

Effects of TV and Cable News Viewing on Climate Change Opinion, Knowledge, and Behavior

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Summary

For the general public, the news media are an important source of information about climate change. They have significant potential to influence public understanding and perceptions of the issue. Television news, because of its visual immediacy and authoritative presentation, is likely to be particularly influential. Numerous studies have shown that television news can affect public opinion directly and indirectly through processes such as agenda setting and framing. Moreover, even in a fragmented media environment largely dominated by online communication, television remains a prominent medium through which citizens follow news about science issues. Given this, scholars over the last several decades have endeavored to map the content of television news reporting on climate change and its effects on public opinion and knowledge. Results from this research suggest that journalists' adherence to professional norms such as balance, novelty, dramatization, and personalization, along with economic pressures and sociopolitical influences, have produced inaccuracies and distortions in television news coverage of climate change. For example, content analyses have found that U.S. network television news stories tend to over-emphasize dramatic impacts and imagery, conflicts between political groups and personalities, and the uncertainty surrounding climate science and policy. At the same time, those skeptical of climate change have been able to exploit journalists' norms of balance and objectivity to amplify their voices in television coverage of climate change. In particular, the increasingly opinionated 24-hour cable news networks have become a megaphone for ideological viewpoints on climate change. In the United States, a coordinated climate denial movement has used Fox News to effectively spread its message discrediting climate science. Coverage on Fox News is overwhelmingly dismissive of climate change and disparaging toward climate science and scientists. Coverage on CNN and MSNBC is more accepting of climate change; however, while MSNBC tends to vilify the conservative opposition to climate science and policy, and occasionally exaggerates the impacts of climate change, CNN sends more mixed signals. Survey and experimental analyses indicate that these trends in television news coverage of climate change have important effects on public opinion and may, in particular, fuel confusion and apathy among the general U.S. public and foster opinion extremity among strong partisans.

Keywords: climate change, television, network news, cable news, public opinion, persuasion, framing, polarization, journalistic norms, Fox News

Subjects: Communication

For the general public, the news media are an important source of information about climate change (Hansen, 2010; Nelkin, 1995). Most lay citizens do not regularly read the primary scientific literature. Moreover, climate change is largely abstract and intangible, and its effects are not immediately observable. Because climate change is often beyond the personal experience of individuals, the media are crucial for translating the issue for the public. Indeed, scholars increasingly recognize the inextricable link between science and media. Scheufele (2014), for example, refers to “science as mediated reality,” given that most citizens hear about science issues, including climate change, not from direct exposure to science and scientists but indirectly through media. These mediated realities have significant potential to influence public understanding and perceptions of scientific topics such as climate change.

The news media have reported on climate change at least since the late 1980s, albeit inconsistently (Wilson, 2000). During this time, scientists, environmental advocates, and some policy makers have argued with increasing resolve that climate change is caused by human activities and will have significant negative consequences for the planet. Despite widespread agreement within the scientific community about the reality and urgency of anthropogenic climate change (Stocker et al., 2013), public opinion, at least in the United States, has remained largely ambivalent. Climate change consistently ranks at or near the bottom of a list of more than twenty issues that Americans feel are important for government to address (Pew Research Center, 2015). Moreover, since the late 1990s, public opinion about climate change has become increasingly polarized along political lines, with liberals and Democrats expressing more concern about the issue and greater support for policies to address it, while conservatives and Republicans are more dismissive toward climate change, with some questioning its existence altogether (Funk & Rainie, 2015; McCright & Dunlap, 2011).

To what extent does television news coverage of climate change contribute to these trends? Television news, because of its visual immediacy and authoritative presentation, has long been argued to have potent effects on audiences (Graber, 1988; Iyengar & Kinder, 1987). Decades of research have shown that television news can influence public opinion directly (Zaller, 1992, 1996) and indirectly through processes such as agenda setting and framing (Iyengar, 1991; Iyengar & Kinder, 1987). And as the form of television news has evolved from the straight-news model of reporting on the broadcast networks to the opinionated, partisan-oriented style on cable, the potential for television media’s persuasive and polarizing effects has intensified (Feldman, 2011; Stroud, 2011).

This article reviews existing literature that applies various media effects theories to understand the influence of television news on public opinion and knowledge related to climate change. The article begins by examining how the television news landscape has changed from the 1950s until present. This is followed by a discussion of journalistic norms and how these norms have shaped network television news coverage of climate change. The article then reviews empirical research findings about the effects of network news on public knowledge, opinion, and behavior relative to climate change. The next section takes up the question of what role cable news has played in the polarization of public opinion about climate change. As a whole, the review focuses primarily on

the content and effects of network and cable TV news in the United States, which is the context for most of the existing research on this topic; however, the article concludes by offering some comparative perspective as well as directions for future research.

The Changing Landscape of U.S. Television News

The time period beginning with the widespread adoption of the television in the 1950s and spanning until the rise of cable in the 1980s is often referred to as the “golden age of television news”; during this time, network television was the dominant medium through which Americans obtained news about current events and public affairs. Each evening, the “Big Three” networks—ABC, CBS, and NBC—broadcast their nightly news programs to a relatively captive audience, given the limited media alternatives at the time (Prior, 2007). These news programs helped fulfill the networks’ public service obligation under the federal Communications Act of 1934. As such, broadcast news was free of commercial pressures and assumed to be a democratic resource that would hold the government accountable for its actions and provide citizens with the information they need to be actively engaged in the political process. TV journalists, in turn, saw themselves as documenters of fact, capable of and committed to reporting an “objective” reality (Baym, 2010). Network news programs were thus construed as the news of record, an authoritative summary of the day’s events. As Weaver (1975) noted, when comparing television and newspaper news:

There is hardly an aspect of the scripting, casting, and staging of a television news program that is not designed to convey an impression of authority and omniscience. This can be seen most strikingly in the role of the anchorman—Walter Cronkite is the exemplar—who is positively god-like: he summons forth men, events, and images at will; he speaks in tones of utter certainty; he is the person with whom all things begin and end.

(Weaver, 1975, p. 84)

Accordingly, the network news anchors, particularly CBS’ Walter Cronkite, were among the most trusted public figures in America (Ladd, 2012). Especially given the “singular worldview” produced by the three nightly newscasts (Baym, 2010, p. 12) and the high degree of confidence afforded to them by the public, television news was found to be capable of setting the public’s agenda of issue priorities—that is, shaping the issues the public sees as most important—and framing the way in which these issues are interpreted (Iyengar, 1991; Iyengar & Kinder, 1987). Although these effects were conditional on audience characteristics and contextual factors, there was nonetheless compelling evidence of network news’ influence (see Price & Feldman, 2009).

The landscape of television news has changed remarkably since the 1980s, as a result of advances in technology, changes in media policy and ownership, and sociocultural developments (Baym, 2010). Today, news audiences, in general, are fragmented across myriad news sources, many online. On television, the 24-hour cable news networks have challenged the networks news outlets’ hold on the mass audience. News organizations not only compete with one another for audiences’ attention but also with an increasing array of entertainment options (Prior, 2007). As

a result, the effects of television news, such as agenda setting and framing, which were relatively homogeneous during the network news era, are now more fractured and contingent on the particular sources to which people turn (Stroud, 2011).

As the boundaries between news and entertainment blur and news organizations face increasing competition, the substance and depth of TV news reporting has degraded (Hamilton, 2004). In particular, contemporary network television news increasingly has shifted toward sensational and celebrity-oriented, or “soft” coverage. Public trust in mainstream TV news outlets has deteriorated, in part because of the public’s distaste for their tabloid-style reporting and also because of increasing criticism of the mainstream press by political elites (Ladd, 2012). Network news also has been plagued by scandals involving such high profile personalities as Dan Rather and, more recently, Brian Williams, which have implicated the credibility of the once infallible TV news anchor. Still, despite these challenges, in 2013, 65% of Americans watched network news over the course of a month, and they did so for an average of 12 minutes per day, according to Nielsen data (Olmstead, Jurkowitz, Mitchell, & Enda, 2013). In 2014, the nightly evening newscasts on ABC, CBS, and NBC collectively drew 24 million viewers on average, a slight uptick from the previous year (Mitchell & Holcomb, 2016).

CNN, the first national 24-hour cable news network in the United States, was founded in 1980, but it was not until its real-time coverage of the Gulf War in 1991 that it began to challenge the dominance of the network news outlets. Fox News and MSNBC entered the fray in 1996, and Fox News soon became cable news’ prime-time ratings leader, a position it continued to hold at the time of this writing in 2015 (Mitchell & Holcomb, 2016). Overall, in 2014, CNN, Fox News, and MSNBC attracted a median prime-time viewership of 2.8 million, which represented a decline from its peak in 2009 (Mitchell & Holcomb, 2016). In terms of cumulative audience, in 2012, the three networks each attracted just over 40 million unique viewers per month who tuned in to cable news for an hour or more (Pew Research Center, 2013). Prior (2013) more conservatively estimates that about 10–15% of the voting age population watched cable news at a rate of 10 minutes or more per day.

