San Jose State University

SJSU ScholarWorks

Summer 2010

A Framing Study of Media Coverage on Climate Change from 1989 to 2009

Marie McCann
San Jose State University

Follow this and additional works at: https://scholarworks.sjsu.edu/etd_theses

A FRAMING STUDY OF MEDIA COVERAGE ON CLIMATE CHANGE FROM
1989 TO 2009

A Thesis

Presented to

The Faculty of the School of Journalism and Mass Communications

San José State University

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

by

Marie E. McCann

August 2010

A FRAMING STUDY OF MEDIA COVERAGE ON CLIMATE CHANGE FROM
1989 TO 2009

by

Marie E. McCann

APPROVED FOR THE SCHOOL OF JOURNALISM AND

MASS COMMUNICATIONS

SAN JOSÉ STATE UNIVERSITY

August 2010

Dr. William Tillinghast	School of Journalism and Mass Communications
Professor Thomas Ulrich	School of Journalism and Mass Communications
Dr. Matthew Cabot	School of Journalism and Mass Communications

ABSTRACT

A FRAMING STUDY OF MEDIA COVERAGE ON CLIMATE CHANGE FROM
1989 TO 2009

by Marie E. McCann

This thesis examined how climate change has been framed in four major news magazines—*Maclean's*, *Newsweek, The Economist*, and *U.S. News and World Report*—over the past 20 years. We looked at a number of framing elements, including primary frames, depth of coverage, framing the science, sources of information, section placement, and verbiage. A content analysis of 476 articles was performed. Articles included in the sample appeared in one of the four news magazines during the years 1989, 1993, 1997, 2001, 2005, and 2009 and included at least one sentence devoted to climate change. We found that the most predominant primary frame used to cover climate change was the political-economic frame. We also noted a shift away from framing the science as neutral towards a valid science frame.

ACKNOWLEDGEMENTS

First and foremost, I would like to thank my primary advisor, Dr. William Tillinghast. Your guidance, support, and sense of humor have made this process enjoyable and fulfilling. I would also like to thank thesis committee members, Professor Thomas Ulrich and Dr. Matthew Cabot. This project would not have been possible without your guidance.

I would also like to thank my family for their unwavering support. Mom, Larry, Eric, Grandma, and Tim, you have been there at every turn and I cannot thank you enough. I would also like to thank my friends, family, and colleagues.

Finally, I would like to mention my father, John, who passed away during this process. My father taught me about the importance of meaningful relationships, to enjoy every moment, to laugh, and that life is a gift.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

Introduction

In today's society, people obtain much of their information about current events, politics, celebrity gossip, and even the weather from the mass media. This is mainly because much of the information that people seek, including information on climate change, exists outside of their own experiences, and the media is the main source of information (Gamson & Modigliani, 1989; Graber, 1984). Because much of the information received through mass media outlets is second-hand, audiences are subject to frames constructed by media outlets.

Recently, climate change has become a mainstream topic in the United States. Citizens and governments alike are faced with the issue of climate change and its associated consequences as a major challenge of the 21st century, thus making it a major political issue (Carvalho & Peterson, 2009). Major news media outlets covered the Kyoto Treaty meetings, and films such as Al Gore's *An Inconvenient Truth* garnered major attention at the national level. Like other news items, the information sought in relation to climate change must be viewed through mass media outlets. Thus, information on climate change is subject to the frames constructed by the media or media sources. This study explored the frames used for reporting climate change in four major news magazines—*Newsweek, U.S. News and World Report, Maclean's,* and *The Economist*—over the past 20 years.

A major global issue, climate change affects not only Americans and the rest of the world's population, but the Earth's entire ecosystem. Effects range from the spread

of disease and extinction of animal species to coastal erosion and stress on water resources (Intergovernmental Panel on Climate Change, 2007). However, not all predicted effects are negative; some evidence predicts increases in crop productivity (Intergovernmental Panel on Climate Change, 2007).

The global average surface temperature is rising, and Northern Hemisphere snow is declining. These changes and others have led the Intergovernmental Panel on Climate Change (IPCC) to conclude that the "world is warming" (Intergovernmental Panel on Climate Change, 2007). Furthermore, the warming effect is likely caused by human influence. The report also stated that it is "*extremely unlikely* that global climate change of the past 50 years can be explained without external forcing and *very likely* that it is not due to known natural causes alone" (Intergovernmental Panel on Climate Change, 2007, p. 39). The term, external forcing, refers to any activity that causes a change in the climate not due to a natural shift (Intergovernmental Panel on Climate Change, 2007). An example of an external force would be the release of greenhouse gas, such as carbon dioxide. It is likely that global warming will continue and cause many changes to the global climate system, even more changes than observed in the previous century (Intergovernmental Panel on Climate Change, 2007).

The focus of this paper is not to debate the pros and cons of climate change, but works from the premise that climate change is happening, primarily because of human influence, and is likely to continue, affecting the world ecosystem. Therefore, how the news media frame climate change is an important issue to be researched because the media mediate the dissemination of climate change information to the general public.

Purpose of the Study

This study explored the frames that were presented in the coverage of climate change in four major news magazines. A study of the framing of climate change is important for a number of reasons. First, existing literature on climate change has been mainly concerned with whether or not climate change is reported by the news media, and how often (Boykoff, 2008a; Boykoff, 2008b; Carvalho, 2005). Much of the existing literature looks at newspaper and broadcast television coverage, with a limited number of studies examining news magazines. Second, although past research has examined frames, mainly episodic versus thematic framing (Boykoff & Boykoff, 2007), not many have looked at the physical aspects of framing, such as the inclusion of pictures or section choice. Finally, it is important to gain further understanding of how science news is reported in mainstream media both because of its complex nature and the dependency of human existence upon modern scientific innovations. As Krieghbaum (1967) stated, "Many of the more important and complicated problems facing United States citizens today are heavily intertwined with science and technology" (p. 5).

Chapter II, the literature review, contains a review of critical literature and the analytical framework for the study. Chapter III, the method, identifies the frames to be used for the study, and an explanation of the method. A frame analysis of climate change news articles was performed in *Newsweek*, *U.S. News and World Report, Maclean's* and *The Economist*. Chapter IV, the results, discusses the results of the frame analysis and how the results apply to the proposed research questions. Chapter V, the conclusion and

discussion, explores the implications of the study and identifies further research to be

done in this area.

CHAPTER II

Review of Literature

A review of past literature on framing, and more specifically the framing of climate change, is crucial in understanding the current study. The literature review will first explore the concept of framing, identifying a central definition and explaining how frames are created. The literature review will then examine the common frames used in the reporting of science topics, most specifically climate change.

Framing

Historically, news media has gathered and disseminated news for public consumption. Tuchman (1978) wrote that "the news aims to tell us what we want to know, need to know, and should know" (p. 1). Framing is the act of highlighting certain aspects of a story to allow for interpretation and context, thus making an event or story more understandable for the audience (Entman, 2004; McQuail, 2005). Put simply, framing is the act defining issues—typically by elites—for public consumption, and disseminating these definitions through the use of mass media (Berinsky & Kinder, 2006).

While a vast body of framing literature exists, Entman's (1993) definition of framing will be used as the groundwork for this literature review. Entman wrote:

> To frame is to select some aspects of a perceived reality and make them more salient in a communicating text in such a way as to promote a particular problem, definition, causal interpretation, moral evaluation, and/or treatment recommendation for the item described. (p. 52)

Salience refers to the act of making one piece of information more memorable or meaningful (Entman, 1993). By focusing the audience on salient pieces information, it is therefore easier to then apply an overarching theme to the entire story.

Frames are an inherent part of the news process. Tucker (1998) wrote that frames are "highly ritualized symbolic structures embedded into media content" (p. 143). These frames, as part of the media structure and content, control the flow of information to the audience. Tuchman (1978) equates the framing process to looking through a window. Tuchman stated:

> The view through a window depends upon whether the window is large or small, has many panes or few, whether the glass is opaque or clear, whether the window faces a street or backyard. The unfolding scene also depends upon where one stands, far or near, craning one's neck to the side, or gazing straight ahead, eyes parallel to the wall in which the window is encased. (p. 1)

The window metaphor provides a clear example of how the news frame can include, exclude and skew specific pieces of information depending on what information is placed within view or outside of the metaphorical window.

Framing also allows the author to insert opinion and interpretation. Iyengar (1991) stated that framing is the "subtle alteration in statement or presentation of judgment" (p. 11) in news stories. This alteration of facts and presentation of judgment is often left to the discretion of each reporter, including the reliability of their sources and overall nature of the story (Tuchman, 1978).

The news frame helps to organize information as it applies to everyday reality (Tuchman, 1978). A seminal work by Goffman (1974) identified the primary framework

as the act of taking seemingly meaningless information and making it into something meaningful.

Giving a story context allows the reader to better understand its implications. Context is important so that audience members can view the event or story as it applies to a larger scheme (McQuail, 2005; Tuchman, 1978). McQuail (2005) wrote that "stories are given meaning by reference to some particular 'news value' that connects one event with similar ones" (p. 378). Without frames, news stories would be incomprehensible and unrecognizable, meaningless talk when void of context (Tuchman, 1978). Without context it would be difficult for the reader to understand the significance of a particular news story or event.

In addition to providing context, framing also provides an analysis of events. Fortunato (2005) stated that "people are interested in more than simple facts—they seek out analysis of events" (p. 53). Most people do not have time to read, analyze and interpret all of the available information; they depend on the media to guide them. A study by Graber (1984) found that most audiences allow the media to show them what is important.

Many scholars have noted that people use mass media to learn about events that are outside of their direct experience (Graber, 1984; Iyengar, 1991; Kreighbaum, 1967; Tuchman, 1978). People seek out facts and interpretation because they possess little information about current issues and events (Iyengar, 1991), especially those that are outside of a person's daily experience (Graber, 1984), and the media are the main source of information (Gamson & Modigliani, 1989; Graber, 1984). Politics is one example of

the type of information for which audiences rely heavily on the media. Iyengar (1991) noted that "virtually all political issues are beyond the range of personal experience" (p. 7). Thus, the audience is subject to the frames portrayed by the media outlet.

