

Constructing Climate Change in the Americas: An Analysis of News Coverage in U.S. and South American Newspapers

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Abstract

This study examined the portrayal of climate change in four national newspapers from Argentina, Brazil, Colombia, and the United States. The results indicated that leading media in Brazil and the United States highlighted the policy progress being made to mitigate climate change and presented the issue in economic terms, whereas coverage in Argentina and Colombia portrayed the issue as being urgent and emphasized the catastrophic consequences of climate change. The findings are consistent with previous work indicating a lack of focus on scientific controversy from non-U.S. media and present implications for comparative studies examining nuances in international coverage of climate change.

Keywords

climate change, framing, environmental, journalism, science, mass media, newspapers

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The mass media play critical roles in the identification and interpretation of environmental issues (Boykoff & Boykoff, 2007; Hannigan, 2006; Nelkin, 1995; Schoenfeld, Meier, & Griffin, 1979). This is particularly true for climate change, as most adults in the United States—and most journalists—gain their understanding of the issue from the mass media (Wilson, 2000), which may have substantial implications for public comprehension as well as policy making. As the climate change debate has become increasingly politicized in recent decades (Anderson, 2009; Carvalho & Burgess, 2005; Trumbo, 1996), struggles for the legitimacy of claims by highly interested parties have occurred largely within mediated arenas.

How such claims are interpreted, unpacked, and presented, or conversely, withheld, from public view, is thus likely to affect societal understanding and reactions. Various scholars have noted the difficulty of covering climate change for mass audiences. Trumbo (1996), for example, notes that climate change represents a new class of environmental problems in that it is intangible to the average person. Societies must therefore acknowledge and act on an issue that is practically invisible and long term, yet one that presents the potential for serious consequences (Trumbo, 1996).

While a growing body of research has examined media coverage of climate change, it has not often been explored in a comparative context. Furthermore, the vast majority of these studies focus on the United States (e.g., Boykoff & Boykoff, 2007; McComas & Shanahan, 1999; Nissani, 1999; Wilkins, 1993; Zehr, 2000) and Europe (e.g., Carvalho & Burgess, 2005; Carvalho & Pereira, 2008; Ladle, Jepson, & Whittaker, 2005; Lyytimäki & Tapio, 2009; Peters & Heinrichs, 2008; Taylor & Nathan, 2002; Tsekos & Matthopoulos, 2008; Weingart, Engels, & Pansegrau, 2000), though attention has also been paid to Australia (e.g., Henderson-Sellers, 1998; McManus, 2000), India (e.g., Billett, 2010), Japan (e.g., Sampei & Aoyagi-Usui, 2009), and New Zealand (e.g., Bell, 1994). Only a few studies have done cross-cultural comparisons (e.g., Boykoff, 2007; Brossard, Shanahan, & McComas, 2004; Dispensa & Brulle, 2003; Takahashi, 2008), and almost all focus exclusively on English-language media.

More internationally comparative work is necessary for researchers to understand how claims and frames regarding climate change are presented across nations and cultures (Anderson, 2009). As such, this study seeks to fill a gap in the literature by conducting a cross-cultural content analysis comparing print media coverage of climate change in the United States with that of three countries in South America, a hitherto understudied region, by analyzing the salience of frames and tone of coverage and identifying the claims makers given a voice in the media. How media present issues to their

audiences may affect not only public opinion but also policy direction (Bloch-Elkon, 2007; McQuail, 1994). Finally, South America, home to some of the world's fastest growing economies, is not only particularly vulnerable to the effects of climate change but is also home to some of the world's most important biosystems, thus making it a region worthy of study.

Background

Theoretical Framework

According to McCombs and Shaw (1972), the mass media are a critical institution in the generation of knowledge. Presented within the core tenets of social constructionism—that knowledge and the conception of reality are both contextual and a product of social interaction (Berger & Luckmann, 1967)—our understanding of how the media portray issues becomes important in terms of assigning meaning and providing legitimacy. According to Hall (1982), the news media do not merely reproduce reality but actually help to define it through the “active work of selecting and presenting, of structuring and shaping; not merely the transmitting of an already-existing meaning, but the more active labor of *making things mean*” (p. 64). Consequently, media have become “a site on which various social groups, institutions, and ideologies struggle over the definition and construction of social reality” (Gurevitch & Levy, 1985, as cited in Trumbo, 1996, p. 270).

In developing the narratives that cultivate social realities, journalists consciously and unconsciously privilege particular interpretations and report certain facts while ignoring others in a process commonly referred to as “framing.” While varying perspectives of framing theory exist in the study of mass communication, a commonly cited definition of framing is to “select some aspects of a perceived reality and make them more salient in a communicating text,” thereby promoting a particular reality (Entman, 1993, p. 52). Researchers have found that the manner in which media frame issues affects not only receivers’ understanding of issues but also how they later recall them (Entman, 2004; Nelson, Clawson, & Oxley, 1997; Pan & Kosicki, 1993).

