

Searching for Solutions that Stick:  
U.S. Media Attention on Climate Change 2007 – 2011

by

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## Abstract

Climate change is one of the most pressing environmental issues of our time, and though cohesive solutions remain elusive, U.S. media attention on climate change is decreasing. This master's project examines how media attention on climate change solutions has changed over time and makes recommendations on how coverage trends can be influenced. Two broad solutions frames were chosen for the study: "market" solutions that address human behavior utilizing market forces (e.g. cap-and-trade, carbon tax), and "technology" solutions that focus on developing technological tools to support more climate-friendly behavior (e.g. renewable energy).

The study examined 444 media articles published from January 2007- September 2011 in the *Associated Press*, *Reuters News*, *The New York Times*, *USA Today*, *The Wall Street Journal* and *Washington Post*. Each article was coded according to a numerical rating scale for how prevalent the solution was in the media article, as well as if it was reported as being an effective solution (positive tonality) or ineffective solution (negative tonality). Articles were analyzed for characteristics aligning with the five phases of Anthony Downs' issue-attention cycle: 1) Pre-Problem, with attention from niche audiences only; 2) Alarmed discovery and euphoric enthusiasm for addressing the issue quickly; 3) Increasing negativity as the cost of progress is realized; 4) Gradual decline of intense public interest; and 5) Post-problem, when issue attention drops off.

Findings show that U.S. media coverage of both market and technology solutions to climate change follows Downs' issue-attention cycle, though there are phase variations for each solution. Decreasing coverage volume and increasingly negative tonality 2007-2011 was observed for both market and technology solutions, aligning with Downs' characteristics of issue-attention cycle Phases 2-4. Several topics were consistently associated with short-term increases in coverage around a solution, a relationship that indicates that they may play a role in driving media attention to these solutions. Media consistently reported on technology solutions more favorably than market solutions. A tendency for individual politicians and political infighting to negatively impact tonality was observed, as were instances of media favoring an "underdog" in solutions implementation. Based on these findings, several recommendations are included for communicators looking for ways to increase U.S. media attention on market and technology climate change solutions in Phase 4 and 5 of the issue-attention cycle.

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# Introduction

Words, and the ideas they represent, fall in and out of fashion. “Buzzwords” that engage and inspire when they first appear lose potency over time as they become “overused.” A 2010 Accountemps national poll asked 150 senior executives with the nation’s 1,000 largest companies: “what is the most annoying or overused phrase or buzzword in the workplace today?” Their responses included: synergy, paradigm, win-win, value-added and alignment (Accountemps, 2010) - all terms that at one point drove strategy and sparked enthusiasm for changes in business behavior.

Language drives our understanding of the world around us and influences how we perceive issues. The cognitive scientist and linguist George Lakoff notes that words activate physical neural circuits in our brains around “frames” that help us understand the world around us – and the more we hear certain words, the stronger their frames get (Lakoff, 2009). A study of amygdala activity when making financial choices shows that different ways of framing the same information activates different parts of the brain and impacts complex decision-making (De Martino, Kumaran, Seymour, & Dolan, 2006). In short, frames, conveyed through language, are powerful elements of communications that influence us at a fundamental cognitive level.

The language used in the media to describe the issue of global climate change is an area particularly robust for study. Leading communications scholar Robert Entman and others maintain that reporters construct news frames that help readers develop certain understandings about reported information through the words used and concepts presented (Antilla, 2005; Bendix & Liebler, 1999; Entman, 1993; McCann, 2010). In the environmental arena, experts hypothesize that this news framing can affect the way climate change information is perceived (Center for Research on Environmental Decisions, 2009).

When it comes to frames in environmental media coverage, it is vitally important to realize the powerful role that the prevalence and tone of frames can play in shaping human perception over time. Though drawing conclusions about the level of influence that climate change market and solutions frames in the media have on public perception and behavior is beyond the scope of this study, research suggests that the content of media coverage can influence audience

opinion (Dalton, Beck, & Huckfeldt, 1998; Nelson, Clawson, & Oxley, 1997; Revkin, 2011; Wanta & Hu, 1993). One study found that the content and tone of media coverage around controversial recreational usage questions in Yellowstone National Park influenced public opinion (Shanahan, McBeth, & Hathway, 2011). Another study found that perceived slant of local, national, and Internet news articles on two U.S. environmental policy issues - oil drilling in the Arctic National Wildlife Refuge and ratification of the Kyoto treaty on climate change – helped predict public opinion (Christen & Huberty, 2007). Similarly, the volume of media coverage about an environmental issue can drive public awareness of an issue, and this volume can change over time. In a study of climate change and sustainable development coverage across 112 newspapers worldwide from 1990 - 2008, researchers noted a significant increase in volume of coverage over the time frame, with volume peaks associated with U.N. climate change policy conferences in Rio in 1992, Kyoto in 1997 and Johannesburg in 2002 (Holt & Barkemeyer, 2012).

Climate change is one of the most pressing environmental issues of our time, and as the world's second largest emitter of carbon dioxide (Energy Information Administration, 2011 ), the U.S. plays a key role in both exacerbating the problem and helping to drive solutions as a leading global voice. How is the U.S. media covering climate change? Given the important role that framing plays in understanding an issue and the possible links between media coverage and public opinion, media coverage of climate change solutions in the U.S. is an important area to understand.

My study explores climate change news frames in the U.S. media, examining how they change over the time frame 2007 – 2011. I focus on two specific types of climate change news frames –technology solutions and market solutions – studying both frame prevalence and tonality through the lens of the theory of issue-attention cycle developed by Anthony Downs (Downs, 1972). The goal of this study is to determine the viability of these frames as ways to capture and sustain U.S. media interest in these types of climate change solutions.

## The Issue-Attention Cycle in the Media

Downs notes that the “‘issue-attention cycle’ is rooted in both the nature of certain domestic problems and in the way major communications media interact with the public” (p. 39). Downs found that issues tend to emerge quickly into the public eye, focus our attention for a short time and gradually fade away, even without being resolved. His research ultimately identified five distinct phases:

Stage	Description	Identifying Characteristics
<b>1 - Pre-Problem</b>	A problem exists but has yet to receive public attention.	For individuals aware of the problem, the reality is worse than their perception. Expert groups may be alarmed.
<b>2 - Alarmed discovery and euphoric enthusiasm</b>	Catalyst suddenly draws public awareness to the negative effects of the problem. Public enthusiasm for solving the problem quickly.	Political powers claim the problem can be solved without intense disruption. Often technological solutions are assumed and called for.
<b>3 - Realizing the cost of significant progress</b>	A gradual public realization that the cost of solving the problem is high.	Tension between groups as the public recognizes that a solution will have negative effects on a group or require sacrifices.
<b>4 - Gradual decline of intense public interest</b>	Three public reactions manifest: discouragement, avoidance, and boredom.	Most people experience some combination of the three reactions. By this time in the cycle, another public problem usually is gaining attention (Stage 2), further drawing attention away in Stage 4.
<b>5 - Post-problem</b>	Problem moves into a realm of lesser public attention or brief recurrences of interest.	Entities created to address the problem in earlier stages almost always persist and it is possible to still achieve success through their efforts.

Table 1: The Issue-Attention Cycle (Downs, 1972)

The idea that media coverage follows Downs' issue-attention cycle is not new (McDonald, 2009; Nisbet, 2011; Nisbet & Huge, 2006), and various factors within the media industry influence it. Media article authors have differences in individual reporting style and preferred frames, and shift in staffing and reporter assignments to various news issues, or “beats,” has important implications for the amount of attention an issue receives and how the issue is framed (Nisbet & Huge, 2006). In a study reviewing plant biotechnology coverage in the *New York Times* and *Washington Post* from 1978 - 2004, Nisbet & Huge (2006) found that plant biotechnology media coverage volume in the United States has been lower than other parts of the world, and the

content of coverage predominantly technical and administrative - dealing with policy developed and implemented by scientists and industry - rather than political at the national level. The researchers concluded that coverage had remained light due to the fact that there are fewer technology reporters in the media than political reporters, and proposed that a more politicized issue narrative in the media would have increased the coverage volume.

## **Media Attention on Climate Change in the U.S.**

In the U.S., the volume of media attention on climate change has changed over the past few years, and Al Gore has been credited by some as having caused a sharp increase in media and public attention. In a study of network evening news coverage of "global warming" over several years, Robert Brulle suggested that *An Inconvenient Truth* caused U.S. media issue attention cycle to peak January 2007 (Revkin, 2010). The *New York Times* also noted in a May 2006 review of *An Inconvenient Truth*, that there seemed to be a "tipping point" approaching in terms of public attention on climate change (Kakutani, 2006).

According to Downs' theory, the types of issues likely to run through the issue-attention cycle have three characteristics. Climate change as a national issue follows these characteristics set forth by Downs, with some subtle deviations difficult to have accounted for in the original 1972 model:

- 1. *The problem affects a numerical minority in the U.S., in terms of percentage of the total population (usually less than 15%).***

When Downs' paper was published in 1972, climate change as a national issue could scarcely have been anticipated, and the 15% threshold is difficult to apply to the climate change issue due to the complexity of climate change impacts. Some climate change impacts can be measured in terms of individuals directly impacted, such as those living in coastal areas forecast to be flooded due to rising sea levels, and here, the 15% minority might be identified. A recent study examined the potential effects of sea level rise on U.S. coastal areas with a total population of 40.5 million, a number that translates to 14.4% of the U.S. population of at the time of the study (Weiss, Overpeck, & Strauss, 2011). The study found that approximately 9 - 10% of the land this population occupies could be affected by erosion, temporary flooding and

permanent inundation due to climate change. Furthermore, Curtis & Schneider (2011) suggest that studies based on current, static population data can greatly underestimate the extent of the U.S. population impacted by the issue of climate change. As coastal populations are forced to move due to sea level rise, other communities are forced to absorb additional population causing a potential string of impacts throughout the U.S. (Curtis & Schneider, 2011).

Finally, there is the question of time scale of impact on the climate change problem. Though Downs only addresses short-term population impacts in his model, the concept that an environmental issue has inter-generational effects is an interesting one. Climate change is not a short-term problem with immediate, visible consequences such as poverty, as issue that Downs references frequently when constructing the cycle. The worst effects of climate change in the U.S. will only manifest in the next several generations (U.S. Global Change Research Program, 2009).

**2. *The negative effects of the problem upon this minority are caused by elements that actually have some benefit to a majority or powerful minority of the U.S. population.***

The nature and level of power a minority has in regards to the climate change issue in the U.S. can be seen upon examination of who emits the majority of greenhouse gases, and how these interests are represented in the U.S. climate change policy sphere. Some scholars have argued that a powerful conservative movement in the U.S. between 1990 - 1997, comprised of private foundations, policy-planning think tanks and individuals attempting to further social traditionalism and economic libertarianism, effectively blocked the passage of the Kyoto Protocol and any significant climate change policy (McCright & Dunlap, 2003). Another study quantitatively analyzed 141 English-language environmentally skeptical books published between 1972 and 2005, including those denying the existence of climate change, and found more than 92% were linked to conservative think tanks by author affiliation, publishing organization, or both (Jacques, Dunlap, & Freeman, 2008). Of the 141 books in the study, 130 of them were affiliated with U.S. – based conservative institutions.

