



Utilization of Science-Based Information on Climate Change in Decision Making and the Public Policy Process - Phase 2



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Project Overview

Project Objectives

Agencies such as NOAA recognize the importance of bridging the gap between the producers and users of scientific information, and considerable effort has been made to encourage this. Examples include the work done by NOAA's Regional Integrated Science and Assessment teams and, at a broader scale, NOAA's overall involvement with the global climate change community. Research has already contributed to a shift in the way in which agencies engage stakeholders and transmit climate information they consider critical to decision making.

This project report completes a two-phased NOAA-funded project by the Institute for Science Technology and Public Policy at Texas A&M University ("Utilization of Science-based Information on Climate Change in Decision Making and the Public Policy Process," NA03OAR4310164) exploring several aspects of this vital link between science and decision making. The overall objective of the first phase of the project ("NOAA 1") was to develop a better understanding of how decision makers at the adaptive management level (regional, state and local) and the public perceived the relevance of climate variability and change to the decisions they make, and how they understand and use science-based climate information, particularly in two substantive areas of climate change impact: economic development (land use and agriculture) and public health. NOAA 1 included an investigation of the producers of scientific information by focusing on climate scientists, the way they understood public and decision maker information needs and the way they framed their information for these audiences.

Phase Two of this project, described in this project report and referred to hereafter as "NOAA 2", extends our inquiry into how these perceptions and means of transmitting scientific information affect, and are affected by, the various stakeholders and actors in the national public policy process. This examination will explain how scientific information on climate variability and climate change (CV/CC) is received, processed, and utilized by the major participants in the public policy process, including Congress, the executive branch, scientific advisory groups, as well as interest groups and the subset of climate scientists participating in the policy debate at this level. To this mix of national actors and policy participants, we also include findings from public opinions toward climate variability/climate change science.

The research presented here can provide NOAA and others with important information on how climate change is perceived at the federal level, how science is used, and the barriers and constraints to the consideration of climate science information in decision and policy making. It is critical for science-producing agencies to understand the ways climate science information is perceived and utilized at the national level in order to develop relevant research programs and effective strategies of information delivery.

Research Questions

The broad research questions that were addressed in this project are:

- What role does scientific and technical information on climate variability and climate change (CV/CC) play in the national policy community making decisions in this issue area?
- How is CV/CC science and technical information utilized in the strategic definition of climate problems and solutions and how does CV/CC science and technical information influence the key decision nodes (points of influence) in the climate-related policy process?
- What role does CV/CC science and technical information play, compared to the other systems of factors that contribute to specific policy preferences, in this policy area?



Public Survey

Significant natural disasters have occurred since the 2004 Public Opinion Survey was conducted for the NOAA 1 project. Two major, catastrophic storms, Katrina and Rita, devastated the U.S. Gulf Coast and raised additional questions about the role climate change might play in increasing the frequency and intensity of storm systems. In the NOAA 2 follow up Public Opinion Survey conducted in 2007, we sought to capture this possible change in public sentiment and to characterize if, and how, historical storm events might be affecting larger climate orientations. To get a deeper understanding of particularly affected groups, the 2007 Public Survey oversampled residents of the U.S. Gulf Coast.

National Public Survey

The national public survey was conducted from April 3, 2007 through July 18, 2007 and included a total of 935 completed samples. Out of 935 completes, 833 completes were obtained from the general population of the US and 102 completes were obtained by oversampling residents living in states along the Gulf of Mexico coast. The following analysis is focused mainly on the random sample of the general population. The survey was conducted by the Public Policy Research Institute of Texas A&M University. Following American Association for Public Opinion Research (AAPOR) conventions and algorithms, the response rate was 6.9%, the cooperation rate was 14.7% and the completion rate was 69.5%.

Perceptions of the Climate Change Issue

Table 1 presents the mean scores of respondents concern about climate change, compared to other selected key issues. Though outranked by other issues, climate change still appears to be a source of relative concern for the public.

Respondents were also surveyed about how well informed they felt themselves to be about the climate change issue, as well as other issues of potential concern. As seen in Table 2, respondents reported being relatively well informed about climate change compared to other issues.

Table 1. Concern about Climate Change Compared to Other Key Issues

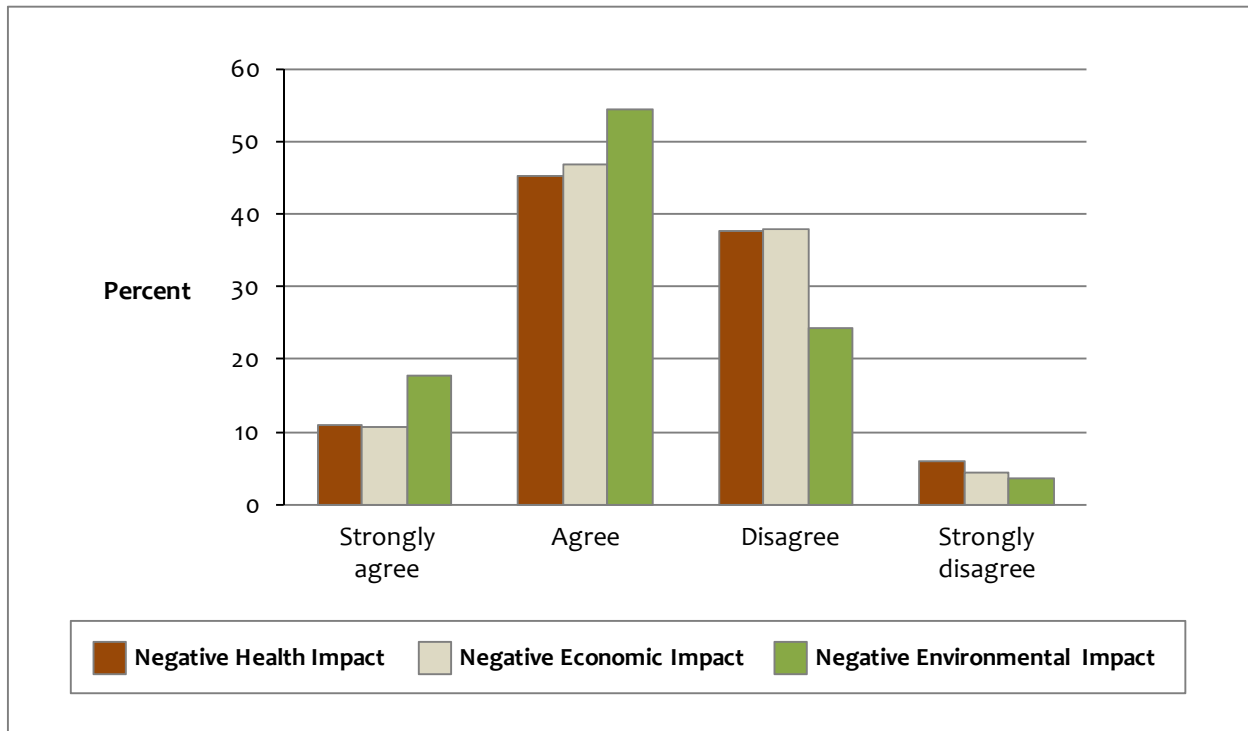
ISSUE	Level of Concern
War in Iraq/Afghanistan	8.33
Energy	7.90
Environment	7.80
Moral Values	7.77
Terrorism	7.66
Social Security	7.59
U.S. Economy	7.45
Global Warming and Climate Change	6.97
Globalization of the Economy	6.67
Genetically Modified Foods	5.89

Table 2. Levels of Information about Climate Change Compared to Other Key Issues

ISSUE	Level of Information
Moral Values	8.03
War in Iraq/Afghanistan	7.42
Environment	7.21
Global Warming and Climate Change	7.08
Terrorism	7.03
U.S. Economy	7.02
Energy	6.91
Social Security	6.82
Globalization of the Economy	5.98
Genetically Modified Foods	5.13

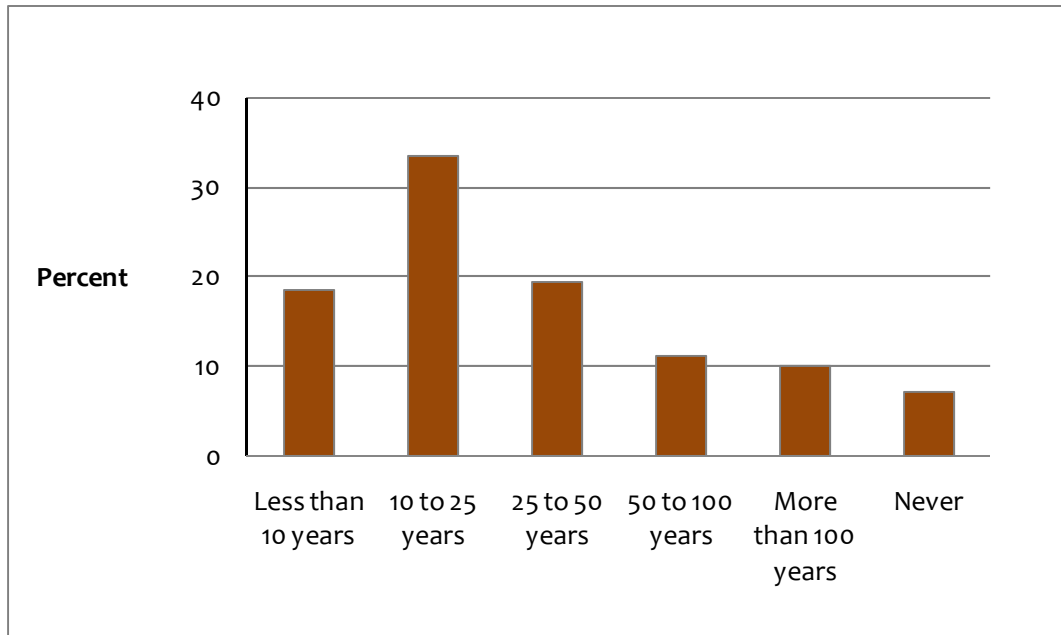
As illustrated in Figure 1, a slight majority of respondents either agrees or strongly agrees that climate change negatively impacts health, the economy, and the environment. However just over 40% of the respondents disagreed, thus there exists some ambivalence about the effects of climate change.

Figure 1. Public’s Views about the Impact of Climate Change



When surveyed as to the time frame for global warming/climate change to exert a significant impact on our society, as shown in Figure 2, a majority of the respondents believe that the impacts will be felt in the near term, i.e. in the 10-25 and 25-50 year time frame. Just under 20% believe that climate change will have a significant impact on the US within the next 10 years.

Figure 2. Time Frame for Global Warming/Climate Change to Exert Significant Impact on the US



Information Sources and Trust/Perceived Competency

We asked respondents for their sources of information regarding climate change and also sought to ascertain the levels of trust accorded to the various information sources. Figure 3 illustrates that sources such as television news and newspapers are a key source of information about climate change for most respondents. Interpersonal interactions are also an important source of information about the issue of climate change.

Figure 4 illustrates the level of trustworthiness accorded to each information source. Overall, survey respondents do not rate the level of trustworthiness of the various information sources on climate change very highly, with most sources ranking only between 5 and 6 on the 11 point scale.

Figure 3. Climate Change Information Sources

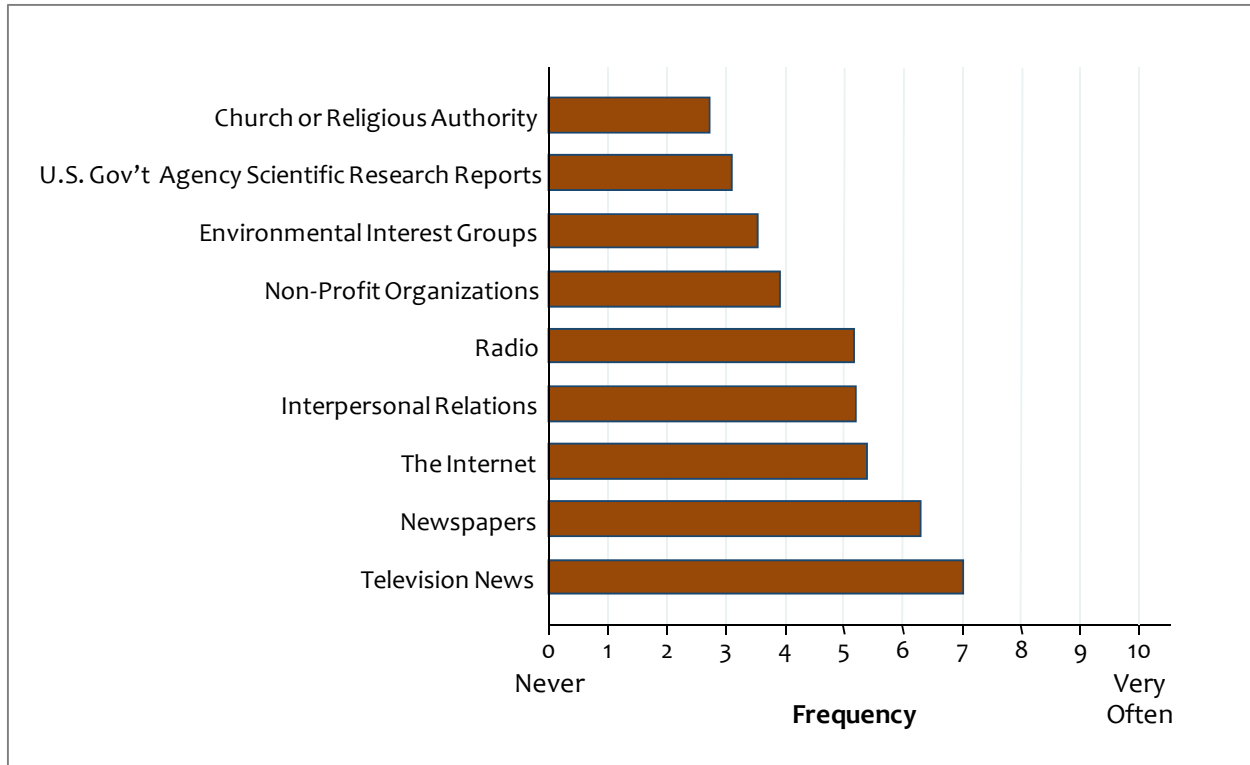
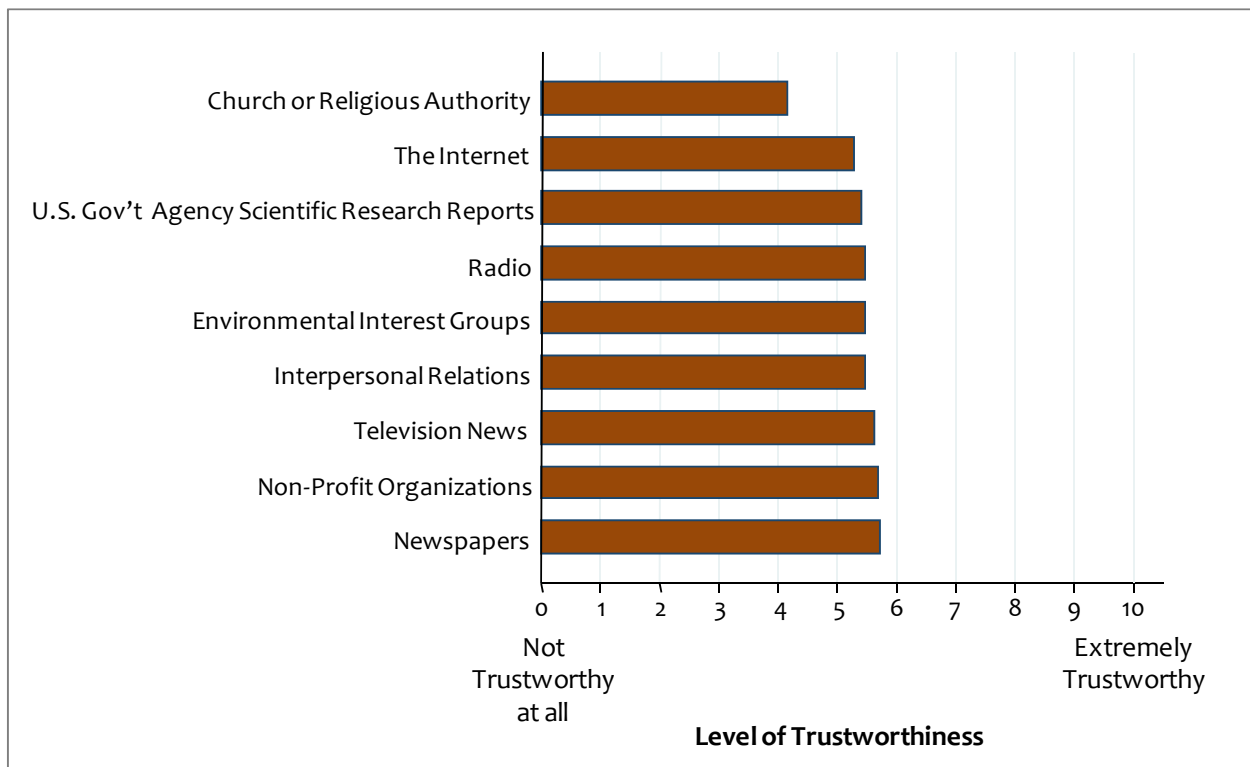


