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Abstract:
Global air temperatures continue to rise despite efforts to curb greenhouse gas emissions. Supplementary technological interventions may become necessary to avoid harmful consequences resulting from unabated temperature increases. One such intervention involves the artificial reduction of incoming solar radiation through the release of reflective particles into the stratosphere: stratospheric aerosol injection (SAI). The American public is generally unfamiliar with SAI, despite increasing media coverage. We conducted a content analysis of frames in U.S. news focused on SAI between 2014 and 2022 to identify and catalogue the most prominent dimensions that are employed in news coverage. We then use these dimensions to design a two-wave survey experiment evaluating how combinations of positive and negative frames that appear in recent journalistic accounts affect the American public's beliefs about SAI and support for research. The results demonstrate how exposure to framed communications can exert a powerful and durable impact on the public's beliefs and general support for SAI.

Keywords: public opinion, media framing, climate engineering, climate change, stratospheric aerosol injection (SAI)

1 Stratospheric Aerosol Injection (SAI) to Reduce Global Surface Air Temperatures

Global air temperatures continue to rise despite efforts to curb greenhouse gas emissions. Several scholarly reports have suggested that supplementary technological interventions may become necessary to avoid catastrophic consequences resulting from unabated temperature increases (National Research Council 2015; National Academies of Sciences, Engineering and Medicine 2021; IPCC 2022).

Solar geoengineering, also called solar radiation management (SRM), is defined as "methods that could be used to ameliorate climate hazards due to long-lived greenhouse gases by modifying the radiative force of climate – primarily by reducing the absorbed solar flux" (Keith 2021). One of the technological interventions that has received attention from scientists and policymakers involves the artificial reduction of incoming solar radiation through stratospheric aerosol injection (SAI).[1] SAI entails the use of airplanes or high-altitude balloons to release reflective particles or aerosols into the stratosphere. These particles then reflect a portion of the incoming sunlight back into space resulting in cooler surface temperatures. SAI has been the subject of debate among experts due to concerns about the physical risks, governance of deployment, and potential regional injustices. Others are concerned about fundamentally altering humans' relationship with nature, including the risk of "termination shock" or negative climate impacts from the sudden cessation of SRM if implemented (Horton et al. 2018; McKinnon 2019). Despite these concerns, many argue that SAI's theorized ability to reduce surface air temperatures could reduce or reverse the negative impacts of global warming, such as

[1] Although there are several SRM strategies, we focus exclusively on SAI given the attention this approach has received in reports published by the National Academy of Sciences (2021).

devastating floods and droughts, stronger coastal storms, sea ice melt, biodiversity loss, and sea level rise (Crutzen 2006; McDonald 2022; Robock 2016; Zarnetske et al. 2021). Jacobson (2018, p. 328) has argued that studies involving the assessment of perceived positive and negative framings contribute to "constructing particular notions of legitimacy within the field," thereby raising ethical issues.

Public support is required for the many decisions involved in both research about and implementation of SAI, and such support is susceptible to the way these issues are framed, "offering both risks and opportunities for climate communication" (Raimi 2021, p.66). A consistent finding in the few studies evaluating opinions about SRM/SAI is that the public is generally uninformed about this technology (Asayama et al. 2017; Carlisle 2020; Cummings et al. 2017). Prior research also suggests several factors associated with support for SAI technologies including specific beliefs about SAI, environmental values, trust in science, and various types of information or frames that people are exposed to as they learn about it, such as information about its benefits, risks, or other implications (Aldy et al. 2021; Bellamy et al. 2016; Bellamy et al. 2017; Scheer and Renn 2014). Prior research has also tracked various themes and metaphors in news accounts describing SAI (Jacobson 2022; Luokkanen et al. 2014; Nerlich and Jaspal 2012; Tingley and Wagner 2017). Our research contributes to existing knowledge by combining some of the most prominent frames in recent journalistic accounts with evidence about the immediate and longer-term impact of these frames on the American public's beliefs about SAI and support for research.

2 Framing and Public Opinion on SAI

The public is unfamiliar with the term *solar geoengineering* and almost completely unaware of stratospheric aerosol injection or SAI (NAS 2021, p. 81; Burns et al. 2016; Corner et

al. 2013; Mahajan et al. 2019; Mercer et al. 2011; Raimi 2021). Consequently, reported support for SAI is largely the result of people's existing beliefs about the perceived seriousness of climate change, trust in science, values such as an aversion to tampering with nature, and political ideology (Dannenberg and Zitzelsberger 2019; Kahan et al. 2015; Lemos et al. 2019; Merk et al. 2015). People generally report concern about the deployment of SRM technologies when they are introduced to these approaches for lowering surface air temperatures (Macnaghten and Szerszynski 2013; Pidgeon et al. 2013; Wright et al. 2014). In this case of general unfamiliarity, the *framing* of messages describing SAI/SRM has a major influence on subsequent beliefs (Raimi 2021).

Message framing refers to the process of emphasizing specific considerations in relaying information, which can shape how receivers interpret the information and form opinions (Chong and Druckman 2007; Entman 1993). Several studies have explored how exposure to framed messages influence public opinion about solar radiation management (SRM) or stratospheric aerosol injection (SAI). In an online survey conducted in the UK, respondents were more supportive of SRM as a response to climate change when it was characterized as analogous to "natural" processes such as volcanic eruptions (Corner and Pidgeon 2015; Corner et al. 2013). In contrast, a survey experiment conducted in the U.S. that manipulated a description of SRM as natural or unnatural found no effect on respondents' support for whether more research should be done on it; instead, people's beliefs about the degree to which it is a fast and cost-effective

alternative to traditional mitigation efforts predicted their support for this "imperfect" solution (Mahajan et al. 2019).[2]

Another common frame or metaphor that media employ in describing SRM is that it is a "Plan B", or a sort of "disaster insurance" that may become necessary in the future to "avoid a planetary catastrophe" (Corry 2017). Empirical research on the impacts of this framing has also shown mixed results. Wilbeck et al. (2022, p. 12) found that lay focus groups in Japan, New Zealand, the U.S., and Sweden supported SAI only when it was a "last resort" or a "means to avoid catastrophic impacts of climate change." Conversely, in a survey experiment conducted on a convenience sample of U.S. residents, when SRM was framed as a "major solution" to combat climate change, the framing had no effect on liberal respondents, but reduced support for policies to mitigate climate change among conservatives and moderates (Raimi et al. 2019). A separate study also conducted in the U.S. found that learning about SRM *increased* perceptions of risk associated with climate change among conservatives (Kahan et al. 2015). In contrast to these two experiments, a study in Germany found that merely describing the technology reduced support for technological solutions to fight climate change (Sütterlin and Siegrist 2017). In most of these studies, respondents were provided with only brief descriptions of solar geoengineering or tested the effects of a relatively narrow range of frames to better understand how specific arguments affect people's related beliefs and opinions (Raimi et al. 2019, p. 312). Most people will

[2] The implementation of SAI does not diminish the need for decarbonization. All major scientific reports and scholarship are clear that SAI (or other solar geoengineering) cannot stand alone (National Research Council 2015; Royal Society 2009; Jacobson 2022, pp. 149-151; Keith 2021).

encounter more detailed explanations, as well as conflicting opinions about both research and implementation, in their everyday lives as SRM/SAI discourse becomes more prevalent. Additional research is needed to assess these "real world" situations if we are to understand the likely impact of this discourse on public support for these technologies.

There have also been studies identifying the most prominent issue/emphasis frames in news stories about SAI. Several studies have evaluated discourses on SRM/SAI in different contexts to shed light on some of the key storylines and frames that are deployed when these technologies are discussed (Anshelm and Hansson 2014a; Anshelm and Hansson 2014b; Burnard and Colvin 2018 and 2022; Reynolds 2022; Huttunen and Hilden 2014; Tingley and Wagner 2017).

Luokkanen et al. (2014) identified four sets of "metaphors" in news articles in the Guardian or the New York Times from 2006-2011 that either promote or oppose solar geoengineering. These metaphors were: war or fight, control or insurance, the Earth as a machine, or the Earth as an organism to be healed and cured. Jacobson (2022) extended this line of research including print and online articles and editorials from 1991-2016. She identified a "mainstreaming" of the topic accompanied by a focus on "controversy". Another rhetorical tool she identified was the use of certain extreme forms of geoengineering proposals as "decoy options" presented in order for them to be easily dismissed in favor of other geoengineering options. Complementing the work of Luokkanen et al. (2014), she found frequent use of mechanistic metaphors such as "thermostat" or medical metaphors such as "chemotherapy". She added that more recent news media, since 2018, seems to take a more "benevolent" framing (p. 170).

The empirical analyses by Luokkanen et al. (2014) and Jacobson (2022) have provided evidence of the evolution of the framing of geoengineering by media in the U.S. and Britain. Our research contributes to this legacy by joining the analysis of themes in the mass media *with the development of a survey experiment* to demonstrate how specific story lines affect public attitudes. We designed an experiment (described in detail below) incorporating the multiple prominent frames toward SAI in U.S. media to evaluate how more detailed portrayals influence initial opinion formation, the persistence of initial attitudes over a short period of time, and the role that initial opinions about SAI, and individual-level predispositions, play in conditioning people's evaluations of "new" information presented at a later time. Based on the large body of research on message framing, we offer the following predictions:

Pre-Registered Hypotheses: Wave 1

Hypothesis 1: Exposure to positive / negative frames about SAI will shift respondents' specific beliefs about SAI in the direction of the information provided.

Hypothesis 2: Exposure to positive (negative) frames about SAI will increase (decrease) general support for SAI as an approach to lower world temperatures.

In addition, we pose the following research question to evaluate the duration of any treatment effects after a short passage of time:

Research Question #1: Do any observed treatment effects from Wave 1 measuring beliefs about SAI and/or general support for SAI persist after a short passage of time (~5 days).

Scientific Consensus Messaging: Wave 2

Exposure to messages that communicate a scientific consensus on any issue can have a powerful impact on public opinion. For instance, the Gateway-Belief-Model (GBM) (Lewandowsky et al. 2013) theorizes that presenting individuals with a message that "97% of climate scientists believe in human-caused climate change" will increase people's accuracy in their estimate of the level of scientific agreement, and that this shift in perception of the expert

consensus will have "cascading changes in other key beliefs about the issue, such as the belief that climate change is happening, human-caused, and a worrisome risk that requires international coordination" (van der Linden et al. 2019, p. 50; van der Linden 2021). We build on this line of research by applying it to the study of public support for SAI by evaluating how learning that a consensus of scientists support SAI and its research impacts people's related views. Bolsen et al. (2022a) show that a consensus-based message increased public support for research to study SAI in contexts where the benefits of scientific research were highlighted. Based on the well-documented effects that communicating scientific consensus information can have on the public, especially when competitive counter-messaging is not present, we offer the following prediction:

Hypothesis 3: Respondents exposed to the positive frames at Wave 1 and who are randomly assigned to the positive "scientific consensus message" at Wave 2 will express higher levels of: (a) general support for SAI, (b) support for research funding, and (c) support for a small-scale SAI study relative to those assigned to the control at Wave 1 and control at Wave 2.

Several studies have tested the impact of communicating scientific consensus messages about climate change in contexts where "competing frames" are present, such as messages that politicize the scientific consensus on climate change (Bolsen and Druckman 2018; Bolsen et al. 2022b; Bolsen et al. 2019). The positive effect that such messages can generate is often blunted when competing considerations are present. For instance, in one study, messages that emphasized both the benefits and risks of SAI research led to the negative information canceling out the positive effects of a consensus message (Bolsen et al. 2022a). Thus, we offer the following prediction:

Hypothesis 4: Respondents exposed to the negative or strong negative frames at Wave 1 and who are randomly assigned to the positive "scientific consensus message" at Wave 2 will express levels of support that do not differ from the baseline on: (a) general support for SAI, (b) support

for research funding, and (c) support for a small-scale SAI study relative to those assigned to the control at Wave 1 and Wave 2.[3]

3 Content Analysis of SAI Frames in U.S. News, 2014-2022

We conducted a comprehensive content analysis of frames in U.S. news focused on SRM/SAI between 2014 and 2022 on which we base our experimental treatments. Identifying frames in communication towards political issues or events in news coverage is a common practice among scholars across disciplines. Chong and Druckman (2011) provide specific steps to identify issue frames in news discourses: first, select an issue, person or event because a frame in communication can only be defined in relation to a specific attitude object (e.g., support for SAI); second, when the goal is to understand how framed communications affect public opinion, isolate the attitude of interest, in this case, attitudes about research on and deployment of SAI; third, identify an initial set of frames inductively to create a coding scheme; fourth, select sources for the content analysis; and fifth, prior to coding, specify how a particular frame can be identified. Finally, when conducting manual (human) coding, which offers greater flexibility than automated software analyses, it is important to conduct inter-coder checks to assess the reliability of the coding instrument. Most previous work applying this methodology has focused on the prevalence of frames in news stories regardless of context.[4]

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[3] We acknowledge the wording of H4 deviates from our pre-registered version where we had inadvertently listed a persistent negative effect stemming from wave 1 as opposed to the competing frames "canceling out" at wave 2.

[4] The focus on frequency stems from assumptions that the considerations a person holds toward any attitude-object often depends on the volume of messages received and accepted on any side

We followed the guidelines detailed by Chong and Druckman (2011) to conduct a content analysis of news coverage on SAI in prominent U.S. news outlets. This list contained both newspapers and news aggregators, online platforms that collect web syndicated content. The list included the AP news, Breitbart, CNN, Forbes, Fox, NBS news, New York Times, NPR, USA Today, Wall Street Journal and the Washington Post, as well as others. We searched the ProQuest database for any stories that included the words "solar geoengineering" in the headline or lead paragraph. We supplemented this search with extensive web-based searches by the authors and the research assistants to add as many news items as possible about solar geoengineering, whether or not this term was actually in the title or headline. We restricted the search to articles published between 2014 and 2022 due to the attention SAI has received from the National Research Council, the National Academy of Sciences and the IPCC over this period (National Research Council 2015; National Academy of Sciences 2021; IPCC 2022). The search resulted in 71 unique news articles that were selected for manual coding.[5]

[Insert Table 1 here]

In developing the initial coding instrument, we identified ten distinct "frames in communication", or "issue frames", employed in news coverage on SAI, including: (1) risky/safe; (2) naturalness/unnaturalness; (3) environmental effects (threats/ benefits); (4) effectiveness/ineffectiveness; (5) moral hazards; (6) governance considerations; (7) national

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of an issue (Zaller 1992). However, *framing theory* shows that such effects depend not only on cognitive "accessibility" processes but also on evaluations of the perceived "strength" or "effectiveness" of any frame (Chong and Druckman 2007).

[5] See Supplemental Appendix F for a full list of these articles.

security implications; (8) economic benefits/costs; (9) ethical/ justice considerations; and (10) industry tactic/ false solution (Table 1). The coding instrument we created (see Supplemental Appendix A) allowed us to identify both the prominence of each frame (entering a binary code of "1" in a coding spreadsheet if the frame was present anywhere in the article, and "0" otherwise), as well as the "direction" (positive/negative valence) of each frame.[6] Notably, the dimensions we identified map nearly perfectly with key positive and negative attributes residents in Australia and New Zealand associated with SRM technologies in in-depth interviews and large N surveys (Wright et al. 2014) and encapsulate the key frames that constitute most macro-level storylines used by the media (Burnard and Colvin 2022; Anshelm and Hansson 2014b).

Emphasis frames may vary both across "dimensions" that are present in any story (e.g., risky/safe, environmental effects, economic effects, moral hazard, etc.), as well as in their "direction" (e.g., an article highlights the environmental *benefits* or *threats*, or SAI's relative economic *costs* or *benefits*, or a mix of all these considerations). We found that several identified frames are largely "one-sided" and (nearly) universally "negative" in their valence when they appear in news articles.[7] Two examples are "moral hazard" and "national security" which were generally described as negative outcomes of SAI research or implementation.

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[6] All supplemental appendices and replication materials may be accessed at: https://doi.org/10.7910/DVN/KCGQXU

[7] Two undergraduate research assistants worked with us to code the articles identified from our search of relevant sources. The method we employed allowed coders the flexibility to identify "other" frames that were not initially identified in the coding instrument to include in the final questionnaire, for example, the effects of SAI on "aesthetics" (e.g., "it will change the color of

[Insert Figure 1 here]

The prominence and direction (or valence) of each of the ten issue frames provided more information for developing the experimental treatments (Fig. 1). The most prevalent frame, appearing in 87 percent of the stories, focused on the potential riskiness of SAI. In most cases, the stories emphasized the *unknown or uncontrolled risks* that SAI might present to humans and societies as opposed to its safety. Slightly more than half of the articles included language from the natural/unnatural frame or the environmental effects frame. About 40 percent of the articles discussed the effectiveness of SAI in controlling global warming or brought up the issue of moral hazard, the notion that deployment of SAI could reduce the motivation to address the root causes of climate change (Cherry et al. 2021; Cherry et al. 2022; Fairbrother 2016). About a third mentioned concerns over the governance of SAI or its threat to national security if there were international conflicts over its use (Bas and Mahajan 2020). Less frequently occurring frames considered the cost/benefit relationships of deploying SAI, its possible impacts on social equity or justice, or the suggestion that SAI was a tactic to benefit elites or the carbon industry.

The results from our content analysis reveal both the prominence of negative information about SAI, and that the range of emphasis frames that exist that may influence public opinion is very broad.