The Framing Process

Dahinden (2002) identified the four levels of framing as: media content, production, audience frames, and general culture. Media content refers to story selection and patterns of reporting (Dahinden, 2002). Production refers to how content is presented, including journalistic norms (Dahinden, 2002). Audience frames take into account the existing mental models and schemas activated by media (Dahinden, 2002). Culture refers to the existing narratives and myths found in modern society (Dahinden, 2005).

Media production. Media content is carefully and thoughtfully presented, and a number of visual cues about the story can therefore be inferred. Schramm and Roberts (1971) wrote that all aspects of a story—from length, size of the headline, position on the page, page of print, inclusion of a picture, caption of the picture, and author's byline—all convey the level of importance of the news item to the reader. Graber (1984, 2002) noted that the visual presentation of news stories—headlines, pictures, and page placement - contribute to the overall salience.

In the study on the visual framing of the Israel-Lebanon conflict, Parry (2008) noted that the presence of a photograph "was more likely to add prominence to the reporting of the conflict" (p. 21), therefore adding to the overall effectiveness of the story. Photographs and other cues often speak to the relative importance placed upon a

news story. Griffin (2004) wrote that photographs are "simple thematic cues, they frequently serve as the most highly visible markers of news emphasis and frames" (p. 384). These "contextual cues" (Iyengar, 1991, p. 11), such as examples, pictures, film and sources, may have the ability to influence receiver decisions (McQuail, 2005).

However, a number of constraints, such as time, space, and format all must be considered when producing a news story. It is because of these constraints that media are unable to present every aspect of a story (Fortunato, 2005). These constraints can be so limiting that they create inconsistencies in reporting. Fortunato (2005) noted that "the nature of news production does not permit even the issues that are covered to be done with the same standard" (p. 50). Media outlets are simply unable to present every aspect of a story, and the resulting frames and nonverbal cues convey further importance and meaning to the reader. An unintended consequence of these constraints is that importance can be placed on stories that are longer in length or, as discussed above, include a picture. Carvalho (2005) said, "The volume of media coverage is the first indicator of the relative salience awarded to an issue over time" (p. 3).

Just as important as examining the information that is framed is examining the information that is not included within a given story, which Tuchman (1978) equated to the information outside of the metaphorical window. Framing has the power to define reality while promoting specific social interests and closing off pathways to others (Tucker, 1998). Having little alternative information will inherently affect the audience's opinions and conclusions about the information presented; the exclusion of information is just as important as the information included (Entman, 1993). Audiences may be led to

believe that the information presented is the only information available, thus affecting decision-making processes. In the case of climate change, the inclusion of both sides—or fair and balanced coverage—provides a more complete picture by providing audiences with alternative information, but at the expense of a scientific consensus (Antilla, 2005; Boykoff & Boykoff, 2007; Smith, 2005).

Audience frames. Although frames have powerful effects, they do not affect each individual the same way. Entman (1993) noted that although the nature of framing may have a common effect on large audiences, the effect would not be universal. Different responses by particular audience members can be attributed to their existing frameworks.

In his seminal work, Goffman (1974) noted that when individuals encounter particular events they would apply "one or more frameworks or schemata of interpretation" (p. 21). Scheufele (2000) also noted that framing invokes interpretive schemas, thus influencing interpretation of incoming information. This allows for individual differences in interpretation based on personal experience or knowledge. Therefore, the act of highlighting certain aspects of a story and playing down other aspects of that same story will lead audience members to have differing reactions to the same story (Entman, 1993).

Cultural Bias

Information is also framed because of personal and cultural biases—intended and unintended. Bias is introduced when reporters begin to interpret facts, straying from objective reporting (McQuail, 2005). News stories regarding international incidents are

often reported in very different ways, depending on the cultural biases of the reporter

(McQuail, 2005). The resulting frames will depend on political factors, public opinion,

country of origin and differences in media systems. These ingrained influences make it

nearly impossible to report just the facts. Framing happens regardless of intention.

Entman (1993) wrote that "journalists may follow the rules for 'objective' reporting and

yet convey a dominant framing of the news text that prevents most audience members

from making a balanced assessment of a situation" (p. 57). Even the most ethical and

objective reporters will inherently introduce cultural biases.

Cultural values also affect how costs and benefits will be assigned to a particular

news story. It is because of frames that causes are diagnosed and moral judgments are

assigned (Entman, 1993). With regard to complex issues such as the environment, the

reporter or news organization often assigns moral judgments and values.

Verbiage

Verbiage is an important part of the framing process. Once certain terms become

accepted, the language itself has power over audience interpretations. The use of "certain

words or phrases" (McQuail, 2005, p. 378) can be used to convey specific meanings.

Verbiage is so integral to framing that straying from commonly accepted terms might

result in a loss of understanding. Entman (1993) wrote:

> Once a term is widely accepted, to use another is to risk that target audiences will
> perceive the communicator as lacking credibility or will even fail to understand
> what the communicator is talking about. Thus the power of a frame can be as
> great as that of language itself. (p. 55)

The media play a crucial role in reinforcing verbiage as it relates to a problem or an issue.

Carvalho (2005) noted that "the media are a crucial site for the definition and re-

definition of meanings associated with climate change" (p. 2). The ability of the public to understand environmental issues depends largely upon how such issues are constricted by media verbiage, and without public understanding there can be no public debate or resolution (Carvalho, 2005).

Prior to 1988, the term "greenhouse effect" was referenced almost exclusively in discourse on climate change (Carvalho, 2005). However, "global warming" gained popularity and by 1990 was the most commonly used term for climate change in the news media (Carvalho, 2005). In 2002, the Republican Party began to coin the term climate change as part of a political move to dominate debates on environmental issues (Bolstad, 2007). Since then, climate change has become the preferred scientific term because it is more encompassing (Intergovernmental Panel on Climate Change, 2007). Climate change refers more to change in the climate due to multiple causes, while global warming is more specifically attributed to human influence; it remains a partisan debate (Bolstad, 2007). Today, both climate change and global warming are widely accepted terms but carry very different connotations (Bolstad, 2007). Many Democrats continue to use the term global warming (Bolstad, 2007). The use of one term or another indicates a preference of the sender in how they view the topic or want the receiver to view the topic, thus framing it through verbiage.

Application of Frames

Not all frames are one-sided, and a single frame can be used to convey conflicting messages. A study by Dahinden (2002) found that frames are not entirely positively or negatively evaluated, and that there is a certain amount of ambivalence in each frame.

Results showed that the most common positively evaluated frames used in the biotechnology debate in Switzerland were globalization, progress, and economic prospect. In the same study, the three most common negatively evaluated frames were the runaway frame, Pandora's Box, and globalization (Dahinden 2002). Most frames are more commonly valued one way or the other and fit well with their theoretical definition, but can be used either positively or negatively depending on the specificity of the definition.

The power of a frame can also be conveyed through the relevance and application to a number of different issues. Whereas issues come and go, frames remain constant over time (Dahinden, 2005). Furthermore, frames are independent of issues; although a multitude of frames can be applied to a singular event, a single frame can be applied to several different issues (Dahinden, 2005). Frames are constructed through a number of overarching personal schemas and cultural beliefs. Therefore, they can be applied to a number of different topics.

Science in the News

Climate change is increasingly becoming a topic worthy of coverage in the U.S. Coverage on climate change has ebbed and flowed over time, peaking in the late eighties and again in the late nineties (Carvalho, 2005). Boykoff (2007a) found that newspaper coverage of climate change in U.S. prestige-press had recently increased by about two and a half times between 2003 and 2006. Boykoff (2008a) found that network television evening news coverage of climate change increased from less than 10 news segments in 1995 to over 20 in 2004, with a spike of over 40 segments in 1997.

Fair and Balanced Reporting

The attempt to provide balance and objectivity to a story is a long-standing tradition in journalism. Gamson and Modigliani (1989) stated, "In news accounts, interpretation is generally provided through quotations, and balance is provided by quoting spokespersons with competing views" (p. 8). The "journalistic norm" of fair and balanced reporting seems to hold especially true in the reporting of science and climate change.

It has been common practice for journalists to provide "balanced" coverage of climate change; despite a general scientific consensus stating that climate change is happening (Antilla, 2005; Boykoff & Boykoff, 2007; Smith, 2005). The attempt to provide a balanced report often leads to the introduction of even more bias, with the claims of special interest groups being validated through news coverage (Antilla, 2005).

In the case of global climate change, introducing dissent is largely problematic, especially when the scientific community agrees (Corbett & Durfee, 2004). Special interest groups that have also been referred to as "climate contrarians" are responsible for introducing much of the dissent in the debate over climate change (Boykoff, 2007b). The climate contrarians are known for spouting "ignorance claims" (Holstein & Stocking, 2006) and adhering to strict rhetoric to get their message out through the media (Boykoff, 2007b).

A study by Foust and O'Shannon Murphy (2009) supported these findings. They found that the apocalyptic framing of climate change opened the findings of the scientific community to objection and pointed to environmentalists as scaremongers. This frame

also removes the responsibility for global warming from humans, blaming it on fate instead (Foust & O'Shannon Murphy, 2009).

A study by Holstein and Stocking (2006) on environmental concerns surrounding the hog industry found that the treatment of opposing claims depended largely on journalists' perceptions of their own role. Some journalists in the study said their role as a journalist depended on a number of factors, including their understanding of science and perceptions of their audience. In some cases, journalists felt it was fair to make their own assessment of the validity of scientific studies, while in other cases journalists refrained from making assessments and simply presented the facts for both sides of the story.

Yet recently Boykoff (2007a) noted that stories depicting anthropologic contributions as the main source of climate change increased by over 30% between 2003 and 2006. Whereas balanced accounts accounted for 37% of the newspaper articles related to climate change in 2006, they were present in only 3% of stories in 2003. Furthermore, in an examination of both mainstream and alternative news sources, Kenix (2008) found that very little of the climate change coverage portrayed the issue as a topic still up for debate. Only 14% of the articles examined for both mediums mentioned any debate about the causes of climate change (Kenix, 2008).

Episodic Versus Thematic Coverage

Despite its growing prevalence in mainstream media, recent studies have found that coverage related to climate change has been episodic in nature (Boykoff & Boykoff, 2007; Check, 1995; Hutchison, 2008; Nitz & Ihlen, 2006; von Storch & Krauss, 2005).