Industry is the largest U.S. economic sector contributing greenhouse gas emissions (U.S. Environmental Protection Agency, 2011), representing a sector with an interest in continuing behavior detrimental to climate change. The oil industry is one of the most powerful global industries, and its products and activities cause rising greenhouse gas emissions (Hove, Menestrel, & Bettignies, 2002). In the U.S., power plants were the largest stationary sources of greenhouse gas emissions in 2010, followed by petroleum refineries (U.S. Environmental Protection Agency, 2012). As Figure 1 shows, these minority groups have increasingly attempted to exert influence over U.S. climate change policy by through lobbyists at the federal level, with manufacturing, power companies and utilities, oil and gas, and transportation organizations leading the number of climate change lobbyists at the federal level in the U.S.:

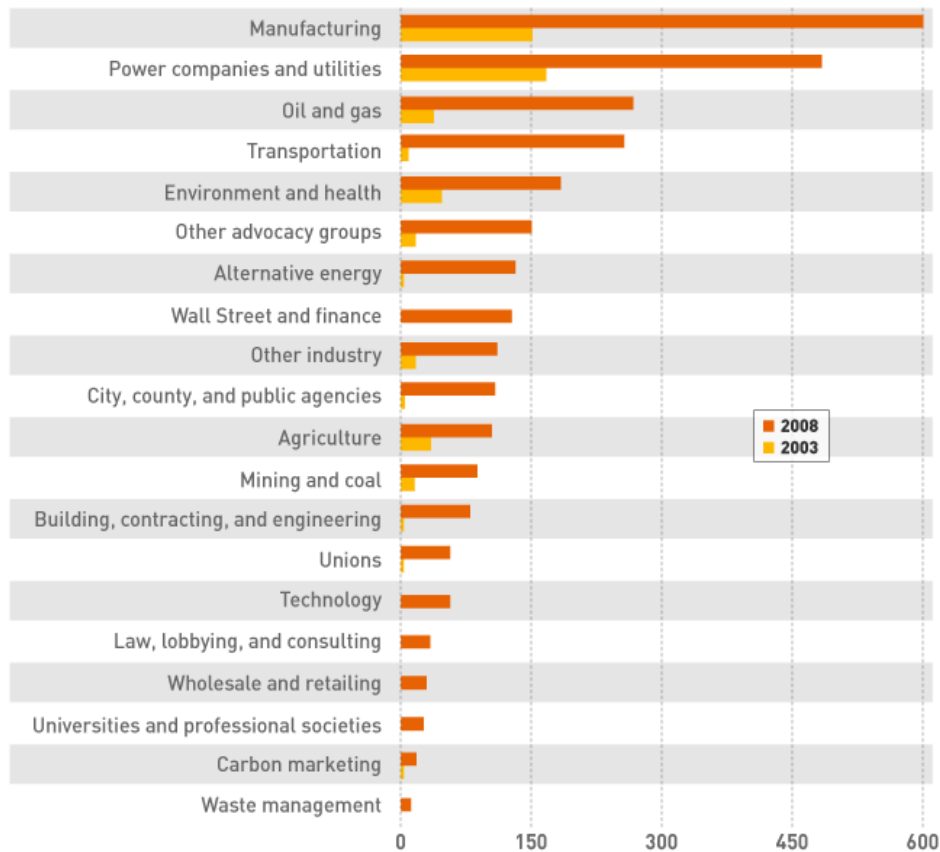


Figure 1: Industry groups with federal climate change lobbyists (The Center for Public Integrity, 2009)

**3. Sensational events that helped to draw intense public focus to the problem initially have died down over time.**

Maxwell Boykoff, a climate change communications scholar, stated in a 2011 interview with DailyClimate.org that shocking scientific findings conveyed in *An Inconvenient Truth*, as well as severe weather events and glacial melting, have not managed to keep public attention focused on the issue of climate change despite growing threats (Fischer, 2011). Another study on the decline of U.S. media attention on climate change noted likely reasons:

- reduced staff at news organizations due to an increasingly digital and social media-driven world;
- limited ability of society to pay attention to more than a few problems at any given time; and
- the issue of climate change losing novel, dramatic qualities for journalists and the public (Nisbet, 2011).

## **Frames in Media Coverage**

As Lakoff (2009) explains, humans think – mostly unconsciously - in terms of systems of structures referred to as "frames," with words activating the frame mentally, and repetition of words making frames stronger mentally. Frames occur in media and within the public, and are an information-sorting tool, whereby humans focus on certain interpretations of an issue over others, determining what is relevant about an issue and what should be ignored (Nisbet & Huges, 2006). Frame prevalence in media helps guide public evaluations about the causes and consequences of an issue, and what should be done, and thus the prevalence of climate change solutions frames is a timely and important study.

Previous scholarship has shown evidence of a media issue-attention cycle around technological solutions to climate change. Figure 2 illustrates a significant increase in the number of wind power articles in three major U.S. newspapers - the *Boston Globe*, *Houston Chronicle* and *Minneapolis Star* – over the same 2000 – 2007 time period (Stephens, Rand, & Melnick, 2009):

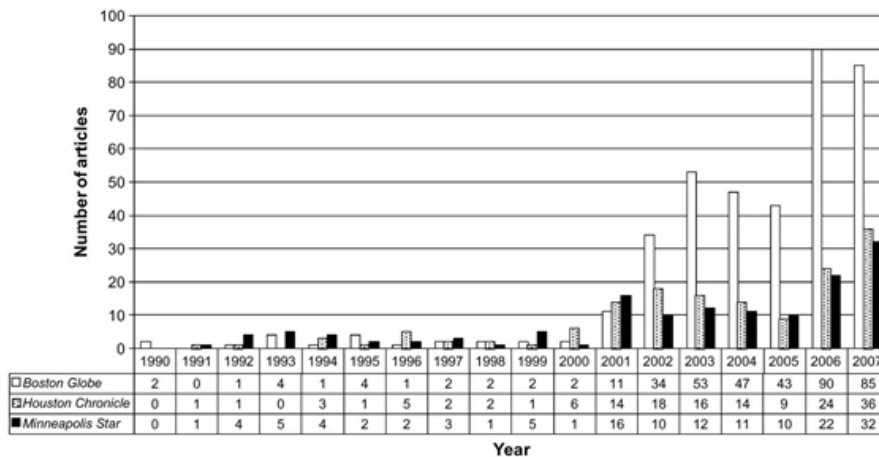


Figure 2: Wind articles in 3 U.S. newspapers (Stephens et al., 2009)

Not only did the volume of technology coverage increase over time, but its framing as a climate change solution increased as well. Of the total sample of 678 articles, 129 linked wind power and climate change, with most of these climate change articles publishing in 2007.

Entman writes of cognitive framing in the media as a way as to promote a particular problem definition and understanding of an issue, and scholars have built upon Entman's idea of framing in the media to include discussion of issue solutions (Entman, 1993; Trumbo, 1996). My study addresses how and why U.S. media attention on market and technology solutions to climate change has varied between January 2007 and September 2011. Previous scholarship around the existence of climate change-related frames in media has identified several solutions-related frames that helped guide my research. One study identified technology and market-related frames used in 4 U.K. tabloid newspapers reporting on climate change from 2000 – 2006 (Boykoff, 2008):

- Economics, as it refers to the costs to individuals, governments and future generations
- Applied science and technology – New technology that will combat, enhance or neutralize the effects of climate change.

This research informed how my study defined climate change solutions frames in the U.S. media. Generally speaking, I examine “market” solutions to climate change that address human behavior utilizing market forces, and “technology” solutions that focus on developing technological tools to support more climate-friendly behavior. In addition to aligning with

Boykoff’s findings, these two frames were chosen because they encompass a wide range of mitigation strategies that have been covered in the media over the past few years, outlined in Table 2:

Solutions Frame Overview	
Frame	Topics
Market solutions	Carbon taxes
	Carbon cap-and-trade
	Emissions targets agreements (U.S. federal and U.N. international)
	Tariffs on energy-intensive products
Technology solutions	Biomass energy
	Carbon capture & sequestration
	Ethanol
	Geoengineering
	Geothermal energy
	Nuclear energy
	Smart grid
	Solar energy
Wind energy	

**Table 2: Solutions topic overviews**

The starting point of January 1, 2007 was chosen because each of these solutions were prevalent in media coverage by at that point, due to a significant increase in climate change articles published after *An Inconvenient Truth* was released in May 2006. The 2007 starting point gives a robust dataset that allows for study of not only how technology and market solutions are covered in general, but sub-patterns of how individual events, such as U.S. cap-and-trade legislation, impact the issue-attention cycle through September 30, 2011, the date this study commenced.

## Materials and Methods

My study’s primary research tracks the frequency of a particular frame’s use over time to determine if there is a noticeable issue-attention cycle, flowing from introduction of the concept, to widespread use and then decline.

Recent work by Holt (2012) examines coverage of sustainable development and climate change in 112 newspapers around the world through the issue-attention cycle and the punctuated equilibrium model of agenda-setting developed by Baumgartner and Jones in the early 1990s.

Holt suggests that shifts from one stage of the issue-attention cycle to the next may be linked to the timing of a punctuated shift, and a possible link between the media issue-attention cycle and punctuated equilibrium is an area to consider for future research. For my study, however, I have focused on the more conventional and well-studied issue attention cycle as a model to map media coverage volume and characteristics against.

My research design employs media article review and coding to analyze how a solutions frame is being presented. The coding criteria addresses two elements recommended for measurement in quantitative media content analysis: reliability (the extent to which different individuals applying the same analysis rules assign the numbers to an article), and validity (where numbers assigned according to a coding sheet are accurate and reflect a greater concept) (Riffe, Lacy, & Fico, 2005).

The coding process involved reading each media article in the dataset and making a series of determinations:

1. **Determine frame prevalence.** The frame was considered to exist in a piece if at least one sentence in the piece described either a market mechanism or technology in the context of it being a solution to climate change. If both frames were included in an article, researchers chose the frame that was mentioned first or discussed in greater detail.

On rare occasions when both frames were evenly represented in the article, the article was coded twice - once for each frame.

2. **Assign tonality.** The analysis aimed to evaluate whether or not a market or technology solution was reported as being an effective tactic (positive tonality) or ineffective tactic (negative tonality).

A coding sheet outlining how articles were reviewed and scored is included in Appendix 6.

## Dataset overview

I served as the primary researcher in this study, with a second researcher re-coding a sample of my dataset to test for inter-coder agreement. Though the number of articles published about

climate change is vast, I narrowed my dataset to a size appropriate for the study's scope and other recent media analyses of climate change coverage. Other scholarship examining media issue-attention on climate change includes: a study of 476 articles from 1989 - 2000 (McCann, 2010), one of 974 articles from 2000 - 2006 (Boykoff, 2008), and one of 69 articles from a single media outlet (*The New York Times*) from 1988 - 2008 (Valentine, 2010). Two of these studies – McCann and Valentine – were conducted as part of a master's thesis in communications, with the student as the primary researcher. Ultimately, I chose a dataset of 444 articles with 199 of these being from *The New York Times*, which surpasses the number of *New York Times* articles Valentine reviewed, and is similar to the total number of articles McCann examined. The researcher profile and study intent of the McCann and Valentine models are the most similar to mine.

Dataset articles were found by conducting a Boolean search for “climate change” and “solution\*” and (“market” or “technology”) articles published 1/1/2007 – 9/30/2011 using both Lexis Nexis and Factiva media databases. Due to individual database limitations, Lexis Nexis was used to search *USA Today*, *The New York Times*, *Washington Post* and *Associated Press*, and Factiva was used to search *The Wall Street Journal* and *Reuters*. The Appendix includes individual descriptors of each outlet and database parameters. Because *Reuters* and *Associated Press* are international news wires, for both these sources, results were filtered further for “United States.”

Though my research focuses on print media, *Reuters* and *Associated Press* are electronic news wires, and *USA Today*, *Wall Street Journal*, *New York Times* and *Washington Post* publish online articles that do not always appear in the print version. In order to capture the full breadth of the news disseminated by these media outlets, both print and online articles were reviewed for the entire time period.

The initial Boolean search results in 725 articles. Due to large set of results from the *Associated Press* and *The New York Times*, every fourth article in these results lists was included in the study dataset. I manually removed editorials, book reviews and articles that did not represent journalistic reporting about the issue of climate change. Articles by “op-ed columnists” who are on staff with the media outlet were included in the analysis. However, editorials authored by

readers or experts from other organizations were removed from the dataset. In instances where the fourth article in the list needed to be disqualified for not meeting dataset criteria, it was replaced with either the article immediately before or after it.

The final dataset included 444 media articles published over the five-year period, January 2007-September 2011.

## Frame prominence

Frames were identified in articles based on the type of content covered. The following outlines specific topics and keywords defining the presence of a solutions frame. The frame is considered to exist in a piece if at least one sentence in the piece describes either a market mechanism or technology in the context of it being a solution to climate change. Specific keywords and topics in dataset articles are included in Table 3, with additional detail included in Appendix 6:

Solutions Frame Keywords	
<b>Market solutions</b>	<b>“Cash for carbon” proposals</b>
	Assigning monetary values to climate change impacts
	Cap-and-trade
	Congestion pricing
	Emissions targets agreements and policy (U.S. federal and U.N.)
	Energy efficiency standards not specifying technology
	Energy efficiency upgrade rebates
	EPA emissions regulations under Clean Air Act <sup>1</sup>
	Food transportation tax
	Fuel economy standards
	Local food purchasing
	Mandates to purchase renewable energy
	Private investment mechanisms for climate change solutions <sup>2</sup>
Tariffs on energy-intensive products	
<b>Technology solutions</b>	Advancements in cattle feed to reduce methane emissions
	Biomass energy
	Clean coal (aka carbon capture & sequestration)
	Ethanol
	Geoengineering
	Geothermal energy

<sup>1</sup> Media articles covered EPA regulations as emissions targets in the study dataset

<sup>2</sup> Private investment mechanisms for clean technology was included as a market solutions frame, due to the fact that the market mechanism is the enabling element for technology

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Green building technologies & related standards
Increase in fuel efficiency MPG
Nuclear energy
Policies that increase the flow of technology to developing nations
Programs supporting technology research
Regulations mandating best available technology
Renewable energy standards
Smart grid
Solar energy
Standards for auto carbon dioxide emissions <sup>3</sup>
Sustainable city planning <sup>4</sup>
Wind energy

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**Table 3: Topics and keywords per frame**

For the purposes of this study, technology solutions did not include those addressing climate adaptation, conservation of nature, and natural gas.