The 24-hour cable news outlets look quite unlike their network news predecessors. Cable news outlets have largely eschewed norms of objectivity and are best characterized as sources of “opinionated news” (Feldman, 2011). Indeed, in 2012, cable news was dominated by commentary and opinion rather than factual reporting (Pew Research Center, 2013), with CNN, Fox News, and MSNBC together spending 26% more airtime on the former. According to Berry and Sobieraj (2014), the expression of opinion on cable news routinely employs uncivil rhetoric, such as name-calling, mockery, fear mongering, and falsehoods, which they term “outrage.” This turn toward opinion and outrage, in part, reflects the economic reality of running a 24-hour news network: Interviews and commentary are less expensive to produce than in-depth story packages and live event coverage and, in many cases, are more engaging and thus more profitable (Berry & Sobieraj, 2014).

The intensity of opinion on cable news is also fueled by the partisan orientation of the cable news networks. Fox News, conceived as a conservative antidote to the mainstream media, was the first national television news outlet to overtly identify with and project a political identity, programming a prime-time lineup of political talk shows hosted by conservative commentators, such as Bill O’Reilly and Sean Hannity. In 2008, MSNBC rebranded itself as a liberal response to Fox News; by 2012, it had become the most opinionated of the three outlets, headlined by personalities such as Rachel Maddow and Chris Matthews (Pew Research Center, 2013). Fox News

and MSNBC routinely employ outrage to vilify their political opponents (Berry & Sobieraj, 2014; Levendusky, 2013). CNN has not aligned itself politically, and as of 2012, was the only one of the three networks to produce more straight news reporting than commentary, albeit by a small margin (Pew Research Center, 2013). Likely as a result, CNN has slipped behind MSNBC in the ratings (Mitchell & Holcomb, 2016), suggesting little public appetite for non-partisan news on cable. Indeed, audiences are often drawn to media that support their existing partisan outlook (Stroud, 2011), and opinionated, partisan-oriented cable news programs and personalities offer an insular, like-minded community, within which audiences are able to validate their identities and viewpoints (Berry & Sobieraj, 2014). Increasingly, the news outlets to which audiences turn and trust are polarized along partisan and ideological lines, with conservatives more likely to watch and trust Fox News, whereas liberals prefer a wider range of news media, including CNN, MSNBC, and network news (Mitchell, Gottfried, Kiley, & Matsa, 2014).

This context provides an important backdrop for understanding the nature of climate change coverage on television news and its influence on public opinion. From the time climate change emerged as a public issue in the late 1980s until now, network news has changed dramatically both in terms of its content and the competition it now faces from other sources, with increasingly less capacity and ambition to cover complex science issues such as climate change. Cable news has grown from a nascent medium to a significant political force, which, as will be discussed in subsequent sections, has become a megaphone for ideological viewpoints on climate change. Importantly, even in a fragmented media environment largely dominated by online communication, television remains a prominent medium through which citizens follow news about science issues. Although in 2012, the Internet became the medium most likely to be named by Americans as their primary source of science and technology information, about a third of Americans (32%) reported television as their chief source of science and technology news (National Science Board, 2014).

Journalistic Norms and U.S. Network TV News Coverage of Climate Change

The construction of news on television and in other media is driven by particular professional norms and practices. As a way to both simplify their work routines and foment audience engagement, journalists rely on these norms and practices when deciding what stories to cover, how much prominence to give them, and which elements of these stories to emphasize in their retelling. For example, since the professionalization of journalism in the early 20th century, journalists have been guided by a norm of objectivity (Kaplan, 2002). One manifestation of this is an emphasis on fairness and balance, which is often fulfilled through a “he said–she said” approach to reporting that gives equal time and weight to the two sides involved in debates over controversial issues and, in so doing, may obscure the true state of knowledge in a particular issue domain (Cunningham, 2003). At the same time, the work of news making has long stressed the novelty of information as a defining principle (Deuze, 2005), which not only requires delivering the news as quickly as possible but also prioritizing news that is, in fact, seen as “new.” Bennett (2009) has written about journalists’ tendency to adopt norms of dramatization and personalization; he characterizes these as informational biases that often detract from and displace substantive, in-depth analysis of issues and problems. Personalization refers to the tendency of journalists to use human-interest angles and to focus on the people and personalities

that reside at the center of newsworthy events and issue debates, typically at the expense of broader social, economic, or political contexts. Dramatization is a related norm that privileges narratives, often with compelling personalities at their center, that are rife with conflict, crisis, and spectacle. This focus on immediate crisis and controversy can foster neglect of enduring problems and complex policy dynamics. As will be discussed in the remainder of this section, the incompatibility between science and traditional news values has resulted in a dearth of coverage of science and environmental issues in TV news, and when these issues are covered, they are contorted to fit the norms of journalistic routines.

Science is a complex, incremental, often imperfect process that relies on a language of uncertainty and probability; these characteristics are ill fitting with journalists' desire for novelty, dramatization, personalization, and balance. As a result, the complexity and nuance of science often get lost in translation by journalists. For example, journalists may over-hype an isolated scientific finding or remote risk for the sake of drama; the personalization norm may lead to an emphasis on anecdotes and individuals rather than broader societal implications (see Iyengar, 1991). Complex, slowly unfolding scientific stories may be ignored because they lack novelty and a sense of imminent crisis and conflict. An overreliance on the norm of balance may lead journalists to focus on the most polarized and vocal voices in a scientific debate rather than the uncertain middle where scientific consensus typically resides (Revkin, 2007).

Andrew Revkin (2007), long-time environmental journalist and author of *The New York Times*' "Dot Earth" blog, has written about the ways in which both the incremental nature of climate change research and the often subtle nature of climate change itself are incompatible with the news process. Climate change is often invisible; its impacts occur over time and space in such a way that "they will not constitute news as we know it" (Revkin, 2007, p. 149). As a result, journalists looking for a way to make climate change "news" may focus on the most provocative elements of climate change—for example, by overstating links between extreme weather and climate change. Indeed, scholars who have interviewed environmental journalists have found that reporters often try to connect climate change to local, observable impacts as a way to make climate change seem more relevant to their audiences and their editors (Gibson, Craig, Harper, & Alpert, 2016; Hiles & Hinnant, 2014). However, Revkin warns:

After covering climate for over twenty years, my sense is that there will be no single new finding that will generate headlines that galvanize public action and political pressure. Even extreme climate anomalies, such as a decade-long superdrought in the West, could never be shown to be definitively caused by human-driven warming.

(2007, p. 151)

Although scientists are confident that anthropogenic climate change increases the intensity and frequency of extreme weather events, it is more difficult to demonstrate a causal link between climate change and any specific weather event (Field et al., 2012); thus, journalists tread a fine line when seeking to use this connection to increase the relevance of climate change for audiences. This challenge may be particularly salient for television news journalists. For instance, analyses have found that network television news broadcasts tend to dramatize climate change by using a narrative of "climate tragedy" that emphasizes the disaster wrought by global warming (Mayer, 2012) and by using "spectacular" imagery of threatened landscapes and communities (Lester & Cottle, 2009).

Notably, extreme weather does not necessarily foster connections to climate change in news coverage. Ungar (2014) found that during the summer and fall of 2012, the network TV news broadcasts only sporadically covered climate change, despite extreme weather events, including the hottest month on record at the time (July 2012), a crop-destroying drought that affected half the nation, destructive wildfires, and Hurricane Sandy. This was in stark contrast to the “social scare” of 1988, when a similar set of events—record-breaking heat, dangerous air pollution, a crop-destroying drought, wildfires, and Hurricane Gilbert—prompted extensive, ongoing coverage of climate change. Indeed, in 1988, when climate change first made most news agendas, the heat waves and drought served as a hook for the global warming story (Wilson, 2000). Consistent with the dramatization norm, common metaphors in this coverage included comparisons with nuclear war and the 1930s dustbowl (Wilson, 2000).

Ungar (2014) suggested several explanations for the change from 1998 to 2012. In 2012, the U.S. economy overshadowed all other issues, scientific and grassroots activism had weakened significantly, and climate change had become deeply polarized; thus, many political leaders avoided the issue even if they considered it a credible threat. Moreover, according to Ungar, the media were less proactive than in 1988, complicit in “indulging the silence in the political arena and for the most part disassociating extensive coverage of extreme weather impacts from climate change” (Ungar, 2014, p. 245). Ungar’s study is an important reminder that the broader socio-political context interacts with journalistic norms to shape how the news media cover science issues (see also Scheufele, 2014).