Figure 4. Trust in Information Provided by Sources



We next sought to discover the public’s levels of knowledge regarding specific elements of climate change by examining responses to selected statements about climate change. Table 3 outlines these results and shows that the public has a good understanding of basic climate change issues. We used these questions to compute a Climate Change Knowledge Index which calculates the number of correct answers given by each respondent. Figure 5 presents the distribution of this Climate Change Knowledge Index. Clearly three correct answers is the mode of the distribution but there is still a significant number who correctly answered more than three questions.

Table 3. The Public’s Levels of Knowledge – Climate Change Questions

QUESTIONS ASKED TO ASCERTAIN RESPONDENTS’ LEVEL OF SCIENTIFIC KNOWLEDGE	Percent Answering		Correct Answer
	TRUE	FALSE	
Scientists agree that, as a result of global warming, the sea level will continue to rise for at least a century.	74.77	25.23	TRUE
There is scientific consensus that there will be an increase in global precipitation as a result of global climate change.	52.52	47.48	TRUE
Biological diversity will increase as global temperature increases.	54.53	45.47	FALSE
The major cause of increased atmospheric concentration of greenhouse gases is human burning of fossil fuels.	74.21	25.79	TRUE
Nitrous Oxide is a greenhouse gas.	62.88	37.12	TRUE
Aerosols are airborne particles that are known to contribute to the formation of clouds and precipitation.	60.59	39.41	TRUE

Evaluation of Climate Change Policy Options

We further focus on how the public examines and evaluates selected climate change policy options. As seen in Table 4, survey respondents were highly supportive, almost across the board, of various policies aimed at ameliorating the effects of climate change, with the distinct exception of increasing the price of fossil fuels. Developing renewable energy sources was the most popular policy option.

Some Bivariate Analysis

In this section we will take a close look at the relationship between the concern for the climate change/global warming issue and individual background characteristics such as age, gender, education, income, political party identification, and ideology. From our data analysis, it appears that women are more concerned about global warming and climate change than men. There is not a huge difference in attitudes towards climate change among different age groups. Political ideology plays a relatively large role in determining the respondent’s attitude towards climate change. Liberals are much more concerned about climate change than conservatives. Along the political party affiliation, Democrats are also much more concerned about climate change than Republicans, with Independents falling in the middle. Table 5 presents the mean value of concern by each of these categories, measured on a scale of 1 to 10.

Figure 5. Climate Change Knowledge Index

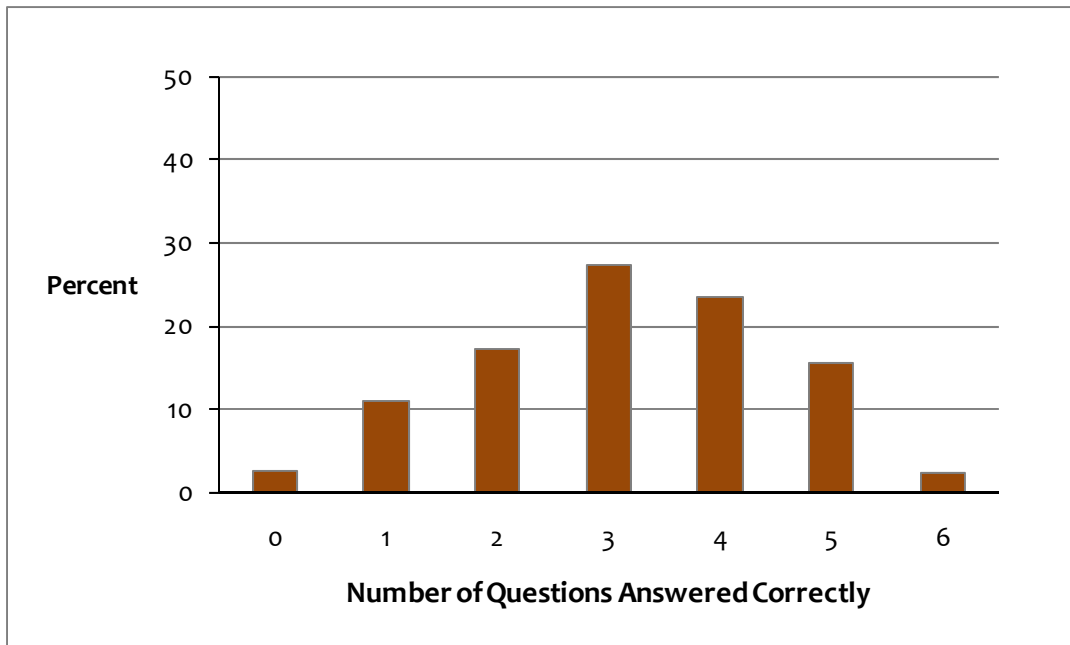


Table 4. Support/Strong Support for Selected Climate Change Policies

POLICY OPTION	Percent Supporting
Develop renewable energy sources, like hydro power, solar power, and windmills that emit no carbon dioxide.	96.72
Reduce dependence on foreign oil.	91.43
Use market incentives to encourage industries to reduce emissions.	90.46
Require automobile companies to build more fuel-efficient vehicles.	89.22
Offer government subsidies for types of energy and other consumer goods that are environmentally friendly.	81.99
Ratify the Kyoto protocol, committing the US to reducing carbon dioxide emissions.	77.74
Impose a tax on industry to discourage industry practices that contribute to global warming and climate change.	71.34
Increase the price of fossil fuels (like gasoline) to encourage people to save energy, and encourage the development of energy efficient devices.	39.98

Table 5. Mean Value of Concern - By Individual Background Characteristics - Scale 1-10

Gender					
Male	Female				
6.38	7.51				
Age					
25 or Younger	26-50	51 or Older			
6.88	6.87	7.13			
Political Ideology					
Liberal	Middle of the Road	Conservative			
8.88	7.36	4.74			
Party Affiliation					
Democrat	Independent	Republican			
8.46	7.16	4.78			
Income					
\$21,000 or Less	\$21,000-\$40,000	\$41,000-\$80,000	\$81,000 or Above		
7.72	7.60	6.95	6.67		
Education					
Less than High School	High School Grad/GED	Trade/Vocational Certification	Some College	College Grad	Post-Grad Degree
7.33	7.37	6.73	7.47	6.56	6.70

Mean value of concern on a scale from 0 to 10, where 1=Not at all concerned, and 10=Extremely concerned

In summary, we can conclude there are marked differences in levels of concern about global warming and climate change based on gender, political ideology and political party affiliations. Age, education, and income do not contribute to significant differences in levels of concern.

Comparison of 2004 and 2007 Surveys

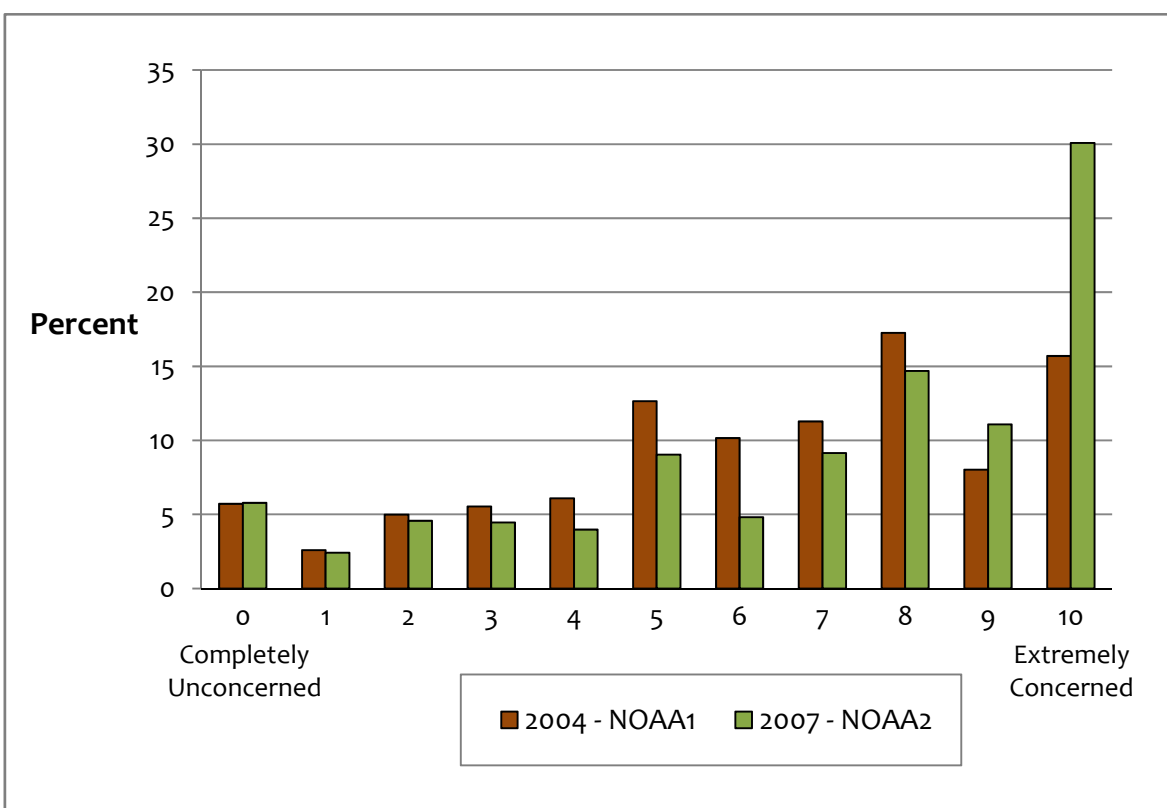
Phase One (NOAA 1) of this two-phased NOAA-funded project, "Utilization of Science-based Information on Climate Change in Decision Making and the Public Policy Process," also included a public opinion survey, conducted from July 13 to August 10, 2004. Both the 2004 and 2007 surveys focused on how the U.S. public evaluated the climate change problem, the impact of climate change, sources of information about climate change, levels of knowledge, and preferred policy options. The 2004 survey had 1093 completes, and following AAPOR conventions and algorithms, the response rate was 12.0%, the cooperation rate was 18.6%, and the completion rate was 69.1%.

Here, we analyze and compare highlights of the 2007 survey with the 2004 public opinion survey about climate change. This analysis will provide insight into how the public's perceptions and views about climate change may have evolved over time.

Perceptions of the Climate Change Issue

Compared to the 2004 national survey, the public in 2007 seems relatively more concerned about climate change. Figure 6 shows that the levels of concern across both surveys were comparable in most regards; however in 2007 the percentage of respondents claiming they were extremely concerned about climate change was twice that of 2004.

Figure 6. Levels of Concern about Climate Change, 2004 & 2007



On a scale from 0 to 10, with 0 being "Completely unconcerned," and 10 being "Extremely concerned."

The study also sought to find out what kind of risks climate change poses and to what elements of society. In the 2004 survey, the public assessed climate change to be a moderate level risk across the sectors of public health, economic development, and the environment. There was little distinction on the impact of climate change across those three categories. In the 2007 survey, the majority of respondents felt more

strongly about the potential negative impact of climate change on the environment than on the other two categories. Respondents in both surveys stated the belief that that the largest negative effects of climate change would occur in the 10-25 and 25-50 year times frame. However, the 2007 survey also found that more people thought the largest negative effects of climate change would occur in fewer than 10 years and within the 10-25 year time frame. This indicates the public's increased sense of urgency regarding climate change.

Information Sources and Trust/Perceived Competency

We also surveyed to find the respondents' sources of information about climate change and their levels of trust in that information. The 2004 survey responses indicated that television news and newspapers were a key source of information about climate change; in addition, personal experience and observation was also highly ranked, with similar results in the 2007 survey. It is worth noticing that while the internet ranked fifth as a source of information in the 2004 survey, in the 2007 survey it had moved up to third place.

We also asked the public to scale the perceived trustworthiness of information sources on climate change. In the 2004 survey, not one source listed was regarded as highly trusted (with a mean score of 7 or greater); all sources ranked between 4 and 6 on the 0 to 10 scale, where 0 was "Not trustworthy at all" and 10 was "Extremely trustworthy." Respondents to the 2007 survey ranked the listed information sources almost uniformly, with scores falling between 5 and 6 on the 11-point scale.

We next sought to ascertain the public's level of knowledge regarding specific elements of the climate change issue by examining respondents' answers to a number of selected statements about climate change. Both surveys show that the public had a good understanding of basic climate change issues. We also computed a knowledge index which calculated the number of correct answers each respondent had. In both surveys, three correct answers is the mode of the distribution but there were a significant number of respondents who answered more than three questions correctly.