Episodic, as opposed to thematic framing, covers issues in relation to certain events. Iyengar (1991) stated:

> The episodic news frame takes the form of a case study or event-oriented report and depicts public issues in terms of concrete instances. The thematic frame, by contrast, places public issues in some more general or abstract context and takes the form of a "takeout" or "backgrounder," report directed at general outcomes or conditions. (p. 14)

Episodic coverage does not allow for the same type of interpretation as that of thematic coverage. Taking into account the complexities of climate change, episodic coverage oftentimes does not provide a complete picture of the issue (Boykoff, 2007b; Boykoff & Boykoff, 2007). In the case of climate change, this creates a problem of consistency and context.

Because of its episodic nature, coverage of climate change has thus ebbed and flowed over time (Boykoff, 2007b). Peaks in coverage have been attributed to key events surrounding the topic. These events include the release of Al Gore's documentary *An Inconvenient Truth* and media attention on the Twelfth Conference of the Parties to the United Nations Framework Convention on Climate Change (Boykoff, 2007b). Event-related reporting was visible in coverage of the biotechnology debate in Switzerland. Nisbet and Lewenstein (2002) found that coverage on biotechnology peaked in the time surrounding major conferences, Congressional hearings and related legislation, breakthroughs in technology and growth of stock.

Coverage of politics on European television has also been found to be episodic rather than thematic in nature, focusing on events within the past 24 hours (Semetko & Valkenburg, 2000). This type of episodic coverage lacked in both context and

interpretation, therefore discouraging further analysis of why the event occurred (Check, 1995). Furthermore, issues that are reported as episodic are in danger of going unreported for long periods of time, until another event brings the issue back into the media (Nisbet & Lewenstein, 2002).

In order to understand climate change, context must be provided. Corbett and Durfee (2004) found that providing context to a story about climate change led to higher levels of certainty about climate change; the reverse was true when context was not provided. Results fell in the middle in cases where context and controversy were provided throughout the story. Furthermore, episodic coverage does not allow for audiences to see the entire picture. Iyengar (1991) posited that episodic coverage might be one reason why Americans cannot see interconnections on various issues in the media. The risk of episodic coverage is that many issues of significance may not be included in news coverage; therefore citizens cannot critically observe national affairs (Iyengar, 1991).

Episodic coverage can also affect policy decisions and the decision-making process. Nitz and Ihlen (2006) noted that "episodic coverage makes it more difficult for policy-makers and stakeholders to come together to make decisions on complex environmental issues" (p. 21). A study released by the Pew Research Center for the People and the Press found that whereas in April 2008, 71% of people surveyed believed that there was "solid evidence that the earth is warming," that number fell to 57% in October 2009 ("Pew Research Center for the People and the Press," 2009).

The same study found that 50% of the people surveyed favor putting limits on carbon dioxide emissions and making companies pay for their emissions, while 36% oppose the idea (Pew Research Center for the People and the Press, 2009). The results indicate a clear split on opinion related to the importance of and policy issues having to do with climate change despite a scientific consensus.

Sources used in the reporting of climate change are also an important factor in determining credibility of information about climate change. Nisbet and Lewenstein (2002) stated that "government agencies and scientists are widely considered credible and necessary authorities in matters of scientific and environmental uncertainty" (p. 386). When the quoted sources are more credible, the story and topic become more credible.

Research on the frames used to report climate change has provided conflicting results. One of the more common frames used for portraying climate change in the media has been that of contention (Antilla, 2005; Boykoff, 2007b; Nitz & Ihlen, 2006). Boykoff (2007b) supported this and noted that the framing of climate change has been that of "conflict and contentions" despite the scientific consensus surrounding climate change. These findings were supported by Hart (2008) in a study of CNN and Fox News broadcasts, with the most common frame being that of scientific uncertainty on both CNN and Fox. Antilla (2005) found numerous examples of articles framed as valid science. However, debate controversy and uncertainty were also well represented in the sample.

It is clear that the ways in which science is reported can cause confusion. A lack of general scientific knowledge, by both the reporter and audiences, causes the reporter to

make an even greater effort to be fair and balanced. Boykoff (2007b) noted, "Through framing—constructed through processes of power and scale—media coverage of anthropologic climate change can depict an arena of great confusion and intense conflict rather than scientific consensus" (p. 478).

Effects of Framing

The presentation of news stories has an impact on the ability of a story to garner audience attention. Graber (1984) found that panelists "showed some preference for front-page and front-section stories, for big headlines, and for spreads with pictures" (p. 112). However, prominent headlines and pictures did not a direct correlation with perceived importance (Graber 1984). Although a story may be framed a certain way through page placement, pictures and other visual cues, audience members may simply notice the story but not view it as important.

Also, the repetition of certain fames throughout a news story or series of stories keeps that frame in the minds of the public and legislators. In an examination of dominant frames used in the Columbine tragedy, it was found that frames that were repeated often in news stories—like gun control—were given greater authority and were therefore on the forefront of new legislation (Graber, 2002).

Frames often affect blame and assignment of responsibility on a number of topics. Iyengar (1989) stated that "the manner in which the news media frame national issues powerfully affects beliefs about cause and treatment" (p. 897). In fact, frames have been said to have more powerful effects than that of persuasion or call to action (McQuail,

2005). Sheufele (2000) said that "framing influences how audiences think about issues" (p. 309).

Public Opinion

Framing has the power to affect overall public opinion. First, news coverage has the ability to highlight and bring forth certain issues onto the public agenda. Next, the framing of those objects has the ability to impact "the pictures of those objects in our heads" (McCombs, 1997, p. 48). Both aspects of framing have the power to impact attitudes, opinions and public behavior (McCombs, 1997).

The frames used to cover climate change are important because of the possible effect these frames may have on public discourse. Nitz and Ihlen (2006) noted that "frames are potentially very powerful in impacting both portrayal and understanding of environmental issues" (p. 19). The authors also noted that a lack of media coverage on a particular issue might make it difficult for policymakers to communicate with the public. This is an important concept to consider as public opinion will be affected by political and media frames. Entman (2004) concluded that "public opinion cannot be divorced from the political discourse and media frames that surround it" (p. 142).

Analytical Framework

The analytical framework is based on works that focus on the framing process and how information is made salient in news stories. For this reason, Entman's (1993) important works regarding the framing process will be referenced, along with his idea of framing as a means to promote a specific problem by highlighting it and thus making it more salient to the audience. The study will also focus on episodic framing, using the

works of Iyengar (1991) to explain the implications of episodic rather than thematic coverage. Nisbet and Lewenstein (2002) will be heavily referenced, as their work highlighted the importance of sources in the reporting of climate change. The authors state that the more credible the sources, the more credible the story. The physical framing of media content will also be accounted for, noting that placement, headlines and use of pictures all convey nonverbal messages to the reader. For this reason, the works of Fortunato (2005) and Schramm (1971) will be referenced. Carvalho's (2005) work will be referenced, as it refers to the importance of verbiage in the public perceptions and reporting patterns of climate change over time.

Specific frames will be identified from more recent studies on the coverage of science and climate change in the news. Studies of significant importance include that of Antilla (2005), Gamson and Mogdalini (1989), and Neuman, Marion, and Crigler (1992). Last, the studies of Boykoff (2007a), Boykoff (2007b), and Boykoff and Boykoff (2007) will be relied upon because of the vast amount of research on climate change, specifically in American elite newspapers. These studies will provide a strong base for comparing and contrasting works from this study. The IPCC report is also an important tool for this study because of its conclusive evidence that climate change is happening, mainly due to human influence.

IPCC Reports

As noted earlier, this paper is not concerned with the specific cause of climate change, only the way in which climate change is framed. However, it is also important to define climate change for the purpose of the proposed study. This paper will work from

the IPCC's definition of any changes to the climate without concern for the specific

cause. The IPCC (2007) noted:

> Climate change in IPCC usage refers to a change in the state of the climate that
> can be identified (e.g. using statistical tests) by changes in the mean and/or
> variability of its properties, and that persists for an extended period, typically
> decades or longer. It refers to any change in climate over time, whether due to
> natural variability or as a result of human activity. (p. 30)

This definition allows for a broad exploration of climate change as it is portrayed

in the media. For the purposes of this study, the term "climate change" will be used

primarily as it has become commonly accepted and encompasses a larger range of issues

related to the climate than the terms "global warming" or "greenhouse effect." Global

warming refers more specifically to the warming of the Earth's surface

(Intergovernmental Panel on Climate Change, 2007).

Publications

The strength of news magazines lies in their in-depth coverage on issues. More

detailed information, in-depth coverage and an analytical view of events is available in

news magazines because of their weekly news cycle, unlike those of newspapers or

television (Griffin, 2004). Neuman et al. (1992) stated that "coverage in weekly news

magazines contains a greater number of contextual and expository elements" than other

media (p. 58). Expository elements refer to the ability of the article to relay information

to the reader in a clear, well-organized fashion ("Information about expository writing,"

2009). And overall, news magazines provide more contextual information than

newspapers and television news coverage (Neuman et al., 1992). Oftentimes, news

magazines can compress, elaborate upon and critique their daily counterparts (Griffin, 2004).

Additionally, because of the detail and complexity of issues, news magazines typically use well-respected sources on major policy issues. Neuman et al. (1992) noted that news magazines contain "more references to expert sources, definitions of terms and concepts, and more analysis of the causes and consequences, and possible policy outcomes" (p. 58). It is these strengths, and their availability to the general public, vast reach and their in-depth coverage on major issues, that make news magazines an appropriate medium for studying the coverage of climate change.

Newsweek. Newsweek was first published on February 17, 1933, and covers world events on the topics of business, science, arts and entertainment, technology, and society (History of Newsweek, 2007). Newsweek's circulation is 2,646,613 (Audit Bureau of Circulations, 2009). Newsweek's large circulation makes it an appropriate medium to study because of its vast reach and influence on the general population.

U.S. News and World Report. U.S. News and World Report was born from the merger of two magazines, United States News and World Report, both published by David Lawrence ("U.S. News history," 2007). The magazines merged in 1948, creating what is currently known as U.S. News and World Report ("U.S. News history," 2007). The magazine's circulation is 1,365,652 (Audit Bureau of Circulations, 2009). U.S. News and World Report has been selected because of its circulation and reach within the U.S.