4 Methods

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the sky") and the mention of SAI as a "Plan B" or backup plan "of last resort" in the case of unmitigated climate change.

4.1 Procedure & Sample

Following the completion of the content analysis, we designed a two-wave survey experiment to evaluate the effects of exposure to initial information on public opinion, the persistence of any initial framing effects (after 5 days), and the role that initial opinions toward SAI play in shaping responses to scientific consensus information provided to respondents in a follow-up survey. The sample for the survey experiment was drawn from a balanced sample provided by Bovitz's high-quality Forthright panel and was fielded in October 2022.[8] Survey respondents were randomly assigned to four experimental treatment conditions in the first wave of the study; and, to a control or treatment condition in the follow-up survey that took place five days following the completion of Wave 1. The purpose of providing the randomized information at Wave 1 was to evaluate the degree to which framed information *establishes an initial positive or negative attitude/belief about SAI*, the persistence of the effect of these messages, and the

[8] Respondents are recruited via mail campaigns based on address-based probability sampling, as well as via online ads, and their data have been used extensively in political science. The sample was quota-matched to represent American adults on age, gender, education, Census region, and race. The survey also included an attention check to ensure the quality of the responses. The final N is based on those who passed the attention check and who completed each survey wave in a credible time: respondents who completed either wave in under a minute were excluded. Descriptive statistics for the sample are provided in Supplemental Appendix B.

degree to which initial beliefs and attitudes moderate how respondents evaluate novel information about a small-scale research study on SAI.[9]

In the first wave (T1) of the survey, respondents were informed that they would read a short statement about a new technology and then be asked a series of questions about it. Next, all respondents read a short paragraph that provided basic and neutral information that defined "Stratospheric Aerosol Injection" (SAI) and explained how it can be used to "reflect sunlight back into space" to offset temperature increases. The paragraph was accompanied by a diagram illustrating how SAI particles in the stratosphere reflect a portion of the sunlight reaching Earth's surface.[10] Respondents in the control condition received no further information before answering the common set of questions about SAI attitudes.

Individuals assigned to the *positive SAI* treatment at T1 read two *additional* short paragraphs that emphasized specific considerations identified as prominent in our content analysis. These included the arguments that the technology is safe, cost-effective, and comparable to such natural processes as volcanoes, reiterated the benefits of stabilizing Earth's temperatures, and emphasized the potential reduction of severe storms and habitat loss.

We tested two different negative treatments in the first wave, given the relative prominence of negatively valenced frames in the content analysis. We constructed these conditions with similar, but distinct, negative information. The *first negative frame* emphasized

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[9] Our pre-registered hypotheses are available at https://osf.io/k6453/?view_only=dd47ba907d434bc2ade4894e93f246e8.

[10] The treatments are presented as they appeared to respondents in full in the Supplemental Appendix C.

the ideas that the technology is unproven, risky, unpredictable and could be misused. Further, SAI would be a temporary measure that might divert attention from the reduction of the production of greenhouse gases in the atmosphere.

The second negative frame was designed to be emotive, arousing distressing thoughts from those who have read or watched a version of Hansel and Gretel. The use of a childhood story to affect the emotional impact of a message is supported by several studies that have shown that stories "improve the ways scientific evidence about the future is listened to" (Dillon and Craig 2022, p. 1), and they are more effective than other communications in persuasion because they capture the attention of the audience more easily and engage them emotionally (Flottum and Gjerstad 2016; Shen et al. 2015). This frame also used more emotional terms such as "rogue actors", "radical idea", and "hack the planet." In addition, it suggests that oil companies may support the idea solely to enhance their profits. Designed to produce an even stronger negative reaction, it is henceforth termed the *strong negative frame*.

Wave 2 of the study took place 5 days after the initial survey. All respondents were either assigned to a *control* condition or to a *scientific consensus frame* condition. The control condition simply stated, "Researchers have proposed a small-scale test flight of a steerable balloon to study Stratospheric Aerosol Injection (SAI)," and were reminded that "SAI involves releasing reflective particles into the stratosphere. These particles would reflect sunlight into space, resulting in cooler temperatures." Respondents assigned to the scientific consensus frame at Wave 2, were informed that "researchers at Harvard University" proposed the small-scale flight and read a headline that stated, "Top American Scientists Recommend Studying Stratospheric Aerosol Injection (SAI)." In addition, a short paragraph suggested that scientists recommended a coordinated research program to advance our understanding of this technology.

4.2 Questionnaire / Dependent Variables

Following exposure to the treatment for each wave, we measured respondents' beliefs about specific aspects of SAI at both Wave 1 and 2 of the survey by asking them the extent to which they disagree or agree with the following eight statements (on a scale of 1 – 7 where 1 is strongly disagree and 7 is strongly agree): (1) It is a fast and cost effective method of cooling the Earth; (2) It can prevent the irreversible loss of species and ecosystems; (3) It could distract society's attention from prompt action to find a permanent solution; (4) It could result in dangerous side-effects; (5) It could pose a threat to national security; (6) It can reduce the frequency and intensity of droughts and damaging storms; (7) It will help the world's poorest and most vulnerable people; (8) It is being promoted as a false solution by oil companies. Note that half the SAI belief items are positive in valence (supportive of SAI) and correspond with considerations identified by our content analysis, and the other half are negative in valence (critical of SAI) and correspond with dominant frames identified in the content analysis (Table 1). We also asked respondents at both waves of the survey the extent to which they oppose or support SAI *in general* and also the extent to which they oppose or support the US investing *in research to study it*. In addition, we asked respondents at Wave 1 preregistered items measuring political, psychological, and demographic characteristics.[11]

In Wave 2 of the study, we measured respondents' support for the small-scale research on SAI by asking respondents, "To what extent do you oppose or support a small-scale test flight of a balloon to study Stratospheric Aerosol Injection (SAI)?" (1-7 response scale, 1= strongly oppose, 7=strongly support). In addition, at Wave 2, respondents answered the same eight-item battery of belief about SAI and their general support for SAI and research into the approach. This

[11] The complete survey questionnaire is included in Supplemental Appendix C.

allowed us to evaluate the persistence/duration of any treatment effects at time 1 on these outcome measures among respondents that were randomly assigned to the control condition at Wave 2.

5 Results - Wave 1

We begin by evaluating the degree to which exposure to framed messages about SAI shapes related beliefs (H1). We accomplish this through the estimation of a series of one-sided t-tests to evaluate the difference between control and treatment group means.[12] We hold the control group as the baseline group in Wave 1, and the group exposed to the control treatment in both Waves 1 and 2 when analyzing group mean differences at Wave 2.

[Insert Table 2 here]

We observe, in line with our finding from the content analysis that an "economic benefits frame" is the dominant positive consideration in news about SAI, that exposure to the *positive* frames about SAI increased the belief that this approach is a "fast and cost effective" option for addressing rising temperatures (Table 2). The positive frames also increased

[12] The use of one tailed t-tests is motivated by our directional, preregistered hypotheses. We are confident that this approach constitutes the most appropriate, simplest testing strategy for our purposes. Statistical significance is determined by *p*-values less than 0.05. However, the significant results discussed herein are substantively identical to results from both linear regression models and ordered logit models, to account for the potentially non-continuous nature of seven-point Likert scales, where the resultant *p*-values are modified in line with directional hypotheses. The results of these complementary analyses may be found in Supplemental Appendix D.

perceptions that SAI might be used for positive environmental benefits such as reducing the "frequency and intensity of droughts and damaging storms." The positive message had no impact on beliefs about whether SAI would "prevent species or ecosystem loss" or "help the world's most vulnerable people". In short, the positive treatment increased participants' agreement with two of the four positively valenced statements about specific aspects of SAI. However, the positive frames did not exhibit any "spillover effects" resulting in increased *disagreement* with the four negatively valenced statements about SAI.

The two negative frames had a greater impact on respondents' beliefs. Both the *negative* and the *strong negative* frames about SAI increased agreement with *all* four negatively valenced statements about SAI. Belief that SAI could result in "dangerous side effects" or present a "national security threat" was increased by about 1 point on the 7-point response scale for respondents in both the negative and strong negative conditions. Respondents in these conditions were also more likely to report that SAI would "distract society's attention" from long-term solutions and agree that it was being promoted as a "false solution" by oil companies. In short, the negative treatments significantly increased respondents' agreement with all negatively valenced belief statements about SAI. In addition, there were "spillover effects" with respondents in the negative frame conditions expressing *lower levels* of agreement with all four positively valenced statements about SAI, with respondents in the strong negative frame conditions expressing lower levels of agreement with three out of four positively valenced statements about SAI. No statistically significant effect was observed on beliefs that SAI could prevent species and ecosystem loss among those exposed to the strong negative frame condition.

To test our second hypothesis, we estimate group mean differences in general support for SAI and support for more research on SAI (Table 3). We found that the positive frames about

SAI increases *SAI support* by over a quarter-point on the seven-point response scale. The positive treatment also increased support for SAI research. The negative treatment decreases *SAI support* by 1.04 points and support for *SAI research* by nearly three-quarters of a point. Finally, exposure to the *strong negative treatment* decreases *SAI support* by 1.17 points and decreases support for *SAI research* by 0.93 points. Taken together, these results provide clear support for Hypothesis 2.

[Insert Table 3 here]

The results from study 1 demonstrate that exposure to positive or negative frames that appear in news stories about SAI can have a considerable impact on both the content of beliefs about the approach as well as generalized support for SAI. Nonetheless, prior work often does not evaluate the longevity of any treatment effects, or how people evaluate "new information" once they have formed an initial opinion. We implemented a follow-up survey 5 days after Wave 1 to evaluate our pre-registered research question about the persistence of the issue-framing effects and our preregistered hypotheses about how positive scientific information about SAI would be evaluated by respondents assigned to different conditions at Wave 1. Forthright conducted the follow up survey with a 90 percent completion rate from respondents at Wave 1.

5.2 Wave 2 – Results

The purpose of the Wave 2 survey was to test the persistence, or longevity of Wave 1 treatment effects on SAI beliefs and general support. For those respondents randomly assigned to the "control" condition at Wave 2, the positive treatment effects at Wave 1 were no longer significant: they no longer viewed SAI as "fast and cost effective" or that it could be used to "reduce droughts or damaging storms" (Table 4). Respondents also no longer expressed greater general support for *SAI* or for further *SAI research* relative to the baseline (Table 5). Second,

most of the effects of the *negative treatment* observed across all outcome measures (i.e., 8 SAI belief items and general support measures) had vanished in the follow up survey, indicating relatively short-lived effects resulting from exposure to the issue frames, despite the relatively large observed impact of those issue frames on identical outcome measures at Wave 1. The only exception was the persistence of significantly higher levels of agreement with the belief that SAI might "distract society's attention" from the root problem (i.e., moral hazard concern).

The *strong negative treatment*, however, had a persistent, significant effect on three out of four negatively valenced statements about aspects of SAI, that is, higher levels of agreement that SAI could have "dangerous side effects", lead to "national security threats", and "distract society's attention," and lower levels of general SAI support, SAI research support, and support for the proposed SAI balloon test. In short, while there was a rapid decay of the impact of the experimental treatments from Wave 1 overall, there was a clear and persistent impact of the strong negative treatment detected after a short passage of time.

[Insert Table 4 and Table 5 here]

As we noted, half of the respondents were treated in Wave 2 to statements about "expert consensus information" related to a proposed small-scale research study on SAI. We found that those who received this consensus treatment, which focused on "top American scientists supporting SAI research" (i.e., a positively valenced frame), following the control treatment in Wave 1, expressed significantly lower levels of agreement with the statement that SAI will result in "dangerous side effects" (Table 4). However, this treatment by itself did not increase general SAI support, SAI research, or support for the proposed SAI study (Table 5).

Second, respondents exposed to the *positive treatment* at Wave 1 and the *consensus treatment* at Wave 2 expressed significantly higher levels of agreement with the belief item

stating that SAI is "fast and cost effective," greater support for SAI research, and higher levels of support for the proposed SAI research study described in the Wave 2 treatment, while decreasing agreement that SAI may cause "dangerous side effects." Thus, while the consensus treatment by itself did not increase support for the small-scale study that was the focus of "consensus treatment" at Wave 2, the combination of exposure to the positive treatment at Wave 1 coupled with the consensus treatment at Wave 2 generated opinion change in the direction of our expectation (H3).

Third, in evaluating the effects of the *consensus treatment* at Wave 2 on respondents assigned to the *negative* or *strong negative* conditions at Wave 1, we should note that these respondents are encountering positively valenced information about SAI research which is incongruent with the negative information they read about SAI at Wave 1.[13] Our analysis shows a general persistence of the negative frames in assessing beliefs about SAI among respondents both in the *negative condition* at Wave 1 and the *consensus treatment* at Wave 2, indicating persistence of the initial treatment effects among these respondents at Wave 2. However, in line with our prediction (H4), there was no lasting impact on general *SAI support*, support for *SAI research*, or for the *proposed SAI study* for respondents in this condition. For respondents in the *strong negative condition* at Wave 1 and the *consensus treatment* at Wave 2, the persistent

[13] Due to this incongruence in the direction of messaging, we had no *a priori* expectations as to which frame would exert a greater impact on respondents' beliefs and attitudes. We therefore revert to two-tailed t-tests to determine the statistical significance of group means when evaluating those respondents exposed to either the negative or strong negative frame conditions at Wave 1 and the scientific consensus frame at Wave 2.

effects of the strong negative frame at Wave 1 is no longer evident with the exception of belief that SAI could pose a national security threat. It is possible that the consensus frame counteracted the previously established beliefs about SAI at Wave 1, but we have no means by which to directly test this proposed explanation in this study.[14]

6 Discussion and Conclusion

The recommendations by prominent scientific organizations to fund research to study SAI underlines the significance of the topic as a possible mitigation strategy to combat climate change (Stephens et al. 2021). Public opinion will play an important role in determining both funding and governance surrounding any research and/or deployment of SAI (Carr et al. 2013, p. 567; Merk et al. 2015). We recognize that studies of the efficacy of framing on the acceptance of further research on SAI raise an ethical issue of whether the studies in and of themselves constitute a step towards "legitimization" (Jacobson 2018). We would argue, however, that more knowledge about the linkage between issue framing and support for this technology will be essential for the development of public policy.

In this research, we extend knowledge about framing and public support for SAI in several important ways. First, our study catalogued and identified the most prominent "issue frames" employed in US news coverage on the topic between 2014-2022. The results indicated that while several positive frames towards SAI have received news coverage, negative frames

[14] We also examined the influence of our treatments, both at wave 1 and wave 2, on the previously discussed outcome measures where the collected demographic and other factors were included in the models. We do not observe a meaningful shift in overall interpretation where these variables are included. These results may be found in Supplemental Appendix E.

that highlight its "unnaturalness," its potential risks and negative environmental impacts, threats to national security, moral hazard concerns and its efficacy are the most prominent frames in the stories that we analyzed. Second, we used these issue frames in a survey experiment examining how specific real news stories influence public opinion on this topic. Third, the use of a multiple wave study allowed us to not only test the persistence of initial framing effects about SAI after a short passage of time, but also to evaluate how individuals respond to a scientific consensus frame about a proposed SAI research study after their initial treatment with positive or negative information about SAI.

Our findings show that when people are exposed to positive or negative information about SAI in news stories that employ a combination of prominent (strong) considerations, such as those we identified our content analysis, it exerts a powerful *initial impact* on people's related beliefs and general support for SAI or its research. Yet these effects appear to be ephemeral and decay rapidly. The negative frames about SAI at Wave 1, in general, exerted a more powerful and enduring influence on opinion compared to positive frames. This result is in line with prior research which shows that negative frames about SAI research can overpower and counteract positive frames that emphasize scientific consensus support for its study (Bolsen et al. 2022a). This may pose significant hurdles for advocates of SAI if the public becomes more opposed to these approaches as they come to learn more about it through news coverage.

The trade-off of employing experimental treatments that rely on more realistic combinations of frames is that our study does not isolate the specific impact of any single emphasis frame that was included in the respective treatments. Our experimental treatments were designed to maximize efficacy and test frames respondents would most likely encounter in the mass media, not identify the comparative efficacy of the individual effects of each frame. Yet we

do observe that negatively valenced frames appear "stronger" than the less common positive frames that emphasize its potential benefits.

Our two-wave experimental design on a large and diverse sample meets the call for research that incorporates how combinations of frames, which constitute "storylines" and "narratives" as portrayed in real news stories, influence public opinion. Future research might test how exposure to competing messages about SAI emanating from different sources (e.g., political actors, interest groups, etc.) in competitive information settings influence the public's views as well as the comparative efficacy of such frames. Additionally, it will be important to extend research on SAI/SRM to non-Western countries where people's beliefs and responses to information about SAI might differ given the imminent threat posed by climate change (Sugiyama et al. 2020; Wibeck et al. 2017).

