

Climate Change Memes From The Political Poles

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Abstract. The impacts of climate change and the methods to address them inspire highly energized debates across the full spectrum of social and political stances. Memes are a way to present a message that can instantly evoke a deep emotional response. This research uses a thematic analysis to reveal how the opposite ends of the political spectrum are using memes to present their perspective of climate change, and we evaluate the similarities and differences in themes on each side. The memes were collected from US-based subreddits that self-identified as either liberal or conservative on the political spectrum and hosted general political discourse. Our main findings indicated that memes used by the conservative generally used more personal ad hominem attacks science-rejecting content while liberal memes were more likely to focus on organizations and larger groups. These results could impact strategies for future influential communications with these groups.

Keywords: Memes, Climate Change, Misinformation

1 Introduction

Anthropogenically induced climate change is an existential threat to life as we know it on Earth. The World Meteorological Organization recently announced that there is a 66% chance that the annual global average temperature will exceed 1.5C above the preindustrial average in the next 5 years [29]. To address this global challenge, swift and decisive action will be needed from governments, organizations and individuals across the world [15]. Calls to dramatically change our sources of energy and lifestyles have elicited strong and polarized messaging campaigns from across the political spectrum. With deeply held convictions on the correct path forward, messengers from the political edges try to create equally strong reactions in the public to move their goals forward.

Memes can be a tool to cause a quick laugh or strike a deep emotional reaction, both of which have been shown to be effective at causing viewers to forward the post to more of their peers [12]. When this desire to share is strong enough with a broad audience the meme can go viral and amplify the original message well beyond the social network of the original content creator. While memes may only be a “partial story” of how communities view the world around them, they can capture the emotions and sentiment of the moment they are shared [6]. This role of memes makes them an important piece to study when looking at society-wide struggles like climate change.

In this research, we set out to answer two research questions:

R.Q.1: When comparing climate change memes posted on liberal or conservative social media groups, what are the shared themes?

R.Q.2: When comparing climate change memes posted on liberal or conservative social media groups, what are the distinguishing themes?

This study is designed to determine the existing thematic patterns in climate change related memes from conservative (right) and liberal (left) contributors in the United States and to understand how the approaches from each side are similar/different. This could provide further background to design effective social media messaging to address the challenges we are facing from climate change.

2 Related Work

2.1 Fact vs Public Perceptions

While the scientific community has reached consensus that climate change is happening and is anthropogenic in origin, the general public has a much less settled view on climate change. A meta-analysis of studies showed that a consensus (53%) of US citizens believed that both climate change is happening and that it is caused by human activity [14]. That same study also found that up to 8% of the US population does not believe that climate is changing at all. This disbelief in the impact of climate change is especially pronounced when comparing a study of European citizens which found 93% declared it a “serious problem” [14] to a study of U.S. citizens while only 53% view it as a “major threat” [21].

Within the United States the viewpoint divides on climate change become even sharper when you factor in political affiliation and has become more significant between 2010 and 2022. The same Pew Research Center study found that during those 12 years the percentage of Democrat and Democrat leaning respondents who said climate change is a major threat increased from 61% to 78%. While Republican and Republican leaning responses held fairly steady only decreasing from 25% to 23%. The politicization of science in general and climate change in particular emerged from the political elite who had a set message and used the tool of scientific “facts” to legitimize their point of view [28]. When exploring issues around climate, “Is climate change real and a threat?” is just part of the discussion. There are also the topics of “Should we do anything about it?” and “If so, what?”.

2.2 Role of Social Media and Memes

The use of social media to share and consume information about significant events is common across many demographics. While a single severe weather storm is difficult to attribute to climate change, which is defined as a change in the 30 year mean of a meteorological variable [29], it often sparks a storm of social media posts talking about how it is or is not an example of climate change.

In a detailed study of Reddit posts, associated comments and users from 2017 that included the terms “climate change” or “global warming” showed less polarization or

echo chambers within the structure of the social network than had previously been found in similar research conducted on Twitter posts [26]. Instead, they found more cross group debate with three dominant topics: “In civil debate,” “Denial / skepticism,” and “US Politics with a heavy focus on Trump and Russia.” Treen et al. [26] found misinformation and polarization of views but on Reddit the “subjectthemed” structure seemed to lead to a broader discussion and less echo chamber in the social network structure.