Analysis included coding for the prominence of as frame, using a scale based on previous scholarship examining biotech media coverage over time. That study coded each frame as not present = 0, present = 1, or outstanding focus/appearing in the lead =2 (Nisbet & Huges, 2006). "Lead" is defined as a headline or first paragraph of a media article. A 3-point prominence scale produced a more nuanced study of coverage volume than simply counting the number of articles that mention a solution. With 2 levels of prominence, I was able to account for the fact that some media articles may be entirely dedicated to a climate change solution, while others may mention it in a single sentence.

For the purposes of analyzing data and identifying patterns, I graphed coverage on a month-by-month basis from January 2007 – September 2011. The monthly prevalence score for a solution would be the sum of all the article scores for the month.

## Frame tonality

Tonality analysis is a subjective examination of article’s content to determine if it is favorable or unfavorable to the person, organization or product discussed (Michaelson & Griffin, 2005).

Tonality can be determined by either an assessment of the tonality of an overall article, or the tone of a specific mention or specific message in an article. In a study of tonality, each article is

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<sup>3</sup> Media articles covered technology solutions to meeting auto emissions regulations in the study dataset

<sup>4</sup> Media articles covered technology solutions enabling greener cities in the study dataset

analyzed individually and then results are aggregated to present an overall picture of the tone of the media (Michaelson & Griffin, 2005). In my study, specific mentions of market and technology solutions (which loosely can be thought of as “products” in the sense that they are constructs under consideration by the public for implementation) were examined for tonality in regards to their viability or success. The analysis aimed to evaluate whether or not a market or technology solution is reported as being an effective tactic (positive tonality) or ineffective tactic (negative tonality).

A positive tonality does not necessarily mean that the solution needs to be presented as a stand-alone “silver bullet.” The fact that a solution is presented as a being part of a necessary mix of approaches does not take away from its positive tonality. It is reasonable to expect that other factors (e.g. funding, policy) are needed to enable a solution.

Articles that paint a solution as good, but impractical or difficult to implement leave an overall negative impression of the solution. For instance, if an article notes current policy or funding is impeding the solution, then the solution is assigned negative tonality.

I assigned tonality to the solutions frame in an article according to the following scale:

<b>Tonality</b>	<b>Point Value</b>
Negative	-2
Mixed – mostly negative	-1
Neutral (e.g. balanced or “mixed”)	0
Mixed – mostly positive	1
Positive	2

**Table 4: Tonality rating scale**

As many articles present both pros and cons of a solution, a “mixed” tone is realistic to expect, and was granted when at least 25% of the article shows an opposing tonality. If the physical article space for both positive and negative points of view is equal, then the article was coded as “mixed” or “neutral.”

Tonality for a particular frame over a time period was calculated by adding the sum of all tonality ratings. The net tonality scores of all articles within a specific month were calculated and graphed to present a picture of how the media’s tone changed over time.

A sample of keywords and content helping define tone is included below in Table 5:

Tonality Indicators	
Tone	Associated Content
Positive	Solution, advance/advantages, transform, environmentalists (or other stakeholder groups) have embraced, economic benefits, cost-efficient, comparable speed, encouraging bipartisan conversation
Negative	Challenge, unintended consequences, risky, uncertainty of performance, it’s going to take several decades to bring this on, undue economic burden, impractical, politically impossible

**Table 5: Tonality indicators**

Additional detail on both frame identification and tonality assignment is included in the Coding Protocol in Appendix 6.

## Intercoder reliability

I used an intercoder reliability test to evaluate the extent to which my evaluation of frame existence, dominance and tonality could be validated by a second researcher using the same coding process. Riffe et al. (2005) state that 80% agreement is generally accepted as the minimum threshold for inter-coder reliability in media analysis.

Following guidance set forth in Riffe et al., I selected 44 random articles of the 444 total framed dataset for a second researcher to re-code, meeting the 10% - 25% sample threshold in a recent study (Wimmer & Dominic, 2003), and exceeding the 5% - 7% sample recommended by earlier research (Kaid & Wadsworth, 1989).

The first area of agreement tested was which frame was dominant in the article: market solution, technology solution, both equally present, or neither present. The two researchers coded the sample independently, utilizing the same coding guidelines, and agreed that the same frame was present in 69.8% of the articles. However, some of the lack of agreement is due to the fact that in some instances, one researcher did not notice a frame at all, which can

be due to a lack of close reading. Only 20.9% of the articles received conflicting dominant frame codes, leaving 79.1% of the dataset. Where the 2 researchers agreed on which frame was present, they agreed on the strength of the frame more than 92% of the time.

Tonality inter-coder agreement was high. Researchers assigned the exact same tonality rating in more than half of the articles, and in an additional 41.7% of articles, the researchers generally agreed on the tonality. Variations included instances where one researcher assigned a “mostly” positive or negative where the other assigned a strict positive or negative. For 8 of the 11 articles that showed tonality variance, a certain researcher was more positive in tonality rating assignments than the other, indicating a difference in personal perspective and hinting at the role psychological differences between researchers can play in assigning subjective value judgments.

## Results & Observations

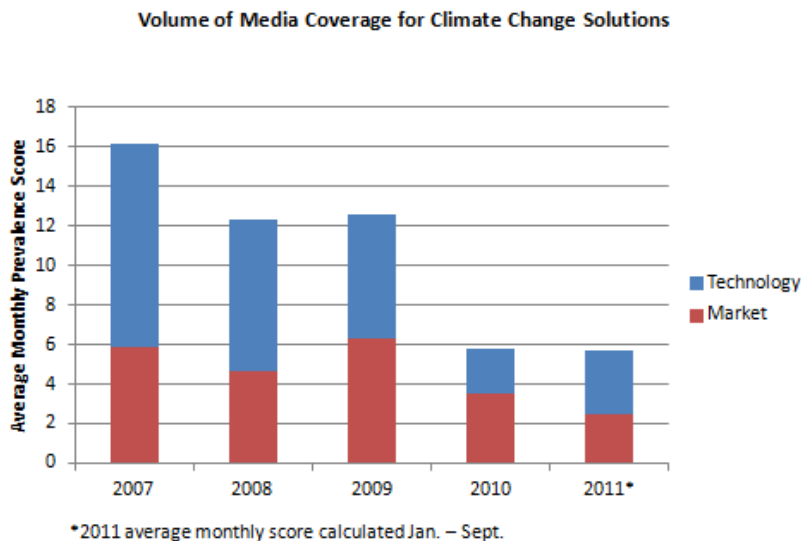
Overall, both solutions frames are currently nearing the end of their issue-attention cycles with the U.S. media. There are, however, differences in terms of timing and length of issue-attention cycle phases, which will be discussed in this section. There are also differences in tonality between market and technology solutions, with media consistently reporting on technology solutions more favorably than market solutions.

My article analysis yielded several findings about where each solution currently is in the issue-attention cycle, what topics and tonality are present in each of the cycle’s phases, and the presence and character of variations in coverage volume (small “spikes”) within a cycle’s phase. In my results, technology and market frames showed greater than a 1-to-1 ratio between the number of articles and the frame prominence, indicating that in many instances, if an article mentioned a frame at all, it included the frame in the headline, subhead, or as part of a significant amount of the article.

***Both the market and technology solutions frames are in the twilight of the U.S. media issue-attention cycle***

The total volume of coverage on climate change solutions – market and technology combined – drops over the course of the study period. Figure 3 shows this as a function of the average monthly “prominence” of each solution. Prominence, as discussed earlier, is a function of the number of articles published each month as well as the prominence of the solution within each article.

January 2007 is clearly a high point of media coverage volume for both the technology and market solutions frames, and for each solution, the 2011 average monthly volume of articles is lower than in 2007. Even in the case of market solutions, where average coverage volume vacillates from 2007 – 2011, 2007 is nevertheless a relative high point in media attention when compared with the final year in the dataset.



**Figure 3: Annual climate change solutions coverage**

Articles within the dataset period January 2007 – September 2011 show characteristics of Downs’ issue-attention cycle Phases 2- 4. Given the relatively high coverage volume for both market and technology solutions at the beginning of the study point, both frames are past Downs’ Phase 1, “pre-problem,” where there is little public awareness outside of expert groups. The pre-problem (Phase 1) of the issue-attention cycle likely began before January 2007 – nearly certainly for the technology frame and highly likely for the market solutions frame. The uptake in volume in the Stephens et al. (2009) study of wind power and climate change

coverage mentioned earlier suggests that further research into the beginnings of the technology solutions frame issue attention cycle may lie before 2001 for Phase 1 (niche expert attention), and between 2001 – 2007 for Phase 2 (alarmed discovery and euphoric enthusiasm).

Identifying the catalyst launching Phase 2 of the issue-attention cycle – which Downs notes may be a sudden event or a dramatic series such a riots - is outside the scope of my study, due to the fact that these events likely took place outside of the dataset. Based on other scholarship, the period 2003 – 2006 could be important to pinpointing the beginning of Phase 2 in both the market and technology solutions frame issue-attention cycles. In a study of international sustainability media coverage, climate change coverage showed a clear increase beginning in 2003, and also observed that the release of *An Inconvenient Truth* in May 2006 may have played an important role in further promoting this rise (Holt & Barkemeyer, 2012).

The persistence of both frames into September 2011, albeit at a reduced volume, indicates that Phase 5, where a frame moves into a realm of lesser public attention or brief recurrences of interest, has not yet occurred.

***Technology and market solutions frames have differing issue-attention cycles in the U.S. media***

As Figure 4 illustrates, throughout 2007, technology solutions are in Phase 2 of the cycle. The volume of articles, as calculated as monthly prominence scores, is high. The tonality, calculated as the net monthly tonality score, is quite positive. Throughout 2008 and 2009, there is less positive coverage, indicating that the solution is entering Phase 3 of the issue-attention cycle, where the public realizes the costs associated with solutions and there is less enthusiasm for action. By 2010, the prominence score is a fraction of what it was in 2007, indicating Phase 4 of the cycle, where interest declines.

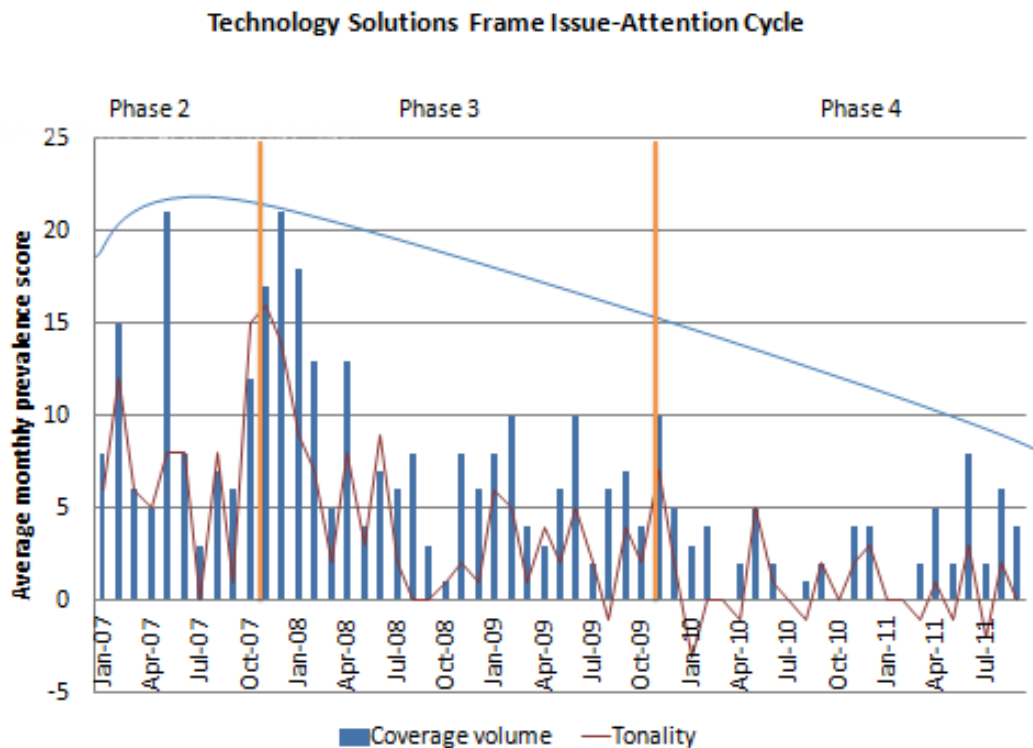


Figure 4: Climate change technology solutions media coverage volume and tonality

## Quantitative technology findings

Calculations of monthly frame prominence and tonality were used to determine the time frames for each phase. Based on the quantitative patterns below, I identified the starting and ending months for each phase, shown in Figure 4.

### Phase 2 of the technology solutions frame issue-attention cycle:

From January 2007 – December 2007, the average monthly frame prevalence score is 10.75<sup>5</sup>, and the average number of articles publishing monthly that contain the frame is 6.83. The ratio of prevalence score to the number of articles published (10.75/6.83) yields 1.57, indicating that slightly more than half the articles in this phase feature the frame prominently in the headline, lead paragraph and/or dedicate the majority of the article to the technology solution. The average monthly tonality score for this phase is 8.25.