In addition to identifying the salience of frames as a means of shaping coverage, it is also important to identify the “frame sponsors,” or the actors selected to participate in the frame-building process (Deprez & Raeymaeckers, 2010). Indeed, entry to mediated arenas is in and of itself a substantial factor, as claims that enter the public arena and become the news are more likely to

prevail in the struggle for legitimacy (Trumbo, 1996). Additionally, while journalists may offer background and context to a story, it is in the sources that the broader authority of the story resides (Trumbo, 1996). The importance of studying source selection is further highlighted by Manheim (1998), who argues that journalists frequently turn to news shapers who “strive systematically to ensure, insofar as possible, that the work product of journalism reflects events and an environment, and creates a reality, which they, and not the journalists, define” (p. 96). Last, sources must generally be in a position of power to have a voice in the news coverage of the climate change debate, thereby further institutionalizing knowledge (Wilkins, 1993).

Constructing Climate Change Coverage

Understanding the components of journalist-constructed artifacts that have salience for public understanding is of particular import for climate change, an issue with political, cultural, and economic resonance. Scholars have noted that the framing of news stories may influence how individuals interpret issues (Aday, 2006), attribute responsibility (Iyengar, 1991), and form policy opinions (Schnell & Callaghan, 2005). More specifically, in the context of climate change, framing decisions may affect both the predispositions for individual behavior change as well as support for policies to address climate change (Hart, 2011). Furthermore, some scholars have argued that the climate change debate inherently spans political and economic divides, creating a fundamental challenge to the legitimacy of the industrial society and the nature of economic growth that must be marginalized to maintain the legitimacy of the ruling authorities (Dispensa & Brulle, 2003).

The complexity of climate change does not bode well for event-driven reporting for an ever-decreasing news hole. Research on the mechanisms that help guide understanding and comprehension of climate change has found that, over time, frames in U.S. media accounts moved from defining problems and diagnosing problems to making judgments and suggesting solutions as the issue became increasingly politicized and scientific voices dropped out of the debate (Trumbo, 1996). Indeed, despite the Intergovernmental Panel on Climate Change and the scientific community’s consensus on climate change, equal weight has been observed to be provided to oppositional viewpoints, effectively distancing media accounts from the scientific consensus (Boykoff & Boykoff, 2007; Brossard et al., 2004; Lahsen, 2005; Stocking, 1999). However, Boykoff (2007) found that, since 2005, coverage was returning to reflecting “the scientific consensus on attribution for climate change” (p. 475).

According to Boykoff and Boykoff (2007), elements of news production, such as personalization, dramatization, novelty, and authority-order bias, play important roles in the construction of the climate change narrative. Consequently, the combination of these norms can create conditions for systematic distortion (Bennett, 2007) and may lead journalists to include rebuttals by fossil fuel industry-affiliated experts (Lahsen, 2005), making the themes of scientific controversy and uncertainty disproportionately salient (Antilla, 2005; Zehr, 2000) despite evident scientific consensus in peer-reviewed journals (Dispensa & Brulle, 2003).

Factors in news production can affect coverage, such as time constraints that predispose journalists toward institutional sources and often drive single-source stories (Stocking, 1999), as well as a variety of business-side constraints (Bennett, 1996). Other research has found that media coverage of environmental issues in the United States suffers from both shallowness and procorporate bias (Nissani, 1999), and may be more likely to include business and industry group sources than comparable countries (Brossard et al., 2004). As a result, individuals in the United States are presented with a reality in which the existence of global warming is heavily debated, despite growing agreement by the majority of atmospheric scientists (Dispensa & Brulle, 2003; Wilkins, 1993; Zehr, 2000).

Drawing from a number of studies analyzing the framing of different science-related policy debates, Nisbet (2009) notes eight frames that are particularly relevant to the issue of climate change. He argues that certain frames, such as scientific uncertainty, the economic consequences of addressing climate change, and the potentially catastrophic effects of leaving climate change unaddressed, reinforce perceptual divides, thus making it increasingly difficult to reach a rational political consensus on the issue. In contrast, by framing the issue in terms of a shared and solvable moral challenge, or by emphasizing alternative paths to energy independence, media can break this perceptual gridlock.

Analyzing climate change coverage in an international context is important, given the global nature of the issue and the vulnerability of much of the world to its potential effects. Scholars have also found several distinctions between non-U.S. and U.S. media coverage of climate change, including an emphasis on ecology/science and consequences frames while de-emphasizing the conflict surrounding global warming (Dispensa & Brulle, 2003; Gordon, Deines, & Havice, 2010; Massarani & Buys, 2007), a focus on consequences rather than causes (Taylor & Nathan, 2002), an emphasis on international relations (Brossard et al., 2004), and a reflection of "a certain discursive

coalescence” among business, government, and big nongovernmental organizations (Carvalho, 2005, p. 21).