Memos can be a powerful modulator of the level of belief of climate change data and trust of the source of that information [30]. Wong et al. [30] showed that a brief exposure to climate change focused memes can induce an emotional response that will alter a participant’s evaluation of the trustworthiness and belief of scientific analysis. This response was found to be significant regardless of the political orientation of the viewer or the memes presented. Further results from Wong et al. showed that conservative themed memes more often induced angry and laughing responses while liberal memes drew more care and love-based reactions. With memes being most popular at ages where the young are still learning about the impacts of climate and the older demographic [7] where people are well removed from classroom learning [19] there is an opportunity for memes to be used to address climate change.

2.3 Themes in Global Change Social Media

Thematic analysis has been used in multiple studies to reveal the common threads used to tell the story of the changing global environment on social media. In an analysis of 100 TikTok videos that included the hashtag #climatechange, three themes ("climate change is real", "affected populations", and "climate anxiety/frustrations") were found in over 50% of the videos [2]. In the same collection less than 5% of the video contained the themes of "misinformation", "climate change is fake", or "tornados".

In a broader study of environmentally focused memes from Facebook, Twitter, Instagram, 4Chan and Imgur, the authors found the themes centered around 3 main categories: “Environmental Degradation as a Source of Inner Turmoil”, “Environmental Issues as a Source of Social Tension and Construction of Social Identity” and “Social Representations of the Different Actors Involved” [8]. The results showed that the use of memes in one’s posts can be a method to “achieve positive distinctiveness” as a pro-environment image is seen in a positive light while nonenvironmentally friendly messages are seen as a negative. Their findings on the use of memes also had a message for policy makers and marketers, pointing out impending doom from environmental issues without offering solutions was often seen as unethical as it increased anxiety and a feeling of powerlessness.

3 Data and Methods

To gather a corpus of memes focused on anthropogenic climate change posted by users of the liberal and conservative of United States politics, we first studied data from

Reddit. These were selected for their popularity amongst US social media users and the organization of groups and subreddits by self-identified political affiliation.

We searched for Reddit subreddits that self-identified as politically liberal or conservative. For inclusion, these groups also needed to have a large number of user shared memes, but the groups did not need to be focused on climate change specifically. We set a minimum member at 30,000 to ensure the groups were popular and active. For each, we confirmed that the content being shared there aligned with the self-identified topic of the group.

The identified subreddits included one on the political right (*r/ConservativeMemes*) and five on the political left (*r/DankLeft*, *r/DemocraticSocialism*, *r/neoliberal*, *r/WayOfTheBern*, *r/The_Leftorium*, and */r/alltheleft*). The imbalance in numbers of groups was due to the need to collect comparable number of appropriate memes. We were able to find more memes in */r/ConservativeMemes*, but we needed to expand our search in order to find a matching number among the political left. These groups are public and viewable by anyone without the need for special group membership. We then manually searched posts made from July 2019 to August 2023 for any memes containing messaging related to climate change.

Memes were considered related to climate change if they contained text or imagery related to climate but were not limited to those specifically mention climate or temperatures. They could include topics like sea level, sea ice/snow/glaciers, climate adaptation or mitigation strategies, etc.

To collect data, we collected approximately 50 memes from each end of the political spectrum, for roughly 100 total memes. This number allows for good coverage of the diversity of memes while still being manageable to code by hand [1][4] It is also generally in line with the number of memes analyzed in other social media meme studies [6,8,17,18].

The groups these memes were collected from focused on a wide variety of political topics which meant that a small percentage of the posts on the subreddits were about climate change. Between July 2019 and May 2023, 51 climate change-focused memes were found in *r/ConservativeMemes*. Using that same start date in the liberal meme search to remain consistent, we collected 55 memes for a final collection of 106 image-based memes.

4 Thematic Analysis

To explore the corpus of memes through thematic analysis [3], we developed a set of applicable themes or codes that encompassed the range of topics of interest.

We labeled each meme and converged on codes and distinguishing characteristics. These codes were condensed into themes. There were ten main themes, presented below in Section 6. After the thematic analysis was complete, it became apparent that these themes mapped closely to those found in “Climate Change Denial: A Content Analysis of Social Media” [1]. In her 2020 thesis, Bacon had conducted a similar analysis on a body of Facebook *comments* covering deliberations about climate change denial [1].

Bacon had 9 themes that were identical to our themes: Authority, Alarmism, Ad hominem, Money, Political, and Sustainability. Three of her themes did not apply to our data: Posted Media Only, Foreign Language and Facebook Administrator; we chose not to exclude memes based on language or if there was text accompanying the image, and Facebook administrator posts were not relevant to Reddit. Finally, our dataset had four additional themes that were not in Bacon's work: Futility, Jobs, Pro-science, Science rejecting. The substantial overlap between our themes and Bacon's validates the cross-platform applicability of the themes and the common strategies used by climate-related meme makers.

