

# The Moral Rhetoric of Climate Change

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## Abstract

Communication in the media about climate change in the United States is complicated by the intensely ideologically polarized state of the debate surrounding the issue; moral rhetoric is an important dimension of how ideology is communicated. In this study we examined how moral rhetoric regarding this issue differs on the basis of a publication's perceived ideological lean. To address the question, we built a corpus from a diverse group of online news media that were rated for their perceived ideological lean. Using Latent Semantic Analysis we calculated the average loading for the five moral domains identified in Haidt's Moral Foundations Theory (Haidt & Joseph, 2004) on the terms "climate change" and "global warming." We found that there were higher moral loadings overall for "climate change" with a greater difference seen among the more progressive media.

**Keywords:** Climate Change; Moral Rhetoric; Climate Communication; Latent Semantic Analysis

## Introduction

Morality is a building block of modern society. It underlies our reasoning and decision making, and guides many of our everyday actions. In this paper we examine the moral stance taken by the popular media with respect to a topic that has been the subject of vigorous debate for decades: climate change. In doing so, we use a new computational approach to identify the types of moral reasoning exhibited in the media when discussing this topic and how they vary based on ideology, and over time.

We base our analysis of moral reasoning on Moral Foundations Theory (Graham et al., 2013; Haidt & Joseph, 2004), which identifies five different types of moral intuitions or concerns: Harm, Fairness, Loyalty, Authority, and Purity. Each of these moral concerns accounts for a different style of reasoning about moral dilemmas. For instance, consider a person who believes that climate change is a problem because it endangers the lives of people and animals. This person is primarily concerned with the *harm* that climate change could cause to living beings. In contrast, another person might argue that climate change is problematic because of its complexity and global reach, making it the obligation of nations to adhere to guidelines set by international treaties. That person is using a type of argument that emerges from reasoning about *authority*. Critically, when analyzing any

argument, it is important to remember that such moral concerns are not exclusive, and that a single argument can exhibit traits from several different concerns.

Research based on Moral Foundations Theory has demonstrated that sensitivity to the different moral concerns varies across cultures (Graham, Haidt, & Nosek, 2009), as well as based ideological beliefs (Graham et al., 2009; Koleva, Graham, Iyer, Ditto, & Haidt, 2012). In this paper, we are interested in how U.S. progressive and conservative media differ in the moral concerns they highlight in discussing climate change, and how the moral rhetoric they employ changes over time.

## Climate Change in the Media

Media coverage of climate change has a strong influence on public opinion (e.g., Brulle, Carmichael, & Jenkins, 2012; Hart, Nisbet, & Myers, 2015). It is possible that the moral stance taken by the media is important not only because it is a reflection of public opinion, but also because it may help shape it. This is especially true when media serve as a conduit that summarizes and explains complex scientific research that is difficult to understand with little or no relevant knowledge. In debates around climate change, the public often relies on reporters to provide them with a reliable analysis of the subject matter. For instance, Brulle et al. (2012) found that media coverage was a major factor that affected the level of public concern about the climate change. Moreover, Hart et al. (2015) find that exposure to media coverage affects liberals and conservatives opinions on climate change differently, especially where perceptions of harm are concerned. Because of this, the moral stance taken by the media on the topic has the potential to greatly influence the type of arguments and reasoning that the public employs when considering climate change.

There is much research on how the media covers events that have a prominent impact on the climate change debate, and what effects coverage has on public opinion. "Climategate", which came to light in late 2009, is a good example. This well publicized event, which involved emails obtained through the hacking of a server at the Climatic Research Unit at the University of East Anglia, cast doubt on the integrity of climate scientists. It had a deleterious effect

on public trust in climate science (Leiserowitz, Maibach, Roser-Renouf, Smith, & Dawson, 2013), and was followed by a greater incidence of searches on the world wide web associated with climate skepticism (Anderegg & Goldsmith, 2014). There was also an increase in pejorative religious metaphor in blog entries in the period following the scandal (Nerlich, 2010).