Latin American Media and Climate Change

Comparative research across regional media offers an avenue to explore the nuances in mediated cultural contexts that may play particular roles in shaping news coverage of climate change. While Latin America is a region with distinct cultural, political, and economic environments, it is also one particularly vulnerable to the effects of climate change (Magrin et al., 2007) and is home to some of the world’s most important biosystems. In recent years, environmental problems have been increasingly cited by citizens in Latin America as a top global threat, with some nations registering dramatic increases in public concern regarding environmental issues since 2002 (Pew Global Attitudes Project, 2007). Furthermore, environmental journalism has grown in some Latin American countries, such as Brazil (Moreira, 2005), with some scholars noting the presence of “considerable” reporting on science, health, and technology issues in countries in this region (Massarani & Buys, 2007; Massarani, Buys, Amorim, & Veneu, 2005). Nonetheless, as Boykoff and Roberts (2007) note, coverage of climate change remains notably diminished outside of Europe and North America, and earlier studies of coverage of environmental issues in South America found that it had not kept pace with other areas, such as crime or the economy, even as most Latin American economies depend on the exploitation of natural resources (Hansen, 1993). For example, in Argentina, “[N]one of the major news organizations have sections devoted to environmental news” (Waisbord & Peruzzotti, 2009, p. 702). Furthermore, some scholars studying media coverage of environmental issues in Latin America have critiqued it as being relatively superficial rather than substantive, reliant on official sources rather than scientists, and lacking the inclusion of potential solutions (Boykoff & Roberts, 2007; Carabaza, 2004; Carabaza et al., 2007; Encalada, 2001; Reis, 1999).

Comparative research of an issue so global in scope and nature also provides an opportunity to examine the prospectus for cultural nuances relating to journalistic practices, something others have observed with international comparisons of media coverage of climate change (Brossard et al., 2004). South American media have historically been influenced by two press models: the European partisan press with ties to political entities and the U.S. media model of independent, neutral reportage (Waisbord, 2000b). Since the latter half of the 20th century, neoliberal forces have untied media from states and created “market-powerful” media, although in some cases strong ties to states or state actors can remain (Waisbord, 2000a, 2010).

The present work sought to assess, in a comparative manner, the framing of the issue of climate change by the elite press in three South American countries—Argentina, Brazil, and Colombia—and the United States. Indeed, while several scholars have studied news coverage of climate change in the United States and Europe, little comparative work has been done in Latin America. Through this analysis, we hoped to gain a better understanding of how differing contexts may affect coverage and, perhaps ultimately, policy making and public opinion. Our research questions therefore were the following:

Research Question 1: Do significant differences exist in the way the different U.S. and South American newspapers framed the issue of climate change?

Research Question 2: Do significant differences exist in the tone undertaken by the different U.S. and South American newspapers in covering the issue of climate change?

Research Question 3: Do significant differences exist in the scope and origin of coverage present in the different U.S. and South American newspapers?

Research Question 4: Do significant differences exist in the classes of sources consulted by the different U.S. and South American media?

Method

Sample

Four dominant newspapers representing national-level discourse were selected to represent the elite media in Argentina, Brazil, Colombia, and the United States: *La Nacion*, which caters to the affluent Buenos Aires audience and is one of the two top dailies in Argentina (Silvestri & Vassolo, 2009); *Folha de Sao Paulo*, one of the most influential newspapers in Brazil (Clark, 2009); *El Tiempo*, the newspaper of record in Colombia (Arango-Forero et al., 2009); and the *New York Times*, an elite newspaper that is widely considered to be an agenda setter for other media in the United States (McCombs, 2004). These newspapers were selected because of their influential status and because they are among the newspapers with the highest circulation in their respective nations. Indeed, the *New York Times* has 1.1 million readers, *El Tiempo* has 361,000, the *Folha de Sao Paulo* has 311,000, and *La Nacion* has 157,000 (World Association of Newspapers, 2009). Furthermore, the three Latin American countries are among the most populous in South America; have independent, competitive media ecosystems;

offer geographical variance; and are based in countries that, combined, represent nearly three quarters of the continent's greenhouse gas output (World Resources Institute, 2009). Finally, the *New York Times* was also selected because it serves as a point of reference, since a great deal of research into climate change coverage in the United States has featured it.