<sup>5</sup> All values are rounded to the nearest hundredth

### Phase 3 of the technology solutions frame issue-attention cycle:

From January 2008 – November 2009, the average monthly frame prevalence score drops to 7.04, and the average number of articles publishing monthly that contain the frame is 4.13. The ratio of prevalence score to number of articles is 1.70, indicating that a slightly higher percentage of the articles within this time period feature the technology solution prominently. As questions about feasibility and negative portrayals of political management of technology policies surface, negative tonality emerges in media articles and the average monthly tonality score for this phase lowers significantly to 3.52.

### Phase 4 of the technology solutions frame issue-attention cycle:

Media boredom, a key characteristic of Phase 4, is apparent in a lack of articles from December 2009 – September 2011. March 2010 is the first month in the study period in which no technology solutions articles appear in the dataset; 4 additional “zero” months take place in this phase’s timeframe.

From December 2009 – September 2011, the average monthly frame prevalence score drops to 2.77, and the average number of articles publishing monthly that contain the frame is 1.55. The ratio of prevalence score to number of articles is 1.79, indicating that though there are few articles, the percentage of them dedicated to the technology solutions frame is slightly higher than in Phase 3.

Interestingly, as the technology solutions frame moves through the phases of the issue-attention cycle, it becomes a sharper focus of a smaller number of articles. When reporters do cover the frame, the frame is dominant within the article. Increasing prevalence of the technology solutions frame as coverage volume recedes points to its potency as a frame.

Despite a sharpening focus on technology solutions, media discouragement with their implementation is apparent in this phase, with average monthly tonality plummeting to .55.

## **Qualitative technology findings**

Table 5 below outlines technology topics and tonality covered in each phase. Phase 2 articles included positive coverage of nuclear energy and industry commitments to development more climate-friendly automobiles. The “costs” Downs attributes to Phase 3 manifest in the media coverage as monetary and non-monetary costs, such as environmental consequences of ethanol. In Phase 4, a decline in coverage of technology solutions (“boredom” in Downs’ cycle) is coupled with increasing negativity (“discouragement”) about the commercialization of carbon capture and sequestration and electric vehicles.

Technology Solutions			
Phase	Downs’ Characteristics	Frame Characteristics in Media	Time Period
<b>2 - Alarmed discovery and euphoric enthusiasm</b>	Public enthusiasm for solving the problem quickly. Political powers claim the problem can be solved without intense disruption.	Articles cover industry shifts towards more sustainable products (e.g. automotive); media tonality is consistently positive toward greener automotive fuels and energy technologies; expert support of nuclear energy as climate-friendly is reported	January 2007- December 2007
<b>3 - Realizing the cost of significant progress</b>	A gradual public realization that the cost of solving the problem is high. Tension between groups as the public recognizes that a solution will have negative effects on a group or require sacrifices.	Though many new technological solutions are still covered positively throughout the phase, articles questioning the effectiveness, sustainability and feasibility of solutions surface; political conflicts around implementing technological at the U.S. and international levels gain media attention and the frequency of articles covering technology solutions decreases	January 2008 – November 2009
<b>4 - Gradual decline of intense public interest</b>	Three public reactions manifest: discouragement, avoidance, and boredom.	Significant drop in the number of articles covering the solution frame; increased negativity with content focused on flaws in policy and slow market adoption	December 2009 – September 2011 <sup>6</sup>

Table 5: Phases of the media issue-attention cycle on climate change technology solutions

## Quantitative market findings

<sup>6</sup> Phase 4 likely ends past September 2011 (end of study period)

As Figure 5 illustrates, throughout the first 9 months of 2007, market solutions are in Phase 2 of the cycle. The volume of articles, as calculated as monthly prominence scores, is increasing. The tonality, calculated as the net monthly tonality score, is variable but on the whole more positive during this time frame than later in the study period. Throughout 2008 and 2009, tonality sinks and there are months with little coverage, indicating that the solution is entering Phase 3 of the issue-attention cycle, where the public realizes the costs associated with solutions and there is less enthusiasm for action. After November 2009, the prominence score does not rise past 6 – compared with spikes of 8 – 13 in previous phases - indicating Phase 4 of the cycle, where interest declines.

Market solutions show lower prominence than technology solutions throughout the dataset, with the highest monthly prominence score being 13, compared with technology solutions prominence scores of more than 20 on 2 occasions. Phase 3 begins three months earlier for market solutions than technology solutions, taking place from October 2007 – November 2009. There is consistent controversy over market solutions in the media, illustrated by the way that tonality vacillates between positive and negative throughout the cycle. However, tonality still shifts towards the negative as the issue moves into Phase 4, where the highest tonality peaks are lower than the highest peaks of the previous 2 phases and a greater amount of coverage in Phase 4 rests below zero.

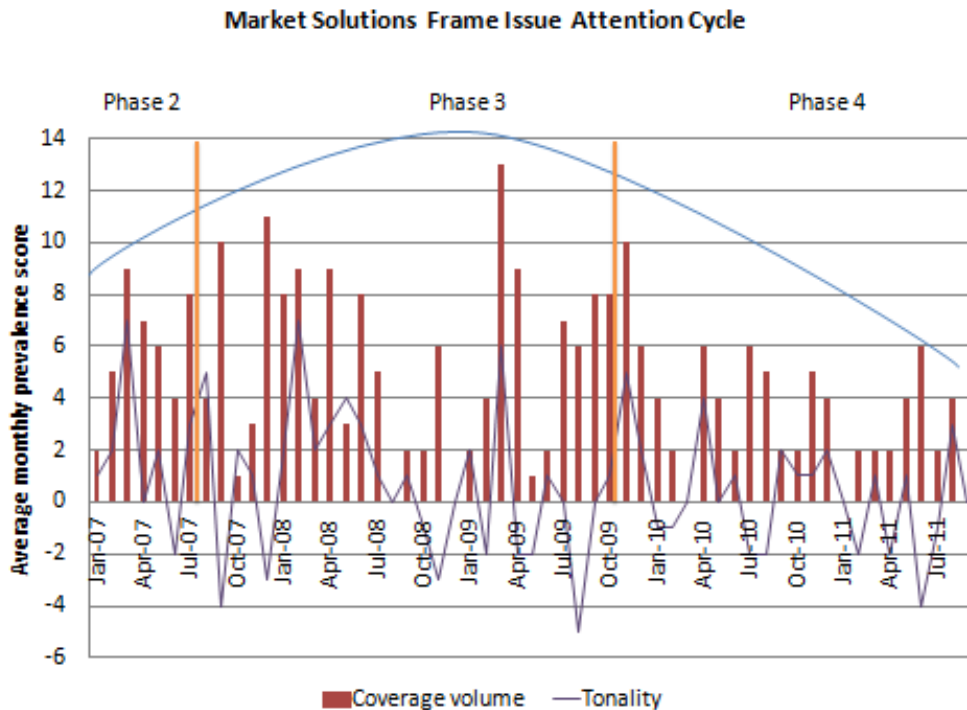


Figure 5: Climate change market solutions media coverage volume and tonality

Phase 2 of the market solutions frame issue-attention cycle:

From January 2007 – September 2007, the average monthly frame prevalence score is 6.11, and the average number of articles publishing monthly that contain the frame is 3.33. The ratio of prevalence score to the number of articles published yields 1.83, indicating that more than 80% the articles in this Phase feature the frame prominently in the headline, lead paragraph and/or dedicate the majority of the article to the market solution. The average monthly tonality score for this phase is 1.5, driven by extreme variance in monthly tonality ranging from 7 to -4.

Phase 3 of the market solutions frame issue-attention cycle:

From October 2007 – November 2009, the average monthly frame prevalence score drops to 5.42, though the average number of framed articles publishing monthly remains similar at 3.30. Even though a similar amount of articles contain the frame, its share of voice within each article drops, with a ratio of 1.64. Average monthly tonality drops significantly to .88. Again, there is wide variance in tonality scores from 7 to -5, though lower positive monthly scores and more

negative monthly scores serve to lower the average from Phase 2. Overall, positive coverage is more modest and negative coverage is more frequent.

Phase 4 of the market solutions frame issue-attention cycle:

From December 2009 – September 2011, the average monthly frame prevalence score drops to 1.95, and the average number of articles publishing monthly that contain the frame is 3.18. The ratio of prevalence score to number of articles drops to 1.63, with the market solutions frame more often limited to single-sentence mentions in articles.

Negativity dominates media coverage during this time frame, with average monthly tonality plummeting to .13 – significantly lower than the .55 technology solutions average tonality for that frame’s corresponding Phase 4.

## Qualitative market findings

As outlined in Table 6, in Phase 2 (January – September 2007), coverage focused on U.N. climate change conferences addressing an international agreement capping carbon emissions and a U.S. nationwide cap-and-trade system. In Phase 3, from October 2007 – November 2009, costs associated with business impacts of market solutions and political infighting emerge in coverage. In Phase 4, beginning in December 2009, federal and U.N. policy solutions are reported as failures and the number of articles declines.

Market Solutions			
Phase	Downs’ Characteristics	Frame Characteristics in Media	Time Period
<b>2 - Alarmed discovery and euphoric enthusiasm</b>	Public enthusiasm for solving the problem quickly. Political powers claim the problem can be solved without intense disruption.	U.S. federal government and UN attempt to develop market-based policy caps to carbon emissions	January 2007 - September 2007
<b>3 - Realizing the cost of significant progress</b>	A gradual public realization that the cost of solving the problem is high. Tension between groups as the public recognizes that a solution will have negative effects on a group or require sacrifices.	While some local governments and companies successfully implement market-based solutions, there is increasing coverage of national and international inability to gain political consensus; arguments emerge about economic disadvantages of mandatory	October 2007 – November 2009

		emissions caps	
<b>4 - Gradual decline of intense public interest</b>	Three public reactions manifest: discouragement, avoidance, and boredom.	Demise of U.S. cap-and-trade legislation decreases volume of federal legislative coverage; U.N. conferences continue but hope for resolutions are diminished	January 2008 - September 2011 <sup>7</sup>
<b>Table 6: Phases of the media issue-attention cycle on climate change market solutions</b>			

### **November 2009 - the end of Phase 3**

Though not marked by any notable event, November 2009 nonetheless is a negative turning point in tonality for both market and technology solutions coverage followed by a decline in coverage. This month marks the end of Phase 3 and beginning of Phase 4 of the issue-attention cycle for both solutions frames. In November 2009, two key topics permeating both frames’ media articles are characterized by a new hopelessness:

- Federal policy: In November 2009, in the wake of an unsuccessful Senate bid to pass climate change legislation, the U.S. EPA moved forward with steps to regulate greenhouse gases in what has been covered in the media as a last resort tactic, due to political opposition and alleged jobs impacts (Elperin, 2009; Mufson & Fahrenthold, 2009; The Associated Press, 2009d).
- Automotive industry: Previous media coverage had focused on the automotive industry leading technology solutions to climate change (The Associated Press, 2007b, 2007c, 2009a). A *Wall Street Journal* article in January 2008 covered Nissan and other auto makers’ investment in electric vehicles as a “major commitment to develop battery-powered cars, with an eye toward producing significant volumes within three to five years” (Shirouzu, 2008). But in November 2009, *The Associated Press* ran a story on Nissan CEO Carlos Ghosn remarks that electric vehicle technology, positioned as a climate change solution, was in fact “not going to take the market by storm” (The Associated Press, 2009c).

<sup>7</sup> Phase 4 ends likely past September 2011 (end of study period)

Two other major findings results from analysis of article tonality and content across both market and technology solutions frames:

***Technology solutions were consistently portrayed more positively than market solutions***

Throughout the study period, the average monthly tonality for technology solutions coverage was more positive than for market solutions. In Figure 6, technology and market solutions article tonality are mapped over time. Y-axis values represent the “net tonality” of that month’s coverage for the frame – the addition of all positive and negative article scores.

Months with high volumes of positive coverage show positive y-axis scores, months with high volumes of negative coverage show large negative y-axis values.