Evaluation of Climate Change Policy Options

We next examine how the public evaluates selected policy options for dealing with climate change. As seen in Table 6, both 2004 and 2007 survey respondents were highly supportive of the listed policy options, with the notable exception of an increase in the price of fossil fuels. This policy was supported by only 46.5% of the respondents in the 2004 survey, and slightly under 40% in 2007. Developing renewable energy sources had the highest support, with over 96% support in both surveys. For the six policy options common to both surveys, the public was less supportive of four out of the six categories in the more recent 2007 survey than in 2004.

Table 6. Support for Selected Climate Change Policies

POLICY OPTION	Percent Supporting	
	2004 Survey	2007 Survey
Develop Renewable Energy Sources	96.32	96.72
Reduce our dependence on foreign oil	*	91.43
Use Market Incentives to Reduce Emissions	86.87	90.46
Require More Fuel-Efficient Vehicles from Auto Industry	91.15	89.22
Offer Gov't Subsidies to Environmentally Friendly Energy/Consumer Goods	*	81.99
Ratify the Kyoto Protocol	82.21	77.74
Tax Industry from Practices Contributing to Global Warming	75.69	71.34
Increase the Price of Fossil Fuels	46.50	39.98

*This option was not listed in the 2004 survey

2007 Survey - Gulf Sample and National Sample Comparisons

Gulf Oversample

As noted earlier, the 2007 public survey sought to capture more in-depth information from Gulf Coast residents. This was accomplished by a targeted oversample of citizens living in that region. The oversample, with 102 completes, were obtained through additional sampling of the residents living in the states along the Gulf Coast.

Perceptions of the Climate Change Issue

The comparison of the Gulf oversample to the national sample shows that, surprisingly, the residents of Gulf Coast states are slightly less concerned about climate change than is the national sample, with a mean score of 6.79 compared to the general sample (mean score of 6.97).

The study also examined the respondents' views of how informed they are about the climate change issue. Respondents in Gulf Coast states feel that they are relatively well informed about climate change, with a mean score of 7.31. This is not much different from the general public, with a mean score of 7.03.

In regards to risk perceptions associated with climate change, the residents of Gulf Coast states assessed climate change to be only a moderate risk. Similar to the perceptions of the general public, Gulf Coast respondents believed that climate change effects would pose a greater risk to the environment than it would for public health or economic development.

As to the time frame for Global Warming/Climate Change to exert significant impact on our society, Gulf Coast respondents believe that the impacts will be felt in the near-term, defined as the 10 to 25 or 25 to 50 year time frame. This view was also shared by the general public.

Information Sources and Trust/Perceived Competency

Key sources of information for residents of the Gulf Coast about climate change and global warming were television news and newspapers. The internet and radio were also cited as important sources of information.

We asked the public to rate the trustworthiness of various information sources on the climate change issue. With the exception of church or religious authorities, the Gulf Coast respondents viewed the sources of information on climate change almost uniformly, with a score of between 5 and 6. Overall, the level of trust in information sources was not very high. These responses are similar to those of the general public.

Evaluation of Climate Change Policy Options

When examining the public’s preferences for selected climate change policy options, Gulf Coast residents have views similar to the general public sample. For example, across the board, Gulf Coast respondents are highly supportive of policy options to address climate change, with the exception of increasing the price of fossil fuels. The policy option of developing renewable energy sources has the greatest support. Table 7 presents comparisons of the general public and the Gulf Coast oversample.

In summary, we did not see significant differences regarding climate change issues – concern about climate change, risk perceptions, and policy support – between residents of the Gulf Coast and the general public. There are two possible explanations for this. First, a small level of increased concern for the whole population between 2004 and 2007 could be bringing the Gulf Coast numbers in line with the overall population. Also, there is evidence that those who may sense greater risk from coastal living might move, thereby leaving behind a population that is less concerned and more likely to discount the risks associated with coastal living, such as major storms (see, for example, Tiebout, 1956).

Table 7. Support/Strong Support for Selected Climate Change Policies – Gulf Coast Respondents versus General Public

POLICY OPTION	Percent Supporting	
	Gulf Coast	General Public
Develop Renewable Energy Sources	98.04	96.72
Reduce our dependence on foreign oil	93.07	91.43
Use Market Incentives to Reduce Emissions	90.00	90.46
Require More Fuel-Efficient Vehicles from Auto Industry	85.15	89.22
Offer Gov’t Subsidies to Environmentally Friendly Energy/Consumer Goods	79.79	81.99
Ratify the Kyoto Protocol	70.84	77.74
Tax Industry from Practices Contributing to Global Warming	70.10	71.34
Increase the Price of Fossil Fuels	30.69	39.98



Media Coverage of Global Warming and Climate Change

Theory and Method

Theoretical Framework

Policy scholars have constructed various theories and models to study policymaking. Many of the earlier theories focus on power structures, democratic accountabilities, policy impacts, and distribution effects. The agenda setting and information processing approach emphasizes the importance of studying the key elements of pre-decision information-processing and policymaking processes in which some public issues and policy alternatives receive more attention than others (Baumgartner & Jones, 1993; Cobb & Elder, 1983; Rochefort & Cobb, 1994; Jones, 1994, 2001; Jones and Baumgartner, 2005; Kingdon, 1995). This approach has greatly contributed to our understanding of the complexity of the policymaking process in the United States.

Agenda setting is a process in which public problems are identified and defined, and various solutions or alternatives are proposed and attached to these problems. As Kingdon (1995, p. 5) defined, an agenda is “the list of subjects or problems to which governmental officials, and people outside of government closely associated with those officials, are paying some serious attention at any given time.” Since all decision makers possess very limited information-processing capacities and are constrained by institutional arrangements, the list of subjects or problems receiving attention is typically very short at any given time (Jones, 1994; Jones & Baumgartner, 2005). In agenda setting, a particular public problem that gains serious attention in this short list is more likely to be addressed than other, less prominent, problems. More importantly, a public problem can be portrayed, characterized, and defined in numerous ways by different actors using various frames and information sources. How an issue is framed and defined in the agenda setting process affects how people think about the issue and what kinds of alternatives or solutions are pursued, proposed, or supported (Baumgartner & Jones, 1993; Cobb & Elder, 1983; Rochefort & Cobb, 1994; Stone, 1989).

Guided by the policy agenda setting and information processing theories, we conducted research of news media coverage regarding global warming and climate change. Our research was designed to (1) trace the changes of issue salience in media attention to climate change; (2) identify patterns and variations in the news stories on the climate change issue; and (3) examine the use of climate science in the media.

Data Collection

To examine how the issue of global warming and climate change is defined and characterized in the news media, we employ typical content analysis methods and techniques (e.g., Neuendorf, 2002). Two online searchable document archives – Lexis-Nexis and Pro-Quest, were utilized for our data collection. Three key words – “climate change,” “global warming,” and “greenhouse gas” – were chosen to search and retrieve all relevant newspaper articles beginning in 1969 (Liu, Vedlitz and Alston, 2008). Both Lexis-Nexis and Pro-Quest provide news collections up to the current date. We completed our final round of news article searches in the early 2006.

Using the three key words, we retrieved all the news articles on global warming and climate change up to the end of 2005 from four U.S. national newspapers archived in either Lexis-Nexis or Pro-Quest: *The New York Times*, the *Chicago Tribune*, the *Los Angeles Times*, and the *Houston Chronicle*. These four newspapers were chosen because they are among the top 10 circulated daily newspapers and each represents a distinct geographic location in the United States. Among all the retrieved news articles, we randomly selected 10% samples and reviewed all 1,140 sampled articles. Excluding invalid news stories (in which “climate change,” “global warming” or “greenhouse gas,” were only occasionally mentioned) resulted in a final news database with 608 articles from the four national newspapers. Table 8 shows the distribution of the news articles from the four newspapers.

Table 8. Distribution of News Articles across Four Newspapers

Newspaper	Number of Articles	Percent
Chicago Tribune	101	16.6
Houston Chronicle	80	13.2
Los Angeles Times	159	26.1
New York Times	268	44.1
<i>Total</i>	<i>608</i>	<i>100.0</i>

Coding News Articles

The development of our coding system was generally guided by the agenda setting and information-processing framework. A detailed codebook was created and used to quantify the collected news articles.

In coding the news articles, we were interested in these basic concepts:

- a. “Issue Salience” which refers to the importance of the climate change issue in the news media, measured by the number of articles on climate change that appeared in each year of the news collection. This method of using the annual number of articles to measure issue salience in the news media has been used in general policy agenda studies (Baumgartner & Jones, 1993; Soroka, 2002) and specific studies on news media's attention to global warming and climate change issues (Liu, Lindquist, & Vedlitz, forthcoming; Liu, Vedlitz & Alston, 2008; Mazur & Lee, 1993; McComas & Shanahan, 1999; Trumbo, 1996; Ungar, 1992).
- b. “Issue Attributes” which refers to the ways in which the climate change issue are defined and framed. A particular public issue can be portrayed and framed in various ways based on different attribute dimensions, and different issue attributions can significantly affect the agenda setting process and lead to different policy options (Baumgartner & Jones, 1993; Cobb & Elder, 1983; Dearing & Rogers, 1996; Iyengar & Kinder, 1987; Kingdon, 1995; McCombs & Shaw, 1972; Rochefort & Cobb, 1994). We coded articles for evidence of the following attributes: issue image, issue scope and issue linkage.
- c. “Proposed Solution” which refers to any ideas, suggestions or recommendations proposed in the news stories to address global warming and climate change. The news media are not only discussion sites for various public issues but are also places to propose solutions to policy problems. For this variable we classified each article into either “solution proposed” or “no solution proposed.”
- d. “Use of Science” which refers to the ways in which the news media utilize climate science information in their stories. In our coding, we were particularly interested in identifying (a) whether scientific information (broadly defined as empirical evidence rather than normative argument or belief) was cited or referred to in the news article; and (b) where the scientific information presented in the news article came from (sources or the origins).

We used Microsoft Access in designing our coding platform, and all the coded variables were entered into the final datasets.

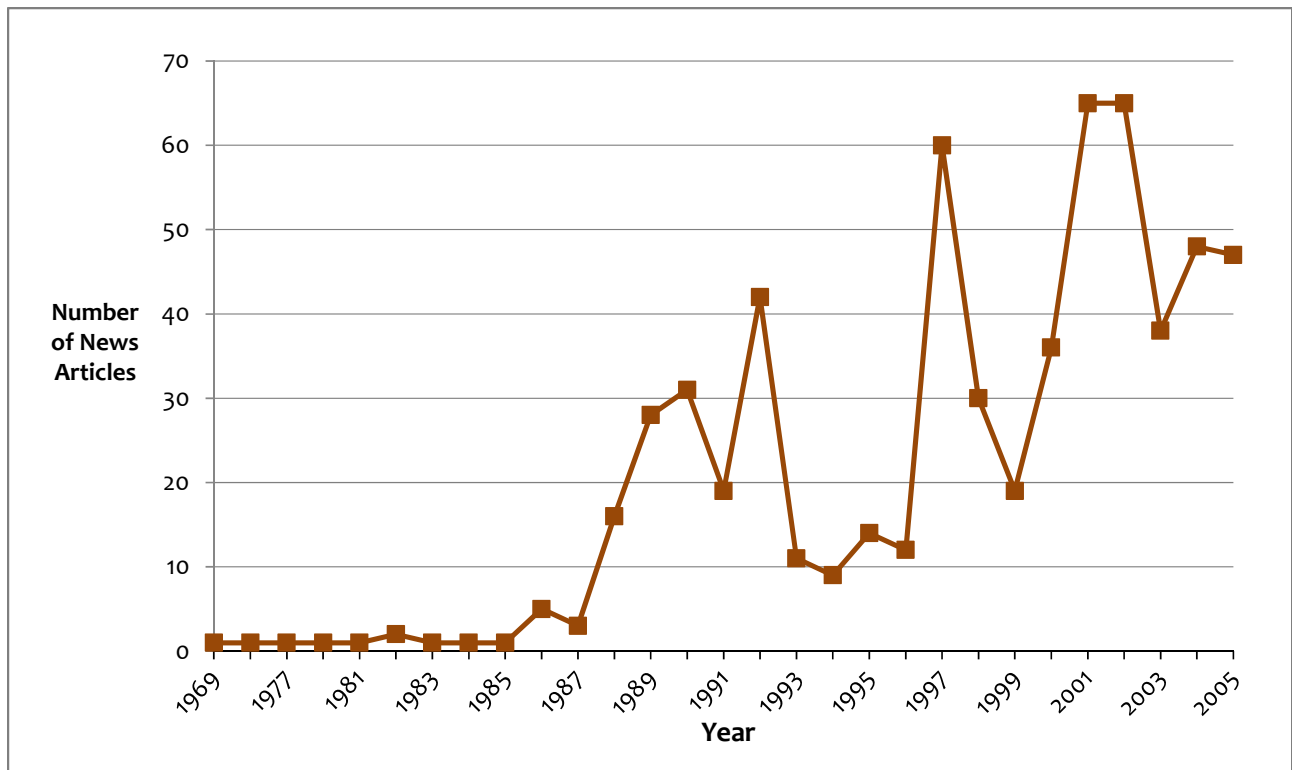
Analysis of News Media Coverage and Discourse

Issue Salience

To measure the salience of the issue of climate change in the news media, we tracked the annual number of climate change articles published in the four national newspapers. As shown in Figure 7, the salience of the climate change issue ebbs and flows over time, but the general trend for the entire period under study is

evidently upward – increasing news coverage on climate change indicates greater salience of this issue. In the 1970s and the early 1980s there was little attention paid to climate change. The year 1988 shows a significant increase in media attention to the issue. Since then, the issue of climate change has maintained a relatively high level of salience despite some short-term declines of interests. This overall trend of increasing media attention is consistent with observations from other studies on media attention to climate change in the US (Liu, Lindquist & Vedlitz, forthcoming; Liu, Vedlitz, & Alston 2008; Mazur & Lee, 1993; McComas & Shanahan, 1999; Trumbo, 1996; Ungar, 1992; Williams, 2001).