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Table 1. Identified Emphasis Frames with Sample Language

Frame / Dimension	***Example elements & language***
Risky	Unknown, unpredictable, unintended, unacceptable, or uncontrollable risks, no "exit-ramps", side-effects, termination shock, unintended consequences
Safe	Safe, acceptable risk, there are "exit ramps"
Unnatural	Un-naturalness of the "process", "fake volcano", sky would turn white, dimming the sun, artificial sunshade, dimming, fake, hack
Natural	"Natural" processes involved (e.g., "mimics a volcano", or natural processes)
Environmental Threats	Droughts, crop failures, extinction of species, famine, change jet stream, monsoon, impede photosynthesis, rainfall, storms, weather
Environmental Benefits	Cool the Earth, cooling, stop global warming, prevent weather disasters, protect ozone layer
Ineffectiveness	SAI won't work, not feasible, it will be temporary and not permanent
Effectiveness	SAI will work, is feasible, innovative
Moral Hazard	People/states will continue to contribute to underlying problem, disincentivize, moral hazard
Governance Threat	No way to coordinate or implement internationally, lack of governance, balkanized, bureaucratic, code of conduct, international, oversight, rules
Governance Promise	States can coordinate research or deployment internationally, global coordination or cooperation is possible
National Security	Geo-political implications, climate wars, conflict, climate migration, national security, refugee, war, rogue actors
Economic Benefits	Cost effective approach, relatively cheap to implement
Economic Costs	Relatively expensive, costly to implement
Equity/Justice Threats	Harmful or negative effects on marginalized groups/states, social risk, inequity, poor countries, unequal, unjust
Equity/Justice Promise	Positive effects/outcomes for marginalized groups/states
Industry Tactic	A way for industry to maintain current practices or profit, billionaires, conspiracy, fossil fuel industry, "technofix"
Other frames	Aesthetics, "Plan B"

Fig. 1. Prominence & Direction of Frames on SAI in U.S. News Media

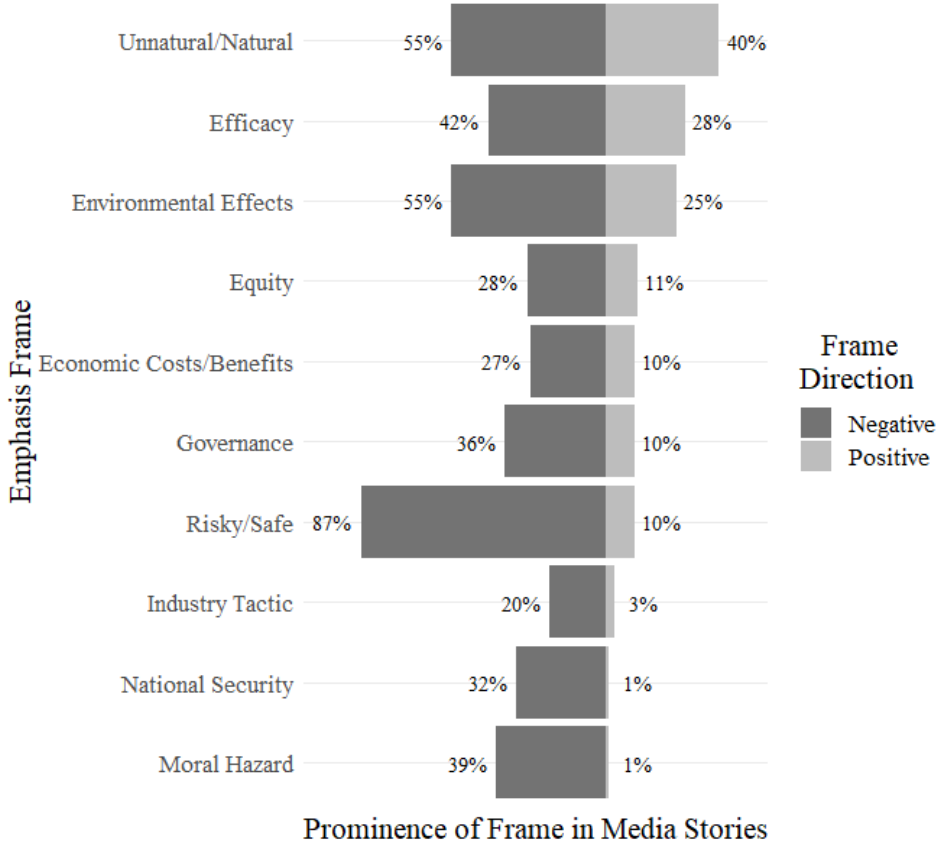


Figure 1. Prominence of Emphasis Frames in Media Stories: 2014 - 2022

Table 2. Mean Differences in SAI Beliefs by Treatment Group: Wave 1.

	Positive Valence				Negative Valence			
	Fast & Cost Effective	Prevent Species Loss	Reduce Droughts etc.	Help Poorest & Most Vulnerable	Distract Society's Attention	Dangerous Side Effects	National Security Threat	Oil Companies' False Solution
Positive	0.299**	0.110	0.166*	0.157	0.130	0.041	-0.114	-0.093
	(0.095)	(0.097)	(0.093)	(0.101)	(0.096)	(0.095)	(0.101)	(0.092)
	[997]	[999]	[999]	[998]	[998]	[998]	[999]	[998]
Negative	-0.393**	-0.422**	-0.602**	-0.708**	0.558**	0.791**	0.926**	0.399**
	(0.098)	(0.103)	(0.098)	(0.102)	(0.049)	(0.091)	(0.102)	(0.091)
	[1,004]	[1,002]	[1,003]	[1,002]	[1,001]	[1,002]	[1,002]	[1,003]
Strong Negative	-0.448**	-0.130	-0.372**	-0.609**	0.512**	1.017**	1.060**	0.648**
	(0.099)	(0.101)	(0.094)	(0.104)	(0.096)	(0.091)	(0.100)	(0.090)
	[991]	[989]	[989]	[991]	[988]	[994]	[991]	[991]
Control Group Mean	4.086	4.332	4.320	3.974	4.426	4.674	3.756	3.873
	(1.492)	(1.484)	(1.429)	(1.573)	(1.493)	(1.505)	(1.610)	(1.413)
	[503]	[503]	[503]	[503]	[502]	[503]	[503]	[503]

Note. Values shown are mean differences between treatment group and control group, with standard errors in parentheses and N in square brackets. Outcomes are measured on 7-point scales where higher values indicate higher degree of belief. Statistical significance determined by one tailed t-tests in line with our directional preregistered hypotheses. Significance levels shown are consistent with both two-sample Kolmogorov-Smirnov tests and linear regression results after calculating one-sided *p*-values. These results are available in the online appendix. Control group mean refers to mean calculation for those not exposed to any treatment. ** $p<0.01$ * $p<0.05$.

Table 3. Mean Differences in General Support for SAI and Support for Greater SAI Research: Wave 1.

	SAI Support	SAI Research Support
Positive	0.295** (0.102) [1004]	0.224* (0.107) [1004]
Negative	-1.039** (0.100) [1011]	-0.706** (0.111) [1011]
Strong Negative	-1.169** (0.103) [1004]	-0.929** (0.112) [1004]
Control Group Mean	4.081 (1.603) [507]	4.428 (1.745) [507]

Note. Values shown are mean differences between treatment group and control group, with standard errors in parentheses and N in square brackets. Outcomes are measured on 7-point scales where higher values indicate higher degree of support. Statistical significance determined by one tailed t-tests in line with our directional preregistered hypotheses. Significance levels shown are consistent with both two-sample Kolmogorov-Smirnov tests and linear regression results after calculating one-sided *p*-values. These results are available in the online appendix. Control group mean refers to mean calculation for those not exposed to any treatment. ** $p<0.01$ * $p<0.05$.

Table 4. Mean Differences in SAI Beliefs by Treatment Groups: Wave 2

	Positive Valence				Negative Valence			
	Fast & Cost Effective	Prevent Species Loss	Reduce Droughts etc.	Help Poorest & Most Vulnerable	Distract Society's Attention	Dangerous Side Effects	National Security Threat	Oil Companies' False Solution
W1: Positive, W2: Control	0.182	0.108	-0.002	0.094	0.168	-0.213	0.058	-0.004
	(0.139)	(0.156)	(0.146)	(0.156)	(0.150)	(0.147)	(0.149)	(0.141)
	[432]	[433]	[431]	[432]	[433]	[434]	[430]	[432]
W1: Negative, W2: Control	0.094	-0.001	-0.106	-0.135	0.271*	-0.037	-0.013	-0.019
	(0.137)	(0.147)	(0.134)	(0.143)	(0.144)	(0.143)	(0.153)	(0.142)
	[466]	[467]	[467]	[468]	[466]	[470]	[463]	[467]
W1: S. Neg., W2: Control	-0.065	-0.127	-0.074	-0.171	0.372*	0.309*	0.387**	0.210
	(0.146)	(0.155)	(0.147)	(0.155)	(0.160)	(0.141)	(0.150)	(0.152)
	[424]	[425]	[424]	[425]	[425]	[427]	[421]	[424]
W1: Control, W2: Consensus	0.203	0.124	-0.076	0.026	0.011	-0.283*	-0.194	-0.192
	(0.138)	(0.074)	(0.144)	(0.149)	(0.146)	(0.146)	(0.149)	(0.144)
	[436]	[437]	[435]	[437]	[435]	[439]	[433]	[436]
W1: Positive, W2: Consensus	0.259*	0.174	0.006	0.113	0.059	-0.225**	-0.109	-0.226
	(0.137)	(0.152)	(0.142)	(0.152)	(0.149)	(0.144)	(0.152)	(0.147)
	[449]	[450]	[449]	[450]	[449]	[451]	[447]	[449]
W1: Negative, W2: Consensus	-0.271	-0.127	-0.369*	-0.305*	0.336*	0.309*	0.362*	0.186
	(0.150)	(0.158)	(0.150)	(0.152)	(0.157)	(0.147)	(0.155)	(0.152)
	[430]	[432]	[430]	[431]	[430]	[432]	[428]	[429]
W1: S. Neg, W2: Consensus	0.099	0.021	-0.127	-0.146	0.260	0.074	0.294*	0.103
	(0.132)	(0.145)	(0.132)	(0.146)	(0.143)	(0.137)	(0.144)	(0.143)
	[473]	[474]	[473]	[474]	[473]	[475]	[471]	[473]
Control Group Mean	4.013	4.112	4.293	3.906	4.250	4.893	4.022	4.134
	(1.458)	(1.649)	(1.554)	(1.611)	(1.642)	(1.559)	(1.604)	(1.602)
	[232]	[233]	[232]	[233]	[232]	[234]	[230]	[232]

Note. Values shown are mean differences between treatment group and control group, with standard errors in parentheses and N in square brackets. Outcomes are measured on 7-point scales where higher values indicate higher degree of belief. Statistical significance determined by one tailed t-tests in line with our directional preregistered hypotheses. The only exception is where the direction of the Wave 1 and Wave 2 treatments conflict: Wave 1 negative and strong negative, and Wave 2 consensus. Significance for these results determined by two tailed t-tests. Significance levels shown are consistent with both two-sample Kolmogorov-Smirnov tests and linear regression results after calculating one-sided *p*-values. These results are available in the online appendix. Control group mean refers to mean calculation for those not exposed to any treatment. ** $p<0.01$ * $p<0.05$.

Table 5. Mean Differences in General Support for SAI, Support for Greater SAI Research, and Support for Proposed Balloon Study: Wave 2.

	SAI Support	SAI Research Support	Balloon Study Support
Wave 1: Positive, Wave 2: Control	0.182 (0.159) [435]	0.195 (0.163) [435]	0.245 (0.157) [435]
Wave 1: Negative, Wave 2: Control	0.004 (0.149) [470]	-0.003 (0.153) [470]	0.010 (0.151) [470]
Wave 1: Strong Negative, Wave 2: Control	-0.332* (0.162) [427]	-0.310* (0.167) [427]	-0.281* (0.164) [427]
Wave 1: Control, Wave 2: Consensus	0.143 (0.156) [439]	0.062 (0.164) [439]	0.093 (0.157) [439]
Wave 1: Positive, Wave 2: Consensus	0.197 (0.155) [451]	0.283* (0.159) [451]	0.319* (0.157) [451]
Wave 1: Negative, Wave 2: Consensus	-0.183 (0.164) [433]	-0.105 (0.172) [433]	-0.061 (0.164) [433]
Wave 1: Strong Negative, Wave 2: Consensus	-0.097 0.147) [476]	-0.016 (0.154) [476]	-0.052 (0.147) [476]
Control Group Mean	4.047 (1.694) [234]	4.372 (1.746) [234]	4.312 (1.676) [234]

Note. Values shown are mean differences between treatment group and control group, with standard errors in parentheses and N in square brackets. Outcomes are measured on 7-point scales where higher values indicate higher degree of support. Statistical significance determined by one tailed t-tests in line with our directional preregistered hypotheses. The only exception is where the direction of the Wave 1 and Wave 2 treatments conflict: Wave 1 negative and strong negative, and Wave 2 consensus. Significance for these results determined by two tailed t-tests. Significance levels shown are consistent with both two-sample Kolmogorov-Smirnov tests and linear regression results after calculating one-sided *p*-values. These results are available in the online appendix. Control group mean refers to mean calculation for those not exposed to any treatment. ** $p<0.01$ * $p<0.05$.

Appendix A: Content Analysis Coding Instrument

Solar Geoengineering Article Coding Instrument

Coder Name (enter in column 1 of Excel spreadsheet)

Date of article (use 6 digits for month day year and enter in column 2)

Source: enter the source code for the article from the list below

1. AP news
2. Breitbart
3. CNN
4. Forbes
5. Fox
6. NBC news
7. New York Times
8. NPR
9. Reuters
10. USA Today
11. Wall Street Journal
12. Washington Post
13. Other (write in name)

Author: Enter the author or authors of the article

Headline (*Frames are often present in the Headline of an article, so we want to be able to account for that in the coding instrument); Enter/Paste the headline of the article in this cell.

HF1 (Headline Frame1) (enter the number from the list below corresponding to a frame that appears anywhere in the headline or subtitle of the article)
HF2 (Headline Frame2) (enter the number from the list below corresponding to a frame that appears anywhere in the headline or subtitle of the article):
HF3 (Headline Frame3) (enter the number from the list below corresponding to a frame that appears anywhere in the headline or subtitle of the article):

0. no frame in the headline
1. risky/safe
2. economic
3. efficacy/effectiveness
4. environmental
5. equity/ /justice
6. fossil-fuel / capitalist "technofix"/ conspiracy
7. governance
8. moral hazard
9. national security
10. unnatural/natural processes
11. other (write in)

SD (StoryDirection) – This variable is to identify if (overall) the article is "pro- climate engineering", "anti-climate engineering", or "neutral" (balanced).
1 = article is (on balance) pro- solar engineering

2 = article is (on balance) anti- solar engineering
3 = article is neutral or balanced
*** Following variables relate to an explicit mention in the article of each distinct "dimension of considerations' – (each frame will be coded "1" if it is present in the article and "0" otherwise).

Risky: (defining element: potentially catastrophic consequences, uncontrollable, no "exit-ramps", buy time, desperation, side-effects, termination shock, unacceptable risk, unintended consequences, unknown, unpredictable)
0=not present
1=present

Safe: (defining element: safe, acceptable risk, there are "exit ramps")
0=not present
1=present

Economic_benefits: (defining element: cost effective approach; relatively cheap to implement; NOT its cost in dollars or that it would take away funding from other projects)
0=not present
1=present

Economic_costs: (defining element: relatively expensive, costly to implement, NOT its cost in dollars or that it would take away funding from other projects)
0=not present
1=present

Efficacy negative: (defining element: it won't work, not feasible, it will be temporary, long-term effects)
0=not present
1=present

Efficacy positive: (defining element: it will work, is feasible, innovative)
0=not present
1=present

Environmental_negative: (defining element: will have negative effects on the environment – e.g., droughts, crop failures, extinction of species, famine, change jet stream, monsoon, impede photosynthesis, rainfall, storms, weather)
0=not present
1=present

Environmental_positive: (defining element: will have positive effects on the environment – cool the Earth, cooling, stop global warming, prevent weather disasters, protect ozone layer)
0=not present
1=present
Equity/Ethics/Justice_negative: (defining element: harmful or negative effects on marginalized groups/states; social risk, inequity, poor countries, unequal, unjust)

0=not present
1=present
Equity/Ethics/Justice _positive: (defining element: positive effects/outcomes on marginalized groups/states)
0=not present
1=present

Fossil-fuel/Capitalist Technofix/Conspiracy_negative (defining element: a way for industry to maintain current practices or profit; billionaires, conspiracy, fossil fuel industry, technofix, tycoons)
0=not present
1=present

Fossil-fuel/ Capitalist Technofix/Conspiracy_positive: (defining element: the idea that this is a conspiracy or technofix for profit is debunked)
0=not present
1=present

Governance_negative: (defining element: there is NOT a way to coordinate research or implementation internationally; lack of governance; Balkanized, bureaucratic, code of conduct, governance, international, oversight, rules
0=not present
1=present

Governance_positive: (defining element: there IS a way to coordinate research or implementation internationally; global coordination or cooperation)
0=not present
1=present

Moral Hazard_negative: (defining element: people/states will continue to contribute to underlying problem; disincentivize, moral hazard, motivation, slippery slope)
0=not present
1=present

Moral Hazard_positive: (defining element: people/states will STOP contributing to underlying problem)
0=not present
1=present

National Security_negative: (defining element: geo-political implications; climate wars, conflict, climate migration, national security, refugee, war, rogue actors)
0=not present
1=present

National Security_positive: (defining element: will contribute to our national security, American ingenuity)

0=not present
1=present
Unnatural: (defining element: Un-naturalness of the “process”; “fake volcano”, sky would turn white, dimming the sun, artificial sunshade; dimming, fake, hack,)
0=not present
1=present

Natural: (defining element: natural” processes involved e.g., (mimics volcanic, mimics natural processes)
0=not present
1=present

Other frames: (write in any other frames that appeared in the article in this cell) –

Are any of the following mentioned anywhere in the article?