5 Quantitative Coding

To understand the prevalence of each theme generally and within each political group, we used these themes for quantitative coding of the data.

The author each independently assigned between zero and ten thematic codes to each meme. On an initial test coding for alignment on the codebook, 56% of the memes had a full or partial match and 44% had no match of the themes selected for each meme. Through discussion of the process and looking at several memes where strong disagreement was found, we refined the codebook for clarity. The themes remained the same, but the codebook was expanded to clarify when and how they should be applied. For example, the "Political" theme was clarified that it should be used any time a political figure is mentioned in a meme since this understanding was not shared between researchers in the test round. After refining the codebook, both researchers then coded all memes. After 2 more rounds of consultations on the remaining disagreements in coding, we reached consensus on all 106 memes.

6 Results

There is a significant difference in the pattern of themes used by liberal and conservative groups to advance their positions in climate change related memes. Six out of 10 themes showed a significant difference in usage between the groups ($p < 0.05$). The most dramatic differences are apparent within the pro and anti-science space. The left are far more likely to utilize messaging suggesting that science is the path to a better future where the right's messaging focuses around the times science has been "wrong" and is a waste of resources. This finding parallels the public policy talking points about the objective science around climate change of the edges popular with US political parties [25].

Authority

The theme of authority focuses on questioning who has the right to deem information about climate change to be right or wrong. This questioning may grow from a strong belief that your individual experience dictates the truth to the entire planet or a stance

that religious teaching should carry more weight than peer reviewed science and traditional science education. Also included in this theme are memes that are generally argumentative. Of the posts from the conservative, 29% were coded as Authority.

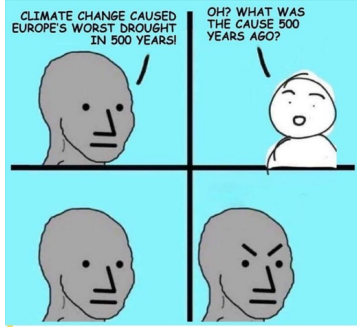


Figure 1. Example Authority Meme

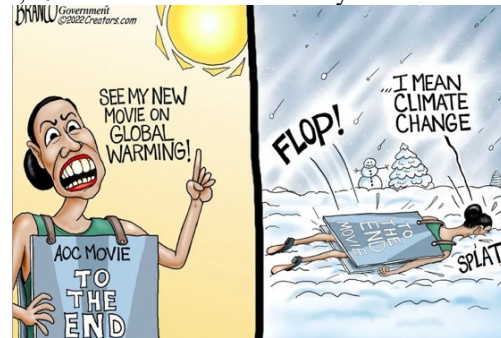


Figure 4. Example Ad hominem Meme

Figure 3 is an example of a conservative meme trying to strip the traditional institutions of science education of their authority. Questioning the validity of what they are teaching about climate change by injecting unrelated hot button issues. Memes like these are questioning authority by eroding the foundation under the science without needing evidence to show climate change isn't real.

Alarmism

Memes coded under Alarmism are focused on provoking a reaction in the viewer due to the "Doomsday" environment that climate change may cause. The liberal memes were tagged at a higher rate of 20% compared to only 2% for the conservative. This correlates closely with the politicization of the risk perception of climate change. The conservative has been shown to diminish the seriousness of climate change [30].

The conservative also uses the theme of Alarmism. The right's use often centers around how the government or science's response to climate change is going to strip away your freedoms, money, livelihood or in this case your life being sacrificed to appease the climate change gods. On both sides the memes are using fear of the near future to cause a reaction.

Ad hominem

These memes include direct attacks on an individual, group or organization. This was the third most common theme for the conservative (20%) and the second least common for the liberal (2%). The right almost exclusively attacked individuals while the only left meme was attacking a corporation.

The creator of the meme in Figure 4 is attempting to discredit Alexandria Ocasio-Cortez by making fun of her for not using the current term Climate Change. Global warming was the older term that focused solely on the rising in temperature and climate change addresses the full range of changes our planet is experiencing due to increased anthropogenic greenhouse gases.

Political

This code includes political themed memes are centered around politicians, political parties, or political systems, but they are more satire focused and not derogatory. Both

the liberal (22%) and conservative (31%) memes were often coded as political. Given that this sample was drawn from self-identifying politically focused groups this is to be expected. With a p-value of 0.006, the conservative posted memes with this theme more often.

Sustainability

The theme of sustainability is centered around solutions to the climate change crisis. The specific topics include actual adaptation and mitigation strategies, praise for individuals and organizations that are making positive steps and memes looking for clarification on technical topics. Sustainability was a theme exclusively found in liberal posts (15%).