Figure 7. Annual Number of News Articles on Global Warming and Climate Change



Issue Attributes

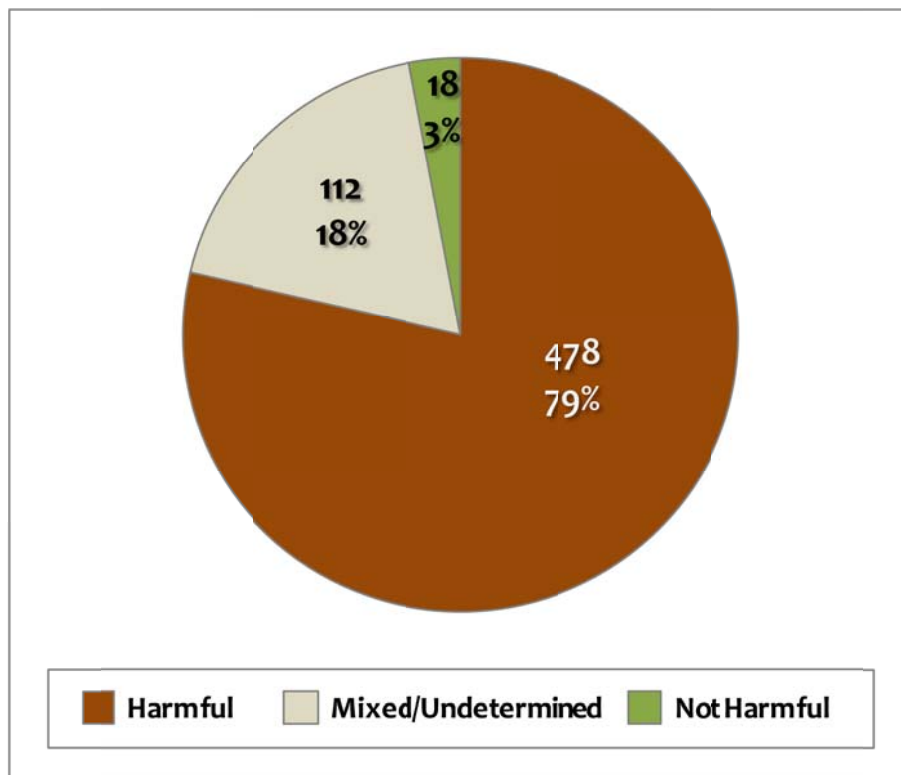
Issue attributes refer to the ways in which a particular public issue is defined and framed. Previous studies indicate that a particular public issue can be portrayed and attributed in various ways based on different attribute dimensions, and different issue attributions can significantly affect issue agenda setting and lead to different policy options (Baumgartner & Jones, 1993; Cobb & Elder, 1983; Dearing & Rogers, 1996; Iyengar & Kinder, 1987; Kingdon, 1995; McCombs & Shaw, 1972; Rochefort & Cobb, 1994). In coding the newspaper articles, we looked for evidence of how the news media portrayed the issue of global warming and climate change in the following attributes: issue image, issue scope, issue linkage, and proposed solutions.

Issue Image. Issue image is the fundamental impression of an issue, which has powerful influence in shaping public understanding and policy agendas (Baumgartner & Jones, 1993; Jones, 1994). Perhaps the most critical question in all climate change debates among the general public, policy makers and climate scientists is whether, how, and to what extent global climate change is harmful. In coding the news articles, our coders evaluated the overall view of each article to discern whether the issue was portrayed as harmful, not harmful, or somewhere between (mixed or undetermined). Articles clearly indicating real or possible negative consequences of climate change were coded as “harmful.” Articles indicating that climate change is not dangerous or arguing that global warming may actually benefit human beings (i.e., greater agricultural productivity) were coded as “not harmful.” Articles presenting both negative and positive views on the effects

of climate change or lacking a clear indication of whether climate change is harmful or not harmful were coded as “mixed/undetermined.”

The aggregated coding results on the image of climate change issue are shown in Figure 8. Among all the 608 news stories, an overwhelming majority (478 articles, 78.62%) projected a harmful image of climate change, while only a small percentage of the news stories (2.96%, 18 articles) viewed climate change as “not harmful.”

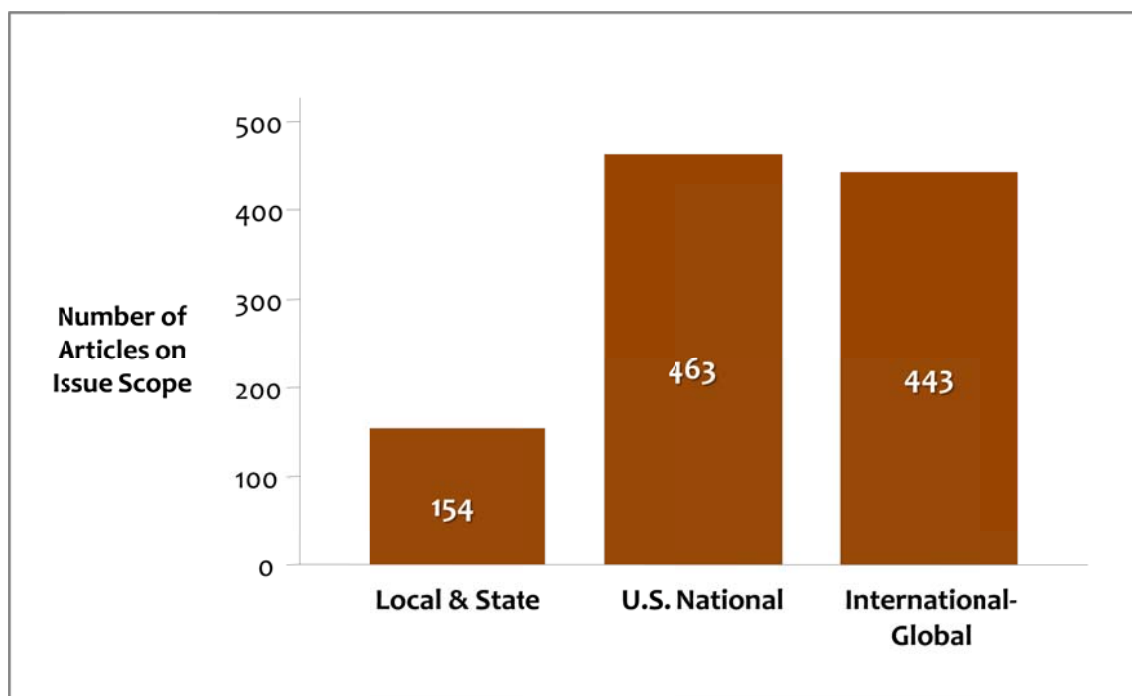
Figure 8. Issue Image Portrayed by the News Media



Issue Scope. Issue scope refers to the fact that an issue may have a broad or narrow range of effect that can ultimately be tied to issue responsibility and policy jurisdiction (Liu, Vedlitz, & Alston, 2008). How the scope of the climate change issue is specified in the news media may affect the thinking about the level of authority responsible for dealing with the issue. In our coding system, the issue scope variable was coded at three levels: Local and State (including multiple states), U.S. National, and International-Global. Since one article may discuss climate change and global warming at several levels, multiple checks on issue scope variable were allowed in our coding. For example, if an article discussed the global warming trend around the world, and then discussed possible consequences of sea-level rise for the Houston-Galveston Bay area, we coded the issue scope of this article as both “international-global” and “local and state.”

Figure 9 represents a simple count of articles in each of the three levels of issue scope. It shows that climate change and its effects were less frequently discussed at the Local & State level (154 articles) than at the U.S. National (463 articles) or International-Global (443 articles) levels. This portrayal of issue scope implies that major climate change solutions and policy responsibilities are expected to lie with the federal government or with international regimes.

Figure 9. Issue Scope in the News Media

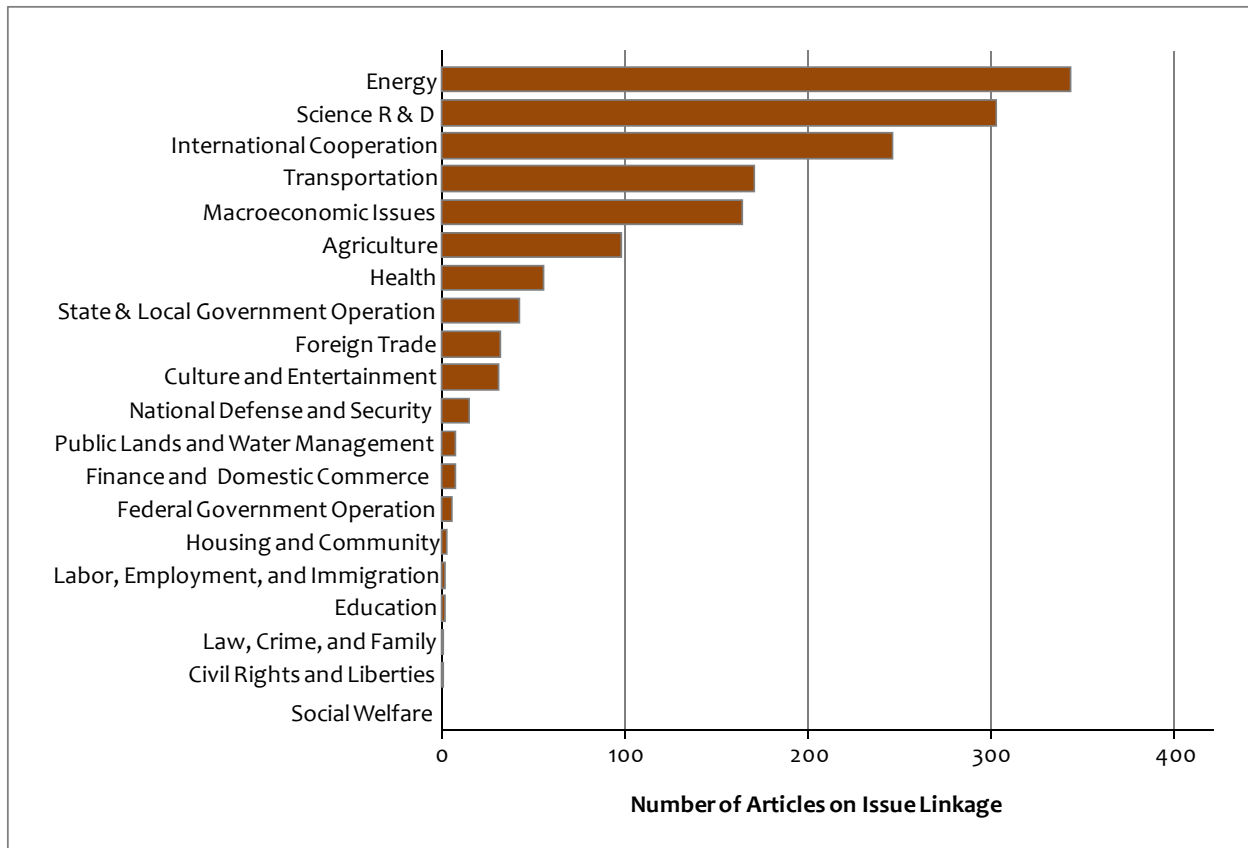


Issue Linkage. Issue linkage is defined as the association of climate change with other social, economic, or public issues. Smith (2005) showed that the climate change issue has been directly linked to a number of other issues ranging from international affairs to health. Different issue linkages may affect the thinking about how the climate change issue should be addressed and with what kind of measures. By its nature, climate change is commonly perceived as an environmental-ecological problem. In our coding of the news articles, we examined how this environmental-ecological issue was associated by the news media with twenty other public issue categories. Since one article could associate climate change with many other issues, multiple checks were allowed in coding this category. The coding results in Figure 10 demonstrate that climate change was perceived and portrayed by the news media as a multifaceted issue. In a wide array of other public issues linked to climate change, energy, science R&D (research and development), international cooperation, transportation, and macroeconomics were the top five most frequently associated issue categories. Perhaps one of the most interesting findings shown here is the strong linkage between climate change and science R&D – it is the second most frequent linkage made in these articles and is driven in large part by reports of climate science uncertainty. The implications of this portrayal of scientific uncertainty will be further discussed in the following “proposed solutions” section.

Proposed Solutions

The news media are not only venues to discuss public issues but are also important settings to propose solutions to policy problems. In our coding of news stories, we identified articles that proposed solutions and strategies to address global warming and climate change. If an article clearly proposed ideas, suggestions, action items, or policy recommendations for dealing with the climate change problem (e.g., developing alternative energy sources for greenhouse emissions reduction; producing fuel-efficiency vehicles), this article was coded as “solution proposed.” Articles without any proposed ideas or solutions were coded as “no solution proposed.” The coding results in Figure 11 show that approximately 60% of the news stories (361 articles) mentioned certain solutions to global warming and climate change, while about 40% (247 articles) did not discuss any proposals for dealing with the problem.

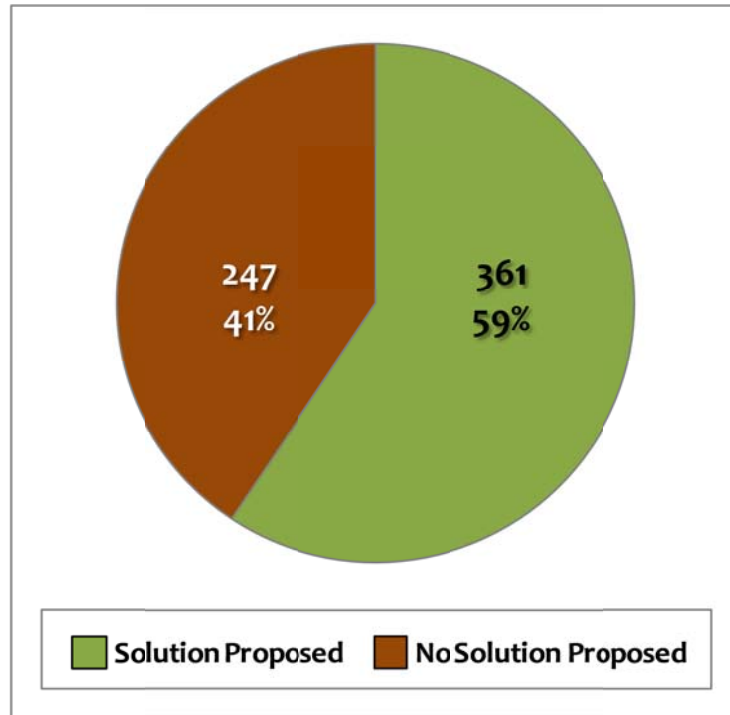
Figure 10. Number of News Articles Linking Climate Change to Other Issues



As discussed previously, agenda setting theory states that how the climate change issue is framed along different attribute dimensions may affect how the issue should be addressed in the agenda setting and policy formation processes. To further examine this statement, we employed the logistic regression model to predict “solution proposed” (1=solution proposed in the news article; 0 = otherwise) from the three issue attributes described above (i.e., issue image, issue scope, and issue linkage). Issue Image is coded as 1= harmful, 0=mixed/undetermined, and -1=not harmful. Issue Scope includes three dummy variables: Local & State (1= local and/or state scope specified; 0=otherwise); U.S. National (1=U.S. national scope specified; 0=otherwise), and Global (1=international or global scope specified; 0=otherwise). For Issue Linkage, we used the top five issue categories that climate change was most frequently associated with: Energy, Science R&D, International Cooperation, Transportation, and Macroeconomics. Table 9 shows the logistic regression coefficient, Wald test, and odds ratio for each of the predictors.

