with each article beginning with the basics and then moving on to more complex concepts Ideal for advanced undergraduates and academic researchers

Includes case studies that illustrate the practical application of remote sensing principles, further enhancing understanding

a geoengineering solution to combat climate change might involve: *Cross-Border Resource Management* Rongxing Guo, 2005-07-25 This essay is about the management of natural and environmental resources in cross-border areas. It explores a group of geographical, political, legal, economic and cultural factors that arise when political units (such as sovereign countries, dependent states and other administrative units) seek to utilize natural and environmental resources efficiently and equitably while minimizing the resultant damages (for example, prevention of resource degradation and preservation of the physical environment). * Examines various types of cross-border areas at both international and sub-national levels throughout the world as well as their geographical, political, economic and cultural influences on the cross-border resource management * Uses the latest international and area data, resulting in new findings for cross-border environmental activities * Contains a large number of case studies throughout the world including four in-depth case studies of cross-border resource management

a geoengineering solution to combat climate change might involve: *Managing Global Warming* Trevor Letcher, 2018-11-08 *Managing Global Warming: An Interface of Technology and Human Issues* discusses the causes of global warming, the options available to solve global warming problems, and how each option can be realistically implemented. It is the first book based on scientific content that presents an overall reference on both global warming and its solutions in one volume. Containing authoritative chapters written by scientists and engineers working in the field, each chapter includes the very latest research and references on the potential impact of wind, solar, hydro, geo-engineering and other energy technologies on climate change. With this wide ranging set of topics and solutions, engineers, professors, leaders and policymakers will find this to be a valuable handbook for their research and work. - Presents chapters that are accompanied by an easy reference summary - Includes up-to-date options and technical solutions for global warming through color imagery - Provides up-to-date information as presented by a collection of renowned global experts

a geoengineering solution to combat climate change might involve: *Engineering* Great Britain. Parliament. House of Commons. Innovation, Universities, Science and Skills Committee, 2009 Incorporating HC 470-i-iii, 640-i-iii, 599-i-iii, 1064-i, 1202-i, 1194-i of session 2007-08

a geoengineering solution to combat climate change might involve: *Resilience* Zinta Zommers, Keith Alverson, 2018-05-09 *In Resilience: The Science of Adaptation to Climate Change* leading experts analyze and question ongoing adaptation interventions. Contributions span different disciplinary perspectives, from law to engineering, and cover different regions from Africa to the Pacific. Chapters assess the need for adaptation, highlighting climate change impacts such as sea level rise, increases in temperature, changing hydrological variability, and threats to food security. The book then discusses the state of global legislation and means of tracking progress. It reviews ways to build resilience in a range of contexts— from the Arctic, to small island states, to urban areas, across food and energy systems. Critical tools for adaptation planning are highlighted - from social capital and ethics, to decision support systems, to innovative finance and risk transfer mechanisms. Controversies related to geoengineering and migration are also discussed. This book is an indispensable resource for scientists, practitioners, and policy makers working in climate change adaptation, sustainable development, ecosystem management, and urban planning. - Provides a summary of tools and methods used in adaptation including recent innovations - Includes chapters from a diverse range of authors from academic institutions, humanitarian organizations, and the United Nations - Evaluates adaptation options, highlighting gaps in knowledge where further research or new tools are needed

a geoengineering solution to combat climate change might involve: *The Climate Solutions Consensus* National Council for Science and the Environment, 2012-06-22 In 2007, the Intergovernmental Panel on Climate Change shared the 2007 Nobel Peace Prize (with former Vice President Al Gore) for its reporting on the human causes of climate change. In 2008, the National

Council for Science and the Environment reported that the acceleration of climate change is already faster than the IPCC projected only a year earlier. How we deal with the rapid environmental changes, and the human forces that are driving these changes, will be among the defining issues of our generation. Climate Solutions Consensus presents an agenda for America. It is the first major consensus statement by the nation's leading scientists, and it provides specific recommendations for federal policies, for state and local governments, for businesses, and for colleges and universities that are preparing future generations who will be dealing with a radically changed climate. The book draws upon the recommendations developed by more than 1200 scientists, educators and decision makers who participated in the National Council for Science and the Environment's 8th National Conference on Science, Policy and the Environment. After presenting a lucid narrative of the science behind climate change and its solutions, Climate Solutions Consensus presents 35 practical, results-oriented approaches for minimizing climate change and its impacts. It clearly spells out options for technological, societal, and policy actions. And it deals head-on with controversial topics, including nuclear energy, ocean fertilization and atmospheric geo-engineering. One of the book's key conclusions is that climate solutions are about much more than energy sources. They involve re-examining everything people do with an eye toward minimizing climate impacts. This includes our eating habits, consumption patterns, transportation, building and housing, forestry, land use, education, and more. According to these scientists, the time to act is now. With clarity and urgency, they tell us exactly what needs to be done to start reversing the driving factors behind climate change, minimizing their consequences, and adapting to what is beyond our power to stop.

a geoengineering solution to combat climate change might involve: Reflecting Sunlight
National Academies of Sciences, Engineering, and Medicine, Policy and Global Affairs, Division on Earth and Life Studies, Committee on Science, Technology, and Law, Committee on Developing a Research Agenda and Research Governance Approaches for Climate Intervention Strategies that Reflect Sunlight to Cool Earth, Board on Atmospheric Sciences and Climate, 2021-12-25 The National Research Council report Climate Intervention: Reflecting Sunlight to Cool Earth (NRC, 2015) reviewed the state of the science and provided high-level findings and recommendations regarding SG methods. This current study was tasked to update the 2015 assessment of the state of understanding and to provide recommendations for how to establish a research program, what to encompass in the research agenda, and what mechanisms to employ for governing this research.