News stories—operationalized as periodical content longer than three paragraphs, excluding editorials, opinion columns, letters to the editor, and advertisements—were obtained from the ProQuest online database and discriminated by full-text searches of articles published between December 31, 2008, and January 1, 2010, that included any of the following terms: *global warming*, *climate change*, and *greenhouse effect*. The Spanish and Portuguese translations for the terms were *calentamiento global*, *cambio climático*, and *efecto invernadero* (Spanish) and *aquecimento global*, *alterações climáticas*, and *efeito estufa* (Portuguese). The time frame was selected because of its recency and because the issue received substantial international interest in 2009, which would yield more stories for comparative analysis. Indeed, both the Copenhagen Summit on climate change and the e-mail controversy at the Climate Research Unit at the University of East Anglia (known as “Climategate”)—which generated much media attention worldwide—occurred in 2009.

The searches yielded a total of 2,116 results. One of the researchers subsequently screened all of the results and kept only those that were either (a) primarily about the idea or actuality of changes in the climate or (b) about other issues in which the topic of climate change is linked to explicitly and principally within the headline or the first three paragraphs. For example, an article discussing Brazil's effort to curb deforestation in the Amazon was not included unless it explicitly mentioned the effect the action would have on the world's climate. A total of 457 articles met the selection criteria and ultimately comprised the sample.

Coding Instrument

This study employed a deductive approach to frame analysis and used modified coding instruments sourced from previous studies. In a review of science-related frame typologies, Nisbet (2009) identified eight frames applicable to climate change: social progress, economic development and competitiveness, morality and ethics, scientific and technical uncertainty, Pandora's box/Frankenstein's monster/runaway science, public accountability and governance, middle way/alternative path, and conflict and strategy. Nisbet (2009, p. 18) defined these frames as follows:

Conflict and strategy: “A game among elites, such as who is winning or losing the battle; or a battle of personalities or groups (usually a journalist-driven interpretation).”

Economic development and competitiveness: “An economic investment; market benefit or risk; or a point of local, national, or global competitiveness.”

Middle way/alternative path: “A third way between conflicting or polarized views or options.”

Morality and ethics: “A matter of right or wrong; or of respect or disrespect for limits, thresholds, or boundaries.”

Pandora’s box/Frankenstein’s monster/runaway science: “A need for precaution or action in face of possible catastrophe and out-of-control consequences; or alternatively as fatalism, where there is no way to avoid the consequences or chosen path.”

Public accountability and governance: “Research or policy either in the public interest or serving special interests emphasizing issues of control, transparency, participation, responsiveness, or ownership; or debate over proper use of science and expertise in decisionmaking (‘politicization’).”

Scientific and technical uncertainty: “A matter of expert understanding or consensus; a debate over what is known versus unknown; or peer-reviewed, confirmed knowledge versus hype or alarmism.”

Social progress: “A means of improving quality of life or solving problems; alternative interpretation as a way to be in harmony with nature instead of mastering it.”

Coders were asked to perform a holistic reading of news articles before coding them against the Nisbet (2009) framework. In addition to Nisbet’s definitions, coders were also presented with more specific exemplars and keywords. For example, the scientific and technical uncertainty frame may have manifested itself in any of the following contexts: through suggestions that a scientific study may have a methodological flaw, through the acknowledgement that findings are not unequivocal and may require further study, or through the presentation of oppositional claims about the science behind climate change. Keyword indicators associated with that frame included the following: debated, disputed, flawed, limitations, scientific bias, transparency, uncertainty, and unsettled. Table 1 provides examples derived from the texts for each of these frames.

As Trumbo (1996) notes, claims made at the top of articles are more likely to be processed and stored by a reader, therefore granting the specific claim

Table 1. Selected Quotes.

Frame	Example From News Texts
Conflict and strategy	“In a step that reflected deep partisan divisions in the Senate over the issue of global warming, Democrats on the Environment and Public Works Committee pushed through a climate bill on Thursday without any debate or participation by Republicans.” (<i>New York Times</i> , November 6, 2009, p.A15)
Economic development and competitiveness	“The initiative, InDeck officials say, is good for the environment but imposes an unfair burden on some power producers. They say the rules saddle the company with unrecoverable costs of \$1.6 million a year to buy what are called allowances, which permit companies to pollute.” (<i>New York Times</i> , April 2, 2009, p.A24)
Middle way/alternative path	“Efforts like EnCana's save energy and money. Yet they are also a cheap, effective way of blunting climate change that could potentially be replicated thousands of times over, from Wyoming to Siberia, energy experts say.” (<i>New York Times</i> , October 15, 2009, p.A1)
Morality and ethics	“Jose Marcolini, a farmer here, has a permit from the Brazilian government to raze 12,500 acres of rain forest this year to create highly profitable new soy fields. But he says he is struggling with his conscience. A Brazilian environmental group is offering him a yearly cash payment to leave his forest standing to help combat climate change.” (<i>New York Times</i> , August 22, 2009, p.A1)
Pandora's box/ Frankenstein's monster/runaway science	“Global warming is causing more than 300,000 deaths and about \$125 billion in economic losses each year, according to a report by the Global Humanitarian Forum, an organization led by Kofi Annan, the former United Nations secretary general.” (<i>New York Times</i> , May 29, 2009, p.A5)
Public accountability and governance	“The House Energy and Commerce Committee, splitting largely along party lines, approved on Thursday the most ambitious energy and global warming legislation ever debated in Congress.” (<i>New York Times</i> , May 22, 2009, pg.A13)
Scientific and technical uncertainty	“But as representatives of about 200 nations converge in Copenhagen on Monday to begin talks on a new international climate accord, they do so against a background of renewed attacks on the basic science of climate change.” (<i>New York Times</i> , December 7, 2009, p.A1)
Social progress	“Steven Chu, the new secretary of energy, said Wednesday that solving the world's energy and environment problems would require Nobel-level breakthroughs in three areas: electric batteries, solar power and the development of new crops that can be turned into fuel.” (<i>New York Times</i> , February 12, 2009, p.A24)