Overall, all three issue attributes (image, scope and linkage) had significant partial effects on the predicted variable “solution proposed.” More specifically, the odds ratio for the issue image suggests that, when holding all other variables constant, for each one point increase on the three-point image scale (i.e., moving from “non-harmful” to “mixed/undetermined” to “harmful”) there is 4.34 times more likelihood for an article to propose a climate change solution. Depicting the issue scope at the U.S. national level certainly increases the odds of “solution proposed,” while viewing it as an issue with the global-international scope decreases the chance of “solution proposed” in the article. Portraying climate change as a local or state issue also decreases the likelihood for an article to propose any solution, but the effect is not statistically significant. The odds of “solution proposed” are significantly higher in news articles linking climate change to energy, transportation, international cooperation, or economic issues than in those articles where no such linkage is present.

Figure 11. Solutions Proposed in News Articles



From our perspective, perhaps the most interesting finding here is how the characterization of climate change as a scientific uncertainty issue affects the likelihood of solution proposal in the news coverage. As shown in Table 9, if an article portrays climate change as a science R&D problem, the likelihood of solution proposed in the article is significantly lower than articles that do not view climate change as an issue of scientific uncertainty. Several previous studies find a strong linkage constructed by the news media between climate change issue and climate science uncertainty (Liu, Vedlitz, & Alston, 2008; Zehr, 2000), and some scholars argue that the overemphasis on climate science uncertainty in the news media may promote inaction toward global warming and climate change (e.g., Boykoff & Boykoff, 2004, p. 133). Our finding here provides strong empirical evidence, showing that framing the issue of climate change as an issue of scientific uncertainty indeed inhibits solution-proposing in the newspaper articles studied.

Table 9. Logistic Regression Predicting “Solution Proposed” from Issue Image, Issue Scope, and Issue Linkage

Predictor	<i>B</i>	Wald χ^2	<i>p</i>	Odds Ratio
<i>Issue Image</i>				
Harmful	1.467	36.075	.000	4.335
<i>Issue Scope</i>				
Local & State	-.071	.074	.785	.932
U.S. National	.469	3.386	.066	1.599
Global	-.848	9.563	.002	.428
<i>Issue Linkage</i>				
Energy	1.161	26.971	.000	3.192
Transportation	.976	12.185	.000	2.653
Int'l Cooperation	1.174	20.978	.000	3.236
Macroeconomics	.807	8.223	.004	2.241
Science R&D	-.749	11.612	.001	.473

Use of Science

Our fourth key question in media analysis is concerned with the ways in which the news media utilize climate science information in their reporting. Scientific information is broadly defined as empirical observation, identification, description, analysis, and theoretical explanation generated by scientists, experts and analysts. In our article coding, we reviewed each article to see whether it utilized any climate science information (1=yes; 0=no), and if so, where the scientific information came from. Possible scientific information sources were coded into the following five categories: (a) Academic Source – including sources from university professors and researchers, science societies and professional associations, and other independent research organizations; (b) Government Source – including sources from scientific research establishments of U.S. or foreign governments (e.g., U.S. national laboratories); (c) Environmental Source – including sources from scientists of environmental advocacy groups and other environmental-ecological organizations; (d) Industry Source – including researchers and analysts from corporations, companies, and other profit-seeking business groups; and (e) Other Sources – including all other scientific information sources and unidentified information sources. As one article could refer to several science information sources, multiple checks were allowed in the coding.

Figure 12 shows the number and percentage of articles regarding the use of scientific information in the 608 sampled news articles. Despite the complexity of climate science information, Figure 12 indicates that references to scientific information were not uncommon in the news media – almost half (48.68%, 296 articles) of the news articles utilized scientific information in their coverage on global warming and climate change. In Figure 13, we graphed the coded results on the frequency of the five scientific information sources cited in the news stories. The two most frequently used sources of scientific information were academics (176 articles) and governmental scientists (96 articles). Scientific information from environmental advocacy groups or from industry researchers was rarely used in the news stories.

Figure 12. News Articles on the Use of Climate Science Information

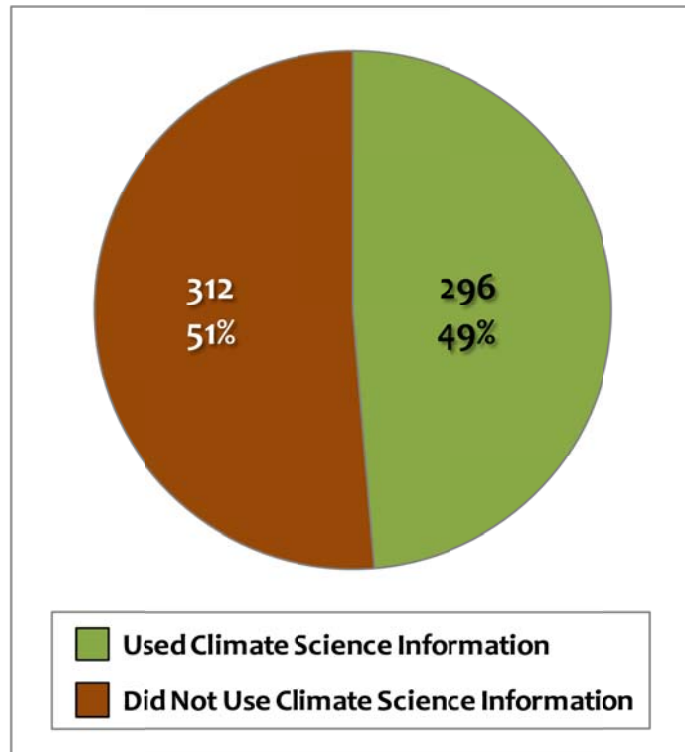
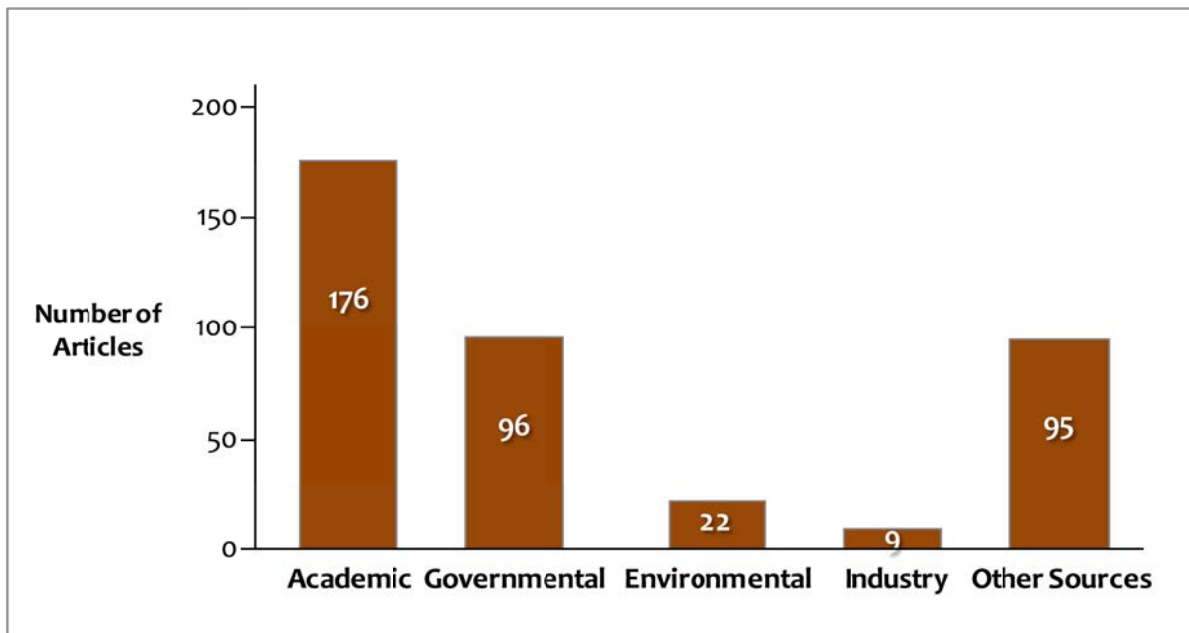


Figure 13. Scientific Information Sources in News Articles





Congressional Activity on Global Warming and Climate Change

Theory and Method

Theoretical Framework

Guided by the same policy agenda setting and information processing theories used in the analysis of media coverage, we conducted research of activities in the U.S. Congress regarding global warming and climate change. Our research was designed to (1) trace the changes of issue salience in congressional attention to climate change; (2) identify patterns and variations in congressional hearings on the climate change issue; and (3) examine the use of climate science in Congress.

Data collection

To examine how the issue of global warming and climate change is defined and characterized in the the U.S. Congress, we employ typical content analysis methods and techniques (e.g., Neuendorf, 2002). Two online searchable document archives – Lexis-Nexis and Pro-Quest, were utilized for our data collection. Three key words – “climate change,” “global warming,” and “greenhouse gas” – were chosen to search and retrieve all relevant congressional hearing records beginning in 1969 (Liu, Vedlitz & Alston, 2008). Both Lexis-Nexis and Pro-Quest provide access to congressional records up to the current date. We completed our search of congressional records in early 2008.

Congressional hearings are important instruments to gather information needed in order for committee members to act as informed policymakers. Witnesses from both government (i.e., the executive branch, concerned members of Congress, and state and local governments) and various non-government organizations (e.g., academic experts, interest groups, and industries) are often invited to appear at the hearings to provide expert assessments and opinions. Using the same three key words used in the news media search, we also searched all the records of congressional hearings and testimonies on global warming and climate change from the Lexis-Nexis congressional database. For the period of 1969 to 2006, we retrieved 168 hearings and 955 related written testimonies on global warming and climate change. Table 10 shows the distribution of the hearings held by committees/subcommittees of the House, the Senate, and the joint hearings held by committees from both the House and the Senate. Table 11 shows the distribution of witnesses from both government and non-government sources.

Table 10. Distribution of House, Senate, and Joint Hearings

Chamber	Number of Hearings	Percent
House	77	45.8
Joint	4	2.4
Senate	87	51.8
<i>Total</i>	<i>168</i>	<i>100.0</i>

Table 11. Distribution of Witnesses from Government and Non-Government Sources

Witness Affiliation	Number of Witnesses	Percent
Non-Government	558	58.4
Executive Branch	348	36.4
Legislative Branch	27	2.8
State-Local Government	22	2.3
<i>Total</i>	<i>955</i>	<i>100.0</i>

Coding Congressional Hearings and Testimonies

The development of our coding system was generally guided by the agenda setting and information-processing framework. A detailed codebook was created and used to quantify the collected congressional hearings and testimony statements.

In coding the congressional hearings and testimonies, we coded the following information:

- a. Hearing date, committees/subcommittees involved in the hearing, and hearing topic
- b. Scientific background of witness – we examined the official title and organizational affiliation of each witness (or the leading person in a group of witnesses) to determine whether the witness is a scientist/researcher/analyst, and if so, from what type of research organization (academic and professional, government, advocacy, or other research organization)
- c. Stated position of witness (or witness group) on the question of whether global warming/climate change is occurring
- d. Stated position of witness (or witness group) on the question of whether they think or believe that global warming/climate change is caused or partly caused by human activities.
- e. Stated position of witness (or witness group) on how they want the Congress to deal with global warming and climate change (mitigation-adaptation, status-quo, or no position); for those urging mitigation-adaptation policies, we further coded their recommended policy priority (doing more scientific research, advancing technological innovation, or other policy priorities such as focusing on international cooperation)

We used Microsoft Access in designing our coding platform, and all the coded variables were entered into the final dataset.

Analysis of Congressional Hearings and Testimonies

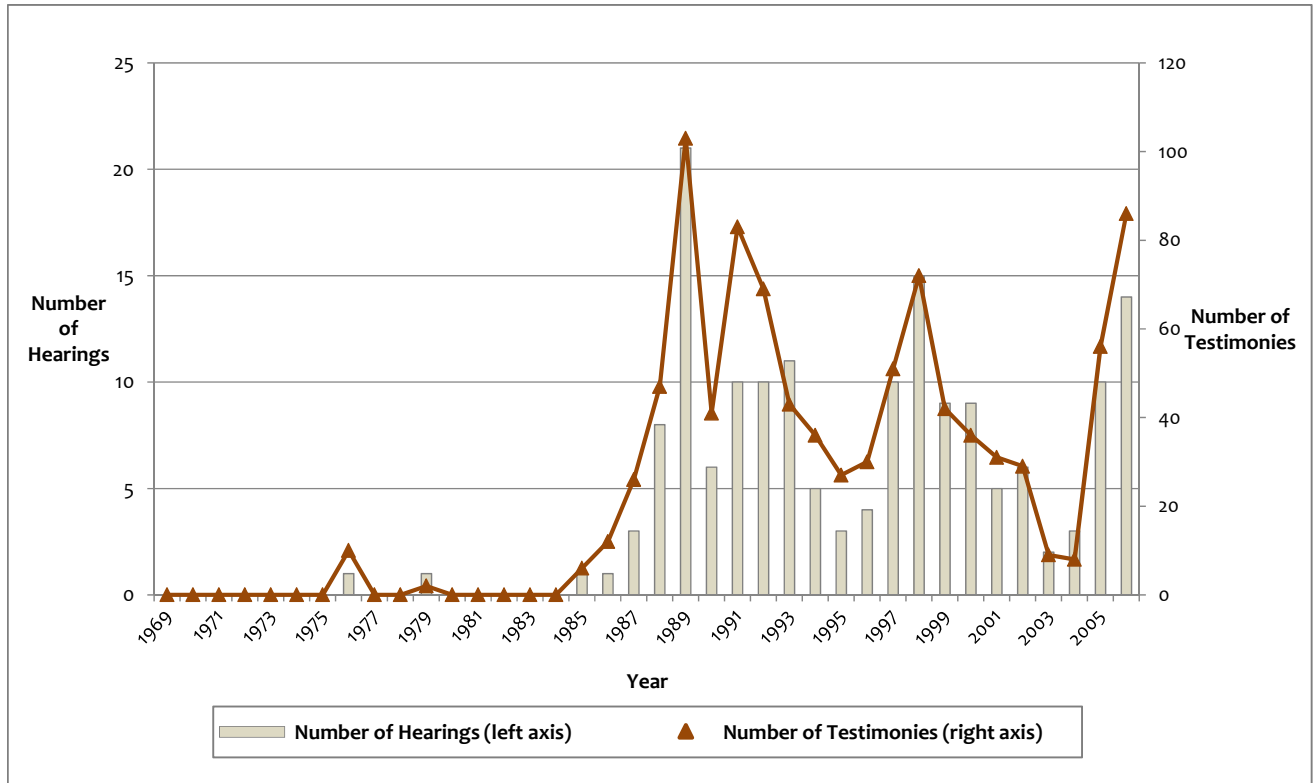
Congressional Attention to Global Warming and Climate Change

To measure congressional attention, we collected the annual number of congressional hearings and related written testimonies on climate change and global warming. Similar methods to measure the attention paid by Congress as a whole to an issue were used in several previous policy agenda studies (Baumgartner & Jones, 1993; Jones & Baumgartner, 2005; see also MacLeod, 2002; Hunt, 2002; Sheingate, 2006). Using the same three keywords as in the news media search, we retrieved all congressional hearings and testimony documents between 1969 and 2006 from the online LexisNexis archive of congressional publications. Figure 14 shows the annual number of congressional hearings (left axis) and the annual number of testimonies (right axis) on climate change and global warming.