Blue bars indicate months when average monthly tonality of technology solutions is more positive than market solutions. Red bars indicate months when market solutions are portrayed more positively than technology solutions. With few exceptions, technology solutions receive more positive coverage – sometimes significantly more positive in as shown by the longest blue bars, October 2007 – January 2008. The months in which market solutions are portrayed more positively than technology solutions are rare, taking place mostly during Phase 4 of the issue-attention cycle:

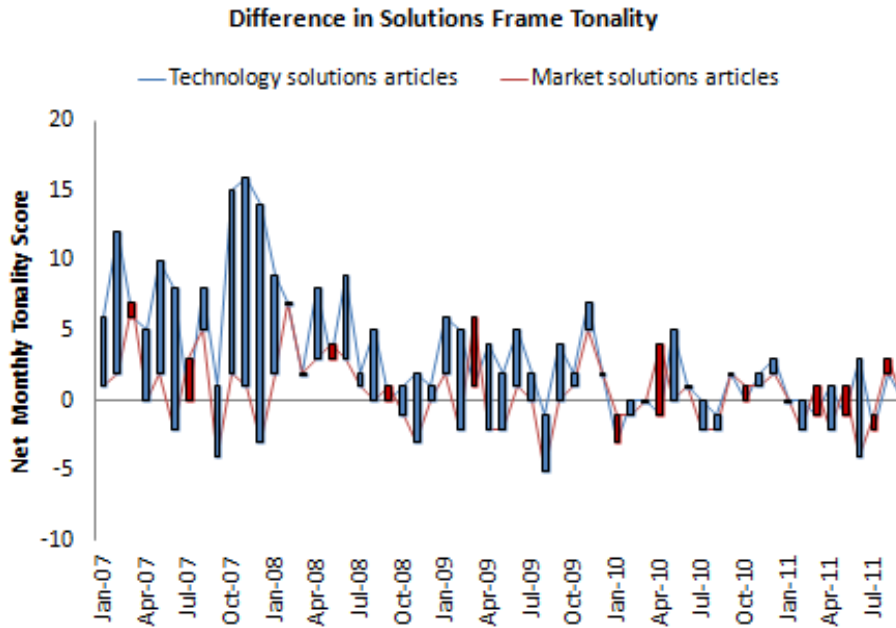


Figure 5: Difference in market and technology solution coverage tonality over time

***Several topics were consistently included in framed articles, a relationship that indicates that they may play a role in driving media attention to these solutions***

Frame drivers behave as issues or events that spark media interest in a topic. For instance, U.S. climate change legislation and energy bill was tangentially mentioned in technology solutions media coverage, and the role it plays in bringing media attention to the solution can be inferred from passive mention of the driver in the subsequent media coverage. In the February 13, 2009 online Reuters article “CERA-US power cos. evaluate cost of carbon controls,” which covers technological solutions to minimizing the climate impact of burning coal, the opening sentence reads: “U.S. utilities are looking for ways to lessen the impact of rising costs from legislation they know is around the corner to limit carbon dioxide emissions from existing coal-fired power plants” (O’Grady, 2009).

Figure 7 illustrates the topics that appeared most consistently in market or technology coverage spikes. A “spike” was defined as periods of time where the frame amplification score reached at least 10, and this score was chosen as a threshold due to the fact that spikes at this level were relatively large, and also well-dispersed throughout the phases. To examine possible drivers of the spike, I read articles in the spike month, as well as the month immediately

preceding and the month afterward. The following is a breakdown of the most prominent topics covered during each spike, with more detail on the specific months during which the coverage appeared included in the Appendices:

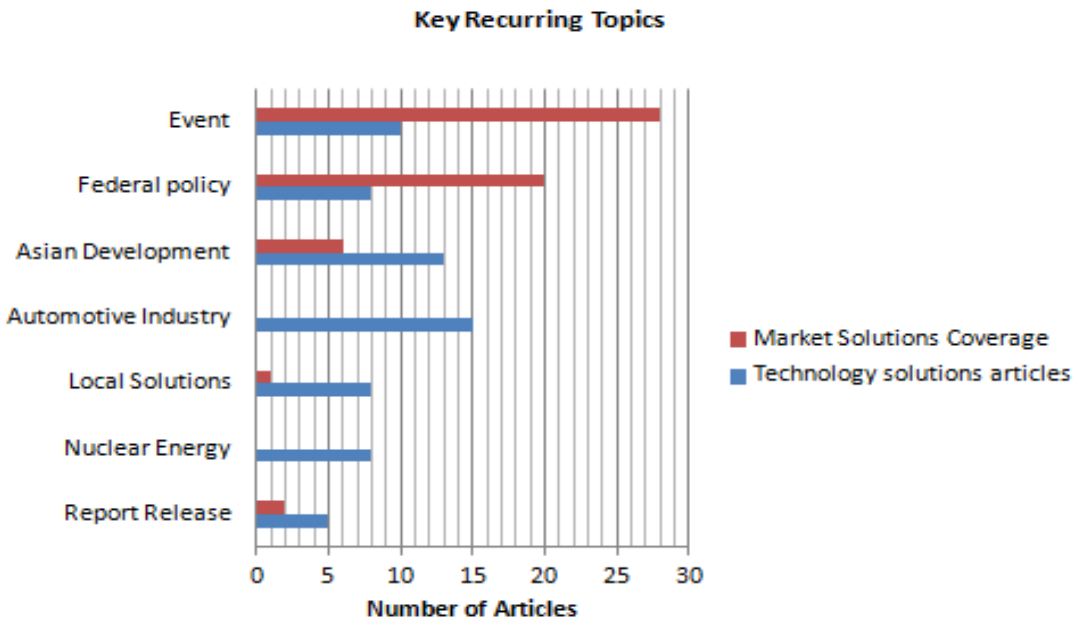


Figure 6: Media drivers for climate change market and technology solutions coverage

As shown in Figure 7, several topics and themes occurred repeatedly throughout market and technology articles, helping to drive media interest:

- Event: Major events such as UN conferences sparked media coverage before, during and after the event.
- Federal Policy: Climate change policy under consideration in the U.S. House and Senate sparked national coverage and commentary in the media throughout the study timeframe.
- Asian Development: The growth of Asia’s economy and possible impact on global climate change, as well as the role India and China play in international climate agreements garnered coverage around UN conferences, announcements of individual country policy stances, and throughout the study period in pieces on foreign relations.

- **Automotive Industry:** The development of new technologies in the automotive industry in response to climate change received media coverage throughout the study period, driven by auto manufacturers.
- **Local Solutions:** State and municipal policy solutions to climate change, either in the form of emissions limits or encouraging the adoption of cleaner technologies, gained coverage particularly in the wake of failed national and international climate change agreements.
- **Nuclear Energy:** Renewed policymaker and expert interest in nuclear energy as a climate-friendly source of energy was covered in the media throughout the study period, including after the March 2011 Japanese earthquake and nuclear disaster.
- **Report Release:** The publication of research reports covering market or technology solutions to climate change garnered media coverage around the date of the report release.

## Discussion

Findings support the idea that the U.S. media follows Downs' issue-attention cycle in terms of both market and technology solutions to climate change. Though minor spikes in attention exist around events, new research reports, policy developments, automotive, nuclear and Asian development trends, this issue-attention cycle clearly moves through the phases identified by Downs. For the study period 2007 – 2011, media attention on both technology and market climate change solutions passed through Phases 2-4 of the issue-attention cycle. Decreasing coverage volume and increasingly negative tonality over time was observed for both market and technology solutions, which aligns with Downs' characteristics of issue-attention cycle Phases 2-4.

A consistently higher tonality for technology compared to market solutions coverage was unexpectedly observed. Market solutions receive decreasing prevalence within articles as well as a decreasing number of articles as the cycle progresses, which is an expected finding for a concept that is waning in the public spotlight. However, technology solutions showed the

opposite trend. Though the amount of media attention on technology solutions wanes over time, the articles that do cover technology solutions give these solutions a greater share of voice within each piece. Though media attention on technology solutions is less by Phase 4, what exists is more focused.

Proposed causes for these findings, as well as implications for climate change communications, are outlined below.

## **The growing issue-attention desert**

This study does not focus on why an issue such as climate change would subside in the public consciousness, though research suggests that factors leading to diminished public concerns about global warming include unemployment, political conflicts around national climate legislation, attacks on climate science (Maibach, Roser-Renou, & Leiserowitz, 2010).

Another element to consider is how new outlet staffing may be influencing climate change coverage. Research by DailyClimate.org found that both the number of print media writers and articles focused on climate change decreased from the time period of 2009-2011. In 2009, approximately 11,100 journalists and opinion writers published 32,400 articles about climate change; by 2010, the number was down to around 7,140 writers and 19,000 articles (Pyper, 2011). It is unclear if a lack of media attention lead to fewer writers, who were able to produce a smaller number of articles, or if the number of total journalists and therefore articles decreased due to other economic constraints.

Media expert Robert Brulle has argued that a lack of politicians discussing climate change is a reason for its decline in 2011 media coverage (Pyper, 2011). Brulle's research has found that climate change media coverage volume in the U.S. increased temporarily when Republican presidential candidates Jon Huntsman and Rick Perry shared their views on climate change research publically. The relationship between politician remarks and media attention on climate change and the potential role they can play in driving media attention in later phases of the issue-attention cycle is an area for further research.

## Technology as a media darling

The relationship between the market solution and economic security has been positioned as tenuous throughout media coverage in the dataset, a factor that may have contributed to its relatively negative portrayal. The *Associated Press* notes that “the most popular remedy for slowing global warming, a mechanism known as cap-and-trade, could put further stress on a teetering economy” (The Associated Press, 2008a), and “cap-and-trade benefits the coasts at the expense of the heartland” (The Associated Press, 2009b).

Evidence for a tendency among Americans to view technology climate change solutions more favorably was also evident in a May 2011 survey of 981 American adults, who rated favorability for technology and market solutions on a scale of 1 (strongly oppose) – 4 (strongly support). Percentage of respondents that strongly opposed technology solutions including increasing nuclear and renewable energy sources was 23% or less; while 40% - 46% were strongly opposed to various gasoline tax options, even if tax revenues were reinvested in public transit infrastructure or income tax refunds (Leiserowitz, Maibach, Roser-Renou, & Smith, 2011). When respondents were asked about tax rebates rewarding their own investment in solar panel and energy-efficient vehicles, only 9% strongly opposed this type of tax.

Psychology may also disadvantage market solutions’ perception and subsequent portrayal in the media. Market solutions may also be less favorably portrayed than technology solutions because they require broader behavior changes, rather than investment in a solution that will allow climate-unfriendly behaviors to continue. Marc Kaufman points out in the context of discussing market solutions, “blunting the consequences of global warming will require different lifestyles” (Kaufman, 2007). Research has found that successfully implementing environmentally or socially beneficial programs at the organizational level is easier if new behaviors are presented as a positive and attractive option, rather than a sacrifice (Howard-Grenville & Hoffman, 2003). Requiring different lifestyles may be a subconscious driver for reporters’ negative perceptions of market solutions, which manifest themselves in negative article tonality.

Even if a market solution to climate change has benefits to individuals, they may not perceive it as so. Humans attempt to act rationally, but they are limited in their ability to achieve pure rationality (Bazerman & Hoffman, 1999; Hoffman & Henn, 2008; March & Simon, 1958; Simon, 1957). A study of residential energy-efficient lighting found that even when payback periods were within the average time frame a U.S. homeowner lives in a property, switching to the higher-cost, more efficient lighting was slow, due to the perceived barrier of upfront cost (U.S. Environmental Protection Agency, 1997). When making environmental decisions individuals tend to over-discount the future and not realize that they will reap greater long-term benefits though some costs may be incurred in the short-term (Bazerman & Hoffman, 1999; Hoffman & Henn, 2008; U.S. Environmental Protection Agency, 1997). A study on the sources of environmentally destructive behavior notes the power of habitual routine in employees at a company, who are unwilling to change their habits even after realizing that a habit damages the environment, due to short-term costs that are associated with changing the habit (Bazerman & Hoffman, 1999).

## **Issue-attention frame drivers: the life preserver model**

Brulle's observation in Pyper (2011) that presidential candidates announcing climate change positions caused climate change media coverage spikes is an example of a phenomenon I observed in my research, which I refer to as a media issue-attention "life preserver." As illustrated in Figure 7, several topics were consistently present in spikes of media activity through the course of my study: major events, new research, U.S. federal policy, significant energy or automotive industry shifts, and Asian development patterns. Close reading of these articles in these coverage spikes indicates that the topics identified are reasons for the reporter to examine the technology or market solution to climate change – they are "drivers" of media attention on the solution. For example, an article on China includes coverage of their environmental policy and emissions caps as a market solution (Arasu, 2009). An article about Nissan's move to electric vehicles includes coverage of these vehicles as a technology solution to climate change (Shirouzu, 2008). I propose that these driver topics are in fact "life

preservers” that help heighten media attention on a market or technology solution to climate change.

My research shows that though these life preserver topics can spur a spike in media attention that lasts for several months, they do not circumvent the movement of interest through the consecutive issue-attention cycle phases. In short, they are effective attention-drivers to increase the volume of coverage on a climate change solution in the short-term, but they will not resuscitate a solutions frame that is fading into obscurity. While life preservers do not alter the trajectory of the U.S. media issue-attention cycle, they do temporarily increase the volume of coverage.

### Events

Policy agenda-setting scholars note that of natural disasters crises such as scandals, trials, public demonstrations, international agreements, creation of new institutions or reconfiguration of existing organizations, scientific discoveries, and prominent publications can serve as focusing events that drive intense issue attention (Hilgartner & Bosk, 1988; Kingdon, 1995). In my study, international summits (e.g. U.N. climate change negotiations) served as focusing events that prompted media discussion of the merits of a specific technology or market solutions. Similarly, research has found that high-profile international events influence media attention on climate change, grabbing the media’ attention instantaneously (Liu, Lindquist, & Vedlitz, 2011).