Maclean's. Maclean's is "Canada's only national weekly current affairs magazine" and was purchased in 1904 by Canadian entrepreneur and journalist Lt.-Col. John Bayne Maclean (Maclean's, n.d.). Operating as a business journal The Business Magazine, and then a few years later as The Busy Man's Magazine, it settled on Maclean's in 1911 (Maclean's, n.d.). It was then that Maclean's began to include articles on politics, art and fiction (Maclean's, n.d.). Today, Maclean's circulation is 355,054 (Audit Bureau of Circulations, 2009). Maclean's prides itself on "strong investigative reporting and exclusive stories from leading journalists in the fields of international affairs, social issues, national politics, business and culture" (Maclean's, n.d.). Although Maclean's has the smallest subscription base of the four magazines, it is the only weekly news magazine in Canada (Maclean's, n.d.), thus making it the news magazine of the nation and appropriate to include in the study.

The Economist. The Economist was established in 1843 as a "political, literary and general newspaper" (The Economist, n.d.). Printed once a week, The Economist has a circulation of 810,821 for its North American Edition (Audit Bureau of Circulations, 2009) and prides itself on the magazine's "extreme center" political position (The Economist, n.d.). Readers everywhere, no matter what edition they receive, receive the same editorial content, except for the British Edition, which has a few extra pages devoted to British news. Although The Economist has a circulation of only 800,000 in the U.S., it is distributed in over 200 countries, selling over 1 million copies each week (Worldwide circulation, 2008). Its large worldwide circulation, world views and

availability to the general public make The Economist a leader among news providers and appropriate to include in the study.

As stated above, the in-depth coverage and reliance on expert sources make news magazines an appropriate medium to study the coverage of climate change. More specifically, each of the publications chosen has a broad circulation, making them largely available to the general public.

Hypotheses

Because the terms "global warming" and "greenhouse effect" carry a politicized connotation and are less scientific, the nature of news coverage may also be more politicized. Given the recent shift to the term "climate change" in 2002, which carries a more generally accepted scientific connotation, a shift in news content would also be foreseeable. In addition to the updated verbiage, because news magazines are able to provide more in-depth coverage, it is possible that coverage would move away from episodic and toward thematic. Conversely, articles appearing prior to 2002 would appear more episodic.

> H1: The depth of coverage in articles appearing on or after January 1, 2002, was more likely to be thematic rather than episodic than in articles appearing before that date.

Because of the increased popularity of climate change as a global topic, the salience of climate change articles is also likely to increase. This increase can be measured by the presence or absence of a visual element.

H2: Articles appearing on or after January 1, 2002, are more likely than articles

appearing before that date to include a visual element (picture, photograph, chart,

illustration, graph, or other).

With regard to salience and the increased popularity of climate change as a

mainstream news topic, it is likely that articles would begin to appear in areas other than

science and technology. Likely new categories include world news, cover stories and

special features.

H3: Articles appearing on or after January 1, 2002, are more likely than articles

appearing before that date to be published in areas other than science and

technology.

Research Questions

RQ1: What frames are used to portray climate change and do the frames change

over time?

RQ2: Are the frames in each of the publications different or the same as the

others?

RQ3: Considering the frames presented, to whom are they attributed, if anyone?

CHAPTER III

Method

The purpose of this study was to analyze and determine the dominant frames used in the reporting of climate change. A quantitative framing analysis of 687 news articles was used to answer the research questions presented in Chapter II. The sample will be drawn from *Newsweek*, *U.S. News and World Report*, *Maclean's,* and *The Economist* for the past 20 years in four-year increments. Years analyzed will include 2009, 2005, 2001, 1997, 1993, and 1989. Each article will be coded for a primary and secondary frame, the tone of the article, how the science is framed, and other variables such as section of the magazine, length (in words), and inclusion or absence of a visual element. A qualitative study will also analyze additional themes within the articles.

The Sample

The sample was drawn from *Newsweek*, *U.S. News and World Report, Maclean's* and *The Economist* for the years 2009, 2005, 2001, 1997, 1993, and 1989. Articles for all four publications were identified through a Lexis/Nexis Academic search of the San Jose State University library database. Search parameters stipulate that either "climate change" or "global warming" or "greenhouse effect" appear at least once within the article. The terms "climate change," "global warming," and "greenhouse effect" have been chosen because of their history as commonly accepted terms used in media discourse to describe what is now most commonly referred to as climate change (Carvalho, 2005).

The years indicated were chosen so that the frames used to cover climate change could be analyzed over time. Rather than a snapshot of the dominant frames used in one year, this study will provide a comprehensive picture that will analyze changes over 20 years. Additionally, because of the variety of sources, the researcher was able to analyze any differences between coverage of the two American news magazines and their Canadian and British counterparts.

Of the 687 articles identified in a preliminary search, articles were eliminated based on a number of factors. First, each article had to contain at least one sentence dedicated to climate change to qualify for the sample. If one of the terms was mentioned only in passing it did not qualify for the sample. Eliminated articles also included letters and duplicates that were published in more than one edition of a certain news magazine. The total number of articles analyzed in the sample was 476.

The unit of measure for the study was an article. Each article was coded for the presence of a number of frames related to climate change. Each paragraph within the article was examined for the appropriate frame and counted. The frame that was identified most often, the most prevalent frame, was coded as the primary frame.

Frame Definitions

Primary frames. Fifteen primary frames were identified for this study. Twelve of the fifteen frames were drawn from a previous study by Boykoff (2008b). Three of the frames were identified by the researcher during the pre-test. The frames are listed and defined below:

1. **Weather events** – Text that focuses on the weather as a cause or result of climate change. This includes heat waves, droughts, floods, etc. (Boykoff, 2008b).

2. **Biodiversity** – Text that focuses on the loss of or change in populations of plant/animal biodiversity on the planet or a changing physical landscape to the Earth (Boykoff, 2008b).

3. **Political actors** – Text that addresses any type of political activity as it relates to climate change. This includes United Nations meetings, rhetoric, action, legislation, etc. (Boykoff, 2008b).

4. **Economics** – Refers to the costs of climate change, including costs to individuals, governments and future generations (Boykoff, 2008b).

5. **Business** – Text that addresses big business, the cost of business, the changing business climate and industrialization as they relate to climate change.

6. **Popular culture** – Text that addresses climate change and its effect on pop culture or changes in pop culture that relate to climate change. This includes celebrity movements, the royal families, films and books, etc. (Boykoff, 2008b).

7. **Justice and risk, public health** – Text that focuses on how climate change will affect the public as a whole or how it affects different populations differently. This includes ethics, inequality, adaptation, disease, etc. (Boykoff, 2008b).

8. **Transport** – The movement of people or goods and how this action affects and/or is related to climate change (Boykoff, 2008b).

9. **Public understanding, knowledge, education** – Text that addresses the public's understanding of climate change. This includes poll results, consumer reports, educational programs, etc. (Boykoff, 2008b).

10. **Religion** – Any text that frames climate change in relation to God, religion or religious practices.

11. **Stewardship** – This frame encompasses any text that talks about humans and their relationship with the Earth, more specifically climate change. This includes humans as the cause of climate change, humans desecrating natural resources, or a responsibility to restore Earth to a natural state.

12. **Discoveries, new studies** – Text that focuses on scientific progress that has been or will be enacted (Boykoff, 2008b).

13. **Science and funding processes** – The process or function of science as it relates to climate change (Boykoff, 2008b).

14. **Applied science and technology** – New technology that will combat, enhance or neutralize the effects of climate change. This includes renewables, alternative energy, etc. (Boykoff, 2008b).

15. **General** – Other (Boykoff, 2008b).

Scientific frames. In addition to primary and secondary frames, articles will be coded for a number of other framing cues. Articles will be coded for the way in which the validity of the science of climate change is framed. The definitions used were drawn from a previous study by Antilla (2005), and the researcher added an additional framing category. Definitions for framing of the science are listed below:

1. **Valid science** – Any article that does not introduce skepticism or the research or climate change. Oftentimes, authors of scientific research will be introduced as a source (Antilla, 2005).

2. **Neutral** – Articles that do not portray climate change as contentious, uncertain, valid or ambiguous. Climate change may be asserted as a fact, yet no sources are provided.

3. **Ambiguous case and effect** – Articles that fall under this classification will oftentimes deemphasize scientific findings. The effects of climate change may be obscured, or the positive effects may be talked about in a satirical manner. Or, the underlying theme may focus on another topic altogether, such as wine making, ski resorts, etc. (Antilla, 2005).

4. **Uncertain science** – Similar to the balanced coverage, as discussed by Boykoff and Boykoff (2007), this classification introduces a balanced perspective, thus introducing bias. This classification will often include scientific studies or findings; yet also introduce balance or a lack of consensus within the scientific community (Antilla, 2005).

5. **Controversial science/contention** – This classification will include articles that introduce rhetoric, typically introduced by climate skeptics who often have fossil fuel industry ties (Antilla, 2005).

Depth of coverage. The depth of coverage in the article will also be framed as either episodic or thematic. Definitions are as follows:

1. **Episodic** – Articles are depicted in a concrete sense, often reporting in an event-oriented style. This type of article may also take the form of a case study and will typically focus on what is happening right now, rather than giving background or context (Iyengar, 1991).

2. **Thematic** – Articles tend to be more abstract in nature, focusing on outcomes and solutions. These articles will oftentimes include a large amount of background information (Iyengar, 1991).

Data

In addition to frames, articles were coded for a number of additional variables that relate to framing. With relation to the framing process, source attribution for quotes was coded and counted within each article. A number of physical attributes were also accounted for. Physical attributes included: the inclusion or absence of a visual element, including pictures, graphs, maps, illustrations, or charts; the section in which the article appears (including if the article is a cover story); the length of the story (determined by number of words); and the number of paragraphs within each story that contain a frame. The appendix includes a complete list of coding measures.

Pre-test

A pre-test was conducted with the purpose of testing the coding scheme and to identify any new frames or glitches in the coding process. Four articles from each year preceding the years to be studied (1988, 1992, 1996, 2000, 2004, and 2008) were chosen for the pre-test. Articles were selected at random.

Intercoder Reliability

The researcher was the primary coder in the study. To determine validity, a second coder analyzed 48 of the 476 articles, which were selected at random, and coded appropriately. Intercoder reliability was determined using a Scott's pi test. Intercoder reliability must fall within 100% to 80% of the primary coder's results.