Boykoff and Boykoff (2007) have argued that journalistic norms such as drama, novelty, personalization, and balance help explain why climate change has not garnered more accurate coverage from U.S. news media. Through a content analysis of network television news segments and newspaper articles between 1988 and 2004, they found that these norms contributed to the construction of climate change as an issue of uncertainty. Specifically, they found that news media attention to climate change was driven by real-world events—such as climate conferences and hearings, major scientific reports, and presidential initiatives—that cohere with journalistic norms. For example, the release of scientific reports and the contrarian claims challenging these reports are contentious moments that feed journalistic norms of drama and novelty, while also playing into journalists’ desire for balance. At the same time, the emergence of personalities, such as scientists and politicians, in debates over climate science and policy drove coverage. According to Boykoff and Boykoff (2007), “the personalization of the climate-change narrative deflects attention from the roots of the problem, favoring the strategic moves of individuals over the political contexts in which they operate” (p. 1197).

Consistent with Boykoff and Boykoff’s (2007) conclusions, Hart and Feldman (2014), in an analysis of network TV news coverage of climate change between 2005 and 2011, found that news broadcasts disproportionately relied on a conflict/strategy frame when discussing actions that can be taken to address climate change; that is, news broadcasts emphasized the power struggles and conflicts involved with influencing action rather than the defined benefits and costs that the actions may offer. Moreover, when news stories used a conflict frame, they were less likely to include information about the positive consequences of taking action. Mayer (2012) also found that the primary frame used in network news coverage of climate change during the 2009 Copenhagen summit and the debate over cap and trade legislation in U.S. Congress emphasized the “policy game,” or the contest and strategies involved in climate policy deliberations.

The norm of balance can, and has been, exploited by those who challenge mainstream scientific views on climate change (Oreskes & Conway, 2011). In an analysis of U.S. television news coverage of climate change on ABC, CBS, NBC, and CNN from 1995–2004, Boykoff (2008) found that more than two-thirds of news segments provided “balanced” coverage regarding anthropogenic contributions to climate change, meaning that they gave equal attention and emphasis to competing viewpoints on the issue. Boykoff further demonstrated a statistically significant difference between television news coverage, based on ratios of coverage, and the scientific consensus on climate change from 1996–2004. Boykoff concluded that “the institutionalized and professional journalistic practice of balanced reporting has served to amplify a minority view that human’s role in climate change is debated or negligent, and has concurrently engendered an appearance of increased uncertainty regarding anthropogenic climate science” (Boykoff, 2008, p. 8).

In an additional analysis of coverage on ABC, CBS, NBC, and CNN from 1995–2006, Boykoff (2007b) found that TV news reports—rather than focusing on the convergent views on climate change within the scientific community—instead drew attention to areas of disagreement and conflict. According to interviews with climate scientists and environmental journalists, this contentious framing was attributable to two interdependent factors: (a) the ability of climate contrarians to use the objectivity-oriented media to challenge findings regarding human-caused climate change with insufficient responses from the scientific community; and (b), scientists’ difficulty communicating uncertainty to the public and policymakers, particularly via the media. For example, when reporting their findings, scientists tend to speak in cautious language, discuss implications in terms of probabilities, and offer qualifiers to their findings. This opens the way for climate contrarians to cast doubt on the integrity and conclusiveness of scientific research, thereby granting them disproportionate visibility in the media.

Although recent analyses of print news content (Boykoff, 2007a; Nisbet, 2011) and journalistic practices (Brüggemann & Engesser, 2014; Gibson et al., 2016; Hiles & Hinnant, 2014) suggest that the tendency of U.S. journalists toward false balance in covering climate science may be ebbing, there are additional consequences of journalists’ adherence to norms of objectivity. In an effort to appear objective, journalists often rely heavily on official, government sources (Bennett, Lawrence, & Livingston, 2007). As a result, journalists may focus on government actors in the climate change space at the expense of citizen-led action and the efficacy of those actions. Hart and Feldman (2014) found that network TV news coverage from 2005 to 2011 portrayed government actions to address climate change as divorced from public opinion, rather than as a response to calls for action by individuals and advocacy groups. Indeed, news stories rarely mentioned the personal or political actions that individuals can take to address climate change or the likely effectiveness of those actions. Similarly, Lester and Cottle’s (2009) visual analysis of TV news coverage of climate change found that activists and NGO spokespeople, when pictured, were often shown standing outside, statically, and not necessarily actively engaging with the landscape behind them. The authors interpreted these images as distancing activists from efforts toward political cooperation and possible solutions to climate change.

Hart and Feldman’s (2014) analysis also found that, although a majority of network television news broadcasts discussed the impacts of climate change, and a majority of broadcasts discussed possible actions to address climate change, impacts and actions were infrequently discussed in the *same* broadcast. This means audiences were often informed about the threat of climate change without any accompanying information about what can be done to reduce this threat, or they received information about actions to address climate change without the context to

appreciate why these actions may be necessary. This, too, may be the result of an adherence to objective reporting. By offering solutions at the same time as presenting the problem, journalists may be construed as advocating for the environment, a role that some actively resist (Hiles & Hinnant, 2014). Indeed, past research on political reporting found that journalists avoid providing “mobilizing information,” or tactical and logistical information in news stories that allow people to act on pre-existing attitudes, because journalists see such information as departing from objectivity (Lemert, 1984). Also, the norm of balance appears alive and well when journalists cover climate policy and other mitigative actions, as this is an arena where journalists still see room for reasonable debate and skepticism (Hiles & Hinnant, 2014). In television news broadcasts, positive and negative efficacy information related to proposed climate change actions was often paired together (Hart & Feldman, 2014); while this may reflect genuine debate and conflict, the implication for the public may be an uneven sense that climate change is an addressable problem.

The informational biases introduced by journalism norms and routines are exacerbated by political economic issues, such as economic and competitive pressures faced by news organizations, deadlines, and space and time constraints. The average length of the network television news package in 2012 was 142 seconds, which was mostly unchanged since 2007 (Pew Research Center, 2013). The complexity and uncertainty surrounding climate science—and all science, really—cannot easily be done justice in the brief snapshots characteristic of television news. Rather than accurately qualify and contextualize news coverage of scientific research and reports, it may be easier for journalists to simply give voice to the contrarians who outright challenge this science.

Moreover, issues that may be difficult for the public to understand may be displaced by stories that will resonate more readily with viewers. In 2011, network TV news devoted just 2% of its “news hole” to science and technology topics and 1% to environmental topics, compared to 8.2% to the economy, 6.1% to election campaigns, and 5.3% to lifestyle (Pew Research Center, 2012). According to the Tyndall Report, which tracks topical coverage on network news, in 2013, the three network news broadcasts collectively devoted 37 minutes to stories related to climate change. In comparison, the top story of the year, which was the Boston marathon bombing, received a collective total of 432 minutes of coverage; the federal budget received 405 minutes, and the healthcare reform rollout received 338 minutes.

Further, as science and environmental reporters are downsized at many news organizations, coverage of climate change is increasingly folded into other news beats (Russell, 2010). This means that reporters often lack expertise in climate science or policy, making it difficult for them to understand and contextualize for audiences the associated scientific and political debates. This, in turn, may lead to false balance and cursory reporting (Gibson et al., 2016). Indeed, even before the economic downturn and seismic shifts in the news industry that occurred around 2008–2009, Wilson (2000) documented journalists’ misunderstanding of the scientific consensus around global warming and of the scientific processes involved in global warming. Full time environmental reporters—who are fast becoming a rarity—had more accurate knowledge than other types of reporters. At the same time, climate change is increasingly covered as a political issue by political reporters (Russell, 2010). Political reporting has a long track record of relying on strategic or game frames that emphasize conflict between political elites and the self-interested motivations of the actors involved (Patterson, 1993; Cappella & Jamieson, 1997). This may help explain the disproportionate reliance of network news broadcasts on conflict framing in their coverage of climate change. In addition, cutbacks at legacy newspapers mean that other

media outlets can no longer depend as readily on “accountability news” from these outlets to inform their own coverage (Boykoff & Yulsman, 2013). Wilson (2000) found in interviews with environmental reporters that newspapers were the dominant source of climate change knowledge for reporters (scientists and science journals placed a distant second and third). All told, the technological changes and economic pressures that have contributed to the decline of newspapers and to fierce competition among news organizations have led to more superficial coverage of science and environmental issues on television.

Effects of U.S. Network TV News on Climate Change Opinion, Knowledge, and Behavior

Based on the previous section, analyses of network television news coverage suggest that, although coverage of climate change peaks around newsworthy events, environmental issues, including climate change, are typically given short shrift. When television news does cover climate change, stories tend to focus on dramatic impacts and imagery, conflicts between political groups and personalities, and the uncertainty surrounding climate science and policy. Less attention is given to the efficacy of actions that can be taken to mitigate climate change and, in particular, the role individuals may play in addressing climate change. Given these trends, what are the consequences of network television news coverage for public opinion, knowledge, and behavior related to climate change?