a geoengineering solution to combat climate change might involve: Climate Ethics
Stephen Gardiner, Simon Caney, Dale Jamieson, Henry Shue, 2010-07-30 This collection gathers a set of seminal papers from the emerging area of ethics and climate change. Topics covered include human rights, international justice, intergenerational ethics, individual responsibility, climate economics, and the ethics of geoengineering. Climate Ethics is intended to serve as a source book for general reference, and for university courses that include a focus on the human dimensions of climate change. It should be of broad interest to all those concerned with global justice, environmental science and policy, and the future of humanity.

a geoengineering solution to combat climate change might involve: The New Climate War
Michael E. Mann, 2021-01-12 Shortlisted for the FT/McKinsey Business Book of the Year award A renowned climate scientist shows how fossil fuel companies have waged a thirty-year campaign to deflect blame and responsibility and delay action on climate change, and offers a battle plan for how we can save the planet. Recycle. Fly less. Eat less meat. These are some of the ways that we've been told can slow climate change. But the inordinate emphasis on individual behavior is the result of a marketing campaign that has succeeded in placing the responsibility for fixing climate change squarely on the shoulders of individuals. Fossil fuel companies have followed the example of other industries deflecting blame (think guns don't kill people, people kill people) or greenwashing (think of the beverage industry's Crying Indian commercials of the 1970s). Meanwhile, they've blocked efforts to regulate or price carbon emissions, run PR campaigns aimed at discrediting viable alternatives, and have abdicated their responsibility in fixing the problem they've created. The result has been disastrous for our planet. In The New Climate War, Mann argues that all is not lost. He

draws the battle lines between the people and the polluters-fossil fuel companies, right-wing plutocrats, and petrostates. And he outlines a plan for forcing our governments and corporations to wake up and make real change, including: A common-sense, attainable approach to carbon pricing- and a revision of the well-intentioned but flawed currently proposed version of the Green New Deal; Allowing renewable energy to compete fairly against fossil fuels Debunking the false narratives and arguments that have worked their way into the climate debate and driven a wedge between even those who support climate change solutions Combatting climate doomism and despair-mongering With immensely powerful vested interests aligned in defense of the fossil fuel status quo, the societal tipping point won't happen without the active participation of citizens everywhere aiding in the collective push forward. This book will reach, inform, and enable citizens everywhere to join this battle for our planet.

a geoengineering solution to combat climate change might involve: Geoengineering of the Climate System R M Harrison, R E Hester, 2014-05-08 It is generally accepted within the scientific community that anthropogenic emissions of greenhouse gases are primarily responsible for a recent warming in global climate and that current trajectories of emissions may lead to potentially catastrophic changes in climate. While reduction in emissions of greenhouse gases, and particularly carbon dioxide, could lead to a stabilisation of global temperatures, this requires international agreements which have yet to be achieved. A possible alternative, which has been widely mooted is to use methods known as geoengineering as an alternative way of limiting increases in global temperature. Geoengineering techniques fall into two main categories of carbon dioxide removal and solar radiation management; within each of these there are a number of options. Following on from "Carbon Capture" (volume 29 in this series), Geoengineering of the Climate System presents an overview of the technologies currently being considered as large scale solutions to climate change, and considers some of the possible benefits and disadvantages of each. Invited contributions have been received by many of the leading experts on these technologies, and the volume provides a comprehensive overview of both carbon dioxide reduction and solar radiation management methods. These give rise to important ethical and governance issues which are also explored. Written with active researchers, postgraduate students and policy-makers in mind, the latest addition to the Issues in Environmental Science & Technology series presents a balanced and informed view of this important field of research and is an essential addition to any environmental science library.

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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.

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Medicine, Division on Earth and Life Studies, Ocean Studies Board, Board on Chemical Sciences and Technology, Board on Earth Sciences and Resources, Board on Agriculture and Natural Resources, Board on Energy and Environmental Systems, Board on Atmospheric Sciences and Climate, Committee on Developing a Research Agenda for Carbon Dioxide Removal and Reliable Sequestration, 2019-04-08 To achieve goals for climate and economic growth, negative emissions technologies (NETs) that remove and sequester carbon dioxide from the air will need to play a significant role in mitigating climate change. Unlike carbon capture and storage technologies that remove carbon dioxide emissions directly from large point sources such as coal power plants, NETs remove carbon dioxide directly from the atmosphere or enhance natural carbon sinks. Storing the carbon dioxide from NETs has the same impact on the atmosphere and climate as simultaneously preventing an equal amount of carbon dioxide from being emitted. Recent analyses found that deploying NETs may be less expensive and less disruptive than reducing some emissions, such as a substantial portion of agricultural and land-use emissions and some transportation emissions. In 2015, the National Academies published *Climate Intervention: Carbon Dioxide Removal and Reliable Sequestration*, which described and initially assessed NETs and sequestration technologies. This report acknowledged the relative paucity of research on NETs and recommended development of a research agenda that covers all aspects of NETs from fundamental science to full-scale deployment. To address this need, *Negative Emissions Technologies and Reliable Sequestration: A Research Agenda* assesses the benefits, risks, and sustainable scale potential for NETs and sequestration. This report also defines the essential components of a research and development program, including its estimated costs and potential impact.

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extinctions from climate change from different time frames in the past explores extinctions documented in the contemporary record sets forth new risk estimates for future climate change considers the conservation and policy implications of the estimates. Saving a Million Species offers a clear explanation of the science behind the headline-grabbing estimates for conservationists, researchers, teachers, students, and policy-makers. It is a critical resource for helping those working to conserve biodiversity take on the rapidly advancing and evolving global stressor of climate change-the most important issue in conservation biology today, and the one for which we are least prepared.

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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.

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