The Scott's pi formula is seen below.

$$\text{pi} = \frac{\text{\% observed agreement} - \text{\% expected agreement}}{1 - \text{\% expected agreement}}$$

Eight of 25 variables yielded a Scott's pi of .1 (100%). The agreement of the remaining 17 variables ranged from .80 (80%) and .97 (97%). The appendix includes a complete list of Scott's pi results.

A chi-square test will be carried out to determine any statistically significant relationships between nominal variables within the sample. Ratio level data will be assessed using a one-way analysis of variance (ANOVA).

CHAPTER IV

Results

The objective of this study was to determine the frames used to portray climate change in *Maclean's*, *Newsweek, The Economist,* and *U.S. News and World Report* from 1989 to 2009. The study examined a number of framing techniques, including the depth of coverage of the article (episodic vs. thematic), how the science of climate change was framed, in what section of the publication the articles appeared, and if the articles included some type of visual element. In total, 476 articles were coded, including 78 from *Maclean's*, 137 from *Newsweek*, 178 from *The Economist*, and 79 from *U.S. News and World Report*. By examining the frames used to portray climate change in these four publications over the given time period, it becomes clear how the issue of climate change is presented to the general public.

Overview

This section is a brief overview of the primary frames used to portray climate change, the framing of the science, and the overall tone of the articles. Fifteen primary frames were apparent in the analysis of the selected articles. Although all fifteen frames were present in the study, the analysis will focus on the five major sets of frames. A set consists of one or more similar frames that can be grouped into an overarching category. The five sets of frames used were: biological/meteorological, political-economic, culture and society, scientific, and general.

It was found that all four publications focused on climate change as a political issue, rather than the actual science of the issue or impact on society and culture. The

political-economic frame accounted 274 articles (57.6%), followed by the culture and society frame with 80 articles (16.8%) and the scientific frame with 73 articles (15.3%).

Political-Economic Frame

The political-economic frame was by far the most predominant frame found during the study, it accounted for 274 articles (57.6%) of the entire sample. This frame consisted of three subcategories that included political, economic, and business. Of the three subcategories, the political frame was the most predominant, accounting for 232 articles (48.7%), followed by the business frame, accounting for 29 articles (6.1%), and finally the economic frame, accounting for 13 articles (2.7%) of the entire population. Political articles focused primarily on possible legislation to regulate climate change and governments taking responsibility for emissions. Many of the articles were concerned with the ratification of the Kyoto protocol and its related issues. Another major topic that was included under the political frame was the nuclear debate; this frame often discussed United States efforts to move away from carbon emissions or the politics and governmental support for nuclear power.

Culture and Society Frame

Culture and society was the second most predominant frame represented throughout the articles with 80 total articles (16.8%). The culture and society frame consisted of six subcategories, including popular culture, justice and risk, transport, public understanding, religion, and stewardship. The largest subcategory was that of justice and risk, accounting for 32 of the articles (6.7%). Articles falling under the justice and risk category were likely to discuss the effect of climate change on different

populations throughout the world. Other articles within the category covered the health hazards of climate change upon the human race or certain populations of the human race. The second largest subcategory was that of public understanding, accounting for 21 articles (4.4%). Articles in this category often discussed poll results or ways in which to increase the understanding of the issue of climate change among the general public. The remaining four subcategories, popular culture, stewardship, religion, and transport, accounted for 18 articles (3.8%), 6 articles (1.3%), 2 articles (0.4%) and 1 article (0.2%), respectively.

Scientific Frame

The scientific frame accounted for 73 of the articles (15.3%). Within this category, the discovery frame was the largest subcategory, accounting for 30 articles (6.3%). This frame discussed new findings and research regarding climate change. Many instances consisted of new climate modeling computer programs. Another major source was the IPCC study that was released in 2007. The applied science category accounted for 26 articles (3.6%). This frame primarily discussed the need for alternative, clean energy sources. Nuclear power was often discussed as an alternative clean energy, as were wind and solar power. The scientific funding subcategory accounted for 17 articles (3.5%). This frame was predominant during 2005 and 2009 when articles began to examine the actual models that were being used to study climate change. Many times, weaknesses of scientific models were discussed as a problem to forecasting or proving climate change.

Ecological/Meteorological Frame

The ecological/meteorological frame accounted for 42 articles (8.8%) within the sample. Within this category, the weather events category accounted for 28 articles (5.9%). The weather frame was typically used in the instance of a natural disaster, such as Hurricane Katrina, or a heat wave or drought. This frame was often introduced as an explanation for the rare weather event or to explain the increased frequencies of such events. The biodiversity subcategory accounted for 14 articles (2.9%). This frame discussed the loss of plant and/or animal life due to climate change.

General Frame

The general frame, also known as other, accounted for 7 articles (1.5%) within the sample. This frame was rarely present as the majority of articles fit within one of the other 14 frames.

Hypotheses

Hypothesis 1. The depth of coverage in articles appearing on or after January 1, 2002, was more likely to be thematic rather than episodic than in articles appearing before that date.

Although it was found that there were twice as many thematic articles as there were episodic articles across the four publications after January 1, 2002, a chi-square test demonstrated that the differences were not statistically significant. However, the p= .091 indicates that a trend towards thematic rather than episodic articles does exist. Results of the chi-square are shown in Table 1 on page 38.

Table 1

Depth of Coverage Prior to 2002 and After 2002

	N=476	
	Prior to 2002 (*n=327*)	After 2002 (*n=149*)
Depth of Coverage	Percent	Percent
Episodic	41%	32%
Thematic	59	67

$X^2(1, N = 476) = 2.833, p = .092$

      Upon examining the data specific to each publication, a chi-square test indicated that a statistical significance did exist in for articles published in *The Economist* by a factor of .051, partially supporting the hypothesis. Results are shown in Table 2.

Table 2

Depth of Coverage Used by the Economist Prior to 2002 and After 2002

	N=179	
	Prior to 2002 (*n=127*)	After 2002 (*n=52*)
Depth of Coverage	Percent	Percent
Episodic	43%	27%
Thematic	57	73

$X^2(1, N = 179) = 3.810, p = .051$

Hypothesis 2. Articles appearing on or after January 1, 2002, are more likely

than articles appearing before that date to include a visual element (picture, photograph,

chart, illustration, graph, or other).

Because articles were coded for the number of times each of the groups of visual

elements appeared, a one-way analysis of variance (ANOVA) test was performed. The

test supported the hypothesis for three of the six groups of visual elements. Significance

factors for the three groups were as follows: picture/photograph .003; illustration/drawing

.001; and graph/chart/diagram .006. See Table 3 for results. The hypothesis was not

supported for the following three groups: map, cover photo, or other.

Table 3

Analysis of Variance for Visual Elements Used Prior to 2002 and After 2002

Visual Element	mean	*df*	*MS*	*F*	*p*
		Between groups			
Picture/photograph	4.712	1	22.201	8.722	.003
Illustration/drawing	1.417	1	2.008	10.354	.001
Graph/chart/diagram	1.158	1	1.340	7.652	.006

Hypothesis 3. Articles appearing on or after January 1, 2002, are more likely

than articles appearing before that date to be published in areas other than science and

technology.

Hypothesis 3 was not supported. In fact, the science and technology category

only accounted for 43 articles within the sample (9%) with 30 articles (9.2%) appearing

before 2002 and 13 articles (8.7%) after that date. The most common section in which articles appeared was international/world, which accounted for 90 articles (18.9%) within the total articles, with 53 articles (16.2%) appearing before 2002 and 37 articles (24.8 %) appearing after 2002.

Research Questions

For the purpose of examining the primary frames, the 15 sub-sections were grouped into five major categories: ecological/meteorological; political-economic; culture and society; scientific; and general.

Research question 1. What frames are used to portray climate change and do the frames change over time?

A chi-square test revealed that there was a statistically significant difference of .007 for the frames used within the six time periods; see Table 4 on page 41. The most common primary frame across all six time periods was the political-economic frame. This frame accounted for 33 articles (43%) in 1989, and 40 articles (57.1%) in 2009, but peaked at 85 articles (64.9%) of the articles in 2001. The second most popular frame overall was the culture and society frame, accounting for 80 total articles (16.8%), peaking in 2009 with 17 articles (24.3%). The scientific frame, which was the second most frequent frame in 1989, and the ecological meteorological frame, which was the third most common frame in 1989, were ranked third and fourth respectively by 2009. The culture and society frame moved from the fourth most frequent frame in 1989 to the second most popular frame in 2009.

Table 4

Primary Frames Used in 1989, 1993, 1997, 2001, 2005, and 2009

	N=476					
	1989 (*n=76*)	1993 (*n=26*)	1997 (*n=94*)	2001 (*n=131*)	2005 (*n=79*)	2009 (*n=30*)
Primary Frame	Percent	Percent	Percent	Percent	Percent	Percent
Ecological/ Meteorological	15%	15%	10%	8%	9%	1%
Political-economic	43	46	57	65	65	57
Culture and society	12	15	19	18	11	24
Scientific	25	23	13	10	14	17
General	5	0	2	0	1	0

$X^2(20, N = 476) = 38.849, p = .007$

The framing trend indicates that the political-economic frame is statistically the most frequently used frame in the portrayal of climate change. Additionally, the culture and society frame ultimately became more frequent than the scientific frame, from 1997 through 2009. This indicates a shift in framing away from the actual science of the issue to it being portrayed as a cultural and societal issue.

Research question 2. Are the frames in each of the publications different or the same as the others?

Upon examining differences between publications no statistically significant differences were revealed. Within each publication, the political-economic frame was the most popular, followed by culture and society, scientific, ecological/meteorological, and

general, respectively. The one exception to this ranking was that the scientific and ecological/meteorological frames tied in *U.S. News and World Report.*

Framing the science. The most frequent category with regard to framing the science of climate change was neutral. This category accounted for 45% of the overall articles. Valid science was the second most common category with 30.5% of the articles, followed by uncertain science at 14.1%, ambiguous cause and effect at 9.2% and contention at 1.3%. When analyzed across the two time periods, before 2002 and after 2002, a statistically significant difference does exist, which is indicated by a p of.001; see Table 5.