Stratospheric Aerosol Injection:
1= yes
0=no
Cirrus Cloud Thinning:
1= yes
0=no
Marine Cloud Brightening:
1= yes

Mirrors: Mentions Mirrors in Space
1= yes
0=no

Gates: Mentions Bill Gates
1= yes
0=no

Politics (Is there any explicit mention that the approach is being driven by political considerations, or mention or support by a political party or elected official?)
0=not present
1=present

Scientific Position (Does the article state that scientists or "an influential scientific body/committee" are opposed to, uncertain, or supportive of these approaches?)
0=not present
1=present

Plan B
(Is there any explicit mention that the approach is a "plan B" or "last-ditch" measure, or "hail Mary pass" or something similar?)
0=not present
1=present

Aesthetics
(Is there any explicit mention that the approach could change the color of the sky?)
0=not present
1=present

Oceans
(Is there any explicit mention that the approach will not have an effect on oceans or ocean acidification?)
0=not present
1=present

Crops/Famine
(Is there any explicit mention that the approach will affect "crops" or cause "famines"?)
0=not present
1=present

Appendix B: Descriptive Statistics of Key Variables

Table B1: Descriptive Statistics of Key Variables

	Mean	Median	Standard Deviation	Min.	Max.	N
Wave 1 Outcome Measures:						
SAI Support	3.603	4	1.734	1	7	2,005
SAI Research Support	4.076	4	1.811	1	7	2,005
SAI Beliefs: Fast and Cost-Effective	3.951	4	1.592	1	7	1,986
SAI Beliefs: Prevent Species & Ecosystems Loss	4.221	4	1.644	1	7	1,984
SAI Beliefs: Distract Society's Attention	4.660	5	1.548	1	7	1,983
SAI Beliefs: Dangerous Side-Effects	5.134	5	1.506	1	7	1,988
SAI Beliefs: National Security Threat	4.220	4	1.677	1	7	1,986
SAI Beliefs: Reduce Damaging Weather	4.119	4	1.565	1	7	1,985
SAI Beliefs: Help Poorest & Most Vulnerable	3.686	4	1.672	1	7	1,985
SAI Beliefs: Oil Companies' False Solution	4.109	4	1.476	1	7	1,986
Wave 2 Outcome Measures:						
SAI Support	4.039	4	1.610	1	7	1,727
SAI Research Support	4.388	5	1.673	1	7	1,727
Balloon Study Support	4.347	4	1.635	1	7	1,727
SAI Beliefs: Fast and Cost-Effective	4.079	4	1.485	1	7	1,718
SAI Beliefs: Prevent Species & Ecosystems Loss	4.135	4	1.549	1	7	1,720
SAI Beliefs: Distract Society's Attention	4.432	4	1.537	1	7	1,719
SAI Beliefs: Dangerous Side-Effects	4.882	5	1.488	1	7	1,724
SAI Beliefs: National Security Threat	4.11	4	1.566	1	7	1,71

	6					3
SAI Beliefs: Reduce Damaging Weather	4.202	4	1.437	1	7	1,717
SAI Beliefs: Help Poorest and Most Vulnerable	3.841	4	1.561	1	7	1,719
SAI Beliefs: Oil Companies' False Solution	4.139	4	1.480	1	7	1,718
Demographic & Political Measures:						
Political Ideology	4.056	4	1.810	1	7	2,000
Party Identification	3.923	4	2.160	1	7	2,001
Trust in Science	4.904	5	1.289	1	7	1,989
Need to Evaluate	2.521	2.667	0.556	1	3.667	1,993
Conspiratorial Ideation	3.193	3.2	0.863	1	5	1,990
Gender	0.504	1	0.500	0	1	1,973
Age	45.04	44	16.442	18	87	2,007
Income	3.629	4	2.243	1	11	1,940
Education	4.196	4	1.911	1	9	2,007
Climate Change Beliefs	5.416	6	1.628	1	7	1,994
Minority Respondent	0.304	0	0.460	0	1	2,007

Appendix C: Full Survey Script

Respondents were first contacted by Forthright Inc. to participate in the survey. Following recruitment, respondents first agreed to participate the survey by reading the following statements and continuing with the survey. Respondents then were randomly assigned, via Qualtric's embedded randomization function to one of the following four conditions: Control, Positive, Negative, and Strong Negative. The accompanying figures were shown on the same page as the treatments. All respondents then answered a series of questions about support for SAI, SAI Research, and beliefs in eight potential aspects of SAI. Finally, respondents completed a number of demographic and political questions. Question 3, belief statements, and 16, conspiratorial ideation battery adapted from Brotherton et al. 2013, were presented as a matrix table with drop down options.

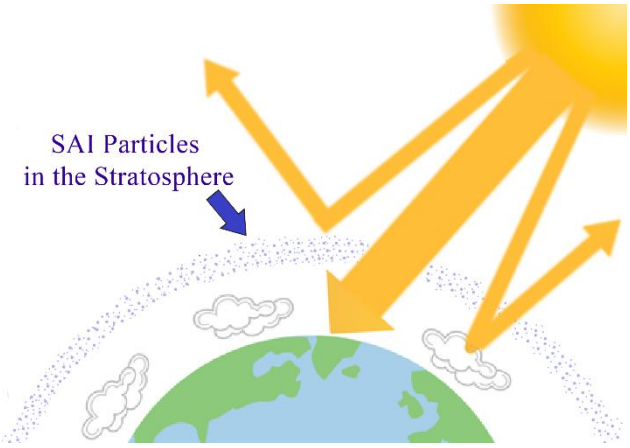
Wave 1

Thank you for agreeing to participate in this survey. You will first read a short statement about an emerging technology. You will then be asked a series of questions about you and your opinions. Please give your genuine views as there are no wrong answers. The entire survey should take between five and ten minutes.

Control

Stratospheric Aerosol Injection (SAI)

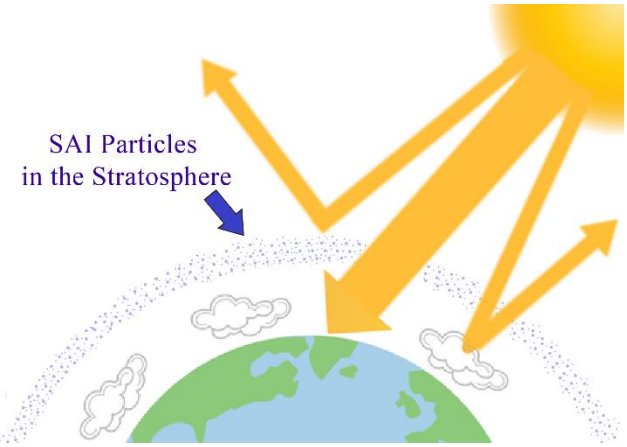
Energy from the Sun warms the Earth's surface. Heat from the Earth's surface is trapped when there is more carbon dioxide in the atmosphere, resulting in rising temperatures. To offset the temperature increases, some have proposed releasing reflective particles into the stratosphere: that is, the second layer of the atmosphere ranging from about 6 to 31 miles above the Earth. These particles would reflect sunlight back into space resulting in cooler temperatures. The figure below illustrates how this process would reflect sunlight. This technology is known as Stratospheric Aerosol Injection or SAI.



Positive

Stratospheric Aerosol Injection (SAI)

Energy from the Sun warms the Earth's surface. Heat from the Earth's surface is trapped when there is more carbon dioxide in the atmosphere, resulting in rising temperatures. To offset the temperature increases, some have proposed releasing reflective particles into the stratosphere: that is, the second layer of the atmosphere ranging from about 6 to 31 miles above the Earth. These particles would reflect sunlight back into space resulting in cooler temperatures. The figure below illustrates how this process would reflect sunlight. This technology is known as Stratospheric Aerosol Injection or SAI.



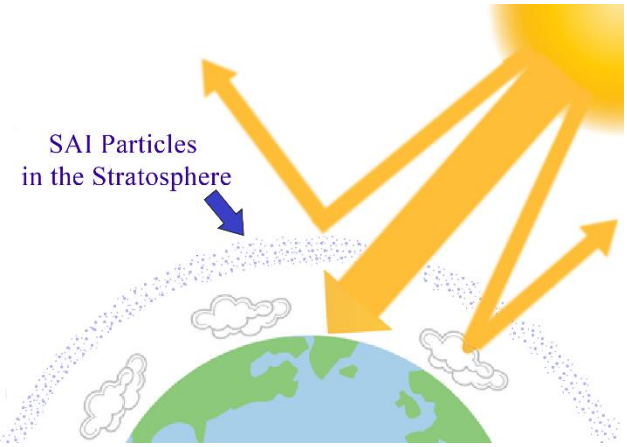
Supporters of SAI argue that these technologies can safely and cost-effectively lower world temperatures. Just as particulates from volcanos have been known to cool the Earth in the past, the SAI particulates too would cool the Earth. It would act as a kind of sunblock while a permanent solution is found for lowering carbon emissions. Compared to the trillions in costs from the effects of continued climate change and the expenses of cutting CO_2 emissions, SAI is relatively inexpensive.

By cooling the Earth, SAI could stabilize sea-levels, reduce the intensity and frequency of droughts and damaging storms, and prevent climate-caused habitat destruction that results in irreversible losses to species and pristine ecosystems. In addition to its environmental benefits, SAI's cooling effects may help the millions of impoverished people who live in environments that are threatened by severe storms, increasing temperatures, and rising seas.

Negative

Stratospheric Aerosol Injection (SAI)

Energy from the Sun warms the Earth's surface. Heat from the Earth's surface is trapped when there is more carbon dioxide in the atmosphere, resulting in rising temperatures. To offset the temperature increases, some have proposed releasing reflective particles into the stratosphere: that is, the second layer of the atmosphere ranging from about 6 to 31 miles above the Earth. These particles would reflect sunlight back into space resulting in cooler temperatures. The figure below illustrates how this process would reflect sunlight. This technology is known as Stratospheric Aerosol Injection or SAI.



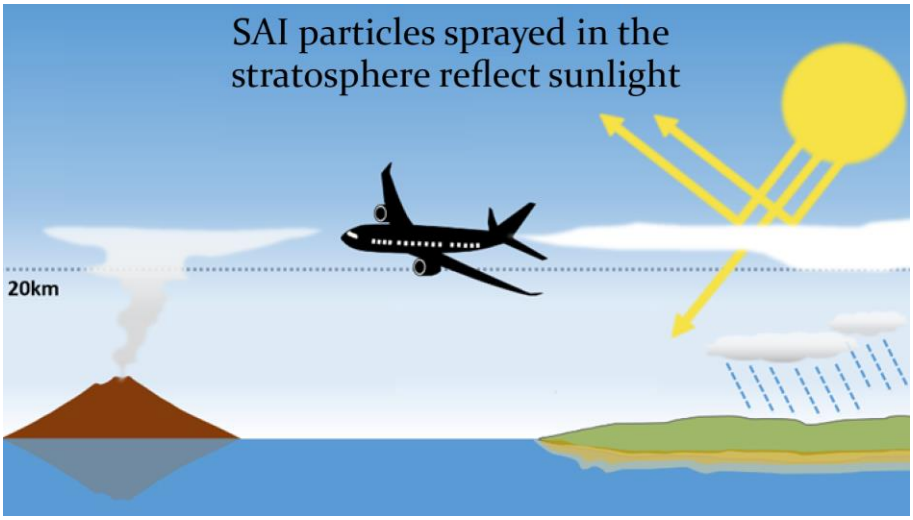
Opponents of SAI argue that these technologies are unproven and risky. They could lead to unknown, unpredictable, and even dangerous side-effects such as damage to the ozone layer, disruption of weather patterns, and droughts. For example, Africa's Sahel region, and parts of the Middle East and India may suffer devastating crop failures, resulting in large-scale migration and possibly war. If adopted, SAI could potentially be weaponized by foreign actors to control and manipulate global temperatures to their benefit, threatening the United States' national security.

Even if it works as intended, SAI would do nothing to reduce atmospheric CO2 and other greenhouse gases. SAI also cannot remedy the by-products of accumulating greenhouse gases such as coral bleaching or oceanic ecological collapse. Even if SAI artificially lowers global temperatures, it may just serve as a distraction while societies continue burning fossil fuels.

Strong Negative

Stratospheric Aerosol Injection (SAI)

Energy from the Sun warms the Earth's surface. Heat from the Earth's surface is trapped when there is more carbon dioxide in the atmosphere, resulting in rising temperatures. To offset global warming, some have proposed spraying dust-like particles into the stratosphere: that is, the second layer of the atmosphere ranging from about 6 to 31 miles above the Earth. This would block sunlight from reaching the planet and artificially lower global temperatures. The figure below illustrates how this process would operate like a volcanic eruption with airplanes injecting particles that block sunlight. This technology is known as Stratospheric Aerosol Injection or SAI. Recall the story of Hansel and Gretel, and how they were sent into the forest because their parents could no longer feed them. This story is based on the Great Famine of 1314-1322 in Europe caused by the eruption of massive volcanoes in southeast Asia and New Zealand. These volcanoes partially blocked sunlight from reaching the Earth and resulted in lower global temperatures.



SAI operates in the same way as ash spewed from huge volcanic eruptions. SAI could be weaponized by rogue actors who want to manipulate regional weather patterns, causing mass migrations, conflict, and wars. SAI also cannot remedy the by-products of accumulating greenhouse gases such as coral bleaching or oceanic ecological collapse. Even if SAI artificially lowers surface temperatures it may just serve as a distraction for oil companies to profit while promoting and financing risky and unproven "technofixes" that will "solve" the problem they have created.

The intentional manipulation of Earth's atmosphere is a radical idea. Spraying particles to block the Sun will alter climate systems in ways that are hard to predict. Schemes like this to "hack the planet" and control the climate could lead to dangerous side-effects such as damage to the ozone layer, disruption of weather patterns, crop failures, and droughts.

1) Based on this information, to what extent do you oppose or support Stratospheric Aerosol Injection (SAI)?
    i) Strongly Oppose
    ii) Oppose
    iii) Somewhat Oppose
    iv) Neither Oppose nor Support
    v) Somewhat Support
    vi) Support
    vii) Strongly Support

2) To what extent do you oppose or support the US investing in research to study Stratospheric Aerosol Injection (SAI)?
    i) Strongly Oppose
    ii) Oppose
    iii) Somewhat Oppose
    iv) Neither Oppose nor Support
    v) Somewhat Support
    vi) Support
    vii) Strongly Support

3) To what extent do you disagree or agree with the following statements about SAI?

    a) It is a fast and cost-effective method of cooling the Earth.
        i) Strongly Disagree
        ii) Disagree
        iii) Somewhat Disagree
        iv) Neither Disagree nor Agree
        v) Somewhat Agree
        vi) Agree
        vii) Strongly Agree

    b) It can prevent the irreversible loss of species and ecosystems.
        i) Strongly Disagree
        ii) Disagree
        iii) Somewhat Disagree
        iv) Neither Disagree nor Agree
        v) Somewhat Agree
        vi) Agree
        vii) Strongly Agree

c) It could distract society's attention from prompt action to find a permanent solution.
   i) Strongly Disagree
   ii) Disagree
   iii) Somewhat Disagree
   iv) Neither Disagree nor Agree
   v) Somewhat Agree
   vi) Agree
   vii) Strongly Agree

d) It could result in dangerous side-effects.
   i) Strongly Disagree
   ii) Disagree
   iii) Somewhat Disagree
   iv) Neither Disagree nor Agree
   v) Somewhat Agree
   vi) Agree
   vii) Strongly Agree

e) It could pose a threat to national security.
   i) Strongly Disagree
   ii) Disagree
   iii) Somewhat Disagree
   iv) Neither Disagree nor Agree
   v) Somewhat Agree
   vi) Agree
   vii) Strongly Agree

f) It can reduce the frequency and intensity of droughts and damaging storms.
   i) Strongly Disagree
   ii) Disagree
   iii) Somewhat Disagree
   iv) Neither Disagree nor Agree
   v) Somewhat Agree
   vi) Agree
   vii) Strongly Agree

g) It will help the world's poorest and most vulnerable people.
   i) Strongly Disagree
   ii) Disagree
   iii) Somewhat Disagree
   iv) Neither Disagree nor Agree
   v) Somewhat Agree
   vi) Agree
   vii) Strongly Agree

h) It is being promoted as a false solution by oil companies.
    i) Strongly Disagree
    ii) Disagree
    iii) Somewhat Disagree
    iv) Neither Disagree nor Agree
    v) Somewhat Agree
    vi) Agree
    vii) Strongly Agree

4) How concerned are you when you think about the use of Stratospheric Aerosol Injection (SAI)?
    i) Not at all concerned
    ii) Slightly concerned
    iii) Somewhat concerned
    iv) Moderately concerned
    v) Extremely concerned

5) Before you read about it just now, how would you describe your familiarity with the term "stratospheric aerosol injection?"
    i) Had never heard of it
    ii) Had heard of it a little
    iii) Had heard some things about it
    iv) Had heard a great deal about it
    v) Was very familiar with it

6) Please select the word 'circle' from the options below [*options were presented in random order]*
    i) Circle
    ii) Triangle
    iii) Square
    iv) Hexagon
    v) Octagon

Next we will ask you some questions about you and your opinions.