greater power. This study thus employed a modification of the scale utilized by Brossard et al. (2004), offering four degrees of frame importance: “not present,” “present,” “in outstanding focus,” and “present in the lead.” Frames were coded as present if they comprised the main topic of at least one sentence in the article. They were coded as being in outstanding focus if they were present in either five or more sentences or in one quarter of the article. Frames were coded as being present in the lead if they manifested themselves clearly within the first three paragraphs of an article.

Source typology was also sourced from Brossard et al. (2004) and included academics and scientists, nonexpert/citizen sources, business/industry groups, economists, unnamed experts or officials, unaffiliated or independent research groups, governmental sources, environmental groups, and other sources. Sources were categorized according to the first title attributed to them in the article, and only the first three quoted sources were studied.

In measuring tone, five potential conditions were offered: alarmist, optimistic, pragmatic, other/unclear, and no judgment. Tone was coded for the headline, body, and the first three sources. Alarmism was coded for when the article predominantly described climate change as a serious issue beyond human control or already taking place. Optimism was coded for when the article predominantly described climate change as a fluctuation or ordinary event that would self-correct. Pragmatism was coded for when the article predominantly described climate change as a potential threat that could be averted by human action.

To assess the scope of the article, six potential conditions were presented: individual, local, regional, national, international, and unclear. These conditions were later combined to represent international and domestic coverage. This was determined through an evaluation of the central focus of the article relative to the newspaper being analyzed. For example, an article that detailed the catastrophic effects of climate change in Colombia was coded as being international in scope for the *New York Times* but domestic in scope for *El Tiempo*.

Last, to assess the origin of the article, two potential conditions were offered: original and wire. This was determined by reviewing both the byline and the tail of the article for an explicit mention of any wire service. Articles that included some information from a wire service (e.g., “The Associated Press contributed to this report”) but contained a byline from an in-house reporter were coded as original reporting.

Intercoder Reliability

Two coders fluent in all three languages served as the primary coders, with one coder coding the entire sample and the other double-coding a random

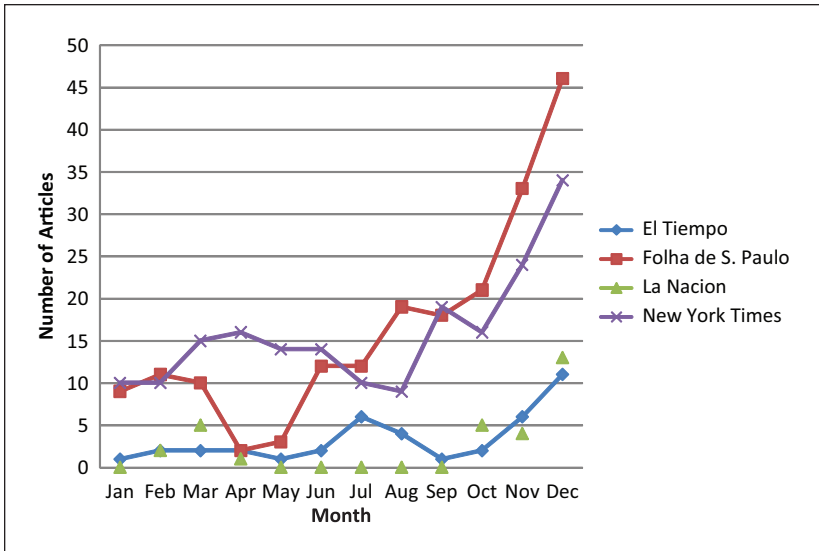


Figure 1. Distribution of articles.

subsample of 47 articles (10%). To assess intercoder reliability for the tone and source identification variables, the researchers used Scott’s pi (Scott, 1955). The coefficients for all of the variables exceeded the minimum bound of .70 suggested by Riffe, Lacy, and Fico (2005), with the article, headline, and source tone variables ranging from .80 to .91, the article scope variable averaging .80, and the article origin variable averaging 1.00. To assess the intercoder reliability for the frames, the researchers used Krippendorff’s alpha (Krippendorff, 2004) for the ordinal data. This yielded a range of .81 and 1.00, exceeding the suggested bound of .80 (Krippendorff, 2004).