Both time series in Figure 14 indicate that the overall congressional attention to global warming and climate change has significantly increased over the last several decades. Before the mid-1980s, global warming and climate change problems drew very little congressional attention. During the 16-year period between 1969 and 1984, there were only 2 hearings held in Congress and about a dozen testimonies provided by

expert witnesses. However, congressional attention to climate change increased significantly and rapidly in the late 1980s – Congress held three, eight, and 21 hearings in 1987, 1988, and 1989, respectively, and more than 150 witnesses were called to provide their testimonies during the last three years of the 1980s. In the following years from 1990 to 2006, there were short term declines of interest, but the overall congressional attention to climate change was sustained at relatively high level, with about eight hearings per year.

Figure 14. Congressional Attention to Global Warming and Climate Change, 1969-2006



Scientific Background of Witnesses

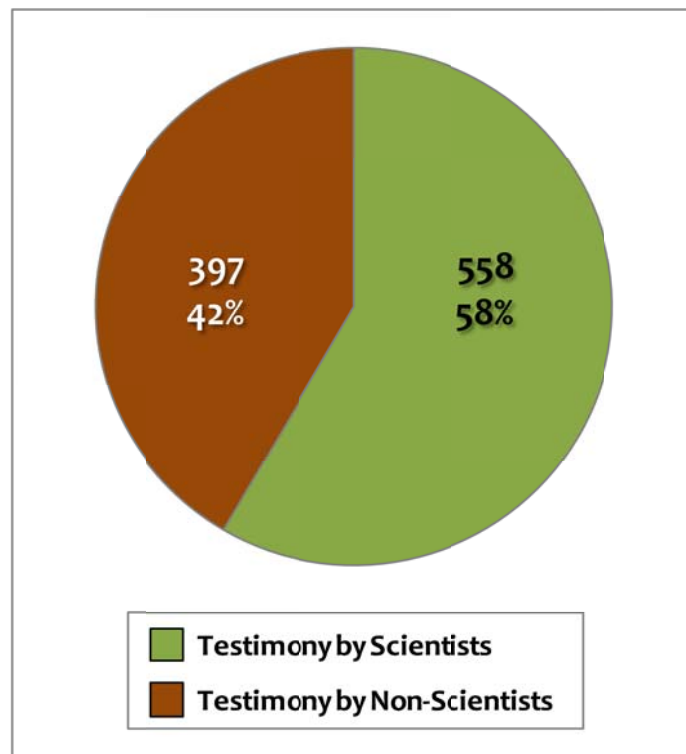
Testimony from experts with specialized scientific knowledge is a vital component of congressional hearings. In our coding of congressional records regarding global warming and climate change, we examined each testimony statement and identified the scientific background of the witness (or the lead person of a witness panel). We coded “scientist witness” if the testimony was provided by a professor, researcher, or analyst who came from a research institution (e.g., university, national laboratory, academic society, professional association, and research unit within an agency, corporate, or non-profit organization). These scientist witnesses generally provided expert assessments based on their specialized field of research (e.g., climate science, oceanography, health science, agricultural science, economics, ecology, environmental science). All other non-expert witnesses (e.g., members of Congress, non-research governmental officials, representatives of industries, concerned individual citizens) were coded as “non-scientist witness.” These non-scientist witnesses were often called to appear in the hearings to express their opinions and interests as well as their policy positions, recommendations, and concerns, and their testimonies were typically based on broad social, political, environmental, and international dimensions rather than from scientific perspectives.

When a scientist witness was identified, we further examined his/her affiliation and coded the type of organization the witness was associated with: (a) Scientist from Academic Institution (e.g., university); (b) Scientist from Government (e.g., U.S. national laboratory); (c) Scientist from Advocacy Organization (e.g., research unit in a company or an environmental group).

Figure 15 shows the number and percentage of testimonies by scientists vs. non-scientists. Among the 955 total testimonies, 558 (58.43%) were provided by witnesses with a scientific background and expertise, indicating that scientific information played an important role in congressional hearings on global warming and climate change.

Figure 16 displays the distribution of scientist witnesses by organizational affiliation. Among the 558 testimonies provided by various scientists, 211 (37.81%) were from academic institutions, 201 (36.02%) from government research establishments, and 146 (26.16%) from advocacy research organizations. Clearly, Congress obtained scientific information on climate change primarily from academic or governmental research sources, and scientist witnesses from advocacy organizations were the least used provider of scientific information.

Figure 15. Background of Witnesses - Scientists & Non-Scientists



Stated Position of Witnesses on Whether Global Warming is Underway

We reviewed each testimony statement to examine the witness's position on the question of whether she/he believed that global warming/climate change is a process that is already underway. The coding results are shown in Table 12. Among all 955 coded testimonies, 468 testimonies (49%) did not express a clear position on the question. Of the 487 testimonies that clearly expressed an opinion on the question, an overwhelming majority (392, 80.5%) indicated that that climate change was already underway, while less than 20% suggested either that climate change was not underway, or that the witness was not sure.

We further examined expert opinions from the "scientist witnesses." The results shown in Table 13 provide a very similar picture – among 330 scientist witnesses who clearly expressed a position on this question, 83% think that global warming is happening. This finding is consistent with other recent survey results, reporting that a majority of scientists and researchers in the climate field believe that global warming is already underway (Rosenberg, Vedlitz, Cowman & Zahran, 2010).

Figure 16. Distribution of Scientist Witnesses by Organizational Affiliation

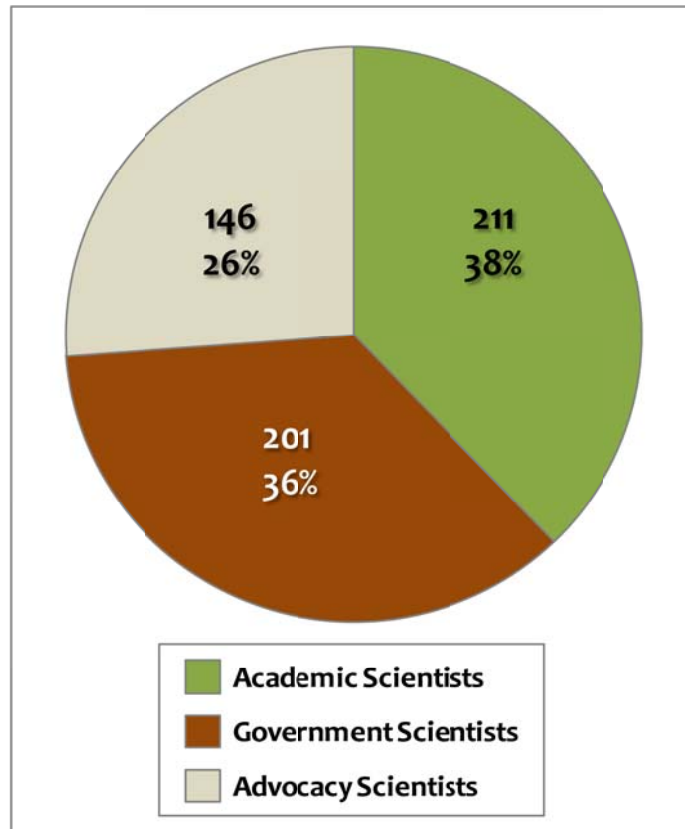


Table 12. Witness Position on Current Status of Global Warming – All Testimonies

Position	Frequency	Percent	Valid Percent
Yes	392	41.0	80.5
No/Not Sure	95	9.9	19.5
<i>Total</i>	<i>487</i>	<i>51.0</i>	<i>100.0</i>
No Position	468	49.0	
<i>Total</i>	<i>955</i>	<i>100.0</i>	

Table 13. Witness Position on Current Status of Global Warming – Scientists Only

Position	Frequency	Percent	Valid Percent
Yes	274	49.1	83.0
No/Not Sure	56	10.0	17.0
<i>Total</i>	<i>330</i>	<i>59.1</i>	<i>100.0</i>
No Position	228	40.9	
<i>Total</i>	<i>558</i>	<i>100.0</i>	

Stated Position of Witnesses on Whether Global Warming is Caused (or Partly Caused) by Human Activities

One central question in the climate change debate is whether human activities are responsible (or partly responsible) for global warming. Our coding results of witness stands on this question are reported in Tables 14 and 15. Table 14 indicates the views of all witnesses, and Table 15 reports the positions of scientist witnesses only. Both tables indicate that, among those who expressed an opinion on this question, more than 75% believe that global warming is caused, to some degree, by human activities.

Table 14. Witness Position on Human Activity as Cause of Global Warming – All Testimonies

Position	Frequency	Percent	Valid Percent
Yes	235	24.6	75.8
No/Not Sure	75	7.9	24.2
<i>Total</i>	<i>310</i>	<i>32.5</i>	<i>100.0</i>
No Position	645	67.5	
<i>Total</i>	<i>955</i>	<i>100.0</i>	

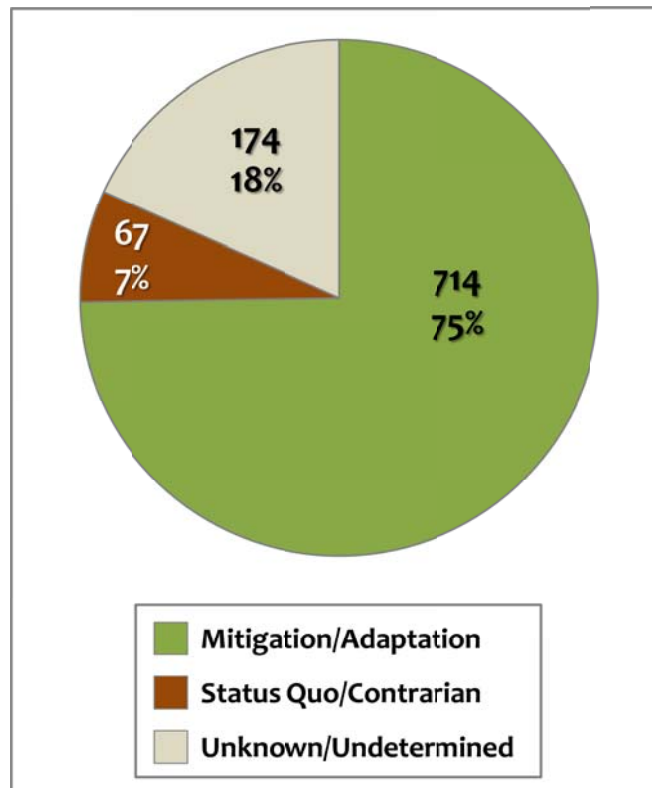
Stated Policy Position

Finally, we examined the stated policy positions of witnesses in our analysis of congressional activities on climate change and global warming. In their testimonies given during congressional hearings, witnesses often include specific policy recommendations to address the need for policy solutions to climate change. In our coding, we identified what type of policy solution was advocated in the testimony and classified each testimony into one of the following “policy position” categories: (a) Mitigation-Adaptation Position – including testimonies with policy recommendations to either actively mitigate the causes of climate change or reactively adapt to actual or expected climate change impacts; (b) Status Quo/Contrarian Position – including those arguing “do nothing,” “no policy is needed,” or opposing existing mitigation-adaptation policies or initiatives; and (c) Unknown/Undetermined Position. The coding results in Figure 17 show that a majority of witnesses (714, 74.76%) pushed for mitigation or adaptation policies to deal with the problems associated with global warming and climate change, while only a small number of witnesses (67, 7.02%) held a status quo or contrarian perspective.

Table 15. Witness Position on Human Activity as Cause of Global Warming – Scientists Only

Position	Frequency	Percent	Valid Percent
Yes	161	28.9	75.2
No/Not Sure	53	9.5	24.8
<i>Total</i>	<i>214</i>	<i>38.4</i>	<i>100.0</i>
No Position	344	61.6	
<i>Total</i>	<i>558</i>	<i>100.0</i>	

Figure 17. Witness Policy Stands





Federal Climate Change Policy Domain Interviews

One of the research tasks for this project was to conduct an assessment and develop a description of the federal/national level climate change policy domain. The objective was to develop a better understanding of how decision makers at the federal level perceive the relevance of climate variability and change as an issue, in general, and how they understand and use science-based climate information. The research focused on understanding how perceptions and means for transmission of scientific information affect, and are affected by, the various stakeholders and actors in the national public policy process. This examination explains how scientific information on climate variability and climate change is received, processed, and utilized by the major participants in the public policy process, including Congress, the Executive branch, scientific advisory groups, as well as interest groups and the subset of climate scientists participating in the policy debate at the national level.

This section of the project report will detail the role climate change policy and technical information plays in the national climate policy process. Included is a description and assessment of the major stakeholders in the federal level climate change policy domain. This description is augmented by the findings of a series of elite interviews conducted with a sample of federal level stakeholders focusing on the major issues as outlined above. This includes a summary of the methods used to conduct the research, how interviews with participants were assessed and a discussion on the findings. The research presented here can provide NOAA and others with important information on how climate change is perceived at the federal level, how science is used, and the barriers and constraints to the consideration of climate science information in decision- and policymaking. It is critical for science-producing agencies to understand the ways climate science information is perceived and utilized at the national level in order to develop relevant research programs and effective strategies of information delivery.

Climate Change Policy Domain and the Federal Policy Environment

In the United States the federal climate policy domain is decidedly fragmented. No single federal agency or bureau administers action on climate change, and legislative jurisdiction over climate change policy is divided among several congressional committees. Federal agencies, the White House, Congress, and a host of interest groups all play a part in the climate policy-making process at the national level. Subgroups within and among these policy arenas play a large role in research and adaptation efforts that inform the formulation and implementation of climate-related policies.

Federal Agencies

Multiple federal agencies are involved in climate change research and mitigation at the federal level. The two agencies receiving the majority of congressionally authorized and appropriated funds for their work on climate science and technology programs are the Department of Energy and the National Aeronautics and Space Administration (NASA), although many other agencies also participate in climate research, technology, and science programs (Congressional Budget Office, 2010). Some other federal agencies working on aspects of climate change include: The Department of Commerce (DOC), Department of State (DOS), Department of Defense (DOD), Department of the Interior (DOI), Department of Transportation (DOT), Department of Health and Human Services (HHS), the National Science Foundation (NSF), the Smithsonian Institution (SI), the Agency for International Development (USAID), Department of Agriculture (USDA), and the Environmental Protection Agency (EPA). Although some work independently on climate research and policy, representatives from these federal agencies with a stake in climate policy also participate in the United States Global Change Research Program (USGCRP) and the White House Climate Change Adaptation Task Force.