Table 5

Framing of the Science Prior to 2002 and After 2002

	N=476	
	Prior to 2002 (*n*=327)	After 2002 (*n*=149)
Science	Percent	Percent
Valid science	20%	54%
Neutral	53	27
Ambiguous cause and effect	12	4
Uncertain science	14	15
Contention	2	0

$X^2(4, N = 476) = 65.691, p = .001$

The difference seen in Table 5 indicates that prior to 2002 articles were most frequently framed as neutral, accounting for 174 articles (53.2%), followed by valid

science, accounting for 64 articles (19.6%). Ambiguous cause and effect accounted for

38 articles (11.6%), uncertain science accounted for 45 articles (13.8%) and contention

accounted for six articles (1.8%). In the time period after 2002, the data indicates a shift

towards framing the science as valid, which accounted for 81 articles (54.4%).

Interestingly, articles tend to shift away from framing the science as neutral or ambiguous

with a slight increase in the category of uncertain science accounting for 67 articles

(14.1%) of the sample.

Upon evaluating the sample for difference in publications, a significant difference

of p= .007 existed in 2001. In this year, *U.S. News and World Report* was the only

magazine to frame five articles (27.8%) as uncertain science, the next closest was

Newsweek with two articles (5.3%), and both *The Economist* and *Maclean's* had none;

see Table 6 on page 44. *U.S. News and World Report* tended to frame the science in a

more polarized fashion than the other three publications, as either valid/neutral or

uncertain.

Table 6

Framing of the Science in 2001 used by Maclean's, Newsweek, The Economist, and U.S. News and World Report

	N=131			
	Maclean's (*n*=18)	*Newsweek* (*n*=38)	*The Economist* (*n*=57)	*U.S News* (*n*=18)
Science	Percent	Percent	Percent	Percent
Valid science	28%	16%	23%	28%
Neutral	61	74	70	44
Ambiguous cause and effect	11	5	5	0
Uncertain science	0	5	0	28
Contention	0	0	2	0

$X^2(12, N = 131) = 27.373, p = .007$

Additionally, in 2005 a significant difference existed, indicated by *p*= .021; see Table 7 on page 45. In this year, while no publication framed any articles as contentious science, *Maclean's* was the only publication that did not have any articles that fell under uncertain science. Neither *The Economist* nor *U.S. News and World Report* had any article fall into the category of ambiguous cause or effect.

Table 7

Chi-Square for Framing of the Science in 2005 Used by Maclean's, Newsweek, The Economist, and U.S. News and World Report

	N=79			
	Maclean's (*n*=17)	*Newsweek* (*n*=20)	*The Economist* (*n*=27)	*U.S News* (*n*=15)
Science	Percent	Percent	Percent	Percent
Valid science	41%	55%	56%	47%
Neutral	53	15	22	27
Ambiguous cause and effect	6	20	0	0
Uncertain science	0	10	22	27
Contention	0	0	0	0

$X^2(9, N = 79) = 19.581, p = .021$

This data indicates that *The Economist* and *U.S. News and World Report* were both more polarized in their framing of the science, presenting articles that were either balanced in coverage and resulting in the category of uncertain science, or articles that leaned more towards the validity of the science. *Maclean's*, however, leaned away from presenting data that would result in the uncertain science or contention category, indicating a belief in the validity of the issue.

   Verbiage. The verbiage (climate change, global warming, and greenhouse effect) was coded for the number of times that each term appeared within each article. Overall, the term global warming appeared the most frequently, appearing 814 times (55.6%) as compared to climate change with 530 appearances (36.2%) and greenhouse

effect with 121 appearances (8.3%). The verbiage was analyzed by an ANOVA and revealed that a statistical significance existed for the category climate change by a factor of .001 and for greenhouse effect by the same factor when looking at all years and publications; see Table 8.

Table 8

Analysis of Variance for Verbiage Used in 1989, 1993, 1997, 2001, 2005, and 2009

Verbiage	Mean	df	MS	F	p
		Between groups			
Climate Change	7.984	5	63.755	20.851	.001
Global Warming	2.739	5	7.503	1.919	.090
Greenhouse Effect	3.952	5	15.619	33.046	.001

The trend indicates that there was a shift away from the term greenhouse effect and towards the term climate change. The term greenhouse effect was present throughout all six time periods.

No significance existed for the category global warming. This same trend was also present in all four publications with the exception of *Maclean's,* which had a significant difference only for global warming and the greenhouse effect categories with *p= .027* and *p=.001*; see Table 9 on page 47.

Table 9

Analysis of Variance for Verbiage Used in Maclean's

Verbiage	Mean	*df*	*MS*	*F*	*p*
		Between groups			
Climate Change	1.813	5	3.287	1.725	.140
Global Warming	2.298	5	5.280	2.697	.027
Greenhouse Effect	2.326	5	5.409	7.539	.001

This data indicate that *Maclean's* demonstrated a stronger shift in terminology towards the term climate change than the other three publications and used it more consistently.

Additionally, in the year 2005, there existed statistically significant differences in the usage of the term climate change across publications by a factor of .001; see Table 10.

Table 10

Analysis of Variance for Verbiage Used in 2005 by Maclean's, Newsweek, The Economist, and U.S. News and World Report

Verbiage	Mean	*df*	*MS*	*F*	*p*
		Between groups			
Climate Change	4.528	3	20.500	7.057	.001
Global Warming	1.875	3	3.516	1.539	.211
Greenhouse Effect	.122	3	.015	1.226	.306

The data indicate that there was a difference in which terms publications used to portray climate change in 2005. While all used global warming and greenhouse effect with similar frequencies, the term climate change was used more frequently by some rather than others, resulting in a statistical difference.

Research question 3. Considering the frames presented, to whom are they attributed, if anyone?

Upon analyzing the data by year with an ANOVA test, it was found that the United Nations was the only category that exhibited a statistically significant difference across years, with a factor of .025; see Table 11. This means that it was more likely to be used in some years rather than others, exhibiting a trend.

Table 11

Analysis of Variance for Sources Used from 1989 through 2009

Source	Mean	*df*	*MS*	*F*	*p*
		Between groups			
United Nations	1.913	4	3.658	3.433	.025

When analyzed by publication, there existed a statistically significant difference in publications that used the appointed official category as sources by a factor of .032; see Table 12 on page 49.

Table 12

Analysis of Variance for Sources Used by Maclean's, Newsweek, The Economist, and
U.S. News and World Report

Source	Mean	*df*	*MS*	*F*	*p*
Between groups					
App. Official	2.197	3	4.828	3.205	.032

CHAPTER V

Conclusion

This study examined the frames used to portray climate change in *Maclean's, Newsweek, The Economist, and U.S. News and World Report* from 1989 to 2009. Examining the frames used to portray climate change demonstrated that climate change has continually been framed in news magazines as a major political issue and increasingly as a social and cultural issue as well.

Discussion

The study revealed that there were no major differences in the way that climate change was framed between publications. However, the frames that were used to portray the issue over time did change. Although political-economic remained the most predominant frame throughout, it is clear that there was a shift away from reporting climate change as a scientific issue and towards a social issue.

Primary Frames. The major primary frame that emerged from this study was that of political economic. The study also showed a significant shift from the scientific frame as the second most represented frame to the social and cultural frame. This shift indicates that the issue has become more commonplace in the lives of everyday citizens. Rather than view the issue as a scientific issue that citizens have no control over or effect upon, the social cultural frame encompasses issues of stewardship, pop culture, public understanding, and justice and risk.

Verbiage. Global warming, overall, was the most frequently used term to describe the climate change phenomenon, appearing 814 times, followed by climate

change, appearing 530 times. The term greenhouse effect only appeared 121 times during the study. This was consistent with the reasoning of Bolstad (2007) who noted that both terms are widely accepted. It is important to remember that both terms carry very different connotations (Bolstad, 2007). The consistency of the term global warming as found in this study may be attributed to the idea that many Democrats continue to use the term because of its connotations, with global warming reinforcing the human factor in contributing to climate change (Bolstad, 2007). Bolstad also noted that the Republican Party began to coin the term climate change as part of a political move to dominate debates on environmental issues. This move was evident in the data as a statistically significant shift from the terminology used before that date.

The findings were also consistent with those of Carvalho (2005), who noted that after 1988 the term greenhouse effect began to slip from the media landscape. It was replaced by global warming, which was the most popular term in 1990 (Carvalho, 2005). The findings in this study confirmed this, in that global warming was the most commonly used term in 1989, appearing 109 times. Greenhouse effect and climate change appeared 89 and 17 times respectively.

The findings of this study confirm that verbiage continues to be an important part of the framing process. As noted by Entman (1993), straying from these commonly accepted terms would result in a loss of credibility and meaning.

Verbiage is an important part of the framing process. Once certain terms become accepted, the language itself has power over audience interpretations. The use of "certain words or phrases" (McQuail, 2005, p. 378) can be used to convey specific meanings.

Verbiage is so integral to framing that straying from commonly accepted terms might result in a loss of understanding (Entman, 1993). It is evident from the results of this study that although the terms used to describe climate change have evolved over time, there still exists an importance and meaning that is attached to the terms themselves.

Frequency of Climate Change Articles

Boykoff (2007a) noted that newspaper coverage of climate change in the U.S. prestige-press had recently increased by about two-and-a-half times between 2003 and 2006. This study revealed a trend towards an increase in coverage from 1989 to 2009. With the exception of 1993, articles related to climate change increased from 75 articles in 1989, 25 articles in 1993, 93 articles in 1997, and 130 articles in 2005, to 148 articles in 2009. These numbers indicate that climate change is becoming an increasingly important topic in the news media. However, it is difficult to confirm an upward trend because samples were taken at four-year increments rather than consistently over the 20-year period.

Fair and Balanced Reporting

This study saw an increase in articles framed as uncertain science, which accounted for seven articles (5%) in 2001 to 10 articles (14.3%) in 2009. These findings were inconsistent with the findings of Boykoff (2007a), which noted that balanced accounts decreased from 37% of articles to 3% of articles from 2003 to 2006. Yet the study yielded similar results to those of Kenix (2008), who also found that only 14% of the articles examined in mainstream and alternative news sources mentioned any debate about the causes of climate change.

However, the study also found a sizeable increase in the amount of valid science articles from 14 articles (18.4%) to 41 articles (58.6%) between 1989 and 2009. These results were similar to the results of Boykoff (2007a), which noted that stories depicting anthropologic contributions as the main source of climate change increased by over 30% between 2003 and 2006. This study found an increase from 22.1% in 2001 to 58.6% in 2009. Results were also similar to those of Antilla (2005), who found numerous examples of articles framed as valid science. However, debate controversy and uncertainty were also well represented in the sample.