According to the agenda-setting hypothesis (McCombs & Shaw, 1972), the more the news media cover an issue, the more likely the public will be to view that issue as an important one. Overall, the relative lack of television news coverage of climate change may help explain why the issue consistently ranks low on the public’s list of national priorities; however, studies that explicitly test television news’ agenda-setting effects in the context of climate change have revealed mixed results. Using time series analysis, Brulle, Carmichael, and Jenkins (2012) found that the quantity of media coverage of climate change—including in *The New York Times*, the major broadcast nightly news programs, and weekly magazines—had a significant impact on public concern about the threat posed by climate change, from 2002 to 2010. Additional analyses suggested that elite political cues, advocacy efforts, and economic factors created fluctuations in media coverage of climate change, which, in turn, influenced public perceptions. Krosnick, Holbrook, and Visser (2000) examined the impact of the Clinton administration’s campaign in fall of 1997 to build support for the Kyoto treaty and of the debate that followed. In comparing public opinion before and after the campaign, the researchers found no evidence for an agenda-setting effect; that is, despite a dramatic increase in media coverage, especially on television, there was no change in the proportion of people who thought that global warming was likely to be an extremely serious national problem. Methodological differences between the two studies—such as the time period of study and dependent variable measurement—may help explain the discrepant findings. Overall, however, it may be that agenda-setting effects are more complicated than simple media coverage volume and are contingent on various factors and conditions.

Other studies have examined whether the way that climate change is framed by the news media influences public opinion. Krosnick, Holbrook, Lowe, and Visser (2006) studied the effects of news coverage of the 1995 Intergovernmental Panel on Climate Change’s (IPCC) landmark report, which stated for the first time that human activities had most likely contributed to warming global temperatures over the last century. National television news stories focused almost

exclusively on the assertion that global warming existed; newspapers, on the other hand, carried skeptical views, following initial statements of global warming's existence. This created natural variation in information flows across media and allowed Krosnick et al. to compare the influence of media coverage that framed climate change as a certainty (i.e., on television) to the influence of media coverage that accentuated the uncertainty of the science (i.e., in newspapers). In a survey of Ohioans, they found that exposure to television news was positively associated and exposure to newspapers negatively associated with beliefs in the existence of global warming; however, these effects were highly contingent on individual attributes. The positive effects of television news exposure accrued only to those who were trusting of scientists and who had higher levels of education and thus greater cognitive skills to recall information from news stories over time. The negative effects of newspaper exposure manifested only among those who were trusting of scientists but low in education, and thus more likely to forget the initial message endorsing climate science and remember only the more recent skeptical message. All told, these findings suggest that the media's use of uncertainty framing and tendency toward false balance when covering climate change have important consequences for public opinion.

Corbett and Durfee's (2004) experimental study corroborates these findings. This study found that, when individuals were exposed to news stories that included claims questioning the veracity of climate change, particularly absent any challenge or broader research context, this undermined their certainty about climate change. Malka, Krosnick, Debell, Pasek, and Schneider (2009) similarly found that including an interview with a climate skeptic in television news reports reduced perceptions of scientific consensus, belief in the existence of human-caused global warming, the perceived importance of global warming, and concern about its consequences. Other studies point to the importance of contextual factors beyond media coverage. For example, Scruggs and Benegal (2012) found that deteriorating economic conditions, not skeptical news coverage, was the main driver of decreasing public concern for climate change between 2008 and 2011.

Research also has shown that the effects of news exposure on public opinion about climate change are highly contingent on political ideology and partisanship. In Krosnick et al.'s (2000) study of public opinion changes as a result of the fall 1997 debate on the Kyoto treaty, they found that at the aggregate level, opinions toward global warming seemed largely unaltered. Before the fall 1997 debate began, the general public tended to endorse the views advocated by President Bill Clinton—in that they believed in global warming's existence, saw it as undesirable, and agreed that action should be taken to combat it—and they maintained these views after the campaign. However, there were large differences over time between Democrats and Republicans. Specifically, Democrats moved toward the administration's view and Republicans moved away, thereby widening gaps between the two groups as news coverage increased over the course of the debate. A decade later, during which time climate change became intensely polarized along political lines (McCright & Dunlap, 2011), Hindman (2009) found that political ideology was the strongest and most consistent predictor of individuals' beliefs about whether there is solid evidence for global warming and whether global warming is due to human activity. Moreover, consistent with Krosnick et al.'s (2000) findings, ideological belief gaps regarding the existence of global warming intensified under conditions of greater media coverage. These ideological differences may be the result of party sorting: When political elites take clear sides on an issue, citizens are familiarized with these cues via the media and ultimately follow cues from the political elites whom they trust (Guber, 2012; Zaller, 1992).

Public knowledge about climate change also has been considered as a dependent variable in analyses of television news media's effects. When it comes to general knowledge of current events, research has documented a negative (Eveland & Scheufele, 2000) or null relationship (Pan, Ostman, Moy, & Reynolds, 1994; Vincent & Basil, 1997) between network TV news use and knowledge. Results from Pan et al. (1994) suggested that network television exposure might facilitate the acquisition of basic, image-oriented information but not necessarily more complex, abstract information, which is better learned through print news. Consistent with this previous research, Kahlor & Rosenthal (2009) found no significant relationship between general TV news exposure and knowledge of global warming based on their analysis of an online survey conducted in 2005. The authors attributed the lack of relationship between news media use and knowledge to the dearth of coverage of climate change and the tendency for any existing coverage to oversimplify and confuse the issue.

Some scholars have recognized that different types of news, even within the same medium, may have different effects. Climate change news is not monolithic; rather, the nature of climate change information found in the American news media is highly heterogeneous. At the same time, active news audiences selectively attend to information that reflects their prior needs, interests, and motivations (Katz, Blumler, & Gurevitch, 1973) and are therefore unlikely to pay equal attention to all types of news. Thus, several studies have focused on the effects of individuals' attention to news coverage that reflects different topical emphases, namely political news versus science news (Hart, Nisbet, & Myers, 2015; Nisbet, Cooper, & Ellithorpe, 2015; Zhao, Leiserowitz, Maibach, & Roser-Renouf, 2011). This is because coverage of climate change in the context of national politics is more prone to false balance and conflict framing, whereas science news coverage is more likely to accurately and consistently communicate the established scientific facts. Accordingly, this research has found that political news attention either was unrelated to knowledge about climate change (Hart et al., 2015) or reduced knowledge specifically among conservatives, thereby amplifying ideological knowledge gaps (Nisbet et al., 2015). Political news attention also was negatively related to belief in climate change (Zhao et al., 2011) and had a polarizing effect by increasing perceptions of harm and climate policy support specifically among moderates and conservatives (Hart et al., 2015). Attention to science news, on the other hand, had a positive effect on climate change knowledge (Hart et al., 2015; Nisbet et al., 2015) and beliefs about global warming (Hart et al., 2015; Zhao et al., 2011). Moreover, science news attention decreased ideological knowledge gaps by increasing knowledge among conservatives (Nisbet et al., 2015) and likewise weakened attitude polarization by increasing perceptions of harm and, in turn, climate policy support among conservatives (Hart et al., 2015).

Given the capacity for news media to activate concern for and knowledge of climate change, researchers have explored whether there may also be a link between television news use and pro-environmental behavior. These studies have found that news media use, and particularly television news use, is positively correlated with such behaviors as recycling, energy conservation, green consumerism, and pro-environmental political advocacy (Arlt, Hoppe, & Wolling, 2011; Holbert, Kwak, & Shah, 2003; Huang, 2016; Östman, 2014). The mechanism for this influence remains unclear, however. It may be that news media help increase awareness of environmental issues such as climate change (Östman, 2014), or they may alter perceived social norms surrounding environmental behavior (Liao, Ho, & Yang, 2016), which in turn spur behavioral engagement; news coverage also may elicit emotional reactions such as fear, guilt, or

hope, which may drive behavioral changes (Holbert et al., 2003; Östman, 2014). These theoretical mechanisms have not been directly tested; thus, more research is needed to better understand the nature of television news' direct and indirect effects on behavior.

The effects of other characteristics of television news coverage of climate change, such as the focus on threat information in the absence of a clear efficacy message, and the use of spectacular imagery, have not been explicitly studied in the context of network news; however, the results from several experimental studies are telling. For example, Feldman and Hart (2015) found that news stories that paired information about political actions to address climate change with information about climate impacts increased participants' hope and decreased their fear relative to a story that only discussed the impacts of climate change; hope, in turn, was a driver of climate-related activism. Similarly, Chadwick (2015) found that exposure to a message that emphasized the possibility that individuals can take action to improve the climate increased subjective feelings of hope. This may mean that network TV news stories that systematically exclude efficacy information are hindering hopeful emotional reactions among the public and perhaps facilitating apathy-inducing fear or cynicism. Another prominent feature of network news coverage of climate change is its emphasis on political conflict; prior research has shown that conflict framing in TV news—by focusing on the self-interested motivations of political actors—can induce high levels of cynicism toward government, politics, and policy formation (Cappella & Jamieson, 1997). Although untested, it is possible that a similar dynamic is at play in the specific context of climate change.