7) To what extent do you disagree or agree with the following statements:

   a) "Technological advancements will lead to a future in which people's lives are mostly better."
      i) Strongly Disagree
      ii) Disagree
      iii) Somewhat Disagree
      iv) Neither Disagree nor Agree
      v) Somewhat Agree
      vi) Agree
      vii) Strongly Agree

   b) "I trust the work of scientists to make life better for people."
      i) Strongly Disagree
      ii) Disagree
      iii) Somewhat Disagree
      iv) Neither Disagree nor Agree
      v) Somewhat Agree
      vi) Agree
      vii) Strongly Agree

   c) "I trust scientists can find solutions to our major technological problems."
      i) Strongly Disagree
      ii) Disagree
      iii) Somewhat Disagree
      iv) Neither Disagree nor Agree
      v) Somewhat Agree
      vi) Agree
      vii) Strongly Agree

8) Some people have opinions about almost everything; other people have opinions about just some things; and still other people have very few opinions. What about you? Would you say you have opinions about almost everything, most things, many things, some things, a few things, or very few things?
    i) Almost everything
    ii) Many things
    iii) Some things
    iv) Very few things

9) Compared to the average person, do you have far fewer opinions about whether things are good or bad, somewhat fewer opinions, about the same number of opinions, somewhat more opinions, or far more opinions?
    i) Far fewer opinions
    ii) Somewhat fewer opinions
    iii) About the same
    iv) Somewhat more opinions
    v) Far more opinions

10) Some people say that it is important to have definite opinions about lots of things, while other people think that it is better to remain neutral on most issues. What about you? Do you think it is better to have definite opinions about lots of things or to remain neutral on most issues?
    i) Better to remain neutral
    ii) Better to have definite opinions

11) Generally speaking, which of the following options on the scale below best describes your party identification?
    i) Strong Republican
    ii) Weak Republican
    iii) Lean Republican
    iv) Independent
    v) Lean Democrat
    vi) Weak Democrat
    vii) Strong Democrat

12) Do you lean Republican, lean Democrat, or consider yourself to be a pure Independent? [*This question was only displayed if respondent selected 'Independent' in the previous question]*
    i) Lean Republican
    ii) Pure Independent
    iii) Lean Democrat

13) Which point on this scale best describes your political views?
    i) Very Conservative
    ii) Mostly Conservative
    iii) Somewhat Conservative
    iv) Moderate
    v) Somewhat Liberal
    vi) Mostly Liberal
    vii) Very Liberal

14) Do you think that climate change is happening?
    i) Definitely is NOT happening
    ii) Very likely is NOT happening
    iii) Probably is NOT happening
    iv) Not sure
    v) Probably is happening
    vi) Very likely is happening
    vii) Definitely is happening

15) To what extent do you disagree or agree with the following statement: "climate change is occurring faster now because of human activity."
    i) Strongly Disagree
    ii) Disagree
    iii) Somewhat Disagree
    iv) Neither Disagree nor Agree
    v) Somewhat Agree
    vi) Agree
    vii) Strongly Agree

16) There is often debate about whether or not the public is told the whole truth about various important issues. Please indicate the degree to which you believe each statement is likely to be true on the following scale: Definitely not true; Probably not true; Not sure/cannot decide; Probably true; Definitely true

a) The government permits or perpetrates acts of terrorism on its own soil, disguising its involvement
   i) Definitely not true
   ii) Probably not true
   iii) Not sure/cannot decide
   iv) Probably true
   v) Definitely true

b) Certain significant events have been the result of the activity of a small group who secretly manipulate world events
   i) Definitely not true
   ii) Probably not true
   iii) Not sure/cannot decide
   iv) Probably true
   v) Definitely true

c) Evidence of alien contact is being concealed from the public
   i) Definitely not true
   ii) Probably not true
   iii) Not sure/cannot decide
   iv) Probably true
   v) Definitely true

d) Experiments involving new drugs or technologies are routinely carried out on the public without their knowledge or consent
   i) Definitely not true
   ii) Probably not true
   iii) Not sure/cannot decide
   iv) Probably true
   v) Definitely true

e) New and advanced technology which would harm current industry is being suppressed
   i) Definitely not true
   ii) Probably not true
   iii) Not sure/cannot decide
   iv) Probably true
   v) Definitely true

17) SAI Groups Of the following options, which groups and/or individuals do you think are in favor of Stratospheric Aerosol Injection (SAI)? Select all that apply.
    i) Democrats
    ii) Republicans
    iii) Independents
    iv) Scientists
    v) Environmentalists
    vi) Oil Companies
    vii) Other (Text Entry)

18) Please list the most important ideas or considerations that come to mind when you think about SAI (Text Entry)

Wave 2

Following a delay of 5 to 7 days, respondents were again contacted by Forthright Inc. to complete the second wave. Respondents were first exposed to one of the following two conditions: consensus control or consensus. Respondents were randomly assigned to either condition by Qualtrics' embedded randomization function. Unlike Wave 1, these treatments were not accompanied by any illustration or figures.

Control Group

Stratospheric Aerosol Injection (SAI)

Researchers have proposed a small-scale test flight of a steerable balloon to study Stratospheric Aerosol Injection (SAI). SAI involves releasing reflective particles into the stratosphere. These particles would reflect sunlight into space, resulting in cooler temperatures.

Scientific Consensus Message Group

Top American scientists recommend studying Stratospheric Aerosol Injection (SAI)

Scientific researchers at Harvard University have proposed a small-scale test flight of a steerable balloon to study Stratospheric Aerosol Injection (SAI). SAI involves releasing reflective particles into the stratosphere. These particles would reflect sunlight into space, resulting in cooler temperatures.

The proposed test flight is an example of what the U.S. National Academy of Sciences, Engineering, and Medicine recommended in its March 2021 consensus report titled "Reflecting Sunlight". This report advocated for further research and study of SAI, which is seen as among the most promising and best understood of these technologies. The academy report concluded that lowering world temperatures "requires a full scientific understanding of the possible options to respond" and therefore recommended a coordinated research program to study SAI.

After exposure to one of the two treatment conditions, respondents were then asked the following questions. Question 4, consisting of 8 belief statements, was presented as a matrix table with drop down options.

1) To what extent do you oppose or support a small-scale test flight of a balloon to study Stratospheric Aerosol Injection (SAI)?
    i) Strongly Oppose
    ii) Oppose
    iii) Somewhat Oppose
    iv) Neither Oppose nor Support
    v) Somewhat Support
    vi) Support
    vii) Strongly Support

2) To what extent do you oppose or support the US investing in research to study Stratospheric Aerosol Injection (SAI)?
    i) Strongly Oppose
    ii) Oppose
    iii) Somewhat Oppose
    iv) Not Sure
    v) Somewhat Support
    vi) Support
    vii) Strongly Support

3) To what extent do you oppose or support Stratospheric Aerosol Injection (SAI)?
    i) Strongly Oppose
    ii) Oppose
    iii) Somewhat Oppose
    iv) Neither Oppose nor Support
    v) Somewhat Support
    vi) Support
    vii) Strongly Support

4) To what extent do you disagree or agree with the following statements about SAI?

   a) It is a fast and cost-effective method of cooling the Earth.
      i) Strongly Disagree
      ii) Disagree
      iii) Somewhat Disagree
      iv) Neither Disagree nor Agree
      v) Somewhat Agree
      vi) Agree
      vii) Strongly Agree

   b) It can prevent the irreversible loss of species and ecosystems.
      i) Strongly Disagree
      ii) Disagree
      iii) Somewhat Disagree
      iv) Neither Disagree nor Agree
      v) Somewhat Agree
      vi) Agree
      vii) Strongly Agree

   c) It could distract society's attention from prompt action to find a permanent solution.
      i) Strongly Disagree
      ii) Disagree
      iii) Somewhat Disagree
      iv) Neither Disagree nor Agree
      v) Somewhat Agree
      vi) Agree
      vii) Strongly Agree

   d) It could result in dangerous side-effects.
      i) Strongly Disagree
      ii) Disagree
      iii) Somewhat Disagree
      iv) Neither Disagree nor Agree
      v) Somewhat Agree
      vi) Agree
      vii) Strongly Agree

e) It could pose a threat to national security.
   i) Strongly Disagree
   ii) Disagree
   iii) Somewhat Disagree
   iv) Neither Disagree nor Agree
   v) Somewhat Agree
   vi) Agree
   vii) Strongly Agree

f) It can reduce the frequency and intensity of droughts and damaging storms.
   i) Strongly Disagree
   ii) Disagree
   iii) Somewhat Disagree
   iv) Neither Disagree nor Agree
   v) Somewhat Agree
   vi) Agree
   vii) Strongly Agree

g) It will help the world's poorest and most vulnerable people.
   i) Strongly Disagree
   ii) Disagree
   iii) Somewhat Disagree
   iv) Neither Disagree nor Agree
   v) Somewhat Agree
   vi) Agree
   vii) Strongly Agree

h) It is being promoted as a false solution by oil companies.
   i) Strongly Disagree
   ii) Disagree
   iii) Somewhat Disagree
   iv) Neither Disagree nor Agree
   v) Somewhat Agree
   vi) Agree
   vii) Strongly Agree

5) How concerned are you when you think about the use of Stratospheric Aerosol Injection (SAI)?
    i) Not at all Concerned
    ii) Slightly Concerned
    iii) Somewhat Concerned
    iv) Moderately Concerned
    v) Extremely Concerned

6) Would you say the description you read about the planned balloon test portrays scientists in the U.S. as being more opposed, neither opposed nor supportive, or more supportive of research to study Stratospheric Aerosol Injection (SAI)?
    i) Definitely Supportive
    ii) Supportive
    iii) Somewhat Supportive
    iv) Neither Supportive nor Opposed
    v) Somewhat Opposed
    vi) Opposed
    vii) Definitely Opposed

7) Of the following options, which groups and/or individuals do you think are in favor of Stratospheric Aerosol Injection (SAI)? Select all that apply.
    i) Democrats
    ii) Republicans
    iii) Independents
    iv) Scientists
    v) Environmentalists
    vi) Oil Companies
    vii) Other (Text Entry)

Appendix D: Supplemental Analyses

Table D1. Table of Contents for Appendix D.

Table	Content	Outcome Measures
Table D1	Table of Contents for Appendix D	
Table D2a	Replication of Table 2 with Linear Regression Analysis	SAI Beliefs: Wave 1
Table D2b	Replication of Table 2 with Ordered Logit Analysis	SAI Beliefs: Wave 1
Table D3a	Replication of Table 3 with Linear Regression Analysis	SAI Support: Wave 1
Table D3b	Replication of Table 3 with Ordered Logit Analysis	SAI Support: Wave 1
Table D4a	Replication of Table 4 with Linear Regression Analysis	SAI Beliefs: Wave 2
Table D4b	Replication of Table 4 with Ordered Logit Analysis	SAI Beliefs: Wave 2
Table D5a	Replication of Table 5 with Linear Regression Analysis	SAI Support: Wave 2
Table D5b	Replication of Table 5 with Ordered Logit Analysis	SAI Support: Wave 2

Table D2a. Estimated Influence of Treatments on SAI Beliefs: Wave 1.

	Positive Valence				**Negative Valence**			
	Fast and Cost Effective	Prevent Species Loss	Reduce Damaging Weather	Help Most Vulnerable	Distract Society's Attention	Dangerous Side Effects	National Security Threat	False Solution
Positive	0.299***	0.110	0.166*	0.157	-0.130	0.041	-0.114	-0.093
	{0.096}	{0.097}	{0.093}	(0.103)	(0.096)	{0.096}	(0.101)	(0.092)
	[0.002]	[0.258]	[0.076]	[0.128]	[0.177]	[0.666]	[0.257]	[0.310]
Negative	-0.393***	-0.422***	-0.602***	-0.708***	0.558***	0.791***	0.926***	0.399***
	{0.098}	{0.103}	{0.098}	(0.103)	(0.096)	{0.091}	(0.101)	(0.091)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Strong Negative	-0.448***	-0.130	-0.372***	-0.609***	0.512***	1.016***	1.060***	0.648***
	{0.099}	{0.101}	{0.094}	(0.104)	(0.097)	{0.091}	(0.101)	(0.092)
	[0.000]	[0.199]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Constant	4.085***	4.332***	4.320***	3.974***	4.426***	4.674***	3.755***	3.873***
	{0.067}	{0.066}	{0.064}	(0.073)	(0.068)	{0.067}	(0.071)	(0.064)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
N	1,986	1,984	1,985	1,985	1,983	1,988	1,986	1,986
R^2	0.036	0.015	0.037	0.050	0.039	0.089	0.099	0.041

Note. Coefficients shown are the result of linear regression analyses, with influential outliers removed by model. Outcomes are coded such that higher values indicate a greater degree of belief with the related statement. Standard errors in parentheses, 'HC3' variant robust standard errors in curly brackets, *p*-values in square brackets. *** p<0.01, ** p<0.05, * p<0.1

Table D2b. Estimated Influence of Treatments on SAI Beliefs: Wave 1.

	Positive Valence				**Negative Valence**			
	Fast and Cost Effective	Prevent Species Loss	Reduce Damaging Weather	Help Most Vulnerable	Distract Society's Attention	Dangerous Side Effects	National Security Threat	False Solution
Positive	0.388***	0.145	0.255**	0.189*	-0.116	0.029	-0.111	-0.112
	(0.112)	(0.110)	(0.112)	(0.112)	(0.112)	(0.113)	(0.112)	(0.116)
	[0.001]	[0.189]	[0.022]	[0.092]	[0.300]	[0.801]	[0.324]	[0.332]
Negative	-0.436***	-0.415***	-0.696***	-0.784***	0.687***	0.973***	1.076***	0.489***
	(0.112)	(0.113)	(0.114)	(0.113)	(0.113)	(0.114)	(0.115)	(0.116)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Strong Negative	-0.480***	-0.146	-0.437***	-0.692***	0.631***	1.284***	1.217***	0.830***
	(0.113)	(0.112)	(0.113)	(0.114)	(0.113)	(0.116)	(0.115)	(0.117)
	[0.000]	[0.194]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
τ_1	-2.298***	-2.493***	-2.682***	-2.135***	-2.945***	-3.414***	-2.072***	-2.568***
	(0.101)	(0.106)	(0.109)	(0.097)	(0.132)	(0.168)	(0.105)	(0.118)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
τ_2	-1.532***	-1.621***	-1.795***	-1.329***	-1.938***	-2.329***	-1.144***	-1.445***
	(0.089)	(0.089)	(0.092)	(0.087)	(0.099)	(0.114)	(0.088)	(0.092)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
τ_3	-0.972***	-1.197***	-1.275***	-0.849***	-1.278***	-1.678***	-0.508***	-0.892***
	(0.084)	(0.085)	(0.086)	(0.084)	(0.088)	(0.097)	(0.083)	(0.086)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
τ_4	0.478***	0.194**	0.228***	0.580***	0.163**	-0.070	0.987***	1.113***
	(0.081)	(0.080)	(0.081)	(0.082)	(0.082)	(0.082)	(0.086)	(0.087)
	[0.000]	[0.015]	[0.005]	[0.000]	[0.046]	[0.392]	[0.000]	[0.000]
τ_5	1.564***	1.152***	1.299***	1.549***	1.125***	0.858***	1.799***	1.884***
	(0.091)	(0.085)	(0.087)	(0.092)	(0.086)	(0.085)	(0.093)	(0.095)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
τ_6	2.908***	2.290***	2.614***	2.811***	2.168***	1.791***	2.766***	2.924***
	(0.125)	(0.104)	(0.116)	(0.126)	(0.097)	(0.092)	(0.106)	(0.115)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
N	1,986	1,984	1,985	1,985	1,983	1,988	1,986	1,986
Log-Likelihood	-3490.012	-3548.398	-3461.784	-3513.055	-3459.354	-3252.903	-3511.840	-3247.103

Note. Coefficients shown are the result of ordered logit analyses. Outcomes are coded such that higher values indicate a greater degree of belief with the related statement. Standard errors in parentheses, *p*-values in square brackets.
*** p<0.01, ** p<0.05, * p<0.1

Table D3a. Estimated Influence of Treatments on Support for SAI and SAI Research: Wave 1.

	SAI Support	SAI Research Support
Positive	0.295*** (0.102) [0.004]	0.224** (0.110) [0.043]
Negative	-1.039*** (0.102) [0.000]	-0.706*** (0.110) [0.000]
Strong Negative	-1.169*** (0.102) [0.000]	-0.929*** (0.110) [0.000]
Constant	4.081*** (0.072) [0.000]	4.428*** (0.078) [0.000]
N	2,005	2,005
R^2	0.134	0.069

Note. Coefficients shown are the result of linear regression analyses, with influential outliers removed by model. Outcomes are coded such that higher values indicate a greater degree of belief with the related statement. Standard errors in parentheses, *p*-values in square brackets. *** p<0.01, ** p<0.05, * p<0.1

Table D3b. Estimated Influence of Treatments on Support for SAI and SAI Research: Wave 1.

	SAI Support	SAI Research Support
Positive	0.376*** (0.112) [0.001]	0.232** (0.111) [0.037]
Negative	-1.141*** (0.113) [0.000]	-0.704*** (0.112) [0.000]
Strong Negative	-1.317*** (0.115) [0.000]	-0.938*** (0.113) [0.000]
τ_1	-2.301*** (0.098) [0.000]	-2.282*** (0.099) [0.000]
τ_2	-1.476*** (0.089) [0.000]	-1.615*** (0.090) [0.000]
τ_3	-0.876*** (0.084) [0.000]	-1.128*** (0.086) [0.000]
τ_4	0.427*** (0.082) [0.000]	-0.115 (0.082) [0.158]
τ_5	1.467*** (0.092) [0.000]	0.867*** (0.085) [0.000]
τ_6	2.607*** (0.120) [0.000]	2.145*** (0.104) [0.000]
N	2,005	2,005
Log-Likelihood	-3547.363	-3688.970

Note. Coefficients shown are the result of ordered logit analyses. Outcomes are coded such that higher values indicate a greater degree of support. Standard errors in parentheses, *p*-values in square brackets. *** p<0.01, ** p<0.05, * p<0.1

Table D4a. Estimated Influence of Treatments on SAI Beliefs: Wave 2.