In addition to media coverage, ideology and the position of political elites are important predictors of public attitudes toward climate change (Brulle et al., 2012). The influence of partisan politics also has grown markedly since the turn of the century (McCright & Dunlap, 2011). Ideology also strongly influences how people interpret media related to climate change; for example, the loss of trust in climate scientists seen in Leiserowitz et al. (2013) was most marked amongst conservatives. A content analysis by Painter and Ashe (2012) found that ideology has a strong association with the kinds of articles published in certain news outlets, with more unchallenged skepticism appearing in more conservative media. There is also an ideological effect on the terminology as used in partisan media, with ‘climate change’ and ‘global warming’ showing different degrees of synonymity (greater for progressives) and semantic neighbors, depending on the ideological lean of the publications they appear in (Gann & Matlock, 2014). However, the analysis in that study did not examine the use of moral language in particular.

In addition to an increase in web searches, as seen in Anderegg and Goldsmith (2014), there is evidence of changes to the climate change discourse following major events such as Climategate. In examining the public response to news media, Koteyko, Jaspal, and Nerlich (2013) analyzed comments attached to articles regarding climate change in a British tabloid both before and after Climategate, using keyword comparisons, collocations, and concordance analysis, and found a greater incidence of pejorative references to science, and an emphasis on uncertainty, after Climategate.

### Predictions

In this paper, we investigate two main hypotheses. First, following the results of Gann and Matlock (2014), we hypothesize that the terms *climate change* and *global warming* are used somewhat differently. In particular, progressives, more than conservatives, are likely to use *climate change*. Feinberg and Willer (2013) showed that progressives were more sensitive to moral frames when discussing the environment. Thus, we predict that if particular moral concerns are emphasized in the media, such emphasis will be greater for progressives than conservatives. However, they also demonstrated that conservatives were responsive to appeals based on the purity concern, and that may be reflected in articles appearing in conservative publications.

Second, we hypothesize that the rhetoric surrounding these terms will be sensitive to the geo-political climate and affected by relevant events. In particular, as discussed above,

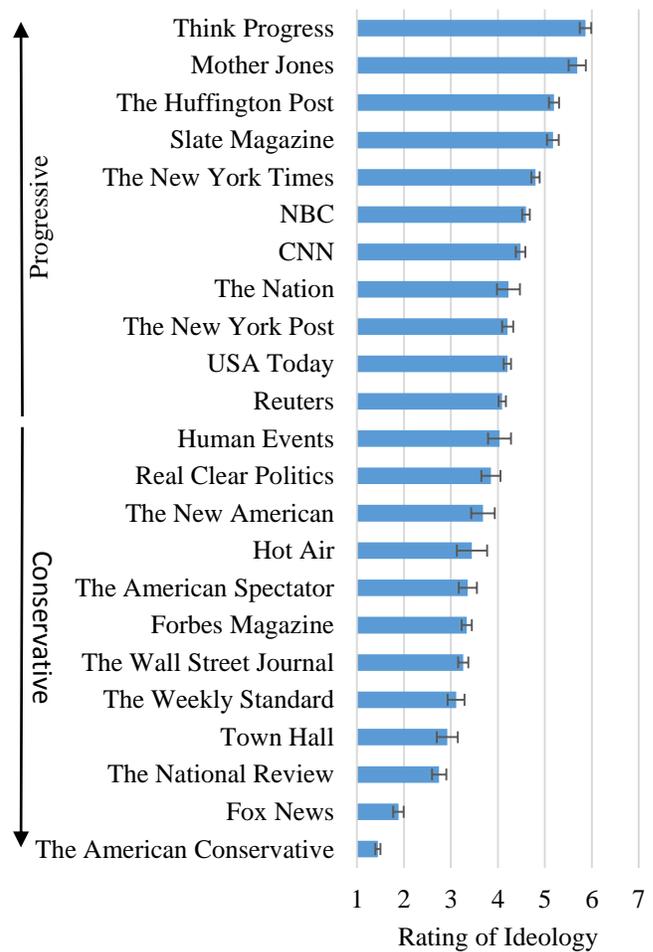


Figure 1: Mean rating of ideology for each of the media sites in the corpus. Error bars represent standard error of the mean.