Finally, one of the attributes of television news that distinguishes it from other news forms is its use of moving images. Images can provide an interpretive frame for a news story, thereby guiding individuals' attention and structuring their perceptions of the information contained within the story (Messaris & Abraham, 2001). In particular, because of their analogic and indexical qualities, images often seem more closely linked to reality than words and are thus more likely to be taken at face-value, rendering them especially powerful framing devices (Messaris & Abraham, 2001). Because of the salience and richness of visuals, they also help attract audience interest and aid in remembering information in news stories (Graber, 1990), and may play a particularly important role in shaping individuals' emotional reactions to climate change (Leiserowitz, 2006).

Although no existing research has isolated the effects of visual imagery in television news broadcasts about climate change, O'Neill and colleagues (O'Neill, Boykoff, Niemeyer, & Day, 2013; O'Neill & Nicholson-Cole, 2009) used Q-sort methodology to study audience reactions to static visual images often used in news stories about climate change. They found that spectacular, threat-depicting climate change images, such as images of floods and droughts, increased the perceived importance of climate change. These same images, however, made individuals feel that there was nothing they could do about climate change.

In sum, existing research indicates several important effects of network news on public opinion and knowledge about climate change. First, there is some—albeit mixed—evidence for an agenda-setting effect, such that the amount of media coverage devoted to climate change predicts the public's level of concern about the issue. In terms of framing effects, when coverage accentuates uncertainty or controversy, this promotes public skepticism about climate change. At the same time, exposure to television news coverage may signal audiences to follow elite partisan cues on climate change, thereby leading to ideological polarization in climate change attitudes

and knowledge. This polarization is enhanced when audiences attend to climate change coverage in the context of national politics but is reduced when they attend to science news coverage of climate change.

Overall, television news exposure does little to promote climate change knowledge; however, this also depends on the type of news to which people pay attention, with science-oriented coverage increasing knowledge and politically oriented coverage decreasing knowledge. Finally, although more research is needed, there is indication that some of the characteristics of television news coverage of climate change—such as conflict framing, limited efficacy information, and spectacular, threat-depicting imagery and narratives—may contribute to public disengagement around climate change and particularly may foster a sense of disempowerment and cynicism among the public.

U.S. Cable News as a Source of Public Opinion Polarization About Climate Change

Given the opinionated, often one-sided, partisan-oriented content on U.S. cable news outlets, the chief question pertaining to cable news vis-à-vis climate change is whether it has contributed to the polarization of public opinion. Notably, the popularity of the cable news networks, especially Fox News, grew over the same time period that witnessed widening partisan gaps in public perceptions of global warming. For example, cable news ratings increased fairly steadily from the late 1990s onward, peaking in 2008–2009 (Mitchell & Holcomb, 2016); the opinion gulf between liberals and conservatives followed a similar pattern (McCright & Dunlap, 2011). During this time, there was also very strong ideological sorting among the partisan electorate, as the mean Republican and Democrat each became more ideologically consistent in their political outlooks. Better educated, more politically attentive Democrats tended to consistently take a strong liberal position on most issues, including climate change, and their Republican counterparts tended to taken an even stronger conservative position (Abramowitz, 2010; Guber, 2012; Levendusky, 2009).

In the context of this broader pattern of party sorting, opinionated cable news may play a role in opinion polarization (Levendusky, 2013). Research on partisan selective exposure demonstrates that partisan identity guides media choice (e.g., Stroud, 2011). Republicans and conservatives are more likely to watch Fox News than Democrats and liberals, whereas Democrats and liberals are more likely to watch MSNBC and CNN. If political partisans gravitate toward different media outlets, and if those media cover climate change differently, it stands to reason that the content on those media outlets may have something to do with their divergent beliefs. As will be discussed throughout this section, the three leading cable news outlets—CNN, Fox News, and MSNBC—do indeed cover climate change in distinctive ways, and these differences are reflected in their audience's beliefs about climate change. Through a reinforcing dynamic of selective exposure and partisan media effects, cable news shapes and polarizes public opinion about climate change.

Fox News's overt conservative orientation has made it a hospitable place for the climate change denial movement in the United States to effectively spread and amplify its message discrediting climate science. Fox News has been used to distribute findings produced by conservative think tanks—often with funding from the fossil fuel industry—that purported to challenge existing

empirical evidence highlighting the risks of global warming (Dunlap & McCright, 2010, 2011; Oreskes & Conway, 2011). This was achieved by placing contrarian scientists and think tank representatives as interview guests and by otherwise influencing the substance of Fox News' reporting on climate change in such a way as to “manufacture uncertainty” about climate science (Dunlap & McCright, 2010). For example, Fox News helped turn “Climategate”—a series of hacked emails from scientists at the University of East Anglia that critics exploited to suggest that the scientists had doctored data to make global warming appear worse than it is (claims that were later disproven)—into a full-blown scandal, using it to cast doubt on the integrity of climate science (Mayer, 2012). Even a year after the scandal, during the 2010 United Nations climate change conference in Cancun, Mexico, Fox invoked Climategate in its coverage of the conference (Boykoff, 2012).

Several content analyses have systematically documented stark differences in how Fox News has covered climate change relative to its cable news counterparts. For example, a comparison of coverage of climate change on CNN, Fox News, and MSNBC in 2007 and 2008—a peak period for climate change news coverage following the release of the fourth Intergovernmental Panel on Climate Change (IPCC) report on climate change, an Oscar win by Al Gore's documentary *An Inconvenient Truth*, and the award of the 2007 Nobel Peace Prize to Al Gore and the IPCC—found that, in terms of their overall tone, Fox News broadcasts were more dismissive of climate change, whereas news segments on CNN and MSNBC were more accepting (Feldman, Maibach, Roser-Renouf, & Leiserowitz, 2012; see Figure 1).

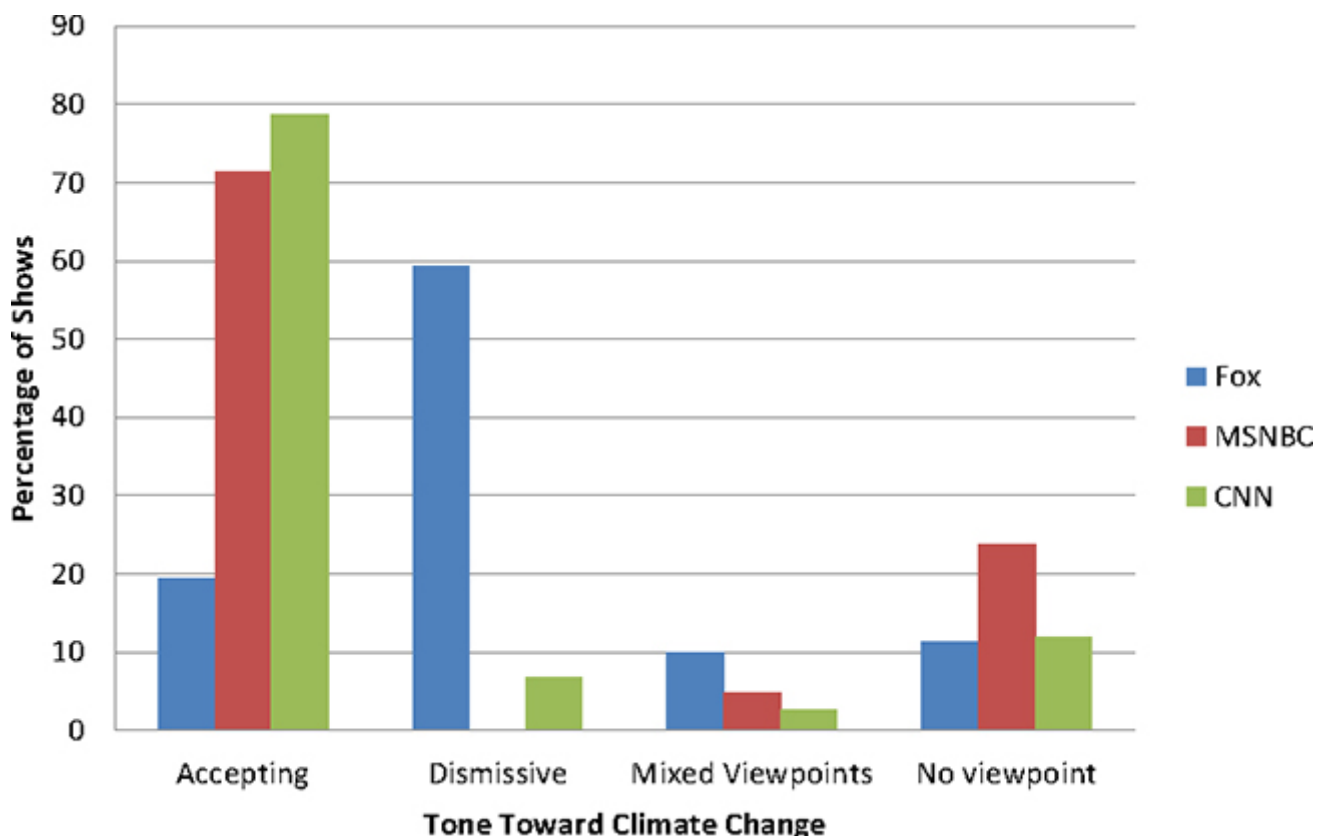


Figure 1. Overall tone toward climate change in cable news evening broadcasts, 2007–2008.