Results

As shown in Figure 1, a total of 457 articles were analyzed, with the *Folha de Sao Paulo* ($n = 196$) and the *New York Times* ($n = 191$) accounting for the vast majority of coverage, followed by *El Tiempo* ($n = 40$) and *La Nacion* ($n = 30$). The issue was most salient in the fourth quarter of the year and peaked in the month of December ($n = 104$), when the Copenhagen summit occurred.

Table 2. Saliency of Frames.

Frame	<i>El Tiempo</i> (n = 40)		<i>Folha de Sao Paulo</i> (n = 196)		<i>La Nacion</i> (n = 30)		<i>New York Times</i> (n = 191)		F(3, 457)	p
	M	SD	M	SD	M	SD	M	SD		
Conflict and strategy	0.55	1.11	0.81	1.24	0.77	1.22	0.88	1.22	0.85	.465
Economic development	0.20	0.72	0.47	0.92	0.27	0.64	0.63	0.99	3.37	.019*
Middle way	0.10	0.44	0.10	0.50	0.07	0.37	0.16	0.60	0.55	.647
Morality	0.10	0.50	0.04	0.20	0.03	0.18	0.07	0.33	0.73	.532
Pandora's box	1.18	1.39	0.49	1.07	1.10	1.40	0.49	1.05	6.78	<.001**
Public accountability	1.10	1.41	1.33	1.35	0.97	1.38	1.60	1.29	3.37	.018*
Scientific uncertainty	0.00	0.00	0.17	0.59	0.00	0.00	0.30	0.80	4.02	.008**
Social progress	0.63	1.08	0.20	0.69	0.53	1.04	0.36	0.86	3.84	.010*

Note: minimum = 0, maximum = 3.

* $p < .05$, two-tailed. ** $p < .01$, two-tailed.

Framing Climate Change

On aggregate, the issue of climate change was primarily framed in terms of public accountability and governance ($M = 1.40$, $SD = 1.34$), followed by conflict and strategy ($M = 0.82$, $SD = 1.22$), Pandora's box ($M = 0.59$, $SD = 1.14$), economic development and competitiveness ($M = 0.50$, $SD = 0.93$), social progress ($M = 0.33$, $SD = 0.84$), scientific uncertainty ($M = 0.20$, $SD = 0.65$), middle way ($M = 0.12$, $SD = 0.53$), and morality and ethics ($M = 0.06$, $SD = 0.29$).

A one-way analysis of variance was used to test whether the source periodical affected the saliency of the eight news frames. As shown in Table 2, statistically significant differences were found among five of the frames: social progress, economic development and competitiveness, scientific uncertainty, Pandora's box, and public accountability and governance.¹

Tukey honestly significant difference comparisons indicated that *El Tiempo* was more likely to exhibit a social progress frame than the *Folha de Sao Paulo*. In terms of the economic development and competitiveness frame, the *New York Times* had a significantly higher mean than *El Tiempo*. Similarly, the *New York Times* was more likely to frame a story in terms of scientific uncertainty than both *El Tiempo* and *La Nacion*. Last, the Pandora's box frame was most emphasized by *El Tiempo* and *La Nacion*, while the *New York Times* and the *Folha de Sao Paulo* offered the frame relatively moderate saliency.

Tone of Coverage

A chi-square test of the article tone indicated that significant differences existed among the four newspapers, $\chi^2(9, N = 457) = 26.28, p < .01$. Both *La Nacion* and *El Tiempo* had distinctly higher proportions of alarmism in their news stories (43.3% and 32.5%, respectively) than the *Folha de Sao Paulo* and the *New York Times* (19.4% and 13.1%, respectively). On aggregate, coverage was primarily pragmatic (43.8%) or suggesting that climate change could be averted by human action, followed by no judgment (32.2%), alarmist (19.5%), and unclear (3.7%). Only 0.9% of articles presented the issue in a manner that was predominantly optimistic or suggesting that the issue was not real or would work itself out without human intervention.

There were no statistically significant differences in the tone of the headline across the different newspapers. On aggregate, 72% of the headlines did not pass judgment on the actuality of climate change. When indicated, however, headlines were primarily alarmist (15.5%), followed by pragmatic (10.5%), other/unclear (1.3%), and optimistic (0.7%).