we expect that the Climategate scandal will affect the level of *authority* exhibited in the use of the terms. Because the scandal introduced more skepticism into the discussion, we predict that rhetoric on *authority* will decrease in response to the event rather than increase. That is, the use moral rhetoric that evokes the *authority* concern should be more prevalent prior to Climategate (i.e., in 2009 and earlier) than after it.

## Method

### The Corpus

Our corpus consists of 18,906 articles drawn from 23 online news sites chosen based on popularity, as measured by their Alexa rank, or on their potential for ideological lean. To be included in the corpus articles had to have at least 200 words, and have at least one instance of “climate change” or “global warming.” All articles were published between January 1st, 2008 and December 31st, 2013.

To get a sense of the ideological lean of these publications, we surveyed 200 native English speakers on Amazon

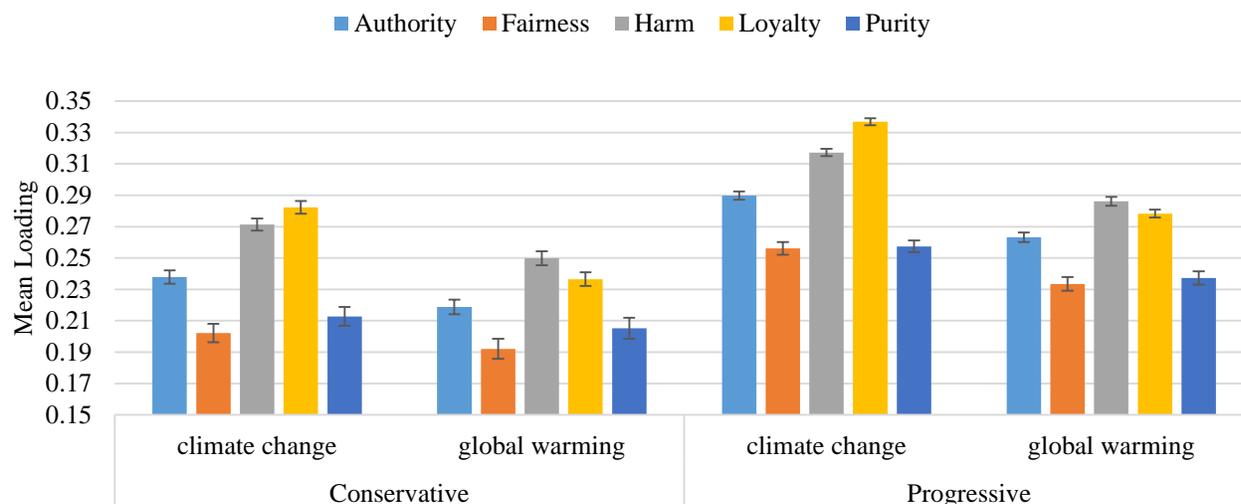


Figure 2: Mean loadings on the five moral domains, by source ideology and term. Error bars represent standard error.

Mechanical Turk. The first page of the survey asked participants to rate how familiar they are with each publication. The second page asked them to rate each publication on ideological lean, ranging from 1 (very conservative) to 7 (very progressive). Only publications that a given rater had said they were familiar with on the first page appeared for them on the second. Figure 1 shows the list of publications and average ideological lean ratings. We identified the twelve most progressive publications as representing the progressive media and the remaining eleven publications as representing the conservative media.