	Positive Valence				**Negative Valence**			
	Fast and Cost Effective	Prevent Species Loss	Reduce Damaging Weather	Help Most Vulnerable	Distract Society's Attention	Dangerous Side Effects	National Security Threat	False Solution
Wave 1: Positive, Wave 2: Control	0.182 {0.139} [0.191]	0.108 (0.149) [0.468]	-0.002 (0.139) [0.991]	0.094 (0.150) [0.530]	0.168 (0.148) [0.256]	-0.213 (0.142) [0.134]	0.058 (0.150) [0.699]	-0.004 (0.142) [0.980]
Wave 1: Negative, Wave 2: Control	0.094 {0.137} [0.493]	-0.000 (0.143) [0.997]	-0.106 (0.133) [0.426]	-0.135 (0.144) [0.347]	0.271* (0.142) [0.056]	-0.037 (0.136) [0.785]	-0.013 (0.145) [0.928]	-0.019 (0.137) [0.891]
Wave 1: Strong Negative, Wave 2: Control	-0.065 {0.147} [0.659]	-0.127 (0.151) [0.400]	-0.074 (0.140) [0.596]	-0.171 (0.152) [0.260]	0.372** (0.149) [0.013]	0.309** (0.144) [0.032]	0.387** (0.152) [0.011]	0.210 (0.144) [0.145]
Wave 1: Control, Wave 2: Consensus	0.203 {0.138} [0.142]	0.124 (0.149) [0.405]	-0.076 (0.138) [0.580]	0.026 (0.149) [0.863]	0.011 (0.147) [0.940]	-0.283** (0.141) [0.045]	-0.194 (0.150) [0.195]	-0.192 (0.142) [0.174]
Wave 1: Positive, Wave 2: Consensus	0.259* {0.137} [0.059]	0.174 (0.146) [0.234]	0.006 (0.136) [0.962]	0.113 (0.147) [0.443]	0.059 (0.145) [0.685]	-0.225 (0.139) [0.106]	-0.109 (0.147) [0.458]	-0.226 (0.139) [0.105]
Wave 1: Negative, Wave 2: Consensus	-0.271* {0.152} [0.075]	-0.127 (0.150) [0.397]	-0.369*** (0.139) [0.008]	-0.305** (0.151) [0.043]	0.336** (0.148) [0.024]	0.309** (0.143) [0.030]	0.362** (0.151) [0.016]	0.186 (0.143) [0.193]
Wave 1: Strong Negative, Wave 2: Consensus	0.099 {0.133} [0.457]	0.021 (0.142) [0.882]	-0.127 (0.132) [0.336]	-0.146 (0.143) [0.307]	0.260* (0.141) [0.065]	0.074 (0.136) [0.587]	0.294** (0.143) [0.041]	0.103 (0.136) [0.449]
Constant	4.013*** {0.096} [0.000]	4.112*** (0.101) [0.000]	4.293*** (0.094) [0.000]	3.906*** (0.102) [0.000]	4.250*** (0.101) [0.000]	4.893*** (0.097) [0.000]	4.022*** (0.103) [0.000]	4.134*** (0.097) [0.000]
N	1,718	1,720	1,717	1,719	1,719	1,724	1,713	1,718
R^2	0.011	0.004	0.006	0.007	0.008	0.020	0.017	0.010

Note. Coefficients shown are the result of linear regression analyses, with influential outliers removed by model. Outcomes are coded such that higher values indicate a greater degree of belief with the related statement. Standard errors in parentheses, 'HC3' variant robust standard errors in curly brackets, *p*-values in square brackets. *** p<0.01, ** p<0.05, * p<0.1

Table D4b. Estimated Influence of Treatments on SAI Beliefs: Wave 2

	Positive Valence				Negative Valence			
	Fast and Cost Effective	Prevent Species Loss	Reduce Damaging Weather	Help Most Vulnerable	Distract Society's Attention	Dangerous Side Effects	National Security Threat	False Solution
Wave 1: Positive, Wave 2: Control	0.224 (0.172) [0.191]	0.089 (0.175) [0.610]	-0.031 (0.176) [0.861]	0.108 (0.176) [0.538]	0.165 (0.172) [0.337]	-0.286* (0.173) [0.098]	0.094 (0.172) [0.583]	-0.035 (0.177) [0.844]
Wave 1: Negative, Wave 2: Control	0.091 (0.167) [0.585]	-0.079 (0.167) [0.635]	-0.250 (0.168) [0.137]	-0.178 (0.166) [0.283]	0.318* (0.165) [0.054]	-0.016 (0.165) [0.924]	0.050 (0.169) [0.768]	0.056 (0.172) [0.743]
Wave 1: S. Negative, Wave 2: Control	-0.077 (0.176) [0.661]	-0.141 (0.175) [0.421]	-0.149 (0.178) [0.404]	-0.176 (0.177) [0.318]	0.491*** (0.177) [0.005]	0.317* (0.172) [0.065]	0.485*** (0.174) [0.005]	0.282 (0.182) [0.120]
Wave 1: Control, Wave 2: Consensus	0.213 (0.171) [0.213]	0.096 (0.170) [0.573]	-0.210 (0.175) [0.231]	0.022 (0.172) [0.897]	-0.060 (0.169) [0.722]	-0.369** (0.172) [0.032]	-0.171 (0.172) [0.320]	-0.179 (0.177) [0.310]
Wave 1: Positive, Wave 2: Consensus	0.296* (0.168) [0.078]	0.173 (0.170) [0.309]	-0.039 (0.172) [0.820]	0.134 (0.172) [0.433]	0.041 (0.169) [0.809]	-0.345** (0.171) [0.044]	-0.152 (0.171) [0.372]	-0.246 (0.176) [0.162]
Wave 1: Negative, Wave 2: Consensus	-0.308* (0.177) [0.081]	-0.137 (0.175) [0.436]	-0.499*** (0.179) [0.005]	-0.353** (0.175) [0.043]	0.424** (0.175) [0.015]	0.352** (0.175) [0.044]	0.392** (0.176) [0.026]	0.306* (0.180) [0.090]
Wave 1: S. Negative, Wave 2: Consensus	0.118 (0.164) [0.471]	0.001 (0.165) [0.996]	-0.204 (0.166) [0.218]	-0.189 (0.166) [0.255]	0.270 (0.164) [0.100]	0.083 (0.163) [0.611]	0.342** (0.165) [0.038]	0.148 (0.171) [0.386]
τ_1	-2.353*** (0.140) [0.000]	-2.366*** (0.141) [0.000]	-2.779*** (0.149) [0.000]	-2.170*** (0.136) [0.000]	-2.735*** (0.154) [0.000]	-3.557*** (0.180) [0.000]	-2.526*** (0.146) [0.000]	-2.678*** (0.152) [0.000]
τ_2	-1.596*** (0.127) [0.000]	-1.640*** (0.129) [0.000]	-2.061*** (0.135) [0.000]	-1.385*** (0.126) [0.000]	-1.820*** (0.132) [0.000]	-2.656*** (0.146) [0.000]	-1.562*** (0.128) [0.000]	-1.792*** (0.134) [0.000]
τ_3	-1.019*** (0.122) [0.000]	-1.086*** (0.124) [0.000]	-1.543*** (0.129) [0.000]	-0.875*** (0.123) [0.000]	-1.075*** (0.124) [0.000]	-2.068*** (0.134) [0.000]	-0.816*** (0.123) [0.000]	-1.208*** (0.129) [0.000]
τ_4	0.615*** (0.120) [0.000]	0.451*** (0.122) [0.000]	0.298** (0.123) [0.015]	0.810*** (0.123) [0.000]	0.301** (0.121) [0.013]	-0.344*** (0.121) [0.004]	0.786*** (0.123) [0.000]	0.852*** (0.127) [0.000]
τ_5	1.784*** (0.128) [0.000]	1.473*** (0.127) [0.000]	1.455*** (0.129) [0.000]	1.751*** (0.131) [0.000]	1.314*** (0.125) [0.000]	0.649*** (0.122) [0.000]	1.599*** (0.128) [0.000]	1.597*** (0.132) [0.000]
τ_6	3.093*** (0.158)	2.780*** (0.151)	2.677*** (0.153)	2.924*** (0.158)	2.426*** (0.138)	1.470*** (0.127)	2.435*** (0.140)	2.451*** (0.145)

	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
N	1,718	1,720	1,717	1,719	1,719	1,724	1,713	1,718
Log-Likelihood	-2921.297	-2999.517	-2824.941	-2957.115	-3047.477	-2884.761	-3001.333	-2794.470

Note. Coefficients shown are the result of ordered logit analyses. Outcomes are coded such that higher values indicate a greater degree of belief with the related statement. Standard errors in parentheses, p-values in square brackets.
*** p<0.01, ** p<0.05, * p<0.1

Table D5a. Estimated Influence of Treatments on Support for SAI, SAI Research, and Proposed Balloon Study: Wave 2.

	SAI Support	SAI Research Support	Balloon Study Support
Wave 1: Positive, Wave 2: Control	0.182 (0.154) [0.239]	0.195 (0.160) [0.224]	0.245 (0.157) [0.118]
Wave 1: Negative, Wave 2: Control	0.004 (0.148) [0.979]	-0.003 (0.154) [0.984]	0.010 (0.150) [0.947]
Wave 1: Strong Negative, Wave 2: Control	-0.332** (0.156) [0.033]	-0.310* (0.162) [0.057]	-0.281* (0.158) [0.076]
Wave 1: Control, Wave 2: Consensus	0.143 (0.153) [0.351]	0.062 (0.160) [0.696]	0.093 (0.156) [0.551]
Wave 1: Positive, Wave 2: Consensus	0.197 (0.151) [0.192]	0.283* (0.157) [0.073]	0.319** (0.154) [0.038]
Wave 1: Negative, Wave 2: Consensus	-0.183 (0.155) [0.238]	-0.105 (0.161) [0.512]	-0.061 (0.157) [0.699]
Wave 1: Strong Negative, Wave 2: Consensus	-0.097 (0.147) [0.511]	-0.016 (0.153) [0.915]	-0.052 (0.149) [0.730]
Constant	4.047*** (0.105) [0.000]	4.372*** (0.109) [0.000]	4.312*** (0.106) [0.000]
N	1,727	1,727	1,727
R^2	0.011	0.010	0.011

Note. Coefficients shown are the result of linear regression analyses, with influential outliers removed by model. Outcomes are coded such that higher values indicate a greater degree of support. Standard errors in parentheses, *p*-values in square brackets. *** p<0.01, ** p<0.05, * p<0.1

Table D5b. Estimated Influence of Treatments on Support for SAI, SAI Research, and Proposed Balloon Study: Wave 2.

	SAI Support	SAI Research Support	Balloon Study Support
Wave 1: Positive, Wave 2: Control	0.185	0.172	0.250
	(0.172)	(0.170)	(0.170)
	[0.284]	[0.313]	[0.141]
Wave 1: Negative, Wave 2: Control	-0.055	-0.065	0.005
	(0.165)	(0.163)	(0.163)
	[0.737]	[0.688]	[0.978]
Wave 1: Strong Negative, Wave 2: Control	-0.428**	-0.379**	-0.340*
	(0.175)	(0.172)	(0.174)
	[0.015]	[0.028]	[0.051]
Wave 1: Control, Wave 2: Consensus	0.089	0.013	0.031
	(0.171)	(0.170)	(0.170)
	[0.603]	[0.940]	[0.855]
Wave 1: Positive, Wave 2: Consensus	0.181	0.248	0.342**
	(0.169)	(0.168)	(0.169)
	[0.285]	[0.139]	[0.042]
Wave 1: Negative, Wave 2: Consensus	-0.245	-0.128	-0.057
	(0.175)	(0.175)	(0.173)
	[0.162]	[0.463]	[0.742]
Wave 1: Strong Negative, Wave 2: Consensus	-0.199	-0.096	-0.116
	(0.163)	(0.162)	(0.161)
	[0.221]	[0.553]	[0.472]
τ_1	-2.231***	-2.350***	-2.360***
	(0.137)	(0.138)	(0.139)
	[0.000]	[0.000]	[0.000]
τ_2	-1.587***	-1.759***	-1.742***
	(0.128)	(0.129)	(0.128)
	[0.000]	[0.000]	[0.000]
τ_3	-0.918***	-1.195***	-1.200***
	(0.123)	(0.123)	(0.123)
	[0.000]	[0.000]	[0.000]
τ_4	0.442***	-0.042	0.136
	(0.121)	(0.119)	(0.119)
	[0.000]	[0.727]	[0.253]
τ_5	1.489***	1.014***	1.119***

	(0.127)	(0.121)	(0.122)
	[0.000]	[0.000]	[0.000]
	2.639***	2.155***	2.319***
τ_6	(0.147)	(0.134)	(0.137)
	[0.000]	[0.000]	[0.000]
N	1,727	1,727	1,727
Log-Likelihood	-3090.197	-3134.363	-3089.709

Note. Coefficients shown are the result of ordered logit analyses. Outcomes are coded such that higher values indicate a greater degree of support. Standard errors in parentheses, *p*-values in square brackets.
*** p<0.01, ** p<0.05, * p<0.1

Appendix E: Supplemental Analyses with Demographic, Psychological, and Political Variables

Table E1. Table of Contents for Appendix E.

Table E2. Estimated Influence of Treatments and Demographics on SAI Beliefs: Wave 1.

	Positive Valence				Negative Valence			
	Fast and Cost Effective	Prevent Species Loss	Reduce Damaging Weather	Help Most Vulnerable	Distract Society's Attention	Dangerous Side Effects	National Security Threat	False Solution
Positive	0.275***	0.058	0.144	0.106	-0.160*	0.083	-0.081	-0.098
	(0.094)	{0.089}	(0.091)	{0.095}	(0.096)	{0.096}	(0.103)	(0.094)
	[0.003]	[0.514]	[0.113]	[0.264]	[0.098]	[0.390]	[0.432]	[0.295]
Negative	-0.444***	-0.525***	-0.666***	-0.760***	0.514***	0.833***	0.952***	0.425***
	(0.094)	{0.098}	(0.090)	{0.097}	(0.096)	{0.092}	(0.102)	(0.093)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Strong Negative	-0.468***	-0.182*	-0.420***	-0.638***	0.468***	1.055***	1.076***	0.697***
	(0.095)	{0.100}	(0.092)	{0.098}	(0.097)	{0.092}	(0.104)	(0.095)
	[0.000]	[0.068]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Political Ideology	0.041	0.046	0.056**	0.017	-0.036	-0.011	0.078**	-0.023
	(0.029)	{0.033}	(0.028)	{0.032}	(0.030)	{0.029}	(0.031)	(0.029)
	[0.158]	[0.163]	[0.043]	[0.596]	[0.222]	[0.695]	[0.013]	[0.422]
Partisan Identification	-0.002	-0.028	-0.015	-0.034	-0.033	0.027	-0.046*	-0.040*
	(0.024)	{0.027}	(0.023)	{0.027}	(0.024)	{0.023}	(0.026)	(0.024)
	[0.919]	[0.298]	[0.500]	[0.212]	[0.171]	[0.236]	[0.077]	[0.093]
Trust in Science	0.424***	0.326***	0.401***	0.436***	0.062*	-0.123***	-0.055	-0.084***
	(0.031)	{0.039}	(0.030)	{0.034}	(0.032)	{0.036}	(0.034)	(0.031)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.053]	[0.001]	[0.104]	[0.007]
Need to Evaluate	-0.182***	-0.112	-0.134**	-0.159**	-0.052	0.177***	-0.068	-0.072
	(0.061)	{0.070}	(0.059)	{0.068}	(0.063)	{0.062}	(0.067)	(0.061)
	[0.003]	[0.108]	[0.023]	[0.020]	[0.409]	[0.005]	[0.312]	[0.236]
Conspiratorial Ideation	0.079*	0.143***	0.145***	0.083*	0.225***	0.239***	0.335***	0.268***
	(0.040)	{0.045}	(0.039)	{0.046}	(0.041)	{0.046}	(0.044)	(0.040)
	[0.051]	[0.002]	[0.000]	[0.073]	[0.000]	[0.000]	[0.000]	[0.000]
Female	0.188***	0.259***	0.178***	0.144**	-0.015	-0.058	0.073	-0.071
	(0.068)	{0.072}	(0.066)	{0.071}	(0.070)	{0.067}	(0.074)	(0.068)
	[0.006]	[0.000]	[0.007]	[0.043]	[0.835]	[0.384]	[0.329]	[0.298]
Age	-0.006***	-0.003	-0.004*	-0.005**	0.003	0.007***	0.006**	0.000
	(0.002)	{0.002}	(0.002)	{0.002}	(0.002)	{0.002}	(0.002)	(0.002)
	[0.005]	[0.153]	[0.070]	[0.025]	[0.149]	[0.003]	[0.012]	[0.940]
Income	-0.005	0.019	0.007	-0.006	-0.008	0.010	-0.005	-0.018
	(0.017)	{0.018}	(0.016)	{0.019}	(0.017)	{0.018}	(0.019)	(0.017)
	[0.771]	[0.309]	[0.665]	[0.742]	[0.635]	[0.564]	[0.789]	[0.292]
Education	-0.024	-0.013	0.002	-0.027	0.053**	0.044**	0.035	0.048**
	(0.020)	{0.021}	(0.019)	{0.022}	(0.021)	{0.020}	(0.022)	(0.020)
	[0.237]	[0.533]	[0.924]	[0.211]	[0.010]	[0.031]	[0.113]	[0.016]
Minority Respondent	0.108	0.101	0.201***	0.292***	-0.183**	-0.081	-0.047	-0.010
	(0.078)	{0.080}	(0.075)	{0.082}	(0.080)	{0.077}	(0.085)	(0.078)
	[0.167]	[0.209]	[0.008]	[0.000]	[0.022]	[0.294]	[0.579]	[0.900]
Beliefs in Climate Change	0.116***	0.186***	0.168***	0.054*	0.166***	0.024	-0.047	0.076***
	(0.027)	{0.032}	(0.026)	{0.030}	(0.027)	{0.028}	(0.029)	(0.027)
	[0.000]	[0.000]	[0.000]	[0.072]	[0.000]	[0.395]	[0.108]	[0.004]
Constant	1.719***	1.498***	1.160***	1.963***	2.645***	3.385***	2.805***	3.326***
	(0.332)	{0.360}	(0.321)	{0.369}	(0.341)	{0.397}	(0.363)	(0.331)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
N	1,854	1,852	1,852	1,855	1,854	1,857	1,857	1,857
R^2	0.206	0.169	0.235	0.210	0.111	0.137	0.143	0.084

Note. Coefficients shown are the result of linear regression analyses, with influential outliers removed by model. Outcomes are coded such that higher

values indicate a greater degree of belief with the related statement. Ideology and Partisan Identification coded such that higher values indicate a greater degree of Conservative and Republican alignment. All other demographic and psychological variables coded such that higher values indicate greater amounts of that attribute. Standard errors in parentheses, 'HC3' variant robust standard errors in curly brackets, *p*-values in square brackets.

