CLIMATE CHANGE IN THE AMERICAN MIND

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EXECUTIVE SUMMARY

Despite mounting evidence of global warming, the U.S. has witnessed only a modest increase in climate change risk perceptions. Notwithstanding public resistance to the phase-out of fossil fuels, current findings point to a promising future, identifying climate policies over which Americans may be able to reach common ground. Moreover, the source of climate related information as well as the strategic framing of the policy have important implications for catalyzing climate action.

BACKGROUND

Much is known about the highly politicized nature of the U.S. climate change debate. A larger share of Liberals believe that unprecedented levels of natural hazards we see today are a result of anthropogenic factors, while Conservatives tend to underestimate the severity of the global climate crisis as well as the importance of climate action. But are *all* Conservatives created equal? Is U.S. environmental policy in deadlock, failing to garner support from both party lines?

PURPOSE OF THE PROJECT

In light of such partisan divide, this project seeks to examine what exactly is on the *American mind* and identify policy areas on which Americans would be able to reach an agreement and therefore endorse. By virtue of these policy recommendations, current research aims to set America's pathways toward decarbonization. The analysis will focus on Americans' climate change opinion, predominantly from a political ideology lens.

TARGET AUDIENCE

Given its practical applications, the research product is designed for U.S. policy makers and public administrators in the environment space, such as the Environmental Protection Agency (EPA) and the Department of Energy (DOE).

To allow for data exploration and intuitive understanding of climate survey data, findings were presented as a shiny web dashboard, which is available via the following link:
https://climate-and-environment.shinyapps.io/climate-change-in-the-american-mind/

DATA

The research draws on 4 reputable sources of global temperature data and climate change opinion surveys:

- **NASA Goddard Institute for Space Studies (2023). Surface Temperature Analysis, version 4**
  - The dataset contains estimates for changing global surface temperatures, extrapolated from temperature records from multiple weather stations and oceans.
  - Estimates for 1880-2023 are available at the *monthly* resolution, which can be aggregated to seasonal and yearly averages.

Total number of records	143 years of data	Average temperature anomaly (1880-2022)	0.07°C

  - The baseline is 1850-1900, because it corresponds to the era in which weather stations have become established across the world and therefore global meteorological data have become largely accessible. Hence average global surface temperatures for a given year denote the deviation from that of the latter half of the 19th century.
  - Since records are based on *modeled estimates*, they are subject to measurement error. The uncertainty of average temperature anomaly increases as the granularity of analysis changes from *annual* to *monthly* and subsequently, to the *seasonal* level.
  - There are no restrictions to the use of NASA's data, but it requires due citation.
- **Yale Program on Climate Change Communication and George Mason University Center for Climate Change Communication (2022). Climate Change in the American Mind: National survey data on public opinion (2008-2022)**
  - The annual survey measures Americans' climate change beliefs, attitudes, and risk perceptions, along with policy preferences and information seeking behaviors, across various demographic groups.

Year	Total respondents
2008	2164
2010	2025
2011	2010
2012	2069
2013	1875
2014	2288
2015	2593
2016	2430
2017	2570
2018	2392
2019	2594
2020	2065
2021	2043
2022	1018

- To ensure that results are representative of the U.S. adult population across all geographies, survey participants are drawn using probability sampling methods. To address undersampling of minority groups, sampling weights are provided.
- Commercial use of the survey data is strictly prohibited, although it can be used for research purposes.

- **Pew Research Center (2022). American Trends Panel**
  - Wave 106 measures Americans' climate change beliefs by religious affiliation

Political ideology	Number of respondents
Liberal	2583
Moderate	3648
Conservative	3759
Refused	166
Total number of respondents	**10156**

  - Wave 108 measures Americans' support for various climate change policies, evaluation of government efforts to address climate change, and environmental problems experienced by the local community.

Political ideology	Number of respondents
Liberal	2635
Moderate	3701
Conservative	3787
Refused	159
Total number of respondents	**10282**

  - Given that it is panel data, the *same* pool of survey respondents participate in *multiple* waves, allowing us to make inferences about changes in respondents' perspectives and experiences over time.
  - Although the survey uses random sampling methods to collect data from nationally representative adults across the U.S, attrition could potentially compromise the representativeness of the target population over time, if participants that drop out of the survey are statistically different from those that remain. To account for attrition, the Pew Research Center recruits new panelists every year. To ensure that insights derived from the survey are representative of the U.S. adult population, sampling weights are also provided.
  - The Pew Research Center prohibits any use of data for lobbying or endorsement of a particular candidate or party. Any attempts to ascertain the identity of individual survey respondents are also a violation of their privacy policy.