### Measuring Moral Rhetoric

We based our measure of moral rhetoric on the method described in Sagi and Dehghani (2014), which is built around the assumption that word co-occurrence patterns provide a rough approximation of their intended meaning. That is, the distribution of words in language is not random, and words that relate to similar topics tend to occur in proximity to one another.

Methods such as Latent Semantic Analysis capitalize on this assumption by analyzing these patterns and using them to identify words that convey similar meanings (LSA; Deerwester, Dumais, Furnas, Landauer, & Harshman, 1990; Landauer & Dumais, 1997). Following the WordSpace paradigm (Schütze, 1998; Takayama, Flournoy, Kaufmann, & Peters, 1998), we constructed a matrix in which the rows and columns represented words and each cell contained the count of the co-occurrence of the corresponding row and column words within the corpus. We then calculated a singular value decomposition of this matrix to construct a *semantic vector space*. In this space, each word is represented by a vector, and the distance between two word vectors is inversely related to the probability that the words will co-

occur in the text. The similarity of meaning between words is thus related to the cosine of their angle, which, for normalized vectors, is equivalent to the correlation between the vectors. Furthermore, these patterns of co-occurrence are not random. Words that relate to similar topics tend to occur together more frequently than unrelated words (e.g., *moon* and *earth* occur with each other more frequently than either tends to occur with *gun*).

Likewise, these vectors can be aggregated using vector summation to produce a representation of a phrase, sentence, or even paragraph. In our analysis we computed the *context vector* for each occurrence of a term by summing the vectors of words that occur within a  $\pm 15$  word window around the term.

We calculated the cosines in this space between vectors representing the contexts of our terms of interest (*global warming* and *climate change*) and those representing a set of terms associated with the domain of each particular moral concern, as identified in the Moral Foundations Dictionary (Graham et al., 2009)<sup>1</sup>. These cosines provide us with a profile of the moral rhetoric associated with each occurrence of the terms. Specifically, for each document we calculated the average *loading* of each moral domain separately for the two terms.

### Results

We calculated the average loading on the five moral domains for each occurrence of the terms *climate change* and *global warming*. For our analysis, we averaged these loadings on a per-article basis. Out of 4,925 articles taken from the conservative media, there were 3,487 conservative that mentioned *climate change* and 2,907 that mentioned *global warming*. The progressive media part of the corpus comprised of 13,981 articles in which we found 11,164

<sup>1</sup> See Appendix A for a sample of terms from the dictionary.

articles with mentions of *climate change* and 8,461 articles with mentions of *global warming*. Figure 2 shows the overall mean loadings in the corpus for each moral domain, by ideology and term. A small sample of sentences in which *climate change* and *global warming* appear is provided in Appendix B.<sup>2</sup>

To get a better sense of the difference in the overall use of rhetoric between conservatives and progressives we computed a mixed model in which the mean loading of the five domains was the dependent variable and the ideological position and term were the independent variables. The article's source was a random factor in this analysis. This analysis revealed that there was more moral rhetoric associated with *climate change* than *global warming* ( $F(1, 24672) = 122.44, p < .0001$ ). Moreover, a significant interaction indicated that while both groups had similar levels of moral rhetoric associated with *global warming*, progressives used significantly more morally loaded rhetoric when referring to *climate change* than conservatives ( $F(1, 24672) = 7.70, p < .01$ ; simple effects: *climate change*  $F(1, 13926) = 5.08, p < .05$ ; *global warming*  $F(1, 10726) = 2.87, n.s.$ ).