Table E3. Estimated Influence of Treatments and Demographics on Support for SAI and SAI Research: Wave 1.

	SAI Support	SAI Research Support
Positive	0.228**	0.150
	(0.097)	(0.101)
	[0.019]	[0.138]
Negative	-1.136***	-0.818***
	(0.097)	(0.101)
	[0.000]	[0.000]
Strong Negative	-1.224***	-0.978***
	(0.098)	(0.102)
	[0.000]	[0.000]
Political Ideology	0.012	-0.015
	(0.030)	(0.031)
	[0.688]	[0.631]
Partisan Identification	0.014	0.034
	(0.024)	(0.025)
	[0.571]	[0.187]
Trust in Science	0.405***	0.479***
	(0.032)	(0.034)
	[0.000]	[0.000]
Need to Evaluate	-0.161**	0.036
	(0.063)	(0.066)
	[0.011]	[0.585]
Conspiratorial Ideation	0.029	-0.069
	(0.041)	(0.043)
	[0.488]	[0.110]
Female	0.096	0.076
	(0.070)	(0.073)
	[0.173]	[0.297]
Age	-0.012***	-0.011***
	(0.002)	(0.002)
	[0.000]	[0.000]
Income	-0.013	-0.001
	(0.018)	(0.018)
	[0.456]	[0.976]
Education	-0.007	0.009
	(0.021)	(0.022)
	[0.730]	[0.690]
Minority Respondent	0.203**	0.127
	(0.080)	(0.084)
	[0.011]	[0.129]
Beliefs in Climate Change	0.093***	0.172***
	(0.027)	(0.029)
	[0.001]	[0.000]

Constant	2.374*** (0.343) [0.000]	1.646*** (0.357) [0.000]
N	1,864	1,864
R^2	0.287	0.286

Note. Coefficients shown are the result of linear regression analyses, with influential outliers removed by model. Outcomes are coded such that higher values indicate a greater degree of belief with the related statement. Ideology and Partisan Identification coded such that higher values indicate a greater degree of Conservative and Republican alignment. All other demographic and psychological variables coded such that higher values indicate greater amounts of that attribute. Standard errors in parentheses, *p*-values in square brackets. *** p<0.01, ** p<0.05, * p<0.1

Table E4. Estimated Influence of Treatments and Demographics on SAI Beliefs: Wave 2

	Positive Valence				**Negative Valence**			
	Fast and Cost Effective	Prevent Species Loss	Reduce Damaging Weather	Help Most Vulnerable	Distract Society's Attention	Dangerous Side Effects	National Security Threat	False Solution
Wave 1: Positive, Wave 2: Control	0.154 (0.132) [0.244]	0.107 (0.135) [0.430]	-0.061 (0.127) [0.633]	0.093 {0.143} [0.517]	0.133 (0.144) [0.357]	-0.178 (0.142) [0.211]	0.062 (0.148) [0.674]	0.035 (0.143) [0.804]
Wave 1: Negative, Wave 2: Control	0.027 (0.127) [0.830]	-0.070 (0.130) [0.591]	-0.199 (0.122) [0.101]	-0.200 {0.138} [0.147]	0.250* (0.139) [0.072]	0.048 (0.136) [0.724]	0.044 (0.142) [0.756]	0.012 (0.137) [0.929]
Wave 1: S. Negative, Wave 2: Control	-0.008 (0.137) [0.952]	-0.088 (0.140) [0.531]	-0.009 (0.131) [0.942]	-0.078 {0.148} [0.597]	0.341** (0.150) [0.023]	0.330** (0.147) [0.025]	0.351** (0.154) [0.023]	0.218 (0.148) [0.141]
Wave 1: Control, Wave 2: Consensus	0.220* (0.132) [0.096]	0.197 (0.135) [0.145]	-0.061 (0.127) [0.628]	0.066 {0.136} [0.631]	0.055 (0.145) [0.706]	-0.241* (0.142) [0.089]	-0.168 (0.148) [0.257]	-0.153 (0.142) [0.284]
Wave 1: Positive, Wave 2: Consensus	0.209 (0.131) [0.109]	0.088 (0.134) [0.512]	-0.046 (0.126) [0.714]	0.063 {0.141} [0.654]	0.034 (0.143) [0.810]	-0.161 (0.141) [0.254]	-0.038 (0.147) [0.796]	-0.206 (0.141) [0.145]
Wave 1: Negative, Wave 2: Consensus	-0.345** (0.134) [0.010]	-0.193 (0.137) [0.158]	-0.451*** (0.128) [0.000]	-0.389*** {0.143} [0.006]	0.266* (0.147) [0.070]	0.372*** (0.144) [0.010]	0.448*** (0.150) [0.003]	0.211 (0.145) [0.146]
Wave 1: S. Negative, Wave 2: Consensus	0.114 (0.127) [0.367]	0.063 (0.130) [0.628]	-0.138 (0.122) [0.257]	-0.130 {0.135} [0.338]	0.266* (0.139) [0.055]	0.098 (0.136) [0.470]	0.319** (0.142) [0.025]	0.150 (0.137) [0.274]
Political Ideology	0.031 (0.029) [0.293]	0.015 (0.030) [0.625]	-0.000 (0.028) [0.988]	0.024 {0.032} [0.448]	-0.073** (0.032) [0.022]	0.013 (0.031) [0.669]	0.096*** (0.033) [0.003]	-0.008 (0.031) [0.787]
Partisan Identification	-0.046* (0.024) [0.053]	-0.027 (0.024) [0.273]	-0.004 (0.023) [0.866]	-0.046* {0.026} [0.079]	0.019 (0.026) [0.469]	0.035 (0.025) [0.171]	-0.006 (0.027) [0.832]	-0.035 (0.026) [0.176]
Trust in Science	0.424*** (0.032) [0.000]	0.407*** (0.032) [0.000]	0.385*** (0.030) [0.000]	0.406*** {0.036} [0.000]	0.095*** (0.034) [0.006]	-0.164*** (0.034) [0.000]	-0.104*** (0.035) [0.003]	-0.113*** (0.034) [0.001]
Need to Evaluate	0.002 (0.062) [0.969]	-0.030 (0.063) [0.633]	-0.102* (0.059) [0.086]	-0.076 {0.066} [0.256]	-0.143** (0.068) [0.035]	0.065 (0.066) [0.326]	-0.181*** (0.069) [0.009]	-0.139** (0.067) [0.037]
Conspiratorial Ideation	0.045 (0.040) [0.261]	0.045 (0.041) [0.275]	0.028 (0.039) [0.474]	-0.027 {0.044} [0.541]	0.298*** (0.044) [0.000]	0.289*** (0.043) [0.000]	0.364*** (0.045) [0.000]	0.329*** (0.043) [0.000]
Female	0.165** (0.068) [0.016]	0.183*** (0.070) [0.009]	0.125* (0.066) [0.057]	0.121* {0.071} [0.088]	-0.082 (0.075) [0.274]	0.036 (0.074) [0.620]	0.078 (0.076) [0.305]	-0.129* (0.074) [0.080]
Age	-0.004** (0.002) [0.050]	-0.003 (0.002) [0.175]	-0.006*** (0.002) [0.006]	-0.003 {0.002} [0.265]	-0.004* (0.002) [0.070]	-0.006** (0.002) [0.017]	-0.004* (0.003) [0.080]	-0.004* (0.002) [0.086]
Income	-0.015 (0.017) [0.374]	0.014 (0.018) [0.425]	-0.016 (0.017) [0.339]	-0.006 {0.018} [0.739]	-0.020 (0.019) [0.288]	0.002 (0.019) [0.924]	-0.005 (0.019) [0.796]	-0.002 (0.019) [0.913]
Education	-0.013	0.005	0.010	0.006	0.030	0.044**	0.044*	0.049**

	(0.021)	(0.021)	(0.020)	{0.021}	(0.023)	(0.022)	(0.023)	(0.022)
	[0.520]	[0.827]	[0.627]	[0.792]	[0.190]	[0.046]	[0.056]	[0.027]
	-0.020	0.067	0.004	0.074	-0.185**	-0.197**	0.092	-0.101
Minority Respondent	(0.078)	(0.080)	(0.075)	{0.083}	(0.086)	(0.085)	(0.088)	(0.085)
	[0.794]	[0.406]	[0.956]	[0.370]	[0.031]	[0.020]	[0.294]	[0.235]
	0.089***	0.168***	0.141***	0.132***	0.168***	0.031	-0.042	0.069**
Beliefs in Climate Change	(0.027)	(0.027)	(0.026)	{0.031}	(0.029)	(0.029)	(0.030)	(0.029)
	[0.001]	[0.000]	[0.000]	[0.000]	[0.000]	[0.284]	[0.163]	[0.016]
	1.609***	1.145***	2.087***	1.602***	2.768***	4.330***	3.644***	3.855***
Constant	(0.350)	(0.359)	(0.336)	{0.395}	(0.383)	(0.377)	(0.392)	(0.379)
	[0.000]	[0.001]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
N	1,603	1,605	1,603	1,605	1,605	1,610	1,602	1,604
R^2	0.205	0.229	0.220	0.211	0.102	0.085	0.106	0.063

Note. Coefficients shown are the result of linear regression analyses, with influential outliers removed by model. Outcomes are coded such that higher values indicate a greater degree of belief with the related statement. Ideology and Partisan Identification coded such that higher values indicate a greater degree of Conservative and Republican alignment. All other demographic and psychological variables coded such that higher values indicate greater amounts of that attribute. Standard errors in parentheses, 'HC3' variant robust standard errors in curly brackets, *p*-values in square brackets. *** p<0.01, ** p<0.05, * p<0.1

Table E5. Estimated Influence of Treatments and Demographics on Support for SAI, SAI Research, and Proposed Balloon Study: Wave 2

	SAI Support	SAI Research Support	Balloon Study Support
Wave 1: Positive, Wave 2: Control	0.143	0.150	0.180
	(0.144)	(0.144)	(0.146)
	[0.319]	[0.299]	[0.216]
Wave 1: Negative, Wave 2: Control	-0.096	-0.077	-0.099
	(0.138)	(0.138)	(0.140)
	[0.485]	[0.577]	[0.478]
Wave 1: S. Negative, Wave 2: Control	-0.279*	-0.305**	-0.273*
	(0.149)	(0.150)	(0.151)
	[0.062]	[0.042]	[0.071]
Wave 1: Control, Wave 2: Consensus	0.179	0.115	0.125
	(0.144)	(0.144)	(0.146)
	[0.212]	[0.425]	[0.392]
Wave 1: Positive, Wave 2: Consensus	0.168	0.262*	0.260*
	(0.142)	(0.143)	(0.144)
	[0.237]	[0.067]	[0.072]
Wave 1: Negative, Wave 2: Consensus	-0.269*	-0.208	-0.172
	(0.146)	(0.146)	(0.148)
	[0.066]	[0.156]	[0.244]
Wave 1: S. Negative, Wave 2: Consensus	-0.087	-0.019	-0.067
	(0.138)	(0.138)	(0.140)
	[0.529]	[0.891]	[0.634]
Political Ideology	0.001	-0.014	-0.006
	(0.032)	(0.032)	(0.032)
	[0.980]	[0.660]	[0.844]
Partisan Identification	-0.001	-0.014	0.008
	(0.026)	(0.026)	(0.026)
	[0.957]	[0.587]	[0.770]
Trust in Science	0.426***	0.471***	0.417***
	(0.034)	(0.035)	(0.035)
	[0.000]	[0.000]	[0.000]
Need to Evaluate	0.025	0.087	0.029
	(0.067)	(0.068)	(0.068)
	[0.705]	[0.198]	[0.676]
Conspiratorial Ideation	-0.050	-0.063	-0.038
	(0.044)	(0.044)	(0.044)
	[0.254]	[0.154]	[0.392]
Female	0.050	-0.003	-0.120
	(0.074)	(0.075)	(0.075)
	[0.498]	[0.964]	[0.112]
Age	-0.001	-0.001	0.002
	(0.002)	(0.002)	(0.002)
	[0.822]	[0.793]	[0.384]
Income	-0.013	-0.005	-0.011
	(0.019)	(0.019)	(0.019)
	[0.474]	[0.799]	[0.552]
Education	-0.002	0.000	-0.001
	(0.022)	(0.023)	(0.023)
	[0.927]	[0.998]	[0.976]
Minority Respondent	0.115	-0.002	-0.021
	(0.085)	(0.086)	(0.087)
	[0.180]	[0.984]	[0.804]
Beliefs in Climate Change	0.126***	0.162***	0.166***
	(0.029)	(0.029)	(0.030)
	[0.000]	[0.000]	[0.000]
Constant	1.415***	1.332***	1.448***
	(0.383)	(0.384)	(0.388)
	[0.000]	[0.001]	[0.000]
N	1,611	1,611	1,611
R^2	0.191	0.246	0.199

Note. Coefficients shown are the result of linear regression analyses, with influential outliers removed by model. Outcomes are coded such that higher values indicate a greater degree of belief with the related statement. Ideology and Partisan Identification coded such that higher values indicate a greater degree of Conservative and Republican alignment. All other demographic and psychological variables coded such that higher values indicate greater amounts of that attribute. Standard errors in parentheses, *p*-values in square

brackets. *** p<0.01, ** p<0.05, * p<0.1

Appendix F: List of News Articles used in Content Analysis

Headline	Source	Published	URL
An unspoken option if climate talks fail: Geoengineering	AP News	12/5/2015	https://apnews.com/article/bf754eaa38894127b7f19b033ac7603b
Warming up to solar geoengineering	Axios	3/25/2021	https://www.axios.com/2021/03/25/geoengineering-climate-change-research-program
The game theory of using geoengineering to fight climate change	Axios	6/20/2020	https://www.axios.com/2020/06/20/climate-change-geoengineering
Sulfur Intervention Induced Solar Geoengineering to Reduce Greenland Icecap Melting	AZO Cleantech	7/8/2021	https://www.azocleantech.com/news.aspx?newsID=29781
The Fast, Cheap and Scary Way to Cool the Planet	Bloomberg	6/3/2020	https://www.bloomberg.com/news/articles/2020-06-03/solar-geoengineering-cooling-the-planet-can-be-fast-and-cheap#xj4y7vzkg
Fear of Geoengineering Is Really Anxiety About Cutting Carbon	Bloomberg	6/25/2021	https://www.bloomberg.com/news/articles/2021-06-25/fear-of-geoengineering-is-really-anxiety-about-cutting-carbon?leadSource=uverify%20wall
Solar Geoengineering Research Is a Risk Worth Taking	Bloomberg	1/1/2022	https://www.bloomberg.com/opinion/articles/2022-02-01/a-ban-on-solar-geoengineering-would-limit-our-climate-options?leadSource=uverify%20wall
Researchers say it would be cheap and doable to dim the sun to curb global warming	Boston Globe	11/28/2018	https://www.bostonglobe.com/metro/2018/11/28/researchers-say-would-cheap-and-doable-dim-sun-curb-global-warming/0g5Lg18Cv3ycYfQRvS9PZP/story.html
Solar Geoengineering Can Curb Climate Change, Reduce Global Inequality	Breitbart	1/13/2020	https://www.breitbart.com/news/solar-geoengineering-can-curb-climate-change-reduce-global-inequality/
More Scientists Supporting Research Into Artic Geoengineering	Breitbart	4/13/2017	https://www.breitbart.com/news/more-scientists-supporting-research-into-arctic-geoengineering/
Dimming Sun's Rays Should Be Off-Limits, Say Experts	Breitbart	1/16/2022	https://www.breitbart.com/news/dimming-suns-rays-should-be-off-limits-say-experts/
Efforts to Geoengineer Cooler Temperatures Could Depress Crop Yields	Breitbart	8/8/2018	https://www.breitbart.com/news/efforts-to-geoengineer-cooler-temperatures-could-depress-crop-yields/
Science Panel: Consider Air Cooling Tech as Climate Back-Up	Breitbart	3/25/2021	https://www.breitbart.com/news/science-panel-consider-air-cooling-tech-as-climate-back-up/
Dimming the Sun to Cool Earth Could Ravage Wildlife: Study	Breitbart	1/22/2018	https://www.breitbart.com/news/dimming-the-sun-to-cool-earth-could-ravage-wildlife-study/
Scientists Consider 'Human-Made Volcano' to Slow Global Warming	Breitbart	8/5/2019	https://www.breitbart.com/news/scientists-consider-human-made-volcano-to-slow-global-warming/