Source: Feldman, Maibach, Roser-Renouf, and Leiserowitz (2012).

Relative to CNN and MSNBC, Fox News also was more likely to include explicit claims that challenged the scientific consensus on climate change, the reality of climate change, and the role of human factors. CNN and MSNBC, on the other hand, were more likely than Fox News to include claims that affirmed the scientific consensus on climate change, the reality of climate change, and its human causes. Among its interview guests, Fox included a higher ratio of climate doubters than believers, with the reverse true on CNN and MSNBC. Notably, during this time, Fox News provided the most coverage of climate change and MSNBC the least.

Likewise, Mayer's (2012) analysis of television news coverage between 2001 and 2010 found that Fox News relied heavily on a "hoax" narrative that accused science and scientists of being part of a conspiracy to perpetuate fraud when discussing climate change, a trend that began to dominate coverage in 2007. For example, Fox News segments characterized the science contained in the fourth IPCC report as illegitimate and primarily the work of political appointees as opposed to scientists, and described the report itself as over-hyped. Al Gore was frequently portrayed as a hypocrite who flew around the country on a private jet. According to Mayer's (2012) analysis, MSNBC also accentuated drama and conflict in its coverage, emphasizing, beginning in 2007, the conspiracy among right-wing, oil-funded denialists to refute the scientific evidence and subvert progress on climate change. For example, MSNBC reported on how Exxon-Mobil allegedly offered to pay thousands of dollars to any scientist who undermined the IPCC report. CNN provided a mix of story lines, reflecting its more balanced perspective, although it erred on the side of belief in climate change while also giving voice to the hoax narrative that dominated on Fox. CNN, for example, ran its "Planet in Peril" documentary series in 2007, which highlighted the environmental devastation caused by global warming; however, earlier that year, it ran another special, "Keeping Them Honest: The Truth about Global Warming," which opened with conservative attacks on Al Gore and his documentary *An Inconvenient Truth*. All three networks also frequently framed their coverage in terms of the political conflict and strategy involved in negotiations over climate policy; they invoked this "policy game" narrative even more than the broadcast networks.

A 2013 analysis, conducted by the Union of Concerned Scientists (Huertas & Kriegsman, 2014), focused on the accuracy of cable networks' coverage of scientific claims related to climate change. According to their report, Fox News was the least accurate; a full 72% of its climate-related segments contained statements that were inconsistent with science, typically due to understating the reality or effects of climate change and disparaging climate science and scientists. On CNN, about a third of segments included misleading scientific statements. A significant portion of CNN's misleading coverage was the result of the "debates" it featured between interview guests who accepted mainstream climate science and others who challenged it. MSNBC was the most accurate of the networks; just 8% of its segments contained inaccuracies. These inaccuracies were exclusively due to overstating the relationship between climate change and specific extreme weather events such as hurricanes and tornadoes.

Given the distinctive patterns of coverage across networks, does cable news contribute to polarized views on climate change? Historically, scholars have had difficulty discerning direct media effects on public opinion, in part because, in the past, audiences were exposed to similar messages or to competing messages that cancelled each other out; thus, there was insufficient variation in media exposure. Zaller (1992, 1996) has argued that observation of media effects requires "reception gaps"—for example, people who are exposed to the messages of one political candidate but not the other. Bartels (1993) made a similar case for the importance of "distinctive" media messages—messages that reach one group of people but not the other.

Overall, Fox News paints a very different picture of climate change than CNN and MSNBC. This creates the opportunity for exposure to distinctive messages that are a prerequisite for observing persuasive media effects.

Several survey analyses have shown that watching Fox News is negatively associated with acceptance of climate change, whereas watching CNN and MSNBC is positively related (Feldman et al., 2012; Feldman, Myers, Hmielowski, & Leiserowitz, 2014; Hmielowski, Feldman, Myers, Leiserowitz, & Maibach, 2014; Krosnick & MacInnis, 2010). In other words, the more someone watches Fox News, the more likely they are to doubt the reality of climate change; the more someone watches MSNBC and CNN, the more likely they are to accept the reality of climate change. In one study, the effect of cable news use was roughly as predictive of global warming acceptance as political partisanship and one's identification as an environmentalist (Feldman et al., 2012). Because these effects have been demonstrated over time (Feldman et al., 2014; Hmielowski et al., 2014) as well as cross-sectionally (Feldman et al., 2012), this increases confidence that media use has a causal effect on public opinion.

These studies also help reveal the theoretical mechanisms via which these effects occur. Hmielowski et al. (2014) showed that the effects of partisan media are mediated by trust in scientists. Trust is an important heuristic, or information shortcut, that people use when making judgments about complex issues like climate change. Hmielowski et al. (2014) found that exposure to conservative media, including Fox News, undermined audiences' trust in scientists, which in turn led them to hold more dismissive views toward global warming. In contrast, exposure to non-conservative media, including MSNBC and CNN as well as network news, increased trust in scientists, which led to greater acceptance of global warming.

When considering the relationship between cable news exposure and public opinion, one important question is whether media use drives audiences' opinion, or, via a process of partisan selective exposure, whether audiences are simply drawn to outlets that already support their views, thereby limiting media influence (see Bennett & Iyengar, 2008). However, this line of thinking treats media effects and selective exposure as either/or processes. Slater (2007), in his reinforcing spirals framework, instead argues that media exposure and changes in beliefs are both causes and effects. Slater conceptualizes media selection and effects as a "spiral of ongoing influence," whereby the selection of a particular type of media influences beliefs, and these changes in beliefs beget future consumption of similar media content, leading to the further maintenance or strengthening of said beliefs.

Feldman et al. (2014) tested Slater's reinforcing spirals model in the context of partisan media and global warming. They found that media effects and media selectivity were linked over-time in a process of ongoing influence (see Figure 2 for the reinforcing spirals model tested by Feldman et al.).