Next, we explored differences in the moral rhetoric associated with the two terms separately for conservative and progressive media. For this analysis we conducted a mixed model for each of the five moral domains with the term as an independent variable. As before, the source of each article was included as a random variable. Because this analysis involved multiple comparisons, we applied a Bonferroni correction when interpreting the results. Conservative media used rhetoric that was similar across the two terms on *fairness* and *purity*. However, they used a higher level of rhetoric for *climate change* with respect to the moral domains of *authority* ( $F(1, 4302) = 8.52, p < .005$ ), *harm* ( $F(1, 4706) = 11.85, p < .001$ ), and *loyalty* ( $F(1, 5125) = 56.01, p < .0001$ )<sup>3</sup>. In contrast, progressive media rhetoric regarding *climate change* demonstrated a higher level of moral rhetoric on all five domains. The smallest of these differences was for the domain of *fairness* ( $F(1, 5766) = 16.12, p < .0001$ ).

These results are in accordance with our hypothesis that progressives, more so than conservatives, endorse the term *climate change* over the term *global warming* and associate it with greater levels of moral rhetoric. Nevertheless, it appears that the overall pattern of moral rhetoric is similar between the terms and ideologies, with the domains of *harm* and *loyalty* showing the most loading while *fairness* is the least loaded domain.

Following our second hypothesis, we were also interested in the influence of events on the rhetoric associated with the terms. In particular, we were interested in the effect of the Climategate scandal on the perception of *authority* with

relation to the terms. Since Climategate unfolded mostly during 2010 and the months immediately before and after, we compared the loadings of the 5 moral dimensions for each term during the years 2008-2009 to their loadings from 2011 and onwards. After applying the Bonferroni corrections, there were only two statistically significant changes in rhetoric – Following the scandal, progressive media's use of moral rhetoric when referring to *climate change* shows a lesser degree of concern for *authority* ( $F(1, 4450) = 9.22, p < .005$ ) and an increased concern for *purity* ( $F(1, 2497) = 9.70, p < .005$ ).

The first is in accordance with our prediction that the concern of authority will bear the brunt of the repercussions from the scandal. However, the second result is unexpected and might bear more scrutiny. One possible interpretation is that the media associated the scandal with cheating and impure motives on the part of the researchers, and these associations colored the debate. Interestingly, the scandal appeared to have only affected progressive media's use of *climate change*. In particular, the analyses of these domains for the term *global warming* or conservative media sources were all highly insignificant ( $F < 1$  in all cases). This suggests that the effect of the scandal was highly localized to the progressive media.

To gain further insights into this result, we sampled the text from articles that fit this change in the rhetoric used by the progressive media. Based on this sample, it is possible that the progressive media shifted its focus from reporting on legislation to reporting on the science and implications of climate change. For example, in 2009, we see frequent references to legislative efforts, including phrases such as "... impose meaningful limits on the nation's contribution to climate change" (The New York Time, January 26<sup>th</sup>, 2009) and "Chances for a climate change bill being enacted ..." (Reuters, March 31<sup>st</sup>, 2009). In contrast, after 2010 we find skeptical attitudes expressed more frequently, towards the underlying science as well as its political interpretation (e.g., "... a philosophy that has long cast climate change as primarily a conventional pollution problem, not a technology problem", The New York Times, April 25<sup>th</sup>, 2011). Likewise, we also identified an increased focus on the challenges involved in dealing with climate change. For example, a report from Reuters quotes the representatives from an alliance of insurers stating "... we are conscious of the long term risks that climate change poses to society" (July 7<sup>th</sup>, 2012). While these types of differences are not obviously linked to the Climategate scandal, they can plausibly be interpreted as its repercussions, for instance, increased scrutiny of the science, its conclusions, and its predictions both in the academic sphere and the political arena.

<sup>2</sup> We provide sentences rather than contexts because the contexts are cut off arbitrarily and can therefore be difficult to read. However, the sentences provided substantially overlap with these contexts and can be considered as representing them in a more readable form.

<sup>3</sup> In these and the following results, the reported *df* depends on both whether the term was referred to in the article, and whether

words from the appropriate dimension were mentioned. We only calculated the distances between contexts within each article because we feel that this more accurately reflects how the terms were used by the author.