Article Scope and Origin

A chi-square test of the article scope indicated that significant differences did exist in the coverage by the four newspapers, $\chi^2(3, N = 457) = 16.96, p < .01$. On aggregate, most articles (60.4%) presented the issue in an international manner, with the *Folha de Sao Paulo* having the greatest proportion of international stories (69.9%), followed by *La Nacion* (66.7%) and *El Tiempo* (60%). The *New York Times* was the only newspaper to devote a greater percentage of its coverage to articles with a domestic scope (50.3%).

Similarly, a chi-square test of the article origin indicated that significant differences existed among the four newspapers, $\chi^2(3, N = 457) = 44.54, p < .01$. On aggregate, the vast majority of articles (91.7%) originated from reporters hired by the source periodical, with the *New York Times* having the greatest proportion of in-house stories (98.4%), followed by *La Nacion* (96.7%) and the *Folha de Sao Paulo* (89.3%). *El Tiempo* had a distinctly low proportion of original reporting (67.5%).

Source Selection

Aggregate figures showed that reporters turned primarily toward governmental sources (45.7%), followed by industry and environmental interest groups (19.2%), academic sources (15.5%), independent researchers (7.7%),

Table 3. Distribution of Sources.

Source Type	<i>El Tiempo</i> (n = 48)		<i>Folha de Sao Paulo</i> (n = 307)		<i>La Nacion</i> (n = 45)		<i>New York Times</i> (n = 437)	
	n	%	n	%	n	%	n	%
Academic	8	16.7	60	19.5	3	6.7	58	13.3
Environmental interest group	7	14.6	31	10.1	10	22.2	50	11.4
Government	23	47.9	145	47.2	20	44.4	196	44.9
Independent research group	4	8.3	27	8.8	2	4.4	31	7.1
Industry group	1	2.1	12	3.9	0	0	50	11.4
Other	5	10.4	32	10.4	10	22.2	52	11.9

Note: $\chi^2(15, N = 837) = 38.12, p < .01$.

uncategorized sources (4.9%), nonexpert sources (4.4%), economists (1.9%), and unnamed experts (0.6%). As some of the sources classes were rarely consulted, they were collapsed into the following groups to satisfy the assumptions for a valid chi-square test: academic researcher or scientist, industry group, independent research group, governmental source, environmental group, and other. The resulting chi-square test indicated that significant differences did exist in source selection by the four newspapers, $\chi^2(15, N = 837) = 38.12, p < .01$.

As shown in Table 3, *El Tiempo* was the source most likely to include government sources and the *Folha de Sao Paulo* was most likely to include academic and independent research group sources. *La Nacion* was particularly inclusive of environmental groups and other sources, while the *New York Times* disproportionately included industry group sources.

Discussion

The results indicated that although climate change was generally portrayed as a legitimate, though avoidable, phenomenon affecting multiple nations, the coverage was not uniform across the four newspapers studied. In particular, the framing and tone of the coverage seemed to diverge into two distinct groups: one consisted of the *Folha de Sao Paulo* and the *New York Times* and the other consisted of *El Tiempo* and *La Nacion*. These groups differed in important ways. First, the volume of attention given to climate change varied substantially. Both the *Folha de Sao Paulo* and the *New York Times* published far more articles on climate change than their counterparts in Colombia and Argentina. Second, the key angles for news articles also varied between

the two groups. The *Folha de Sao Paulo* and the *New York Times* were more likely to present the issue in terms of public accountability and governance, economic development and competitiveness, and, to a lesser degree, scientific uncertainty. These newspapers promoted a construction in which the government was actively working to develop policies to address climate change, while highlighting the economic impacts of a comprehensive solution and occasionally bringing the science behind climate change into question, thus in many ways failing to challenge the prevalent status quo of relative inaction before an issue of global importance. Contrasting this coverage, *El Tiempo* and *La Nacion* were not only far more likely to present the issue in an alarmist tone but also disproportionately emphasized the catastrophic consequences of climate change while calling attention to the social progress that could be attained by addressing the issue. This narrative stressed great urgency, highlighting the need for immediate, substantive action in the face of impending catastrophe, while also underscoring the social benefits of tackling the issue.

In accordance with our theoretical framework, these differences present serious considerations. Individuals who read the *Folha de Sao Paulo* and the *New York Times*, which are based in countries that, combined, account for more than one fifth of the world's greenhouse gas output (World Resources Institute, 2009) and are both among the world's largest economies, were arguably presented with a normative construction that simultaneously fails to suggest choices for future direction or change and instills a sense that individual or collective action leading to real change may not be realistically feasible. Therefore, readers of the *Folha* and the *Times* may come to see the issue as a nuisance that is both complex and prohibitively expensive to address and thus demand less action from their government. Similarly, the relatively minute number of articles by *El Tiempo* and *La Nacion*, which are based in countries with smaller economies and with smaller carbon footprints, may counteract its critical and alarmist coverage as it may suggest a relative unimportance of the issue and thus fail to sufficiently motivate readers to hold their governments accountable. Furthermore, the pronounced differences in the media coverage of the issue may foster greater fragmentation of public opinion, making it increasingly difficult to reach comprehensive international agreement on how to address climate change and to take appropriate collective action to address the risks (Kahan et al., 2011).