These differences may be attributed to differences in medium. Whereas news magazines have the ability to give more in-depth coverage on an issue, providing interpretation for the reader, newspapers do not have this luxury. Newspapers are more inclined to quote both sides of the story to provide interpretation (Gamson & Modigliani, 1989).

Episodic Versus Thematic Framing

Many studies have found coverage of climate change to be episodic rather than thematic (Boykoff & Boykoff, 2007; Check, 1995; Hutchison, 2008; Nitz & Ihlen, 2006; von Storch & Krauss 2005). However, this study indicated a significant increase in the number of thematic stories about climate change. The differences may be attributed to the difference in medium, as this is one of the first studies to look at the issue as covered by news magazines.

Although many previous studies have found that coverage on science-related topics increased surrounding major news events such as conferences or the passage of

53

legislation (Nisbet & Lewenstein, 2002), this study was not able to track such changes, as each article was coded by year, rather than specific date. However, qualitatively the results were partially supported. Many articles would begin with the happenings of a major event, but differed in that they proceeded to give much interpretation and background information on the topic. This finding is important as Corbett and Durfee (2004) noted that providing such context leads to higher levels of certainty and understanding.

Sources

Nisbet and Lewenstein (2002) noted that the use of credible sources, mainly government agencies and scientists who are considered credible and necessary to scientific matters, will increase the credibility of a news story. These findings were partially supported by this study. This study found that while "other" was the most common category for sources, appearing 215 times, educational institutions were credited with providing information 178 times, government agencies 86 times, and appointed government officials 81 times. The category other consisted of a gamut of sources, including business people, independent citizens, former officials, and the like.

Conversely, it was also found that special interest groups, non-government organizations (NGO), and independent research organizations were coded as providing source information 177 times. Qualitatively, it was also noted that information was often provided without any sourcing. Furthermore, when sources are provided it is often difficult for the reader to know what type of source an organization might be, such as a "research organization" that is possibly funded by an oil producers association.

Contributions to Literature

This study contributed to the existing literature in three ways. First, it was one of the first studies to look at how climate change has been framed in news magazines. Existing research had primarily focused on newspaper and broadcast coverage of the topic. A study of news magazines, however, is also important because of their reach throughout the general populace. Second, this is one of the only studies to look at the framing of climate change over a 20-year time period. Many of the existing studies focus on a time period of 1 to 3 years. The longer time period allows for the identification of trends, whereas a shorter study gives more of a snapshot of the current state of affairs. Finally, this study looked at not only American news magazines but also one Canadian magazine and one British magazine. This identified differences in the way that climate change is portrayed to different populations throughout the world.

Furthermore, this study identified a new category for framing the science as neutral. This category was prevalent throughout the sample, including text that asserted climate change as fact, yet did not include any scientific studies to support the assertion.

Limitations of the study include its inability to weight articles according to the amount of information that was present regarding climate change. Because all articles with at least one sentence dedicated to climate change were included in the sample, an article that only had one sentence concerning climate change was given the same weight as one that contained several paragraphs.

Implications of the Study

The implications of the study are numerous. First, it is clear that the most common frame used for portraying climate change is the political-economic frame. The implications are that climate change is a problem that should be left to governments to solve, whether that is through treaties, regulations, or political agreements. By using this frame, the message is sent that it is not up to individuals or businesses to take responsibility unless some regulation exists.

A second implication with regard to the science is that before 2002 the science was largely portrayed as ambiguous, whereas after that year it was largely portrayed as either valid or neutral. The implications of these frames indicate a societal acceptance of climate change as a global and political issue.

Directions for Future Research

Future research should continue to focus on how the framing of climate change changes over time. Although the political-economic frame was by far the most prevalent, the culture and society frame increased over time. Future research should continue to examine the framing of climate change in news magazines, focusing on the salience of the articles.

References

Antilla, Liisa (2005). Climate of skepticism[*sic*]: U.S. newspaper coverage of the science of climate change. *Global Environmental Change Part A, 15*(4), 338-352. doi: 10.1016/j.gloenvcha.2005.08.003 Retrieved April 3, 2009, from http://www.sciencedirect.com/science/article/B6VFV-4HJC4JY-2/2/e0ecf7915f6694f5e8bb18f334389a44

Audit Bureau of Circulations: ECerc (June 30, 2009). Retrieved November 17, 2009, from http://www.accessabc.com/products/freereports.htm

Berinsky, Adam J., & Kinder, Donald R. (2006). Making sense of issues through media frames: Understanding the Kosovo crisis. *Journal of Politics, 68*(3), 640-656. doi:10.1111/j.1468-2508.2006.00451.x Retrieved August 21, 2009, from http://libaccess.sjlibrary.org/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=aph&AN=21437040&site=ehost-live

Bolstad, Erika (December 7, 2007). "Climate change" or "global warming." Retrieved November 15, 2009, from http://www.mcclatchydc.com/231/story/22730.html

Boykoff, Maxwell T. (2007a). Flogging a dead norm? Newspaper coverage of anthropogenic climate change in the United States and United Kingdom from 2003 to 2006. *Area, 39*(4), 470-481. Retrieved April 5, 2009, from http://libaccess.sjlibrary.org/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=s3h&AN=27524908&site=ehost-live

Boykoff, Maxwell T. (2007b). From convergence to contention: United States mass media representations of anthropogenic climate change science. *Transactions of the Institute of British Geographers, 32*(4), 477-489. doi:10.1111/j.1475-5661.2007.00270.x Retrieved April 5, 2009 from http://libaccess.sjlibrary.org /login?url=http://search.ebscohost.com/login.aspx?direct=true&db=aph&AN=27091 875&site=ehost-live

Boykoff, Maxwell T. (2008a, January). Lost in translation? United States television news coverage of anthropogenic climate change, 1995-2004. *Climatic Change, 86*(1-2), 1-11. doi: 10.1007/s10584-007-9299-3 Retrieved November 15, 2009, from http://www.springerlink.com/content/74338023j82k2873/

Boykoff, Maxwell T. (2008b). The cultural politics of climate change discourse in UK tabloids. *Political Geography, 27*(5), 549-569. doi: 10.1016/j.polgeo.2008.05.002 Retrieved September 21, 2009 from http://www.sciencedirect.com /science/article/B6VG2-4SWG0D9-2/2/cf7fb485e95f804ec45cbf148e135af7

Boykoff, Maxwell T., & Boykoff, Jules M. (2007). Climate change and journalistic norms: A case-study of U.S. mass-media coverage. *Geoforum, 38*(6), 1190-1204. doi: 10.1016/j.geoforum.2007.01.008 Retrieved April 3, 2009, from http://www.sciencedirect.com/science/article/B6V68-4NC5T4P-1/2/b12f785007ccfc1f461e327fa34af11c

Carvalho, Anabela (2005). Representing the politics of the greenhouse effect: *Critical Discourse Studies, 2*(1), 1-29. doi:10.1080/17405900500052143 Retrieved April 6, 2009, from http://search.ebscohost.com/login.aspx?direct=true&db=ufh&AN=16669761&loginpage=Login.asp&site=ehost-live

Carvalho, Anabela, & Peterson, Tarla Rai (2009). Discursive constructions of climate change: Practices of encoding and decoding. *Environmental Communication, 3*(2), 131-133. doi:10.1080/17524030902935434 Retrieved November 17, 2009 from http://search.ebscohost.com/login.aspx?direct=true&db=ufh&AN=41539621&loginpage=Login.asp&site=ehost-live

Check, Terence (1995). The evaluation of scientific evidence on the Exxon Valdez oil spill. *Conference Proceedings—National Communication Association/American Forensic Association (Alta Conference on Argumentation*, 397-402. Retrieved April 6, 2009, from http://search.ebscohost.com/login.aspx?direct=true&db=ufh&AN=20755204&loginpage=Login.asp&site=ehost-live

Corbett, Julia B., & Durfee, Jessica L. (2004). Testing public (un)certainty of science—media representations of global warming. *Science Communication, 26*(2), 129-151. doi: 10.1177/1075547004270234

Dahinden, Urs (2002). Biotechnology in Switzerland. *Science Communication, 24*(2), 184. doi: 10.1177/107554702237844 Retrieved April 21, 2009, from http://search.ebscohost.com/login.aspx?direct=true&db=ufh&AN=8731450&loginpage=Login.asp&site=ehost-live

Dahinden, Urs (2005). Framing: A decade of research experience. *Conference Papers—International Communication Association*. Retrieved September 21, 2009, from http://search.ebscohost.com/login.aspx?direct=true&db=ufh&AN=18655268&loginpage=Login.asp&site=ehost-live

Entman, Robert M. (1993). Framing: Toward clarification of a fractured paradigm. *Journal of Communication, 43*(4), 51-58. doi: 10.1111/j.1460-2466.1993.tb01304.x

Entman, Robert M. (2004). *Projections of power: Framing news, public opinion, and U.S. foreign policy*. Chicago, IL: The University of Chicago Press.

Fortunato, John A. (2005). *Making media content: The influence of constituency groups on mass media*. Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Foust, Christina R., & O'Shannon Murphy, William (2009). Revealing and reframing apocalyptic tragedy in global warming discourse. *Environmental Communication, 3*(2), 151-167. doi:10.1080/17524030902916624 Retrieved September 21, 2009, from http://search.ebscohost.com/login.aspx?direct=true&db=ufh&AN=41539619 &loginpage=Login.asp&site=ehost-live

Gamson, William A., & Modigliani, Andre (1989). Media discourse and public opinion on nuclear power: A constructionist approach. *American Journal of Sociology, 95*(1), 1-37. Retrieved April 21, 2009, from http://www.jstor.org/stable/2780405

Goffman, Erving (1974). *Frame analysis: An essay on the organization of experience*. New York, NY: Harper & Row.

Graber, Doris A. (1984). *Processing the news: How people tame the information tide*. New York, NY: Longman, Inc.

Graber, Doris A. (2002). *Mass media and American politics* (Sixth Edition). Washington, D.C.: CQ Press.