### Publication of new research

Report releases were more minor drivers, but in order for a report to be a media attention driver, the content should be significant, or its release should be coupled with an event to help drive attention. Specifically, the extent to which a report garnered media attention was based on the controversy of the findings and the timing of the report release aligning with a larger event. In May 2007, media coverage spiked due to the content of a relatively minor IPCC report - the Working Group III's *Summary for Policymakers* (SPM). However, because it was released on May 4 during the 26th session of the IPCC, the report was able to take advantage of media already focusing on the UN meeting itself. A February 2008 report issued by the Netherlands

Environmental Assessment Agency that found global emissions had grown 3.1%, and China's emissions alone had grown by 8% over the past year was included as part of an article about a U.N. climate change conference in Bonn (The Associated Press, 2008b).

In terms of controversial report content driving coverage, article volume spiked in February 2007 due to the release of a SPM based on Working Group I's findings. Though this was a relatively minor publication - not even the full Working Group I report - the content of this SPM included language stating that global warming was unequivocal, marking the first time the IPCC had made that claim. Dramatic language was used in another report issued by the Pew Center on Global Climate Change and the Asia Society Center in 2009, which urged the U.S. and China to take immediate, coordinated action to curb greenhouse gas emissions. The report language was subsequently included in a *Reuters* article: "If these two countries cannot find ways to bridge the long-standing divide on this issue, there will literally be no solution . . . That our planet is now approaching a point of no return on the question of global warming is increasingly self-evident" (Reuters News, 2009).

### Federal policy

Discussions around the possibility of federal climate change legislation, driven by the introduction of a carbon tax by House Democrats in March 2009 and spurred by passage of the Waxman-Markey Bill in the U.S. House of Representatives on June 26, 2009, helped keep both market and technology solutions frames in the media as part of coverage of federal policy.

Policy plays a key role in enabling solutions, and several articles noted the role that market solutions have in enabling technology solutions – indicating that policy is a topical bridge between the market and solutions frames. A May 5, 2007 article in the *Washington Post* quotes an expert who says unless governments take action and "market forces [are] present to attach a price to carbon, we're not likely to get a major dissemination of technologies, no matter how meritorious they may be" (Kaufman, 2007). A February 2, 2009 article in *The New York Times* reported that "some experts argue that in the absence of a broader national effort to encourage cleaner fuels, even the smartest grid will do little to reduce consumption of fuels that contribute to climate change . . . The solution is to put a price on emissions from dirtier

fuels and incorporate that into the price of electricity, or find some other way to limit power generation from coal” (Wald, 2009). The influence of policy on market and technology solutions frame coverage tonality is an area for further study.

Positive tonality around policy-enabled solutions at the state and local level, especially in the face of national and international inaction, point to a love of the underdog in U.S. media coverage, regardless of the president in power. The opening sentence of a *Washington Post* article during the December 2010 U.N. Conference of Parties (COP) noted that “[i]n response to growing frustration that the U.N. climate negotiations are not producing real-world results, individual nations, states and business are cobbling together patchwork solutions” (Eilperin & Booth, 2010). An *Associated Press* article about California’s movement to regulate greenhouse gas emissions in the face of “unconscionable” federal opposition included inflammatory quotes from three leaders, including California Gov. Arnold Schwarzenegger saying “It is disappointing that the federal government is standing in our way and ignoring the will of tens of millions of people across the nation” and Washington Gov. Chris Gregoire stating “[t]his is a failure of leadership that places our economy and our environment at risk” (The Associated Press, 2007a). Less than half of the article content showcasing the EPA’s viewpoint and milder language in the one federal official quoted. A *New York Times* article published the same day included much of the same content, adding quotes from federal leaders opposing the EPA decision, including: Senator Dianne Feinstein accusing the EPA of “shirk its responsibility to protect the health and safety of the American people from air pollution;” Representative Henry A. Waxman saying that the EPA decision “defied law, science and common sense;” and Richard Blumenthal, the attorney general of Connecticut, calling the ruling a “mockery of law and sound public policy” (Broder & Barringer, 2007).

The idea that Americans support groups or individuals that are at a disadvantage against a more powerful entity is commented upon in sociology as well as popular culture (Klapp, 1962; Potter, 1954 ; Prell, 2008; Sagarin, 1970). Sagarin (1970) describes this scenario as “those not favored or expected to win, by virtue of size, strength, experience, or even birth, such individuals or groups have public sympathy” (p. 429), noting that a love of the underdog is an American – rather than human – trait, and that overcoming disadvantage is valued in the

American social structure. Downs himself alludes to the role that national character plays in shaping the issue attention cycle when he describes Phase 2's "alarmed discovery and euphoric enthusiasm" as an outlook "rooted in the great American tradition of optimistically viewing most obstacles to social progress as *external* to the structure of society itself," noting that Phase 2 of the issue-attention cycle would have a different tonality in other cultures (p. 39). Clearly, a society's character plays into how its citizens view national issues, and media coverage of climate change is no exception.

Nuclear renaissance

Coverage of nuclear power is evident in technology frame coverage spikes in Q2 and Q4 2007, Q2 2008, Q2 and Q4 2009. But as Figure 8 shows, the Fukushima Daiichi nuclear disaster following the Tōhoku earthquake and tsunami on March 11, 2011 only caused a small negative dip in technology solutions coverage tonality. Technology tonality was still more positive than market solutions tonality during this time period, indicating that the nuclear disaster was not overly-detrimental to the media's preference for the solutions frame overall.

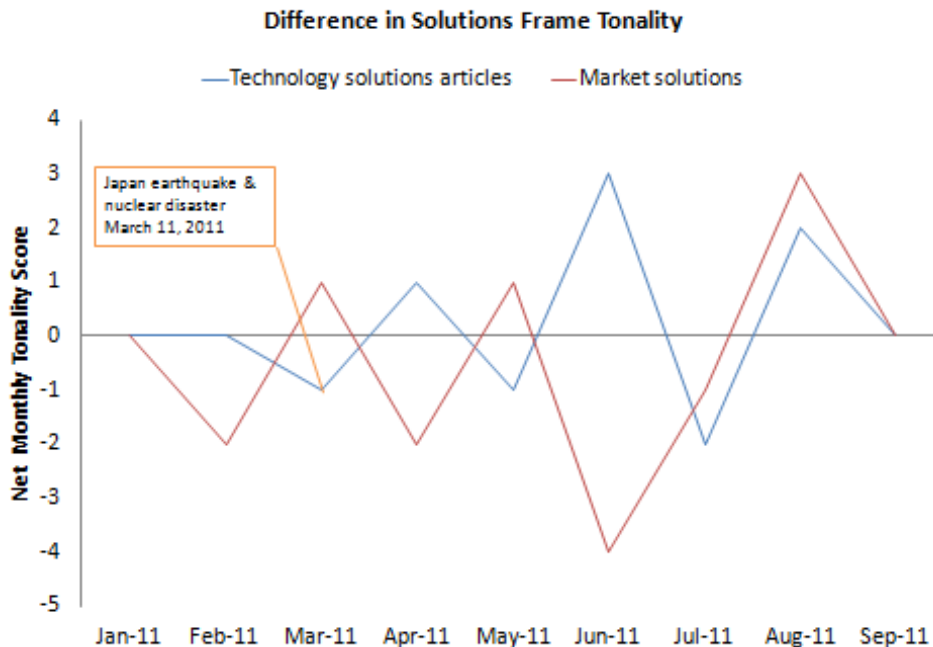


Figure 7: Coverage tonality during Japan nuclear disaster, 2011

Auto industry shift toward cleaner vehicles

Unlike events or report releases that cause a burst of attention that fades shortly after, the auto industry shift towards vehicles that achieve higher miles per gallon (MPG) was included in numerous frame spikes over time. Coverage of advances in automobile technology did not cluster around a particular event; rather they covered a gradual shift in an industry.

### Asian development

Chinese economic development and increasing greenhouse gas emissions was a focus of climate change solutions coverage, though primarily in the technology solutions frame due to the country's requests for technology transfer assistance and its national policy preferences of technology improvements over emissions reductions commitments. A technology solutions media coverage spike in May 2007 was driven by the annual meeting of the Asian Development Bank and its deliberations on how to manage growth. The issue of Asian growth is also seen in solutions frame coverage in Q2 and Q4 2007, Q2 2008, Q1, Q2 and Q4 2009, at times linked with events, but other times not and without specific event coverage, indicating that Asian growth is a more persistent issue.

### The economic downturn

Noticeably absent as a stand-alone frame driver during the study timeframe is the global economic downturn. A Lexis search for "climate change" and "solution\*" and ("market" or "technology") and "recession" in the United States geography yielded 415 results, the vast majority of which were in regional U.S. newspapers, foreign news wires and outlets covering the U.S., industry trade outlets and news releases issued by various organizations. Any articles appearing in my study's focus outlets were driven by other frame drivers already mentioned:

- 8 were *Associated Press* articles - 6 on local solutions (state policy), and 2 on U.N. events
- 5 were *Washington Post* articles – 1 on Asian development, 1 on an event (Group of Eight summit), 2 on a report (IPCC), 1 was an editorial<sup>8</sup> on federal policy
- None were *Reuters* articles

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<sup>8</sup> Though editorials and news releases were manually removed from the framed articles coded for this study, the Lexis search conducted to further explore the lack of a global economic recession driver includes these items.

- None were *New York Times* articles
- None were *Wall Street Journal* articles
- None were *USA Today* articles

Within the 415 articles, foreign outlets covered the impacts of the recession on the potential of climate policy in the context of the 2008 U.S. presidential race and new Obama administration, local outlets covered the regional potential of green jobs spurred by climate legislation, and trade outlets covered the potential costs and opportunities of abiding by climate regulations given the economy. All these coverage foci are stakeholder-centric and largely U.S.-policy driven— they explore the role of the recession on individual groups’ ability to gain from climate change regulation. In short, it seems that foreign outlets were more interested in the role of a new U.S. president on climate change in a tough economy than American were, while Americans themselves were more focused on climate-friendly job opportunities as a means of easing unemployment and the potential impact of climate legislation on already-suffering industries. Though the recession may have been covered along with climate change elsewhere during this time frame, it did not prove to be a driver in how the market or technology solution frame was presented or discussed in my target outlets. Given the content trends of the 415 articles pulled, this may be because there was no clear consensus on how the recession would affect the national approach to either of these solutions. Industry, local and international coverage discusses who these winners and losers would be, but the lack of a uniform impact on industry or civil society perhaps presents too diverse a conversation to elevate to the national level.

The lack of recession impact on media coverage of these solutions in my study’s target outlets is an interesting parallel with public sentiment. Yale’s “Climate Change in the American Mind” study of 2,129 America adults in the fall of 2008 found that despite the economic crisis, more than 90 percent of Americans said the United States should act to reduce global warming, even if it has economic costs (Yale Center on Climate Change Communication, 2011).

#### The failure of Waxman-Markey

The passage of the Waxman-Markey bill by the U.S. House of Representatives on June 26, 2009, appears to have had little effect on the coverage of either frame. For the technology frame, that event comes far into the twilight of the issue-attention cycle, which peaked between Q2 2007 - Q1 2008 and was in decline from Q2 2008 onward. For the more variable market frame, characterized by spikes throughout the time period as coverage of the frame is coupled with a variety of drivers, passage of Waxman-Markey was still too late – the largest and most sustained spikes in frame coverage had taken place between April 2008 – July 2008, and again March – October 2009. A general arc of the issue-attention cycle for the market frame taking into account the largest spikes of coverage puts the peak of this issue-attention cycle in Q1 2009.

## **Political poison for solutions frames**

Throughout the issue attention cycle on climate change solutions, and particularly for market solutions, monthly article tonality and prevalence scores vacillate widely. Politics – either an individual’s punditry or organizations attacking each other’s viewpoints publicly—plays a clear role in stealing the media spotlight from a solution, and driving coverage tonality of a solution towards the negative.

Market solutions media coverage suffers from politics in two ways: first, the prevalence of the solution is at times overshadowed by the celebrity of its messenger Al Gore, and second, its tonality is tainted by the infighting surrounding its implementation. Media coverage of Al Gore’s support of market solutions has a tendency to focus more on the charisma of Gore himself and his alarmism about the problem of climate change than on the solutions he proposes. A March 22, 2007 *Washington Post* article includes the market solutions frame, but as a brief mention in an article that focuses on Al Gore’s congressional testimony that climate change is a serious problem and that that global climate change represents the most dangerous crisis in American history and that that global climate change represents the most dangerous crisis in American history and that measures the U.S. needs to take are “far more drastic” than policy currently under consideration (Fahrenthold, 2007). In leading paragraphs, Gore’s recent Academy Award for *An Inconvenient Truth* is noted, and his personal interactions with legislators are detailed throughout the piece – including the fact that “many legislators greeted

Gore warmly, recalling committee assignments they had shared with him or sharing news of new grandchildren.” A Wall Street Journal piece in the market solutions dataset opens with a description of Gore’s environmental advocacy as his “climate-change show on the road” (Levy, 2008). The solution itself is overshadowed by the cult of Gore.