Of particular interest is the degree to which scientific uncertainty was highlighted. This study's findings are in agreement with those of other scholars who found that non-U.S. media are less likely to present scientific conflict frames (Dispensa & Brulle, 2003; Gordon et al., 2010; Massarani & Buys,

2007). Indeed, in the South American news sources, the scientific uncertainty frame was rarely present. While the *Times* did include the scientific uncertainty frame disproportionately, which is consistent with previous research (e.g., Brossard et al., 2004; Dispensa & Brulle, 2003), our analysis indicated that it was far less prevalent than other frames. In particular, the economic development and competitiveness frame was twice as prominent as the scientific uncertainty frame, with anecdotal evidence suggesting that opponents of measures to address climate change may be increasingly turning away from questioning the science behind it and instead highlighting the prohibitive costs of ameliorating the issue, such as through the presentation of easily manipulated economic models (Barringer, 2009). However, it should be noted that global economic uncertainty was prevalent throughout 2009, which may have resulted in the disproportionate salience of these concerns.

Finally, the continued overreliance on government sources remains a serious concern for all four news sources and lends support to previous findings that climate change has become increasingly politicized (e.g., Anderson, 2009; Carvalho & Burgess, 2005; Trumbo, 1996). Official sources are more likely to present mainstream and status quo views and partake in conflict scripts among institutional actors, thus limiting the scope of possible concerns and solutions presented in the press (Bennett, Lawrence, & Livingston, 2008). In fact, academic and independent researchers failed to comprise even one quarter of all sources, suggesting that information about the subject is being predominantly discussed by individuals who either lack expertise in the matter or are not impartial. This is particularly concerning in the United States, where most journalists have had limited scientific training (Dunwoody & Peters, 1992), bringing into question the effectiveness of the mainstream media as a tool for aiding comprehensive public understanding of climate change.

Limitations and Suggestions for Future Research

While a cross-sectional study may offer a more detailed snapshot of a given point in time, the complex nature of climate change coverage may be better understood over time (Carvalho & Burgess, 2005). As such, similar comparisons over a longer period of time would substantiate the findings of this study and offer a finer lens into the construction of coverage of climate change in South America.

Additionally, the instrument employed for measuring tone and frame allowed only for limited analysis. Future researchers should seek to employ more honed tools, such as linguistic repertoires (e.g., Ereaut & Segnit, 2006)

to gain a more nuanced understanding of the issue. Furthermore, as noted by Nisbet (2009), “in many cases, a specific frame only is effective if it is relevant—or applicable—to the audience’s preexisting interpretations” (p. 17). This presents interesting challenges for scholars examining cultural, political, and economic contexts and is an important point that merits additional attention from future scholars.

It is also worth noting that Nisbet (2009) identified two emerging frames that may be relevant to the issue of climate change that were not considered in this analysis: public health and national security. The exclusion of these frames may have thus led to an underreporting of the negative consequences of climate change as well as of the importance of addressing the issue. As such, the inclusion of these frames in future analyses may yield valuable insights.

Finally, the selected news sources may not be generalized to represent the entire media landscape of the respective countries, and future studies should look to include more media that better represent the dominant sources of information. While the findings of this study are thus limited, they do offer future researchers a platform on which to build in order to address a severely understudied segment of a complex topic.

Conclusion

In conclusion, the findings of this study suggest that news coverage among the four newspapers was not uniform. The *New York Times* and *Folha de Sao Paulo*—based in countries with considerable greenhouse gas outputs—were both more likely to promote frames that failed to challenge the status quo, while *El Tiempo* and *La Nacion*—based in countries with comparatively small carbon footprints—presented the issue in a significantly more critical fashion, though with far less frequency. Of note was the near-absence of the scientific uncertainty frame in the South American coverage and its moderate use in the U.S. coverage. This suggests that mainstream media coverage may be increasingly reflecting the scientific consensus in that regard and that discourses among opponents of measures to address climate change may be shifting. Last, the results also indicated a continued overreliance on government sources and a failure to adequately include impartial expert voices that may facilitate the understanding of a complex scientific issue, thereby arguably reinforcing perceptual divides.

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Note

1. Chi-square analyses comparing the presence or absence of frames across the news sources found significant differences in the same frames identified with analysis of variance. Specifically, the results were: social progress ($\chi^2 = 14.65, p = .002$), economic development and competitiveness ($\chi^2 = 15.75, p = .001$), scientific uncertainty ($\chi^2 = 13.25, p = .004$), Pandora's box ($\chi^2 = 19.79, p < .001$), and public accountability ($\chi^2 = 19.76, p < .001$).

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