Griffin, Michael (2004). Picturing America's "war on terrorism" in Afghanistan and Iraq. Journalism, 5(4), 381-402. doi:10.1177/1464884904044201 Retrieved November 17, 2009, from http://search.ebscohost.com/login.aspx?direct=true&db =ufh&AN=15273489&loginpage=Login.asp&site=ehost-live

Hart, Philip (2008). Market influences on climate change frames in CNN and Fox news channel broadcasts. *Conference Papers—International Communication Association,*1-38. Retrieved April 6, 2009, from http://search.ebscohost.com/login .aspx?direct=true&db=ufh&AN=36956440&loginpage=Login.asp&site=ehost-live

History of Newsweek. (2007). Retrieved November 14, 2009, from http://www.newsweek.com/id/42663

Holstein, Lisa, & Stocking, Holly S. (2006). Manufacturing doubt: Journalists' roles and the construction of ignorance in a scientific controversy. *Conference Papers— International Communication Association,* 1-34. Retrieved April 6, 2009, from http://search.ebscohost.com/login.aspx?direct=true&db=ufh&AN=27204309&login page=Login.asp&site=ehost-live

Hutchison, Phillip J. (2008). Journalism and the perfect heat wave: Assessing the reportage of North America's worst heat wave, July-August 1936. *American Journal, 25*(1), 31-54. Retrieved April 6, 2009, from

http://search.ebscohost.com/login.aspx?direct=true&db=ufh&AN=32066667&login
page=Login.asp&site=ehost-live

Information about expository writing (n.d.). Retrieved November 14, 2009, from
http://www.stanford.edu/~arnetha/expowrite/info.html

Intergovernmental Panel on Climate Change (2007, November). *Climate Change
2007: Synthesis Report.* Valencia, Spain.

Iyengar, Shanto (1989). How citizens think about national issues: A matter of
responsibility. *American Journal of Political Science, 33*(4), 878. Retrieved April
6, 2009, from http://search.ebscohost.com/login.aspx?direct=true&db=bth
&AN=5243188&loginpage=Login.asp&site=ehost-live

Iyengar, Shanto (1991). *Is anyone responsible? How television frames political issues.*
Chicago, IL: The University of Chicago Press.

Kenix, Linda Jean (2008). A comparative analysis of climate change in the alternative
and mainstream press of New Zealand and the United States. *Conference Papers—
International Communication Association,* 1-31. Retrieved April 3, 2009, from
http://search.ebscohost.com/login.aspx?direct=true&db=ufh&AN=36956799&login
page=Login.asp&site=ehost-live

Krieghbaum, Hillier (1967). *Science and the mass media.* New York, NY: New York
University Press.

Maclean's (n.d.). Retrieved November 14, 2009, from http://www.macleans.ca/
about/index.jsp

McCombs, Maxwell (1997). New frontiers in agenda setting: Agendas of attributes and
frames. *Mass Comm Review, 24*(1 and 2), 32-52. Retrieved May 4, 2009, from
http://libaccess.sjlibrary.org/login?url=http://search.ebscohost.com/login.aspx?direct
=true&db=ufh&AN=4510169&site=ehost-live

McQuail, Denis. (2005). *McQuail's mass communication theory* (Fifth Edition ed.).
Thousand Oaks, CA: Sage Publications Inc.

Neuman, W. Russell, Just, Marion R., & Crigler, Ann N. (1992). *Common knowledge:
News and the construction of political meaning.* Chicago, IL: University of Chicago
Press.

Nisbet, Matthew C., & Lewenstein, Bruce V. (2002). Biotechnology and the American
media: The policy process and the elite press, 1970 to 1999. *Science
Communication, 23*(4), 359. Retrieved April 21, 2009, from

http://search.ebscohost.com/login.aspx?direct=true&db=ufh&AN=6807153&loginpa
ge=Login.asp&site=ehost-live

Nitz, Michael, & Ihlen, Oyvind (2006). Oil and gas as natural riches or environmental
problems: Framing contests in public relations. *Conference Papers—International
Communication Association*, 1-39. Retrieved April 6, 2009, from
http://search.ebscohost.com/login.aspx?direct=true&db=ufh&AN=27204402&login
page=Login.asp&site=ehost-live

Parry, Katy (2008). A visual framing analysis of British press photography during the
2006 Israel-Lebanon conflict. *Conference Papers—International Communication
Association*, 1-35. Retrieved November 17, 2009, from
http://search.ebscohost.com/login.aspx?direct=true&db=ufh&AN=36956929&login
page=Login.asp&site=ehost-live

Pew Research Center for the People and the Press (2009). *Fewer Americans See Solid
Evidence of Global Warming.* Retrieved November 14, 2009, from http://people-
press.org/report/556/global-warming

Scheufele, Dietram A. (2000). Agenda-setting, priming, and framing revisited: Another
look at cognitive effects of political communication. *Mass Communication &
Society, 3*(2&3), 297-316. Retrieved April 11, 2009, from
http://libaccess.sjlibrary.org/login?url=http://search.ebscohost.com/login.aspx?direct
=true&db=ufh&AN=3455306&site=ehost-live

Schramm, Wilbur & Roberts, Donald F. (Eds.) (1971). *The process and effects of mass
communication* (Second Edition ed.). Chicago, IL: University of Illinois Press.

Semetko, Holli A., & Valkenburg, Patti M. (2000). Framing European politics: A
content analysis of press and television news. *Journal of Communication, 50*(2), 93.
Retrieved May 4, 2009, from http://search.ebscohost.com/login.aspx
?direct=true&db=ufh&AN=3227833&loginpage=Login.asp&site=ehost-live

Smith, Joe (2005). Dangerous news: Media decision making about climate change risk.
Risk Analysis: An International Journal, 25(6), 1471-1482. Retrieved April 5, 2009,
from http://search.ebscohost.com/login.aspx?direct=true&db=s3h&AN=
19473332&loginpage=Login.asp&site=ehost-live

The Economist (n.d.). Retrieved November 14, 2009, from http://www.economist.com
/help/DisplayHelp.cfm?folder=663377#About_The_Economist

Tuchman, Gaye (1978). *Making news: A study in the construction of reality*. New York,
NY: The Free Press.

Tucker, Lauren R. (1998). The framing of Calvin Klein: A frame analysis of media and discourse about the august 1995 Calvin Klein jeans advertising campaign. *Critical Studies in Mass Communication, 15*(2), 141. Retrieved September 28, 2009, from http://search.ebscohost.com/login.aspx?direct=true&db=ufh&AN=900579&loginpage=Login.asp&site=ehost-live

U.S. News history (2007). Retrieved November 14, 2009, from http://www.usnews.com/usnews/usinfo/history.htm

von Storch, Hans, & Krauss, Werner (2005). Culture contributes to perceptions of climate change. *Nieman Reports, 59*(4), 99-102. Retrieved April 6, 2009, from http://search.ebscohost.com/login.aspx?direct=true&db=ufh&AN=19403355&loginpage=Login.asp&site=ehost-live

Worldwide circulation (2008). Retrieved November 17, 2009, from http://ads.economist.com/the-economist/circulation/worldwide-circulation/

Appendix

Coding Booklet

1. Publication – the publication of each article was coded as follows (Scott's pi reliability coefficient = 100%):

Category	Code
Maclean's	1
Newsweek	2
The Economist	3
U.S. News and World Report	4

2. Year – the year in which each article was published was coded as follows (Scott's pi reliability coefficient = 100%):

Category	Code
1989	1
1993	2
1997	3
2001	4
2005	5
2009	6

3. Identification – articles were coded numerically for identification purposes beginning with 100.

4. Section – the section in which the article appears was coded as follows (Scott's pi reliability coefficient = 85%):

Category	Code
Cover story	1
International/World	2
Science and Technology	3
Special Report	4
Society	5
Business	6
Nation	7
Environment	8
Finance and Economics	9
Culture	10
Other	11

5. The number of words each article contains was recorded numerically (Scott's pi reliability coefficient = 100%).

6. Visual element– the presence or absence of a visual element was coded numerically (Scott's pi reliability coefficient for category= 98%).

Category	Number

Cover
(Scott's pi reliability coefficient = 100%)

Picture/Photograph
(Scott's pi reliability coefficient = 97%)

Graph/Chart/Diagram
(Scott's pi reliability coefficient = 100%)

Illustration/Drawing
(Scott's pi reliability coefficient = 100%)

Other
(Scott's pi reliability coefficient = 89%)

7. Verbiage – the number of times each climate change term was used was recorded numerically as follows (Scott's pi reliability coefficient for category = 99%):

Category	Number

Climate Change
(Scott's pi reliability coefficient = 100%)

Global Warming
(Scott's pi reliability coefficient = 100%)

Greenhouse Effect
(Scott's pi reliability coefficient= 96%)

8. Primary frame – the primary frame was coded as follows (Scott's pi reliability coefficient = 85%):

Category	Code
Weather events	1
Biodiversity	2
Political actors	3
Economics	4
Business	5
Popular culture	6
Justice and risk, public health	7
Transport	8
Public understanding	9
Religion	10
Stewardship	11
Discoveries, fundamentals, new studies	12
Science funding and processes	13
Applied science and technology	14
Other	15

9. Sources – the number of times information was attributed to a source was coded numerically according to the number of times it appeared within the article. Sources information was not included if it did not specifically refer to the validity, causes or effects. Sources were coded as follows (Scott's pi reliability coefficient = 88%):

Category	Number

U.S. President
(Scott's pi reliability coefficient = 85%)

British Prime Minister
(Scott's pi reliability coefficient = 100%)

Canadian Prime Minister
(Scott's pi reliability coefficient = 100%)

Appointed administration official
(Scott's pi reliability coefficient = 92%)

Elected official
(Scott's pi reliability coefficient = 84%)

Al Gore
(Scott's pi reliability coefficient = 96%)

United Nations and it's agencies
(Scott's pi reliability coefficient = 80%)

Government agency
(Scott's pi reliability coefficient = 86%)

Special interest, non-government agencies, non-profit,
or research institute
(Scott's pi reliability coefficient = 82%)

Educational institutions
(Scott's pi reliability coefficient = 85%)

Other
(Scott's pi reliability coefficient = 82%)

10. Science – the presentation of scientific information or climate change was recorded numerically according to the number of times it appeared within the article as follows (Scott's pi reliability coefficient = 84%):

Category	Code
Valid science	1
Neutral	2
Ambiguous cause and effect	3
Uncertain science	4
Contention	5

11. Depth of coverage – the overall depth of coverage was recorded as follows (Scott's pi reliability coefficient = 82%):

Category	Code
Episodic	1
Thematic	2