Politicians can also serve as tonality “lead weights” that drive negativity. With a dubious environmental record throughout his term, George W. Bush’s approach to climate change was portrayed negatively, even though the solutions he proposed were technology-focused. A September 29, 2007 *Washington Post* article noted that though Bush “touted technology as the ultimate solution, citing ideas he has promoted for years, such as cleaner coal production; more nuclear, solar and wind power; additional ethanol as a substitute for gasoline; and increased vehicle fuel-efficiency standards,” critics “complained that it would not add up to anything unless he reverses himself and embraces some form of mandatory limit on emissions” (Baker & Eilperin, 2007). Technology solutions that are consistently covered positively in other articles are here demeaned in favor of a market solution that does not receive the same consistency of positive tonality.

Coverage of the politics of climate change negotiations also overshadows the message of the market solution itself. Coverage of U.S. presidential environmental policy for both George W. Bush and Obama mentions emissions caps as part of political agenda-setting (Baker, 2007; Baker & Eilperin, 2007; Connolly & Smith, 2008). Opening paragraphs of *Associated Press* coverage of the December 2007 UN conference on climate change first mentions the emissions cap market solution only halfway through the article, and even then, within a political context: “[a]mong the most contentious issues ahead will be whether emission cuts should be mandatory or voluntary, as the U.S. favors” (Coleman, 2007; UN Kicks Off Global Warming Conference To Build New Climate Agreement", 2007); politics again permeates market solutions coverage for the 2009 UN talks in Copenhagen (Zeller, 2009). International relations between the U.S. and other countries - particularly China - is also an example of market solutions to climate change being part of what is primarily political coverage (Arasu, 2009; Pitchford, 2009; Shin & Sheridan, 2009).

It is interesting that Downs specifically identifies a call for technology solutions as part of the issue-attention cycle: “[i]n the optimistic American tradition, such a technological solution is initially assumed to be possible in the case of nearly every problem” (p. 40). The relative difficulty of “teasing out” the market solutions frame in the dataset and its diminishing prevalence in coverage, as opposed to sharpening as the technology solutions frame did, seems to underscore Downs’ observation of the role of technology solutions in issue-attention cycles around U.S. issues in general.

## Conclusion

The issue-attention cycle is as applicable today as it was 40 years ago. The U.S. media, like the general public Downs’ originally studied, does exhibit a cycle that moves from enthusiasm, to disillusionment, to boredom.

From 2007 – 2011, U.S. media issue-attention on the market and technology solutions frames decreased, moving from Phase 2 to Phase 4 of the 5-phased cycle. Media coverage in January 2007 was relatively high in volume and positive, media coverage by the end of September 2011 was much less in volume with a more negative tonality. Key observations are the preference of technology over market solutions throughout the phases observed; the role of events, research, federal policy, international development, automotive and nuclear industries as drivers of short-term spikes in attention within the larger cycle; and the tendency for federal politics to negatively impact market solutions coverage while smaller entities bucking the federal political process are covered positively. While policy itself can serve as a driver for media attention, punditry and political infighting can overshadow coverage of the solution itself or cast the solution in a negative light, effectively serving as a “lead weight” for prevalence and tonality.

Given a relative lack of attention, several recommendations for communicators looking to increase U.S. media attention on climate change solutions emerge. These include: focusing communications on technology solutions, leveraging frame drivers - “life preservers” - to spark media interest, and positioning market solutions as “underdogs” to gain positive tonality in media coverage.

The growing desert of media coverage of these two climate change solutions frames over the past 5 years might cause one to conclude that dialogue around mitigating climate change is dead in the U.S. Scholars have noted that public opinion is heavily influenced by media coverage (Christen & Huberty, 2007; Jacques et al., 2008; Revkin, 2011), with a decline in media coverage of an issue decreasing its public issue saliency (Revkin, 2011). In a January 2011 interview, sociologist Robert Brulle opined that the cycle of media interest in climate change has “run its course” (Revkin, 2011). He notes that in January 2007, 5% of respondents to Gallup’s poll asking to identify the “most important problem” facing the U.S. today, and from September – December 2010, that percentage had remained steady at 1% or less.

However, Downs’ issue-attention cycle does provide a reason to hope – he notes that once major problem is elevated to national prominence, it may sporadically recapture interest or become part of a future issue undergoing the cycle.

The U.N. Intergovernmental Panel on Climate Change reports that the impacts of climate change will be exacerbated in the future (*Climate Change 2007 : the physical science basis : contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, 2007). As climate change effects become significant disruptions to our lives and economy, the U.S. media will be forced to cover solutions.

Results of this study suggest that if a solution is to be framed in a way to secure positive media attention from top U.S. news outlets, one should focus on technology-based solutions, as opposed to market solutions. Given that policy approaches can incorporate both market and technology elements—such as a carbon tax to fund renewable energy R&D—it should be feasible to focus on the technological aspects of a variety of solutions for the purposes of effective communications.

The possibility of linking climate change solutions discussions to other issues that have captured U.S. media attention provides an exciting opportunity to leverage “life preserver” topics noted in this study to help drive short-term media attention on climate change solutions in a Phase 4 and Phase 5 world.

Downs noted that “in the present mood of the nation, I believe that most citizens do not want to confront the need for major social changes on any major issues except those that seem immediately to threaten them” (pg. 49). How close the “present mood” in 1972 matches the U.S. public today. Unfortunately, we do not have long to wait for immediate threats from climate change – which means the U.S. media issue attention cycle on climate change may soon renew.

## **Limitations & suggestions for further research**

Research is needed to further determine the role of policy in enabling these two solutions frames. While the content of articles studies showed that market and technology solutions are often enabled by policy, the prevalence of policy in articles and the difficulty in obtaining researcher agreement on frame existence in articles that included policy shows that “market solution” and “technology solution” frames are not pure. Additional researchers’ analysis of tonality would also be useful in further studies, as the inter-coder reliability test employed in this study illuminated consistent differences between researchers in making this subjective judgment.

In addition, inter-coder reliability is calculated based on percentage agreement and intended to test the soundness of the research design, rather than validate conclusions. The percentage agreement method used in this study does not apply a secondary statistical analysis to correct for chance agreement. Several scholars note that despite its simplicity and widespread use, percent agreement alone fails to correct for chance agreement, and that especially for nominal studies, this method may inflate the level of agreement (Lombard, Snyder-Duch, & Bracken, 2010; Riffe et al., 2005). As this study utilizes a single researcher focused on relative changes in quantitative metrics to develop qualitative conclusions, additional statistical analysis to check inter-coder reliability was not employed. Interestingly, Riffe et al. (2005) note that in several key communications journals, a significant amount of content analysis research lacks any inter-coder reliability testing at all.

Examination of additional articles and engagement of additional researchers would increase the number of data points per frame, and provide a forum for discussion to further refine keywords defining each frame, and increase inter-coder reliability.

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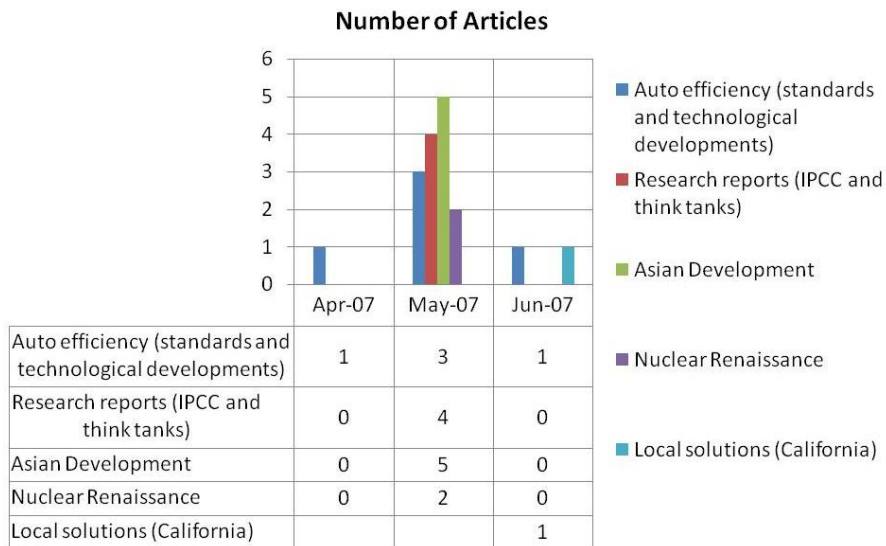
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# Appendices

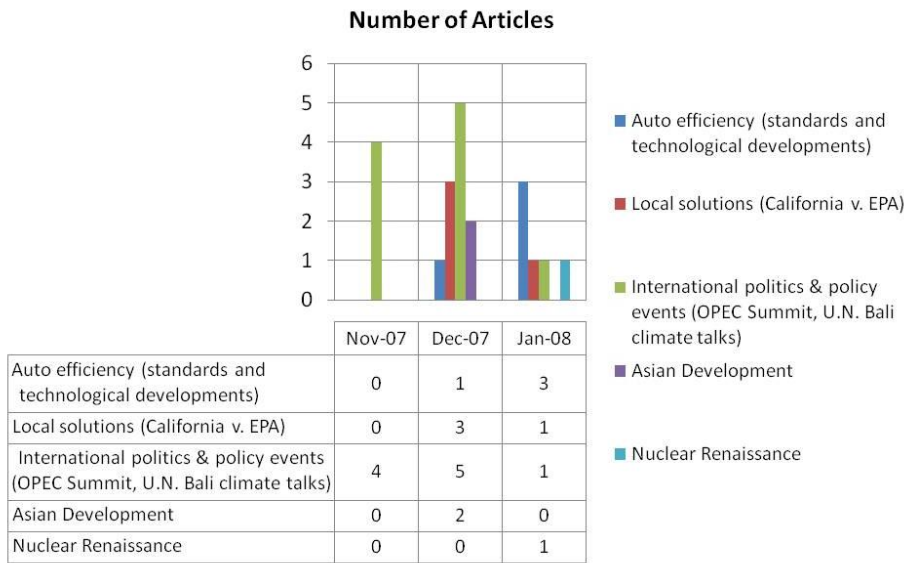
## Appendix 1: Technology frame drivers

Articles that comprise technology frame prominence spikes were further analyzed for patterns of topics and events contained within those articles. A “spike” is defined as points in time when the frame prominence reached a score of at least 10.

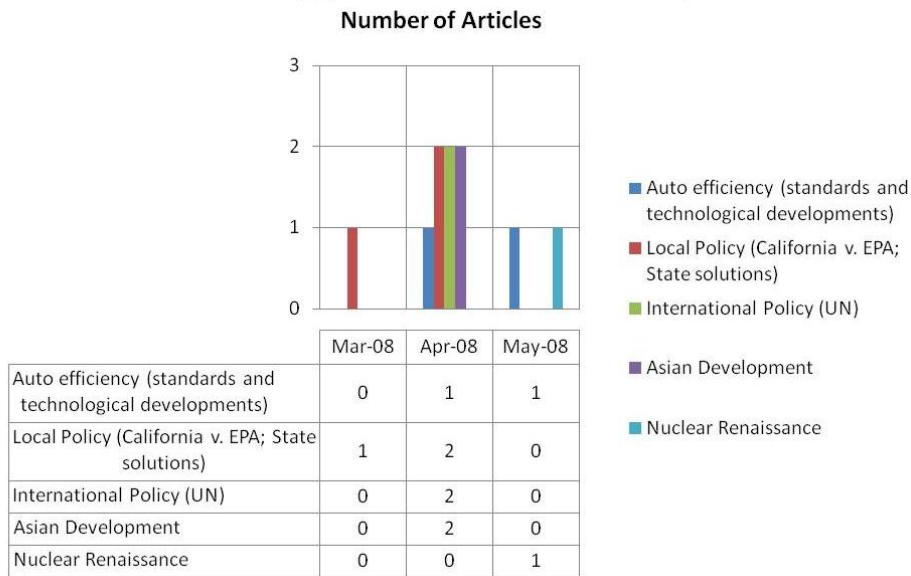
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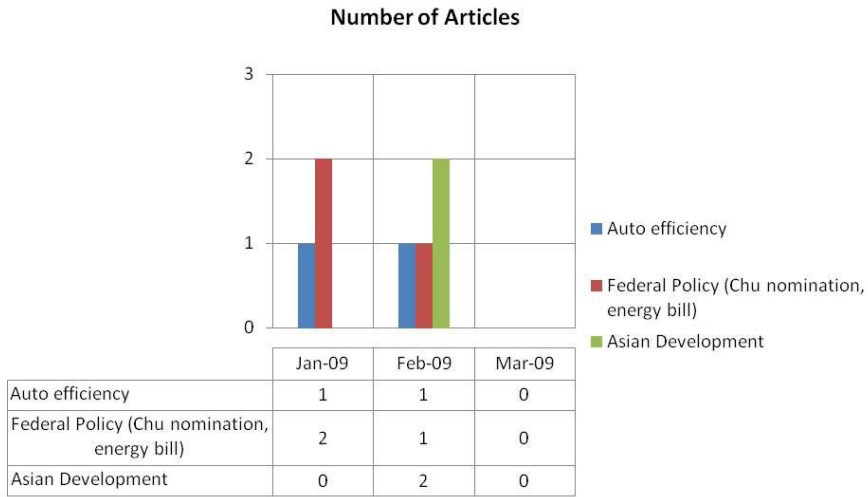
Technology frame spike - Q4 2007