U.S. Global Change Research Program

In accordance with the Global Change Research Act of 1990, the USGCRP “coordinates and integrates federal research on changes in the global environment and their implications for society” (USGCRP). The White House Office of Science and Technology Policy (OSTP), Council on Environmental Quality (CEQ), and Office of Management and Budget (OMB) provide program oversight for the USGCRP and its thirteen other departments and agencies (DOC, DOD, DOI, DOT, HHS, NSF, SI, USAID, USDA, EPA, NASA, DOS). Within the program, the Subcommittee on Global Change Research steers the program’s ten interagency working groups, under the counsel of the White House. The groups are comprised of representatives of agencies responsible for the activities of each of the groups, which include: Atmospheric Composition, Climate Variability and Change, Communications, Ecosystems, Global Carbon Cycle, Global Water Cycle, Human Contributions and Responses, International Research and Cooperation, Land Use and Land Cover Change, and Observations & Monitoring. An integration and coordination office facilitates the activities of the program.

The USGCRP also works on a comprehensive National Assessment of climate impacts and response options, required every four years by the Global Change Research Act. These assessments have been used to inform the work of the Interagency Climate Change Adaptation Task Force and to “identify science needs in understanding current and future climate impacts and regional or sector-related vulnerability to those impacts, supporting adaptation and mitigation decisions, and informing effective translation of science into services and applications” (CEQ, 2010a). The next report is currently under development and is scheduled for publication in 2013.

White House and Interagency Climate Change Adaptation Task Force

Within the executive office of the President, the Office of Science and Technology Policy (OSTP) and the Council on Environmental Quality (CEQ) both work on climate issues.

On October 5, 2009, the President, by executive order, established the Interagency Climate Change Adaptation Task Force (CEQ, 2010b). This group of 23 agencies, which is delegated with making recommendations for adapting to climate change domestically and globally, is headed by OSTP, CEQ, and the National Oceanic and Atmospheric Administration (NOAA), and guided by a steering committee that consists of representatives from seven agencies including DOS, OMB, OSTP, DOI, EPA, NOAA, CEQ and DOD. The full task force includes members from the USDA, DOC, DOD, Department of Education (DOEd), Department of Energy (DOE), HHS, Department of Homeland Security (DHS), Department of Housing and Urban Development (HUD), DOI, DOS, DOT, Treasury, USAID, EPA, NASA, National Intelligence Council (NIC), White House Office of Energy and Climate Change (OECC), National Security Council (NSC), OMB, Council of Economic Advisors (CEA), National Economic Council (NEC), NOAA, OSTP and CEQ. The Task Force has evolved into twelve workgroups that tackle issues such as: Health, Agency Adaptation, Science Inputs to Policy and Coasts and Oceans. The Task Force also conducts “listening sessions” to consider input from outside stakeholders and experts in the climate policy process.

The Task Force will report to the President in the fall of 2010 on “the development of domestic and international dimensions of a U.S. approach to climate change adaptation and what Federal Agencies are doing to support this effort.” Moreover, the task force “will recommend additional aspects to consider in the development of a comprehensive national strategy” (CEQ 2010a).

Congress

Several congressional committees and subcommittees are responsible for climate change policy and legislation. The two major committees at work on climate change legislation are the House Energy and Commerce Committee and the Senate Environment and Public Works Committee. Chairmen Henry Waxman (D-CA-30) and Barbara Boxer (D-CA) and their staff generally control the actions on and formulation of climate legislation in their respective Houses. In addition, other committees with some jurisdiction include: the House Science and Technology Committee, Subcommittee on Energy and Environment; the House Agriculture Committee, Subcommittee on Conservation, Credit, Energy, and Research; the House Natural Resources Committee; the House Select Committee on Energy Independence and Global Warming; the Senate Commerce Science and Transportation Committee, Subcommittee on

Oceans, Atmosphere, Fisheries, and Coast Guard; the Senate Energy and Natural Resources Committee; and the Senate Agriculture, Nutrition and Forestry Committee, Subcommittee on Energy, Science and Technology. Other committees may become involved with legislation that includes provisions related to their areas of jurisdiction.

Leadership of both Houses set policy priorities and agendas for the House and Senate. House Speaker Nancy Pelosi (D-CA-8), House Majority Leader Steny Hoyer (D-MD-5), and Senate Majority Leader Harry Reid (D-NV) and their staff are involved with agenda-setting for the House and Senate on climate-related legislation and congressional votes.

Interest Groups

A large number of groups representing business, energy, environmental, and other interests are actively involved in the federal climate policymaking process. The Center for Public Integrity recently estimated that about 1,160 businesses and groups are aggressively lobbying on climate legislation (Lavelle & Pell, 2009). These stakeholders include but are not limited to: advocacy groups representing environmental, health, energy, biotechnology, manufacturing, transportation, labor, and other interests; oil and gas, power, financial, technology, nuclear, retailing, and mining and coal companies; city, county and public agencies; professional societies and associations; and lobbying and consulting groups (Center for Public Integrity, 2010).

Interview Research Design and Implementation Methodologies

This section of the report focuses on interviews conducted with various stakeholders from the federal climate change policy domain, as described in the previous section. Researchers applied multiple methods for identifying potential respondents. Some interviewees were identified from their membership in the United Nation's Intergovernmental Panel on Climate Change (IPCC) and others were identified based on their involvement in federal climate change policy. The UN IPCC is a scientific panel that analyzes the impact and risks of human-induced climate change. Researchers contacted various members of the panel to discuss their experience with climate change policy. Interviewees included bureaucrats and staff members from the Environmental Protection Agency, Department of State, U.S. Geological Survey, Department of Energy and NASA. The interviews also included representatives from various interest groups involved in climate change or energy policy, as well as congressional and White House staff members. The interviews were conducted by phone and lasted approximately 30 to 45 minutes. Interviews were conducted beginning in September 2009 and continued through April 2010. In all, researchers were able to conduct 17 interviews for this task. At least two researchers were involved with each interview and notes were transcribed and collated for accuracy. Audio recordings of the interviews were not made.

The interview guide was designed in an open format, allowing for flexibility of direction, depending on the background and expertise of the respondent. Design followed basic elite interview techniques as suggested in public policy research practices (see, for example Berg, 1989). Included with the guide were the required consent forms and communication documentation. The interview guide and other materials were approved by the Texas A&M University Human Subjects and Institutional Review Board process and practices. Respondents are not identified by name in this report or in related documents and research.

The interview questions were arranged around several broad themes, including the general issue of climate change policy, climate change and policy agendas, policy formation or information gathering, and the involvement in current climate change policy proposals and policy decisions. The following is a sampling of interview questions:

- How does the issue of climate change rank on your list of policy priorities? Would you say it is a top priority?
- To what extent does the scientific and research community play a part in these discussions?
- To what extent does scientific data influence decision-making on climate-related policy issues and legislative votes?
- In relation to other influences (such as constituent groups and political parties) how important is scientific data to legislators' decisions about climate policy?

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- Would better access to technical data and scientific information affect your position on or interest in climate change legislation and policy?

Findings and Discussion

Once all the interviews were complete, researchers reviewed the transcripts and categorized the responses into general themes:

- General Perceptions Regarding Climate Change
- Structural and Network Coordination Issues
- Dissemination and Use of Scientific Information
- Forming Legislation
- Perception of NOAA within the Policy Domain
- Political Transition and Climate Change
- Climate Change Collaboration and Information Sharing
- Roadblocks and Barriers to Climate Change Policy
- The Challenge of Climategate

This section of the report summarizes the response themes and concludes with a discussion of the implications of these findings for the project.

General Perceptions Regarding Climate Change

Climate change policy is viewed as a moving target, in general, and is not a priority to all legislators because it does not affect the daily lives of all Americans. According to some respondents, climate change is considered an elitist, scientific issue, and one which the average American does not understand. One problem associated with this perspective is the difficulty in articulating why a small increase in global temperature can have a dramatic impact on the environment, human health, and a variety of other issues. Compounding this situation is the view that the federal government has done a poor job conveying the complex issue of climate change. Suggestions were made that the federal government craft more coherent messages to the public on the distribution impacts, ethical dimensions, and costs of climate change. The significance of the message to policy alternatives was stressed in the interviews. Adaptation strategies, for example, can only be successful if there has been an effective communication strategy to make people understand and accept risk. Specific responses included:

- Climate change effects are regional in nature; therefore addressing it is a priority for some legislators, but not others, depending on the geographic area they represent.
- Technology is a critical key and technological advances are the best way to expedite the response process.
- Uncertainty is portrayed as a weakness, instead of being recognized as a fact of science.
- Problems with time scales and the ethical dimensions associated with climate change impacts were also mentioned.

Structural and Network Coordination Issues

Many of the respondents focused on the structural and network aspects of the climate change issue. Network coordination for climate change policy is transformative and necessary because no one discipline can solve the problem of climate change. It was stressed that groups and stakeholders at the federal level of the debate needed to create new modes of collaborating and working together across disciplines and institutions. According to some respondents it has been a challenge for the federal government to design successful programs that can address such a complex issue within existing institutions. The problem of climate change requires a systems mentality and the cross-cutting issues of climate change require new organizational and systematic perspectives. Some stakeholders stated that creation of a dedicated climate change agency or department was required; an entity which would work as an overarching, coordinating body. Current institutions, such as the DOE, may have individuals recognized as leaders on the issue, and agencies

are working together to the best of their abilities, but this was not considered optimal. Other responses included the following:

- The need exists for a collective response to the overwhelming demand for science to be used for decision making in order to leverage the comparative advantages of each agency; all working together to meet the demand.
- Important coalitions are being formed and some stakeholders are more active than others in regard to the policy implications of climate change. Business groups are well informed and organized. Environmental non-governmental organizations (NGOs) are important and effective in the debate.

Dissemination and Use of Scientific Information

A significant portion of the interviews focused on the dissemination and use of scientific information within and among the federal level climate change community and stakeholders. The efficacy of the dissemination of scientific information to legislators received mixed reviews from the respondents, primarily as the situation has changed over time. It was suggested that there had been an evolution in the response from members of Congress because climate change has only recently become the “environmental issue of our time.” Compounding the situation is the reality that climate change is still a very political issue and responses suggest that, for some members of Congress, the objective is managing the climate change issue, not necessarily making policy. There is also a distinction between the House and Senate, in that House members are more concerned about the impact of the climate change issue on their district, while in the Senate, members are more concerned with understanding the issue in order to develop their positions. Science is traditionally viewed as helping to guide good policymaking, but, according to respondents, climate change science has not developed a coherent message or clear “marketing” campaign. The science community is not conveying a clear message about the impacts of climate change and how it can be mitigated. Therefore, Congress in general is still confused about the impacts. Many members of Congress, particularly those on relevant committees, rely heavily on scientific information and view scientists as a voice of authority. Some stated that, among members of Congress engaged in the issue, there is a general agreement on the science and cause of climate change. Science is not what opponents argue about as much as the economics of the issue, and quantifying the costs of action and inaction. More specific responses include:

- Science can help guide good policymaking, but it is important to understand what science can and can’t contribute to the debate. However, scientists have created confusion about climate change by focusing too much about what they don’t know. Congress does get objective science information but sometimes hearings can have science panels that are biased toward the committee or members of Congress.
- Some members rely heavily on science and information (from the Congressional Research Service, for example) while some members have an obvious disdain for science. Education does occur in congressional hearings, but as hearings are public, it is also helpful to have individual meetings so that the scientists and members can engage on a private level to explore questions that might never come up in hearings.
- Science is not what opponents currently argue about. The past few years, however, cooler summers and colder winters in some parts of the country have resulted in a rise of skepticism – personal weather experience influences the opinions of decision makers and their constituents. This gives fuel to the naysayers and climate change skeptics.
- A key issue to legislators is addressing the economic issue – quantifying the costs of response and the cost of inaction – this is the information politicians are requesting now.
- One respondent described the collection and use of information as a process. For example, the committee staff would contact the agencies and experts on different issues they are working on. They would often ask scientists from universities and agencies (such as NOAA) to come in and brief them on different issues. If the committee staff had read specific research papers, sometimes they would ask for those authors or scientists to come in and talk more about an

issue. From this interaction the committee would then utilize the science to inform decisions, and in addition they would use hearings to lay down the record on a topic. Experts were always on hand and available to help write legislation, and different scientists were often called upon while the committee was writing legislation to make sure it was correct.

- Respondents suggested that skeptics were the ones who always show up to climate change policy and legislation hearings. On each panel, there may be four or five witnesses, and the minority always gets one witness. Therefore, every hearing on science may include four strong advocates for the science, and one or more skeptics. This gives the impression that 20% or 40% of scientists don't think that climate change is a problem, providing a forum and a podium for skeptics that they might not otherwise have. Using hearings to educate also includes risks because of the inability to alter the beliefs of people who are strong non-believers in the issue.

Forming Legislation

Respondents held a wide range of perspectives on the formulation and passage of climate legislation. One suggested that, in general, voting and co-sponsorship on this issue is politically driven. Members are lobbied heavily by entities in their states (such as the coal industry or local chambers of commerce) which influence their positions on the issue, regardless of the science. Legislators on various committees frequently seek out scientific information from agencies, universities, and other organizations; and conversations with experts are a big part of the legislative process. On the other hand, according to one respondent, it was often a challenge to find information that was actually useful and relevant to policy design. Agencies were also recognized as being frequently called upon to provide input and analyses for legislation.

Some legislative staff suggested that hearings were more of an opportunity to lay down a record, rather than to inform members of Congress; whereas, briefings and informal conversations provide greater opportunities for learning and informing legislation. One respondent noted that the key to any final piece of legislation was flexibility, in that it has to be adaptable to changing science and also to be able to adjust with the way the policy was implemented. Getting locked into policy that is not working properly would be detrimental to progress on mitigating the effects of climate change, stated one respondent. While climate change is not perceived as being at the top of the list of Congress's priorities, some have tried to move it away from cap and trade and adapt it to fit with the broader agenda of jobs and the economy, such as talking about green jobs. According to one respondent, advocates were changing the message to fit with the current audience and focus on jobs. More specific responses on legislation include:

- There is a real incentive and roadmap for how clean energy and technology can be developed and adopted. This should also take into account the focus on recovery and jobs. This approach was viewed not as a substitute for carbon pricing or cap and trade policies, but as building blocks.
- In regard to the design of legislation, respondents emphasized that this stayed within the boundaries of the committee's jurisdiction. Coordination with other committees usually only happened after a bill had been crafted and passed out of committee. Other committees then could claim their pieces of the bill. Committees and staff were always looking for ideas to aid policy formation and legislation, but it was stressed by respondents that it was often a challenge to find information that is useful and relevant to policy design and of interest to members of Congress.

Perception of NOAA within the Policy Domain

NOAA is viewed positively in regard to their role in the climate change issue, but interview respondents stressed concern about their tight budget situation. It was suggested that as NOAA often had to seek out partnerships with other agencies in order to get additional funding from outside sources this could inhibit their future involvement on the issue. The solution was to encourage more robust funding. One respondent suggested that NOAA did not have the structure, staff or background to quickly respond to rapid issues or policy emergencies as they came up. While partnerships with universities, for example, were perceived as beneficial, there was concern about the long turnaround time for scientific information to emerge from these

relationships. Without proper funding and equipment for NOAA, it was suggested that the EPA was now a bigger player than NOAA in climate change.