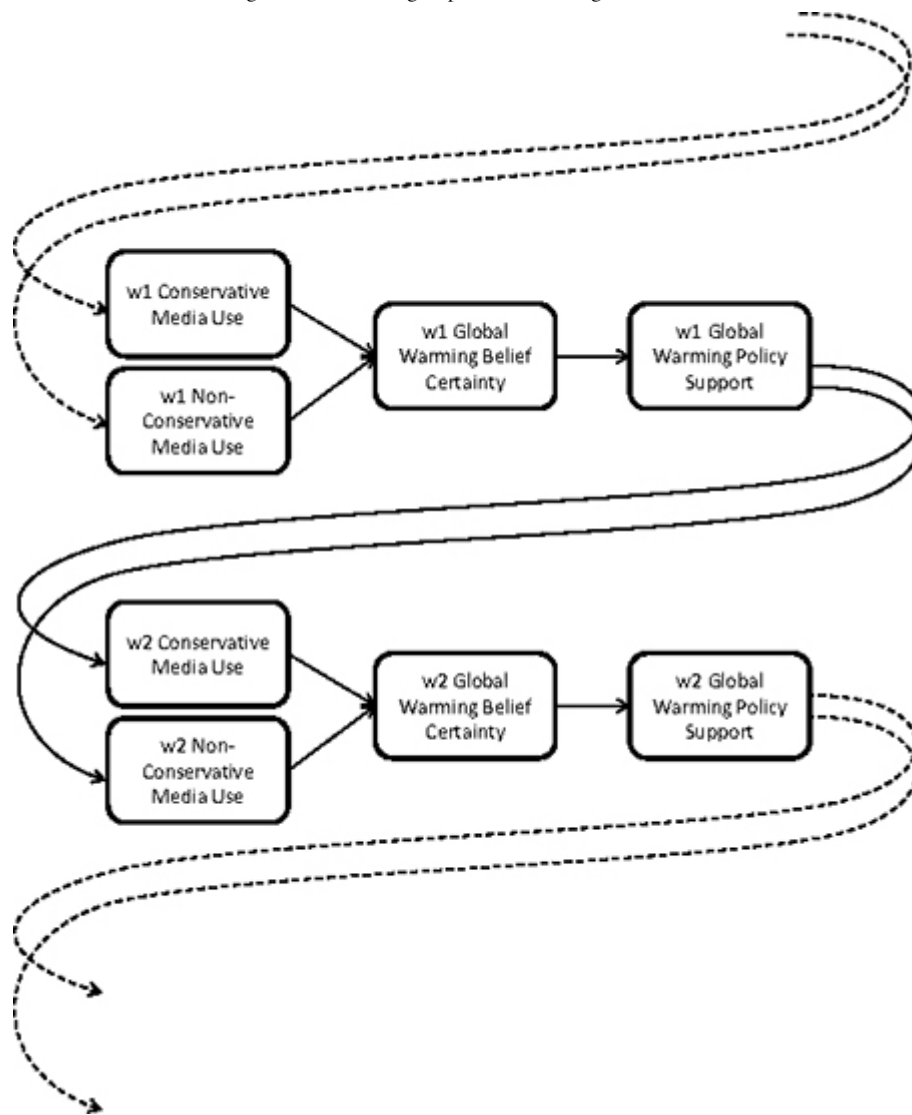


Figure 2. Proposed reinforcing spirals model reflecting over-time relationships between conservative and non-conservative media use, global warming belief certainty, and global warming policy support.

Source: Feldman, Myers, Hmielowski, and Leiserowitz (2014).

Partisan media use influenced audiences' beliefs about climate change, and these beliefs in turn drove people back to the media that supported these beliefs and away from media that didn't, which in turn reinforced and strengthened individuals' initial beliefs, in a repeating cycle. The researchers suspect that this occurred because consuming partisan media increases the salience of partisan identity and associated attitudes, increasing the likelihood of seeking out more like-minded media, which in turn strengthens individuals' political identities and attitudes, and so on. The observed spiraling effects were particularly strong for conservative media (i.e., Fox News and Rush Limbaugh), likely given their coherent messaging on climate change, relative to the more diffuse climate messaging of non-conservative media (i.e., CNN, MSNBC, network news, and NPR).

All told, the results of Feldman et al. (2014) illustrate a cyclical process that perpetuates like-minded media use and polarizes attitudes—in essence, an echo chamber. For example, the findings suggest that, when Fox News audiences see messages that challenge the reality of global warming and warn that any contrary information from scientists or the mainstream media should be questioned or dismissed, this reinforces their current beliefs about global warming and

encourages them to ignore disconfirming evidence from the scientific community, while driving them back to Fox News for more of the same. A similar dynamic may be at play with sources such as MSNBC, which vilifies the conservative opposition and in some cases overstates the evidence on global warming, thereby leading audiences to hold an equally extreme and uncompromising attitude toward climate science and policy. Still, it is important to note that, even with Feldman et al.'s (2014) use of longitudinal data, causal relationships can be difficult to establish; thus, these results should be interpreted with some caution.

Another theoretical question that animates research on the relationship between partisan media use and opinion polarization is whether these effects occur as a result of motivated reasoning or direct persuasion. According to theories of motivated reasoning, partisans process information in defense of their prior beliefs—counter-arguing attitudinally incongruent information and uncritically accepting congruent information (Taber & Lodge, 2006). Such processing is likely to make partisans even more convinced of their initial position, contributing to attitude polarization. This suggests that conservatives and Republicans would be more likely to accept messages on Fox and reject those on CNN or MSNBC, with the reverse true for liberals and Democrats.

Direct persuasion, on the other hand, suggests that all partisans will process information similarly; in other words, Fox News would persuade all viewers—regardless of their partisan orientation—to be more dismissive of climate change. In the context of cable news and climate change, the balance of empirical evidence points to a model of direct persuasion. Feldman et al. (2012) found that Democrats' climate change beliefs did not vary much as a function of cable news use; Republicans' beliefs reflected the outlet they watched, regardless of the outlet's stance toward climate change (see Figure 3).

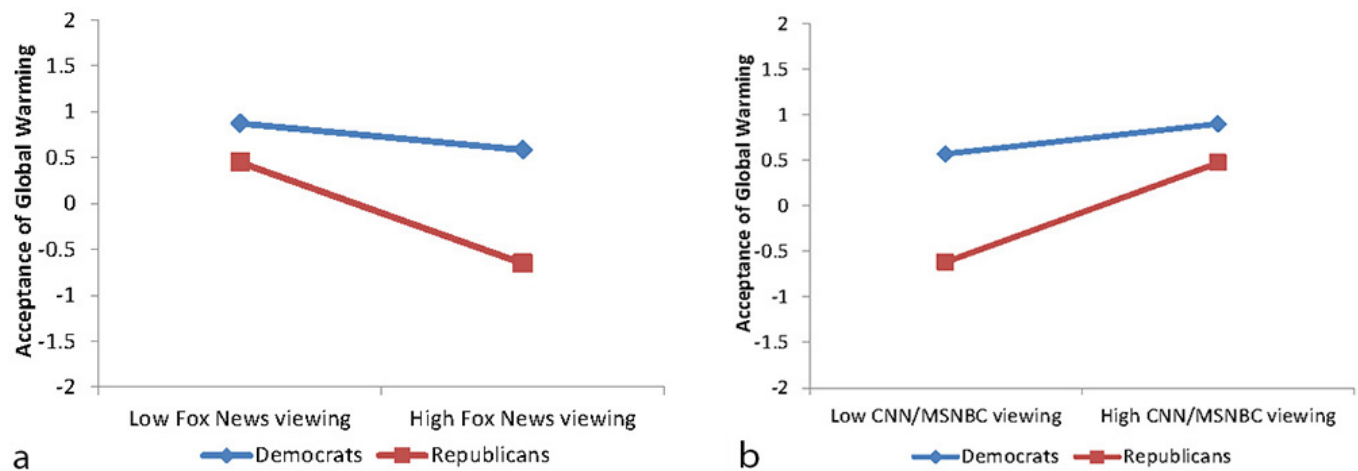


Figure 3. Interaction between cable news use and political partisanship in predicting global warming acceptance. 3(a) shows the effect of Fox News, and 3(b) shows the effect of CNN/MSNBC.

Source: Feldman et al. (2012).

Thus, Republicans who used non-conservative media sources were responsive to coverage painting climate change as a concerning problem.

Other studies of cable news' influence on climate change beliefs found no interaction between media use and partisanship or ideology, suggesting uniform effects across groups (Feldman et al., 2014; Hmielowski et al., 2014). This is consistent with studies from other substantive domains

that found evidence for direct persuasion in response to partisan news (Feldman, 2011; Gvirsman, 2014; Meirick, 2013) and suggests that any polarization that occurs between ideological groups is the result of partisan selective exposure to like-minded media, not biased processing in response to one-sided content. Although there is evidence for motivated reasoning in response to climate messages, in general (e.g., Hart & Nisbet, 2012), this does not appear to be driving polarization in response to cable news specifically.

Finally, it is important to note that the question of media's role in opinion polarization, in general, has received fairly extensive attention from communication and political science scholars in recent years. Many studies support the role of partisan media in driving ideological and partisan opinion gaps (e.g., Jamieson & Cappella, 2008; Levendusky, 2013), particularly via a selective exposure mechanism (e.g., Gil de Zuniga, Correa, & Valenzuela, 2012; Gvirsman, 2014; Stroud, 2011; Tsfati, Stroud, & Chotiner, 2014).

However, some scholars disagree. For example, Prior (2013) argues that most citizens avoid partisan media altogether or cross-view across partisan lines, and the minority who voraciously consume one-sided news are *already* polarized. In support of Prior's first point, Arceneaux and Johnson (2013) found that the polarizing effects of opinionated cable news programs dissipated when people had the option to select out of political information entirely in favor of entertainment. Other evidence suggests that selective exposure is not as problematic as it seems: Although people prefer like-minded media, they don't completely screen out non-like-minded media (Garrett, 2009).

Still, Feldman et al.'s (2014) results suggest that the over-time effects of partisan media use drive people away from counter-attitudinal media. Moreover, although the size of the audience for cable news and other partisan media pales in comparison, for example, to the mass audience that tuned into network news during the latter medium's heyday, cable news viewers are a critical audience of highly involved partisans, who are most likely to participate and make their voices heard on issues such as climate change (Levendusky, 2013). These opinion leaders, in turn, may influence others who are less attentive to climate change news (Nisbet & Kotcher, 2009).