Sustainability through renewable energy production is highlighted and praised as a win/win cause. Wind turbines do not release greenhouse gases into the atmosphere and reduce the amount of oil we need to purchase from countries like Russia.

Science Rejecting

The science rejecting theme is focused on the premise that science is a waste of time, energy and money, is not valid and is often misused to justify solutions to climate change. It was solely a conservative theme found in 18% of the memes.

It highlights the massive amounts of money that has been spent researching our changing planet. The meme points out, in a negative way, that over the decades the primary concern of climate change researchers and activists has changed. Finally, it asserts that science is being used by the government to grab power away from the people.

7 Discussion

	Left	%	Right	%	Chi-Squared	p-value
Authority	9	16.4	15	29.4	7.125	0.028
Alarmism	11	20.0	1	2.0	9.250	0.010
Ad hominem	1	1.8	10	19.6	8.273	0.016
Futility	12	21.8	9	17.6	5.571	0.062
Jobs	3	5.5	0	0	3.000	0.223
Money	7	12.7	4	7.8	3.364	0.186
Political	22	40	16	31.4	10.211	0.006
Sustainability	8	14.5	0	0	8.000	0.018
ProScience	5	9.1	1	2.0	3.500	0.174
Science Rejecting	0	0	9	17.6	9.000	0.011



Figure 5. How often themes are used across the political spectrum. Science Rejecting themes are used only in conservative memes (red), Sustainability memes are only used in liberal memes (blue). The rest of the themes are used by both sides to varying d

These findings may have more general implications around science misinformation and conspiracy theories along political lines. Memes are emotionally resonant [13]. Political memes are an important form of online political expression they are often designed to be persuasive, and exposure to them is positively correlated with anger toward the other political side [15].

The liberal side is significantly more likely to use the theme of alarmism, acknowledging the severity of risk our world faces from climate change. This mirrors the messaging from world climate science organizations based on the results of scientific research on the causes and impacts of climate change [18].

While the conservative memes more often centered on ad hominem attacks, this could be due to the lack of available hard science to support their arguments. When the left did use an attack-based strategy, the attack was aimed at larger corporations and sectors of the economy rather than an individual. This is in line with the reality of where most climate change responsibility lies; the energy generation sector of the US economy contributes 25% of total US greenhouse gas emissions as opposed to the impact a single person could have (EPA, 2023b). In addition to theme of alarmism, the left also heavily focused on sustainability and politics. These themes cover potential sources of adaptation and mitigation solutions to our changing climate. The left promotes these solutions while right avoids them since they assert that the problem doesn't exist or that there are no viable solutions.

This work has shown existing patterns in meme themes, but what is the grounding principle behind this? The themes of content people chose to share with their peers must resonate with them. Guadagno[14] showed that content that invokes feelings of humor or anger were the most likely to be forwarded to a peer. They found that people who received videos that reinforced strongly emotional positive feelings were significantly more likely to forward the video, while a video that did not resonate with them, and therefore had little emotional impact, was less likely to be forwarded. This has potential impacts on the future messaging meant to influence pro and anti-science audiences. Conservative groups may be unlikely to be impacted by pro-science messages. To reach this audience, there is likely a need to find messaging that resonates without offending.

Recent cultural events have shown that conservative groups can be rapidly swayed against a long-favored corporation [35]. With the correct messaging, memes could be a tool to popularize a carbon free economy. As with the right, when themes do not resonate with those on the left, the memes fall flat. Liberal progressive groups unlikely to be swayed by ad hominem attacks. Themes invoking joy and hopefulness such as potential solutions and alternatives to the current path may be more likely to generate a response.

8 Future Work

This work has been narrowly focused on climate change memes from the edges of the United States' political wings. This opens an array of interesting avenues for future work. Liberal and conservative members share information, attempt to influence others

and gain validation for their viewpoints on climate change through many medium. Are these results only applicable to memes or could this analysis be applied to other modes of communication? Climate change is just one of the many targets of the anti-science movement. Do these themes resonate in those different targeted fields and potential outside of memes? Many of the themes could be applied universally to the anti-science movement. The extremes of the political spectrum are enticing to study, but the bulk of the population resides between the extremes. Are the climate change focused themes popular with the political center different from those at either extreme? There was no effort to control for any demographic variables in this study. It could be enlightening to address the potential impact age, gender, race, education or socioeconomic status might have on the pattern of themes used in climate change communication. Finally, an interventional study to look at the response to memes could be valuable for future work in addressing climate change through policy, education and outreach.

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