One respondent was critical of NOAA's culture and lack of outside consultation on large issues such as climate change. The perception was that the agency was content to work internally or through research grants with universities. This was seen as problematic because this model was not responsive to rapid issues or policy emergencies. NOAA also was seen as lacking the capacity in general or the appropriate staff capable of responding in these situations. The problem with academia was the long turnaround, frequently up to three to four years for results. Respondents were positive in their reactions to and support for NOAA's intent to advocate and move forward on a dedicated federal level Climate Service. The National Climate Service should be national, not just a NOAA entity, according to respondents, and should be organized like the National Weather Service, which was seen as the national authority on weather.

Political Transition and Climate Change

Across the board, respondents acknowledged that the transition from the Bush to the Obama administration instigated a broad change and shift in climate policy at the national level, and that the change is taking a while to adjust to in regard to resources. In addition, the Congress's switch from Republican to Democratic also marked a visible change in the direction of climate policy. While scientists at federal agencies continued to work on climate change science throughout the Bush Administration, they still had to follow directions from the politically appointed administrators. In Congress, respondents said, there had been an effort by relevant Committees to ramp up educating members about climate change during the first six months following the presidential election. More specific responses on this issue included the following:

- The heads of agencies are politically appointed, which results in a top-down political direction. Agency scientists did work to continue doing climate change science regardless of the political situation and in the midst of the changing political winds. One respondent stated that since scientists are by nature independent thinkers this situation was a challenge.
- The Bush era climate program (USGCRP) evolved over the course of the administration and became more proactive over the years as climate change became acknowledged as an issue. In the Obama administration there is a perception of more willingness on the part of some stakeholders to discuss these issues. Within the climate change policy domain public health was identified as a hot issue, with several federal agencies showing interest, for example the Centers for Disease Control (CDC) and HHS.
- In general the transition from the Bush to the Obama administration was characterized by recognition that climate change was actually occurring, and that there was a need to investigate and to address it, and to decide how science would contribute to the debate.
- There was a perceived rush of nonfederal stakeholders approaching federal agencies, such as the EPA, for climate science and information. There was a perception that more of dialogue was taking place than ever before, among stakeholders and interested parties, NGOs, nonprofits, states and cities, and even international stakeholders.

Climate Change Collaboration and Information Sharing

Collaboration and information sharing exists between many stakeholders, according to respondents. For example, NASA works closely with NOAA through the funding of labs and proposal development. In Congress, Senate committees receive information from various sources such as the environmental industry and think tanks and the briefings are often bipartisan, providing a forum for universities and other scientific researchers to release their results. It was stressed that this information sharing and collaboration between stakeholders was important and essential because federal agencies are unable to do all the work on their own. More specific responses included the following:

- Congressional committees provide forums for universities and other scientific researchers to release their results.

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- In the Senate, individual pieces of legislation that a committee has jurisdiction over are integrated into a larger package for climate legislation that is then joined by pieces authored by other committees.
 - The relationships between agencies and universities are essential because federal agencies can't do the work on their own.
 - Several respondents noted that climate change planning is being developed at the state and local levels; planning is beginning at the grassroots with local government.
 - Federal agency interaction with the university research is mixed, according to respondents. For example, both NOAA and the United States Geological Survey (USGS) interact with universities throughout the country to expand its research capabilities and some lobbyist groups like the Business Roundtable interact with universities to gain information to support its policy agenda. On the other hand, some agencies like the CDC have little or no contact with universities.

Roadblocks and Barriers to Climate Change Policy

Respondents were very vocal about the perceived barriers and constraints surrounding climate change policymaking at the federal level and they identified various roadblocks that hinder climate change policy formation. First, framing the issue and differentiating between “global warming” and “climate change” is difficult, but necessary, according to respondents. The issue in general is also framed differently by each political party. Second, tension occurs over the use of science and how researchers present the climate change message and frame it to the general public and members of Congress. Other roadblocks that were brought up in the interviews included the prominence of other national concerns, such as jobs, the economy, and healthcare, which sent climate change to the back burner as far as a legislative priority. Some congressional committees have turf issues which hinder them from working together on the issue of climate change since it cuts across such a wide range of legislative jurisdictions. More specific responses included the following:

- There is a perceived institutional barrier regarding committee-agency interactions. Respondents said there was hesitancy at times for a committee to approach certain agencies for information as it could be perceived as stepping beyond the traditional committee jurisdiction.
- Use of the term “climate change” versus “global warming” is a problem, as is trying to frame the debate in politically attractive ways. The general public is easily thrown off when there is a blizzard in Washington, D.C. and no snow in Canada, for example.
- Climate skeptics tend to know more of the science than the advocates do. The believers tend to trust the institutions, such as the IPCC, to provide them with the details on climate science, so they are not as well versed and cannot necessarily argue as effectively

The Challenge of Climategate

Approximately half of the interviews conducted for this project occurred following the international event known as “Climategate” (for a general synopsis of the event see, for example, <http://factcheck.org/2009/12/climategate>). Climategate was perceived by the respondents as a major setback to the nation's work on climate change policy. Not only had this event confused the general public further on the issue and science of climate change, according to respondents, but it had begun to shift the debate backwards from talking about what should be done to whether anything should be done at all. Climategate occurred at a time when climate change science was building support and a consensus, according to some respondents. The country was finally coming to agreement that climate change was happening, which was moving the policy community toward acting on the issue, rather than continuing to debate the science. Clearly, the event bolstered climate skeptics and their arguments; however, since Climategate, even supporters have begun raising questions about the validity of climate change science, using this in the debate about the implications a climate change policy could have on various sectors of the economy. Climategate is viewed as a serious roadblock to eventual success on climate change policy; however, some stakeholders believe that it is only a blip and will not be a long-term hindrance to what can be done on climate change in the future. More specific responses included the following:

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- Climategate is challenging, but at the same time it offered an opportunity for scientists to show and illuminate the processes of scientific inquiry and to be open and transparent. This opportunity can be utilized to improve the processes of the IPCC.
 - Entrenched interests would like to change the question from “what should we do” to “should we do anything at all” as a result of this event; a strategy used on both sides of the issue. Also, cyclical weather events, such as an unusual snowstorm in the southern U.S., created tension on both sides of the debate. There is a strong negative impact on the Hill with the skeptical members using this situation in their favor to sway Congress away from passing cap and trade.
 - During the presidential election both McCain and Obama agreed on climate policy. After the election, the message shifted to denying the state of the science. This dynamic had already started with the Republican Party just saying “no” to anything the Obama administration wanted, but Climategate amplified that message and approach. People who were already reluctant to work on this legislation have been given another reason to resist.

Summary

The interviews provide a rich and provocative illustration of the complex and dynamic climate change situation at the federal level of interaction and decision making. The respondents represented a wide variety of interests, agencies and positions. To return to the general research questions for this project, we see that, according to our respondents, climate science does play an important role in decision making at the federal level of governance. The difficulty arises when science is in competition with other information, or is presented by competing interests. At the federal level, delineating the good, or useful science, is a subjective activity that can be influenced by any number of factors. As far as climate change being on the national agenda, this does not seem to be the case in spite of significant optimism expressed at the end of the Bush administration and the beginning of the Obama administration. Other factors, such as the economy, terrorism and multiple wars, all served as a dampening factor on most other issues, including climate change. Although things can change to push agenda items up and down, this does not appear to be likely any time soon, according to respondents.



Summary & Conclusions

In this section we summarize the findings from the previous report chapters and offer our final conclusions.

Public Survey

The American people are aware of climate change and concerned about it, but they rank this concern as lower than several other major issues. They have a moderate understanding of the facts about climate change. They get most of their climate change information from the media. They do trust the information about climate change provided by government agencies like NOAA and EPA. They are willing to support government policies to mitigate or adapt to climate change effects as long as these policies do not raise taxes or the costs of important consumables. This moderate level of knowledge, concern and commitment to climate change as an issue indicates that the public's opinions on this are fluid, not strongly held, and subject to change. Indications of such changes have occurred as recent stories in the media and accompanying political rhetoric have challenged the veracity of some climate science findings. This has been reflected in more U.S. citizens doubting the veracity and seriousness of climate change in some recent public opinion surveys. Agencies like NOAA need to understand these realities and work harder to provide trusted, consistent information to the public as it seeks to wrestle with competing climate change messages and make meaningful policy choices and resource allocations.

Media Coverage

The salience of the climate change issue ebbs and flows over time, but the general trend for the entire period under study is evidently upward – increasing news coverage on climate change indicates greater salience of this issue. In the 1970s and the early 1980s there was little attention paid to climate change. The year 1988 shows a significant increase in media attention to the issue. Since then, the issue of climate change issue has maintained a relatively high level of salience despite some short-term declines of interests.

In coding the newspaper articles, we looked for evidence of how the news media portrayed the issue of global warming and climate change in the following attributes: issue image, issue scope, issue linkage, and proposed solutions.

Issue Image. Among all the 608 news stories, an overwhelming majority (478 articles, 78.62%) projected a harmful image of climate change, while only a small percentage of the news stories (2.96%, 18 articles) viewed climate change as “not harmful.”

Issue Scope. This portrayal of issue scope implies that major climate change solutions and policy responsibilities are expected to lie with the federal government or with international regimes.

Issue Linkage. Climate change was perceived and portrayed by the news media as a multifaceted issue. In a wide array of other public issues linked to climate change, energy, science R&D (research and development), international cooperation, transportation, and macroeconomics were the top 5 most frequently associated issue categories. Perhaps one of the most interesting findings shown here is the strong linkage between climate change and science R&D – it is the second most frequent linkage made in these articles and is driven in large part by reports of climate science uncertainty.

Proposed Solutions. Approximately 60% of the news stories (361 articles) mentioned certain solutions to global warming and climate change; while about 40% (247 articles) did not discuss any proposals for dealing with the problem.

From our perspective, perhaps the most interesting finding here is how the characterization of climate change as a scientific uncertainty issue affects the likelihood of solution proposal in the news coverage. If an article portrays climate change as a science R&D problem, the likelihood of solution proposed in the article is significantly lower than articles that do not view climate change as an issue of scientific uncertainty. Our finding here provides strong empirical evidence, showing that framing climate change issue as an issue of scientific uncertainty indeed inhibits solution-proposing in the newspaper articles studied.

Use of Science. References to scientific information were not uncommon in the news media – almost half (48.68%, 296 articles) of the news articles utilized scientific information in their coverage on global warming and climate change. The two most frequently used sources of scientific information were academics (176 articles) and governmental scientists (96 articles). Scientific information from environmental advocacy groups or from industry researchers was rarely used in the news stories.

Congressional Hearings and Testimonies

Overall congressional attention to global warming and climate change has significantly increased over the last several decades. Before the mid-1980s, global warming and climate change problems drew very little congressional attention. During the 16-year period between 1969 and 1984, there were only 2 hearings held in Congress and about a dozen testimonies provided by expert witnesses. However, congressional attention to climate change increased significantly and rapidly in the late 1980s – Congress held three, eight, and 21 hearings in 1987, 1988, and 1989, respectively, and more than 150 witnesses were called to provide their testimonies during the last three years of the 1980s. In the following years from 1990 to 2006, there were short term declines of interest, but the overall congressional attention to climate change was sustained at a relatively high level, with about eight hearings per year.

Scientific Background of Witnesses. Among the 955 total testimonies, 558 (58.43%) were provided by witnesses with a scientific background and expertise, indicating that scientific information played an important role in congressional hearings on global warming and climate change.

Among the 558 testimonies provided by various scientists, 211 (37.81%) were from academic institutions, 201 (36.02%) from government research establishments, and 146 (26.16%) from advocacy research organizations. Clearly, Congress obtained scientific information on climate change primarily from academic or governmental research sources, and scientist witnesses from advocacy organizations were the least used provider of scientific information.

Stated Position of Witnesses on Whether Global Warming is Underway. An overwhelming majority (392, 80.5%) indicated that that climate change was already underway, while less than 20% suggested either that climate change was not underway, or that the witness was not sure.

Among 330 scientist witnesses who clearly expressed a position on this question, 83% think that global warming is happening. This finding is consistent with other recent survey results, reporting that a majority of scientists and researchers in the climate field believe that global warming is already underway (Rosenberg, Vedlitz, Cowman, & Zahran, 2010).

Stated Position of Witnesses on Whether Global Warming is Caused (or Partly Caused) by Human Activities. One central question in the climate change debate is whether human activities are responsible (or partly responsible) for global warming; among those who expressed an opinion on this question, more than 75% believe that global warming is caused, to some degree, by human activities.

Stated Policy Position of Witness. A majority of witnesses (714, 74.76%) pushed for mitigation or adaptation policies to deal with the problems associated with global warming and climate change, while only a small number of witnesses (67, 7.02%) held a status quo or contrarian perspective.

Stakeholder Interviews

Although the end of the Bush administration and the beginning of the Obama administration was seen as a potential window of opportunity for climate change advocates and policy makers at the federal level, this window was short lived according to our respondents. Climate change was effectively kept off the federal decision agenda by other more salient issues such as the economy, and the climate issue was further damped down by intervening events such as a very cold winter in the northeast and the mistrust of science and scientists as seen through the Climategate scandal. While there is significant support for climate change mitigation and adaptation policy solutions at the federal level and these policies are supported by a wide range of scientists and scientific findings, our interview findings paint a pessimistic picture of the current situation in regard to making progress on this issue. The network of scientists and decision makers will continue to focus on climate change as a problem, but it was clear from the interviews that the policy side of the equation is not ready or in a position to adopt and implement these solutions under the current political climate.

Conclusions

This project report completes a two-phased NOAA-funded project by the Institute for Science Technology and Public Policy at Texas A&M University ("Utilization of Science-based Information on Climate Change in Decision Making and the Public Policy Process," NA03OAR4310164) exploring several aspects of this vital link between science and decision making. Phase Two of this project, described in this project report, extended our previous research into how these perceptions and means of transmitting scientific information affect, and are affected by, the various stakeholders and actors in the national public policy process. The findings presented here illustrate how scientific information on climate variability and climate change (CV/CC) is received, processed, and utilized by the major participants in the public policy process, including Congress, the Executive branch, scientific advisory groups, as well as interest groups and climate scientists participating in the policy debate at this level. To this mix of national actors and policy participants we also include findings from public opinion research on climate variability/climate change science.

The research presented here can provide NOAA and others with important information on how climate change is perceived at the federal level, how science is used, and the barriers and constraints to the consideration of climate science information in decision and policy making. It is critical for science-producing agencies to understand the ways climate science information is perceived and utilized at the national level in order to develop relevant research programs and effective strategies of information delivery. Significant barriers and constraints remain regarding the use of science in decision making, the role of the scientists in the policy process, and the impact of uncertainty in regard to both public and decision maker perception on climate change as an issue on the decision agenda. In addition, intervening factors such as extreme weather and scandals such as Climategate will continue to influence federal policy and decision making related to climate change and variability issues and problems.



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