In sum, the media's polarizing effects remain an important question for future research. Certainly, the polarization of opinion regarding climate change is a complex phenomenon, driven by multiple causes (e.g., Scruggs & Benegal, 2012); still, the evidence to date points to at least a partial role of the media, and cable news in particular, in the persistent public disengagement and polarization around climate change, an effect that is driven by the twin problems of media content biases and partisan selective exposure.

TV News About Climate Change Around the World

Very few studies have compared television news coverage of climate change and its effects internationally. This is a critical oversight, as such research can help further our understanding of how varying socio-economic, political, cultural, and media contexts shape climate change reporting and audience reactions to it. Some existing scholarship has studied print coverage of climate change from a comparative perspective, and the results suggest that cultural factors are highly significant in explaining cross-national differences in climate reporting, often with non-U.S. coverage more accurately reflecting the mainstream scientific consensus on climate change

(e.g., Antilla, 2010; Brossard, Shanahan, & McComas, 2004; Dispensa & Brulle, 2003; Schmidt, Ivanova, & Schafer, 2013; but see Shehata & Hopmann, 2012). While this research is informative, television is a qualitatively different medium, and given that TV is a leading source of science news around the globe, especially outside of Europe and North America (National Science Board, 2014), television coverage of climate change is deserving of comparative study in its own right.

In analyzing the effects of media coverage of climate change on public attitudes and behavior in Germany, Arlt et al. (2011) found that exposure to public television news programs was more strongly related to climate awareness and behavioral intentions to take action to address climate change than exposure to commercial news programs. Although not a comparative study, these results nonetheless suggest that a country's media system has important implications for the way climate change gets covered on TV news and how this coverage affects audiences. For example, a public service broadcasting model, characterized by the media systems of Finland and Denmark, is more likely to prioritize hard news and thus promote public knowledge of current affairs, relative to the market-driven model characteristic of the United States (Curran, Iyengar, Lund, & Salovaara-Moring, 2009).

In a report for the Reuters Institute for the Study of Journalism, Painter (2014) offered one of the few truly comparative analyses of television news reporting on climate change, analyzing how the evening TV news programs in six countries—Australia, Brazil, China, Germany, India, and the United Kingdom—covered the fifth Intergovernmental Panel on Climate Change (IPCC) assessment report, released in 2013–2014. He found that, across countries, the evening news programs disproportionately used a “disaster” frame that emphasized possible adverse impacts of climate change, despite the fact that the IPCC report itself focused more on how to manage the risks of global warming. This is likely because the disaster frame fits well with the norms of television journalism, given that calamitous impacts are relatively easy to depict visually and readily lend themselves to a compelling dramatic narrative.

At the same time, Painter (2014) found notable differences across countries in the volume of coverage: Indian television did not cover the IPCC report, and Chinese TV provided only one short segment. In contrast, the news programs in Australia, Brazil, Germany, and the United Kingdom devoted several segments to the report. The lack of coverage in India was likely due to the general elections in 2014 superseding attention to the IPCC report. Another factor may be the intense competition among India's 24-hour television news channels and the priority given to soft news as a result (Thussu, 2008), yet another indication that a country's media system is a critical determinant of whether and how climate change gets covered in the news. In China, the lack of coverage was attributed, in part, to the absence of anything “new” in the scientific findings from the IPCC report, given that the Chinese government already recognizes the existence of climate change and is taking steps to mitigate its impact (Painter, 2014). Thus, just as in the United States, journalistic norms in combination with political economic factors drove TV news coverage of climate change.

Painter (2014) also found stark differences in how much attention the television channels devoted to skeptical views and, specifically, to the so-called climate “pause” (i.e., the slowdown in warming global temperatures since 1998, now disputed, which was a popular narrative used by climate skeptics at the time). Only the United Kingdom and Australia prominently featured skeptical views in their TV news reports, suggesting that such discourse may be a strong feature of media coverage in Anglo-sphere countries, but not in most other Western European or developing countries. This may be because Anglo-Saxon countries such as the United States, the

United Kingdom, and Australia all share the presence of at least some political elites who question climate science (although this is most pronounced in the United States, where climate denial has become a tenet of conservative ideology), a powerful fossil fuel industry that is invested in preventing legislative action on climate change, and a partisan media receptive to a message of climate skepticism (see Painter, 2011). For example, although scholars have noted that Fox News, in the United States, is relatively unique globally in providing a “steady drumbeat” of skeptical coverage of climate change (e.g., Mayer, 2012, p. 37), other analyses have shown that right-leaning News Corporation-owned outlets in the United States (which include Fox News), Britain, and Australia are similarly supportive of skeptical views toward climate change, at least in their opinion content (McKnight, 2010).

Taken together, these findings suggest that socio-political factors, along with media ownership structures, are important determinants of cross-national differences in TV news coverage of climate change, with implications for public opinion. Although Painter’s was a relatively small study, in that it focused on a single newsworthy event and analyzed news bulletins from only one television program per country, it represents an important first step in what will hopefully be a continuing stream of scholarship that explores differences in how television news communicates climate change across the globe and, critically, the reasons for these differences.

Concluding Thoughts and Future Directions

The inaccuracies and distortions in television news coverage of climate change have important effects on public opinion and, in particular, may fuel confusion and apathy among the general public and opinion extremity among strong partisans. As has been noted by several scholars, significant societal and political change regarding fossil fuel use hinges, at least in part, on public opinion and pressure of government officials (e.g., Ockwell, Whitmarsh, & O’Neill, 2009). Thus, the media’s influence on public opinion in the context of climate change is of grave consequence to sustainability efforts and the development of effective climate mitigation policy.

Implicit in the link between news media use and public opinion about climate change are questions about the normative role of climate change journalism and television journalism, specifically. Although the news media can certainly improve their coverage of climate change, this does not mean that they should necessarily advocate for one position on climate change over another. Rather, they should strive to clearly and effectively convey the reality of climate science and policy with all of its context and nuance. This, of course, is a tall order, given the institutional constraints and economic pressures that shape media coverage of climate change and often interfere with the ability of news organizations to serve the public interest.

As such, it is important that future research focus not only on the content of television news and its effects but also on the norms and practices that influence news production in the context of climate change both in the United States and internationally, as well as on the dynamic relationships between news organizations, policy makers, scientists, and the public. For example, do policy makers and other strategic actors rely on media coverage of scientific research when developing public policy and making political decisions? How do journalists interface with scientists and policy makers in the process of climate change news making? Recent, high-profile climate-related events—such as the Environmental Protection Agency’s Clean Power Plan, Pope Francis’ climate change encyclical, President Obama’s rejection of the Keystone XL pipeline, and

the United Nations climate summit in Paris—also should be studied in the context of journalistic norms and TV news coverage. Did such events spur increased coverage of climate change? Did these events encourage reliance on typical journalistic frames, such as drama and conflict, or did they lead to alternative framings, such as an emphasis on morality in the context of the Pope's encyclical, and/or increased attention to the efficacy of actions to address climate change?

Future research on the effects of television news on climate change opinion and knowledge also must take into account the changing context for science information consumption. Many television news packages are now consumed online, often embedded in social media contexts such as Facebook, Twitter, and YouTube (Barthel, Shearer, Gottfried, & Mitchell, 2015). Television itself is often watched while using a “second screen” to access additional information online or to weigh in on TV content via social media (Smith, 2012). However, virtually nothing is known about how social networks and other aspects of the digital media environment influence the perceptions of individuals and their engagement with television news. Initial research suggests that online social cues can play a decisive role in shaping audience reactions to science news (Anderson, Brossard, Scheufele, Xenos, & Ladwig, 2014); however, this has not been tested explicitly in relation to television news coverage or in the context of climate change.

More attention also should be paid to differences in how TV news channels cover climate change and the effects of these differences. For example, although it is often assumed that the major TV broadcast networks are fairly homogeneous in their reporting, an analysis of 2015 climate change coverage found key differences across networks in the frequency of coverage, the use of scientists as sources, and the particular climate impacts and actions that the coverage addressed (Seifter, Robbins, & Kalhoefer, 2016). For example, some networks, including CBS, NBC, and PBS, often addressed the link between climate change and extreme weather, whereas others, such as ABC and Fox, did not. MSNBC also is particularly likely to highlight and sometimes overstate the connections between climate change and extreme weather (Huertas & Kriegsman, 2014). An important future research question is whether exposure to climate coverage across different outlets leads viewers to be more or less accepting of this connection, and with what consequences for broader public opinion and behavior related to climate change.

Finally, scholarship on television news effects would benefit from experimental studies that analyze how specific characteristics of climate change coverage, such as conflict framing and spectacular visuals, influence audience perceptions. Existing research designs could be strengthened by conducting studies in environments that more accurately reflect today's contemporary media experience (e.g., Arceneaux & Johnson, 2013) and by incorporating over-time measurements that permit researchers to assess the duration of any observed effects. This, in turn, would allow for more robust inferences about the magnitude and significance of media effects on public opinion.

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