Geoengineering: 'Plan B' for the Planet	Breitbart	8/23/2019	https://www.breitbart.com/news/geoengineering-plan-b-for-the-planet/
Untested Tech Not Part of Climate Fix Guidance: Industry Group	Breitbart	8/31/2019	https://www.breitbart.com/news/untested-tech-not-part-of-climate-fix-guidance-industry-group-2/

Headline	Source	Published	URL
Geo-Engineering No Holy Grail - Study	Breitbart	2/25/2014	https://www.breitbart.com/news/34540dff-ed36-4547-a428-b550fc11fb01/
How a last-ditch 'planet hacking' plan could keep Earth habitable for longer	Business Insider	4/12/2018	https://www.businessinsider.com/geoengineering-atmosphere-clouds-harvard-2018-4
Harvard scientists will soon send chemicals into the atmosphere to test whether a last-ditch planet-hacking plan could keep Earth habitable	Business Insider	12/10/2018	https://www.businessinsider.com/harvard-scientists-to-release-chemicals-into-sky-in-2019-to-cool-earth-2018-12
A rogue country could take planet-hacking into its own hands to alter the climate – and some experts worry it could lead to war	Business Insider	6/13/2019	https://www.businessinsider.in/a-rogue-country-could-take-planet-hacking-into-its-own-hands-to-alter-the-climate-and-some-experts-worry-it-could-lead-to-war/articleshow/69777207.cms
World must act quickly to govern solar geoengineering, report says	CarbonBrief	1/10/2018	https://www.carbonbrief.org/world-must-act-quickly-to-govern-solar-geoengineering-report-says/
Unregulated solar geoengineering could spark droughts and hurricanes, study warns	CarbonBrief	11/14/2017	https://www.carbonbrief.org/unregulated-solar-geoengineering-could-spark-droughts-and-hurricanes-study-warns/#:~:text=Artificially%20cooling%20the%20planet%20through,way%2C%20a%20new%20study%20warns.
Solar geoengineering research could get funding injection	Chemical & Engineering News	3/29/2021	https://cen.acs.org/environment/atmospheric-chemistry/Solar-geoengineering-research-funding-injection/99/web/2021/03
Solar geoengineering? Not in our skies, say Indigenous groups.	Christian Science Monitor	6/10/2021	https://www.csmonitor.com/Environment/2021/0610/Solar-geoengineering-Not-in-our-skies-say-Indigenous-groups#:~:text=Harvard%20researchers%20are%20studying%20whether,an%20unproductive%20and%20risky%20project.
The Planet-wide Problem That Is Solar Geoengineering	Discover Magazine	2/22/2022	https://www.discovermagazine.com/technology/the-planet-wide-problem-that-is-solar-geoengineering
Solar Geoengineering Might Not Work if We Keep Burning Fossil Fuels, Study Finds	EcoWatch	11/17/2020	https://www.ecowatch.com/solar-geoengineering-fossil-fuels-study-2648954678.html
Why Solar Geoengineering May Be Our Only Hope To Reverse Global Warming	Forbes	9/10/2019	https://www.forbes.com/sites/jamesconca/2019/09/10/solar-geoengineering-we-better-do-it-or-well-burn/?sh=4fe8538118ad

Solar Geoengineering: Why Bill Gates Wants It, But These Experts Want To Stop It	Forbes	1/20/2022	https://www.forbes.com/sites/davidrvetter/2022/01/20/solar-geoengineering-why-bill-gates-wants-it-but-these-experts-want-to-stop-it/?sh=402f72a11842
Geoengineering: Injecting Aerosols into the Atmosphere is Untested and Dangerous	Forbes	5/12/2022	https://www.forbes.com/sites/arielcohen/2022/05/12/geoengineering-injecting-aerosols-into-the-atmosphere-is-untested-and-dangerous/?sh=708ff6c36665
Science Says Geoengineering Could Create New Climate Catastrophes	Forbes	11/14/2017	https://www.forbes.com/sites/ericmack/2017/11/14/geoengineering-solar-aerosols-climate-change/?sh=5210435c6b44

Headline	Source	Published	URL
Plans to 'hack Earth' weather' could start World War 3, scientists warn	Fox News	6/14/2019	https://www.foxnews.com/science/plans-to-hack-earths-weather-could-start-world-war-3-scientists-warn
Fake Volcano Can Solve Climate Problems, Scientists Say	Fox News	1/8/2015	https://www.foxnews.com/science/fake-volcano-can-solve-climate-problems-scientists-say
CIA wants to control the weather, climate change	Fox News	10/21/2015	https://www.foxnews.com/science/cia-wants-to-control-the-weather-climate-change
Tweaking the climate to save it: Who decides?	Fox News	11/17/2014	https://www.foxnews.com/world/tweaking-the-climate-to-save-it-who-decides
U.N. Weighs Risks of Artificial Volcanoes, Space Particles, and More	Fox News	1/8/2015	https://www.foxnews.com/science/u-n-weighs-risks-of-artificial-volcanoes-space-particles-and-more
White House Should Coordinate Geoengineering Research to Help Fight Climate Change	Fox News	12/23/2015	https://www.foxnews.com/politics/white-house-should-coordinate-geoengineering-research-to-help-fight-climate-change
Bill Gates support for 'bonkers' study of dimming the sun is 'grossly irresponsible'	Fox News	4/8/2021	https://www.foxnews.com/media/bill-gates-backs-project-to-dim-the-sun-michael-shellenberger
Why a landmark experiment into dimming the sun got cancelled.	Grist	4/8/2021	https://grist.org/science/who-gets-to-decide-if-we-study-solar-geoengineering-after-the-scopex-project-canceled/
Should the world ban solar geoengineering? 60 experts say yes.	Grist	1/21/2022	https://grist.org/science/should-the-world-ban-solar-geoengineering-60-experts-say-yes/
We can’t afford to stop solar geoengineering research	MIT Technology Review	1/26/2022	https://www.technologyreview.com/2022/01/26/1044226/we-cant-afford-to-stop-solar-geoengineering-research/
The secret weapon in fight against climate change	MSNBC	6/30/2015	https://www.msnbc.com/msnbc/the-secret-weapon-fight-against-climate-change-msna629441

First sun-dimming experiment will test a way to cool Earth	Nature	11/27/2018	https://www.nature.com/articles/d41586-018-07533-4
Geoengineering Effort Could Pose Big Problem for Astronomers	NBC News	1/20/2017	https://www.nbcnews.com/mach/space/geoengineering-effort-could-pose-big-problem-astronomers-n709941
Two Audacious Plans to Saving the world's ice sheets	NBC News	5/28/2018	https://www.nbcnews.com/mach/science/can-these-bold-plans-keep-world-s-ice-sheets-melting-ncna877616
Test Flight for Sunlight-Blocking Research Is Canceled	New York Times	4/2/2021	https://www.nytimes.com/2021/04/02/climate/solar-geoengineering-block-sunlight.html#:~:text=The%20Swedish%20Space%20Corporation%20said,outcry%20from%20environmentalists%20and%20others.
As Climate Disasters Pile Up, a Radical Proposal Gains Traction	New York Times	11/10/2020	https://www.nytimes.com/2020/10/28/climate/climate-change-geoengineering.html
Should We Block the Sun? Scientists Say the Time Has Come to Study It.	New York Times	3/25/2021	https://www.nytimes.com/2021/03/25/climate/geoengineering-sunlight.html

Headline	Source	Published	URL
What's the Least Bad Way to Cool the Planet?	New York Times	10/1/2021	https://www.nytimes.com/2021/10/01/opinion/climate-change-geoengineering.html
Pileup of Climate Calamities Seeds a Radical Idea	New York Times	10/28/2020	https://www.nytimes.com/2020/10/28/climate/climate-change-geoengineering.html
To Curb Global Warming, Science Fiction May Become Fact	New York Times	4/4/2017	https://www.nytimes.com/2017/04/04/business/economy/geoengineering-climate-change.html
Scientific Pros Weigh The Cons Of Messing With Earth's Thermostat	NPR	2/10/2015	https://www.npr.org/sections/thetwo-way/2015/02/10/385065816/scientific-pros-weigh-the-cons-of-messing-with-earths-thermostat
U.S. should research solar geoengineering to fight climate change but exercise caution, scientists say	Reuters	3/25/2021	https://www.reuters.com/article/us-climate-change-geoengineering/u-s-should-research-solar-geoengineering-to-fight-climate-change-but-exercise-caution-scientists-say-idUSKBN2BH2AN
Sweden rejects pioneering test of solar geoengineering tech	Reuters	3/31/2021	https://www.reuters.com/article/us-climate-change-geoengineering-sweden/sweden-rejects-pioneering-test-of-solar-geoengineering-tech-idUSKBN2BN35X
Risks of Controversial Geoengineering Approach "May Be Overstated"	Scientific American	7/3/2019	https://www.scientificamerican.com/article/risks-of-controversial-geoengineering-approach-may-be-overstated/
Solar Geoengineering Should be Investigated, Scientists Say	Scientific American	3/26/2021	https://www.scientificamerican.com/article/solar-geoengineering-should-be-investigated-scientists-say/
Asteroid Dust Could Fight Climate Change on Earth	Space	9/28/2012	https://www.space.com/17830-asteroid-dust-geoenineering-global-warming.html

The world needs to explore solar geoengineering as a tool to fight climate change	The Boston Globe	10/19/2020	https://www.bostonglobe.com/2020/10/19/opinion/world-needs-explore-solar-geoengineering-tool-fight-climate-change/
Why you need to get involved in the geoengineering debate - now	The Conversation	10/19/2017	https://theconversation.com/why-you-need-to-get-involved-in-the-geoengineering-debate-now-85619
Solar geoengineering could have big benefits (and also big risks)	The Fast Company	1/13/2020	https://www.fastcompany.com/90450942/solar-geoengineering-could-have-big-benefits-and-also-big-risks
As Earth heats up, the world must consider sunlight reflection	The Hill	5/9/2022	https://thehill.com/opinion/energy-environment/3482345-as-earth-heats-up-the-world-must-consider-sunlight-reflection/
To Limit Solar Geoengineering's Side Effects, the Right 'Dose' Is Needed	The Scientific American	3/12/2019	https://www.scientificamerican.com/article/to-limit-solar-geoengineerings-side-effects-the-right-dose-is-needed/
What Is Solar Geoengineering?	Union of Concerned Scientists	10/29/2020	https://www.ucsusa.org/resources/what-solar-geoengineering
Fact check: Bill Gates is not trying to ‘block the sun’s rays’ in the name of climate change	USA Today	4/23/2021	https://www.usatoday.com/story/news/factcheck/2021/04/23/fact-check-bill-gates-not-trying-block-suns-rays/7310134002/

Headline	Source	Published	URL
Reflecting Sunlight Offers No Quick Fix for Feverish Planet	USA Today	2/15/2015	https://www.usatoday.com/story/opinion/2015/02/15/megadrought-climate-change-ken-caldeira-editorials-debates/23465975/
Creating clouds to stop global warming could wreak havoc	USA Today	1/22/2018	https://www.usatoday.com/story/tech/science/2018/01/22/creating-clouds-stop-global-warming-could-wreak-havoc/1054026001/
Manipulating the climate: The case for a Plan B	USA Today	2/14/2015	https://www.usatoday.com/story/news/nation/2015/02/14/kostigen-climate-engineering/23298625/
The Hot Debate Over Solar Geoengineering and Its Impact on Climate	Wall Street Journal	5/13/2021	https://www.wsj.com/articles/the-hot-debate-over-solar-geoengineering-and-its-impact-on-climate-11620932402
Big-Sky Plan to Cool the Planet	Wall Street Journal	2/16/2018	https://www.wsj.com/articles/a-big-sky-plan-to-cool-the-planet-1518802598
Bill Gates is trying to dim the sun	Washington Examiner	1/1/2021	https://www.washingtonexaminer.com/opinion/bill-gates-is-trying-to-dim-the-sun
Thermostat Wars	Washington Post	2/27/2023	https://www.washingtonpost.com/climate-environment/2023/02/27/geoengineering-security-war/

Note: Three of these articles changed their headlines between content analysis and the preparation of this manuscript. We use the original title in these three cases.

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Appendix G: Attrition Rates by Demographic Characteristics

Table G-1. Attrition Rates by Respondent Gender.

	Gender		
Attritted	Male	Female	Total
No	846	854	1700
	(86.415)	(85.915)	(86.163)
Yes	(133)	(140)	(273)
	13.585	14.085	(13.837)
Total	(979)	(994)	(1973)
	$\chi^2(1) = 0.103$		

Note: Presented values are N for each category. Percentage of attritted respondents by group in parentheses. Chi-squared test results with degrees of freedom in parentheses. * $p<0.05$, ** $p<0.01$.

Table G-2. Attrition Rates by Respondent Region.

	Region				
Attritted	Northeast	Midwest	South	West	Total
No	322	371	644	389	1,726
	(85.867)	(87.089)	(86.327)	(85.120)	(86.128)
Yes	53	55	102	68	278
	(14.133)	(12.911)	(13.673)	(14.880)	(13.872)
Total	375	426	746	457	2,004
		$\chi^2(3) = 0.764$			

Note: Presented values are N for each category. Percentage of attritted respondents by group in parentheses. Chi-squared test results with degrees of freedom in parentheses. * $p<0.05$, ** $p<0.01$.

Table G-3. Attrition Rates by Respondent Racial Category

	Racial Category		
Attritted	White	Person of Color	Total
No	1,208	521	1,729
	(86.471)	(85.410)	(86.148)
Yes	189	89	278
	(13.529)	(14.590)	(13.852)
Total	1,397	610	2,007
	$\chi^2(1) = 0.401$		

Note: Presented values are N for each category. Percentage of attritted respondents by group in parentheses. Chi-squared test results with degrees of freedom in parentheses. * $p<0.05$, ** $p<0.01$.

Table G-4. Attrition Rates by Respondent Age

	Age				
Attritted	18 to 30	31 to 45	46 to 65	66 and Older	Total
No	373	513	572	271	1,729
	(79.193)	(86.949)	(89.236)	(88.852)	(86.148)
Yes	98	77	69	34	278
	(20.807)	(13.051)	(10.764)	(11.148)	(13.852)
Total	471	590	641	305	2,007
	$\chi^2(3) = 26.399$ **				

Note: Presented values are N for each category. Percentage of attritted respondents by group in parentheses. Chi-squared test results with degrees of freedom in parentheses. * $p<0.05$, ** $p<0.01$.

Table G-5. Attrition Rates by Respondent Education

	Education									
Attritted	Less than High School	High School Diploma	Some College	Vocational Degree	Associate Degree	Bachelor's Degree	Master's Degree	Professional Degree	Doctorate	Total
No	54	365	413	95	199	429	142	13	19	1729
	(84.375)	(84.687)	(87.5)	(90.476)	(86.147)	(87.551)	(82.558)	(72.222)	(79.167)	(86.148)
Yes	10	66	59	10	32	61	30	5	5	278
	(15.625)	(15.313)	(12.5)	(9.524)	(13.853)	(12.449)	(17.442)	(27.778)	(20.833)	(13.852)
Total	64	431	472	105	231	490	172	18	24	2007
	$\chi^2(8) = 9.883$									

Note: Presented values are N for each category. Percentage of attritted respondents by group in parentheses. Chi-squared test results with degrees of freedom in parentheses. * $p<0.05$, ** $p<0.01$.

Table G-6. Attrition Rates by Respondent Income

	Income										
	Less than	$25,000	$35,000	$50,000	$75,000	$100,000	$125,000	$150,000	$175,000	$200,000	$250,000	Total

Attritted	$25,000	to $34,999	to $49,999	to $74,999	to $99,999	to $124,999	to $149,999	to $174,999	to $199,999	to $249,999	or Greater	
No	360 (84.309)	231 (86.842)	237 (86.182)	347 (89.433)	209 (85.306)	138 (89.61)	60 (83.333)	31 (86.111)	32 (100)	13 (68.421)	22 (84.615)	1680 (86.598)
Yes	67 (15.691)	35 (13.158)	38 (13.818)	41 (10.567)	36 (14.694)	16 (10.39)	12 (16.667)	5 (13.889)	0 (0)	6 (31.579)	4 (15.385)	260 (13.402)
Total	427	266	275	388	245	154	72	36	32	19	26	1940
$\chi^2(10) = 17.344$												

Note: Presented values are N for each category. Percentage of attritted respondents by group in parentheses. Chi-squared test results with degrees of freedom in parentheses. * $p<0.05$, ** $p<0.01$.