## Discussion

In this paper we examined the moral rhetoric used in media coverage of climate change issues. We found that both conservative and progressive media show a greater moral loading on all dimensions when using the term *climate change* than when using the term *global warming*. This difference was greater for progressive media sources than for conservative ones, showing the preference of progressive media for the term “climate change.” Moreover, the data suggests that *harm* and *loyalty* are the primary moral concerns evident in these discussions.

These results also accord with those of Feinberg and Willer (2013), who found that progressives show more overall moral concern than conservatives, and that progressive media show the most concern for *harm*. However, in our corpus the concern of *loyalty* also seems to be prevalent. At first this might appear odd, but deeper examination of the terms suggests that this could relate to the frequent reference to national and international aspects of the issue. In particular, the moral concern of *loyalty* is primarily about forming coalitions and a sense of community. This aspect of the concern is germane to climate change, especially given that the media coverage is focused on national and global policy and conflicts surrounding them. For example, in a 2011 article about the Kyoto Protocol in Think Progress we find “... further hurt the international community’s endeavor to cope with climate change ...” (November 1<sup>st</sup>, 2011).

Interestingly, our results do not show the same trends as some recent findings on public perceptions of climate change. In particular, Anderegg and Goldsmith (2014) analyze data from Google Trends and report that public interest in the Climategate scandal was short lived. Furthermore, they observe an increase in climate skepticism, but it was short lived and declined back to its baseline level in less than a month. While we found longer lasting effects of the scandal, they were confined to the progressive media’s use of the term *climate change*. This suggests that the lasting impact of the scandal on the rhetoric used in the media was limited in scope. Anderegg and Goldsmith’s study also observed a higher frequency of queries on *global warming* than *climate change*. In contrast, in our corpus *climate change* is more frequent than *global warming* and a similar pattern is also found in the google books corpus. This discrepancy, together with our different findings about the possible repercussions of Climategate, suggest that there are important differences between the public’s perceptions of an issue and the media’s reporting of it.

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### Appendix A – Samples terms from the Moral Foundations Dictionary

Moral Concern / Domain	Terms
Authority	command; control; disobedience; duties; permit; protest
Fairness	balanced; discrimination; disproportionate; honesty; injustice; preference
Harm	abuses; care; damage; defend; protection; violent
Loyalty	ally; enemy; group; insider; national; united
Purity	cleanup; dirty; exploitation; innocent; integrity; pristine

### Appendix B – Samples from the corpus

Text	Source and Mean Loading
In the national debate on health care, it is imperative that the international community and our lawmakers at home not ignore the value of preventing the damage that <b>climate change</b> will cause to both the environment and human health.	Think Progressive (12/7/2011) 0.65
The good news is that there is a growing consensus among corporate leaders and institutional investors that today's major sustainability challenges, such as <b>climate change</b> and water scarcity, present major risks and opportunities for businesses, and that managing those risks and seizing those opportunities will be a key to success in the 21 <sup>st</sup> century economy.	Forbes Magazine (2/21/2012) 0.53
US Ambassador to the United Nations Susan Rice this week issued a blistering rebuke of Russia, China and other countries that blocked the Security Council from adopting a statement linking the threat of <b>climate change</b> to international peace and security.	Fox News (7/21/2011) 0.52
The Copenhagen Accord was bogged down for hours by protests from delegates, who felt they were excluded from the process or said the deal didn't go far enough in cutting the greenhouse gas emissions that cause <b>global warming</b> .	Fox News (12/19/2009) 0.51
He concluded that, in his view, “ <b>global warming</b> was the greatest and most successful pseudoscientific fraud I have seen in my long life as a physicist.”	The New York Times (10/15/2010) 0.40
Obama and Calderón said their discussions ranged from working together to combat global <b>climate change</b> , to efforts at comprehensive immigration reform.	CNN (4/17/2009) 0.23
A severe drought in the Southwest is devastating crops and farm communities -- and sending a warning about <b>climate change</b> .	The Nation (3/16/2011) 0.01