This project draws on *secondary* research, synthesizing information from survey data (primary data) and modeled estimates (secondary data) collected from global weather stations. Apart from temperature data, all variables were categorical (e.g. Conservative/Liberal, Support/Do not support).

METHODOLOGY

The dashboard features: 1) evidence of a warming planet, 2) corresponding changes in Americans' climate risk perceptions over time, 3) beliefs and attitudes about the changing climate, along with a barometer of public opinion on various U.S. environmental policies, across political ideology. 4) Takeaways are provided at the end of each section. In closing, 5) a list of policy recommendations are provided.

- To highlight the unprecedented rise in global temperatures, I plotted an *animated tornado plot* of the extent of a) *seasonal* and b) *annual* average temperature anomalies
  - Data for April and October were used as a proxy for the Spring and Fall (*seasonal*) and averages of the two were used as a proxy for *annual* temperature deviation
  - Data points on the left of the tornado plot represent data for October, those on the right correspond to data for April, of a given year.
  - The colors of the plot represent the extent of *annual* temperature deviation, with darker colors denoting warmer average temperatures compared to the baseline.
- A *line graph* was used to emphasize the *temporal changes* in climate risk perceptions.
  - The percentage of Americans who believe that climate change imposes harm was calculated for each *year* and *target group* that climate change may inflict damage on.
  - The percentages were *unweighted*, due to lack of instructions on the application of sampling weights. However, results from unweighted data seem to be *valid*, given that they are consistent with those of the original publication.
- For a visual summary of climate change beliefs, attitudes, and policy stance, a combination of *dot plots*, *pyramid charts*, and *waffle charts* were employed. Data was aggregated by *political ideology*. Percentages were weighted only for the latter two plots, for the above-mentioned reason. Results from unweighted data did not compromise the original findings, however.
  - [Dot plot] To emphasize how education *intersects* with political ideology, data was aggregated not only by political ideology but also by education levels.
  - [Pyramid chart] 5 Levels of political ideology were reduced down to 2, for the sake of simplicity. I plotted Liberals on the left and Conservatives on the right, for the purpose of contrasting political ideologies. To construct a symmetric 'bar plot' around 0, I converted the percentages to minus values for the Liberals
  - [Waffle chart] Political ideology was also simplified as a dichotomous variable. Missing values were removed. To visualize the motivations for energy conservation, respondents for whom energy conservation was not important were excluded.

ANALYSIS AND POLICY IMPLICATIONS

Issue framing

- To prompt climate action, policy makers may be better off emphasizing the costs that *future generations* would have to bear, rather than the impacts of climate change that would affect the current generation
    - Americans demonstrate greater sensitivity to the risks that *future generations* would be exposed to, than they themselves would
- When it comes to inducing climate mitigation behavior, *Conservatives from underserved groups* are effective targets of behavioral intervention. They are aware of the gravity of the agenda as their livelihoods are impacted by the changing climate, on a tangible scale
    - Not all Conservatives are steadfast climate skeptics
- Climate solutions and policy initiatives communicated via domain experts/scientists would be given more credence than when delivered by politicians. Given the polarization of the climate change debate, trust in politicians are surprisingly low

Policy areas that are likely to garner bipartisan support

- To elicit support all-across-the-board, policy makers should devise climate policies:
    1. That *tackle resultant increase in fuel prices, rising costs of living, and unemployment*, which relate to 'quotidian' aspects of our lives
    2. That *expand solar and wind energy*
    3. *Reforestation* and *tax credits for carbon capture technology*
        - Overall, Americans are more receptive to climate mitigation policies that do *not* require significant sacrifice on their part. Methods that *offset* (rather than *reduce*) carbon emissions draw the least public resistance
    4. That *emphasize the cost-effectiveness of energy efficiency upgrades and retrofits*
        - Cutting down unnecessary energy consumption is of mutual interest, regardless of partisanship. Conservatives, from whom policy makers have had difficulty prompting climate action, are highly sensitive to *economic* factors.

Roadblocks

- That being said, *Conservatives are averse to the adoption of clean vehicles*
    - Majority of Conservatives favor the expansion of offshore oil/gas and coal and resist the idea of abandoning gasoline vehicles within the next decade.
    - As such, tax incentives for electric vehicles will most likely work for Liberals, but fail to gain traction among Conservatives
- *Loss of freedom* is a deterrent for endorsing environmental regulations for Conservatives