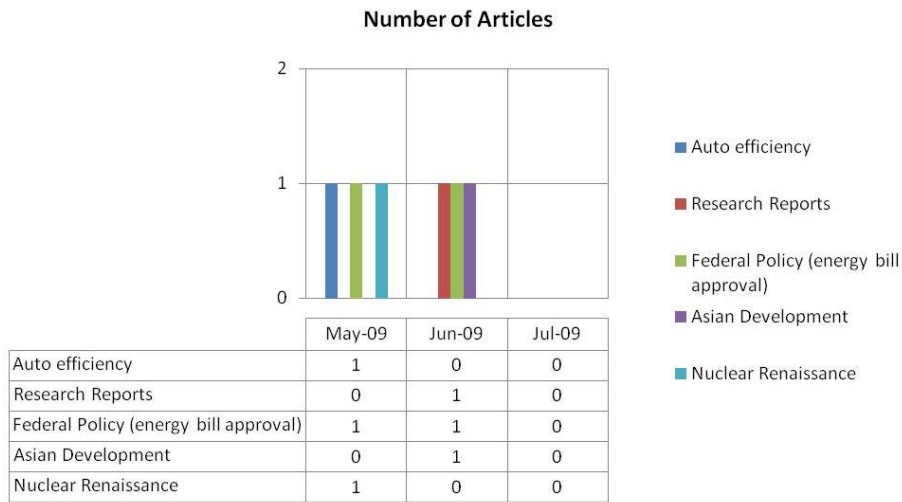
Technology frame spike - Q2 2008



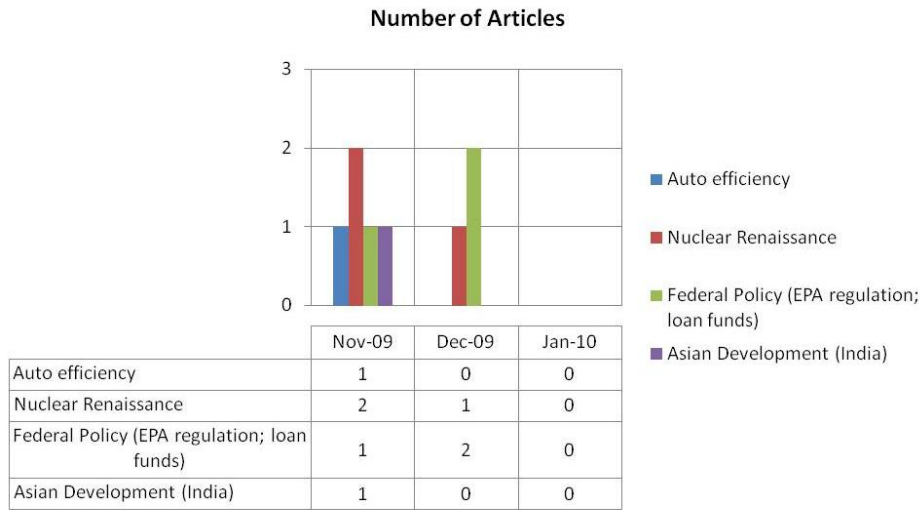
Technology frame spike - Q1 2009



Technology frame spike - Q2 2009



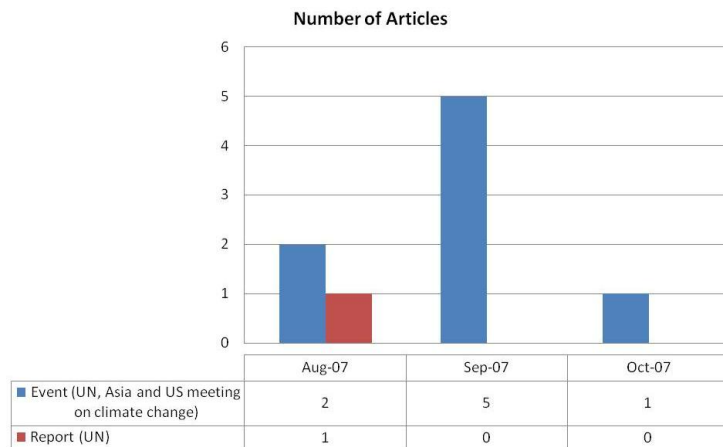
Technology frame spike - Q4 2009



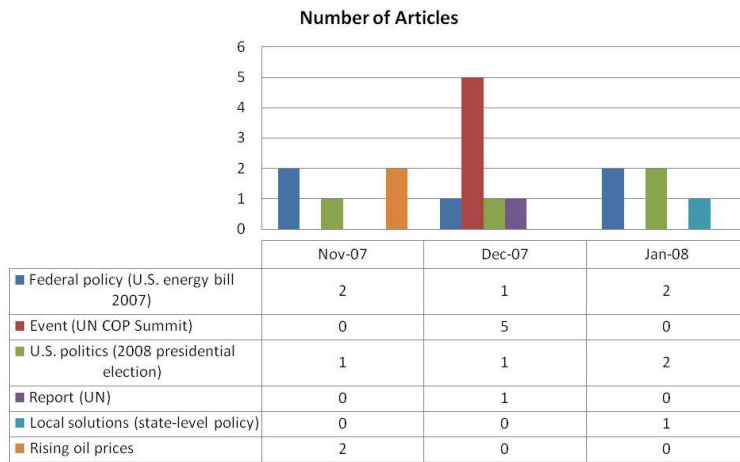
## Appendix 2: Market frame drivers

Articles that comprise market frame prominence spikes were further analyzed for patterns of topics and events contained within those articles. A “spike” is defined as points in time when the frame prominence reached a score of at least 10.

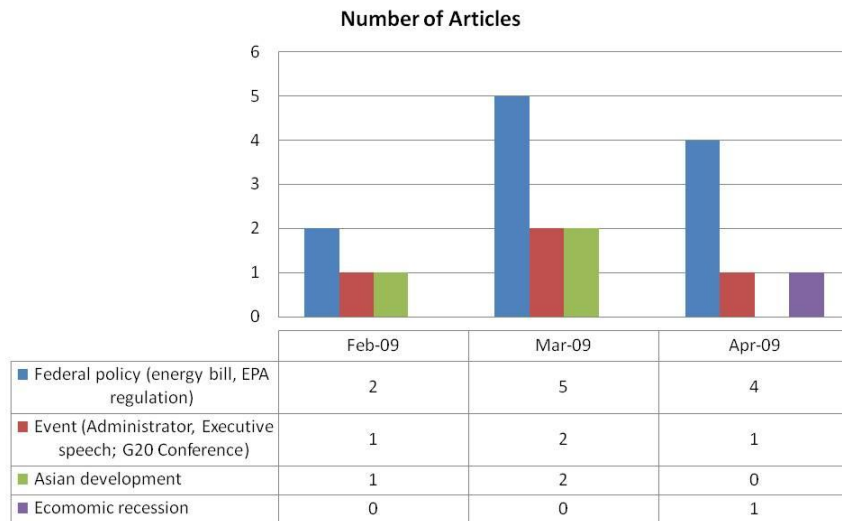
Market frame spike - Q3 2007



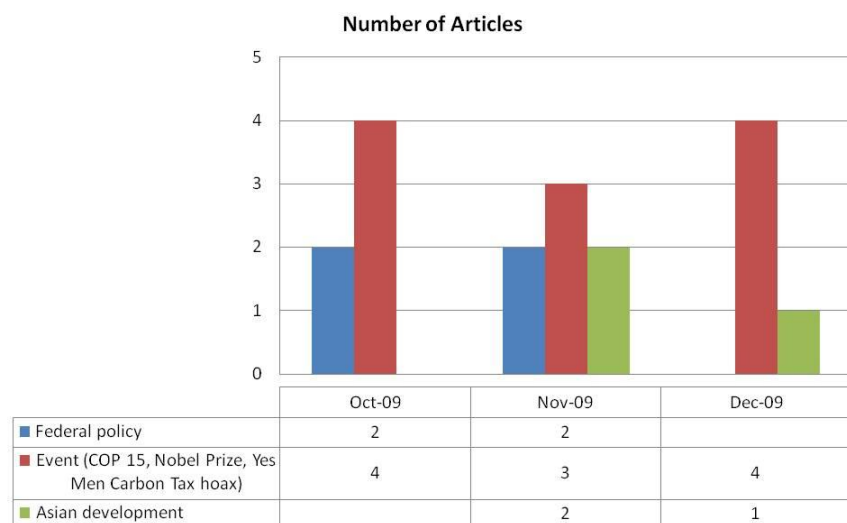
Market frame spike - Q4 2007



Market frame spike - Q2 2009



### Market frame spike - Q4 2009



## Appendix 3:Factiva database outlet profiles

Reuters News	
Description:	Global news from Reuters covering all leading business, political and general news. Country of origin: United Kingdom
Source Code:	LBA
Language:	English
Most Recent Issue:	30 October 2011
First Issue:	27 May 1987
Frequency:	Daily
Update Schedule:	Throughout the day
Online Availability:	Continuously updated
Source Coverage:	Full Coverage
Article Coverage:	Full Text
Format:	Text
Publisher:	Reuters Limited
Publisher URL:	<a href="http://reuters.com">http://reuters.com</a>
Web Address:	<a href="http://www.reuters.com">http://www.reuters.com</a>
Editor's Note:	Certain content targeted specifically at financial market professionals is delayed by 72 hours.

The Wall Street Journal	
Description:	<b>National daily newspaper serving the business community with influential reports on companies, markets, politics and international news. Includes images. Country of origin: United States</b>
Source Code:	J
Language:	English
Most Recent Issue:	29 October 2011
First Issue:	13 June 1979

Frequency:	Monday-Saturday
Update Schedule:	3 a.m. (ET)
Online Availability:	Start of local business day
Source Coverage:	Full Coverage
Article Coverage:	Full Text
Format:	Text
Publisher:	Dow Jones & Company, Inc.
Circulation:	2117796
Publisher URL:	<a href="http://www.dowjones.com">http://www.dowjones.com</a>
Web Address:	<a href="http://online.wsj.com">http://online.wsj.com</a>
Editor's Note:	Coverage History: Abstracts from 13 June 1979 to 1 January 1984 Selected coverage from 13 June 1979 to 1 January 1984  Please note that the images from the Saturday edition will not be available until the following Monday. The Saturday edition began 17 September 2005. All staff-written articles that are included in, or were scheduled for, the Journal's printed four-star edition are available on Factiva products. Doesn't include the "breakingviews" section, which is third-party content.

## Appendix 4: Cision database outlet profiles

USA Today	
<b>Media Type:</b>	Internet Daily
<b>Frequency:</b>	Continuous
<b>Coverage Area:</b>	International
<b>Outlet Focus:</b>	Breaking News, International News, National News
<b>Parent:</b>	USA Today
<b>Web Site Properties:</b>	Editorial Personnel Listing, Links to Other Web Sites, Visitor Feedback, Discussion Groups, FAQs - Frequently Asked Questions, Articles Archived, Videos Archived, Company Press Releases, Keyword Search, Media Kit, Full Text of Some Articles
<b>Visitors Per Month:</b>	16,906,672
<b>Publicity Materials Used:</b>	New Products; By-Lined Articles; Staff-Written Articles; Book Reviews; Arts & Entertainment Listings
<b>Outlet Profile:</b>	usatoday.com is the online version of USAToday. It was launched on April 17, 1995. Editorial provides national and international news which is update 24 hours a day, seven days a week. The site has seven main sections: News, Travel, Money, Sports, Life, Tech and Weather. It also offers a Essentials section, which has links to Markets, Scores, Politics, Games, Blogs, Lotteries, Video and Photos. Users can also access some of USA Today's partner sites, including USA Weekend, Space.com and Sports Weekly. It can deliver its news and information via email to mobile devices, and it offers RSS feeds.

The Washington Post	
<b>Media Type:</b>	Daily Newspaper
<b>Frequency:</b>	Daily
<b>Coverage Area:</b>	Regional
<b>Outlet Focus:</b>	News
<b>Circulation:</b>	507,465
<b>Morning Circulation:</b>	507,465
<b>Saturday Circulation:</b>	485,528
<b>Sunday Circulation:</b>	846,019
<b>Outlet Profile:</b>	The Washington Post focuses on news from the nation's capital, including national business, political issues, commerce, federal regulations and finance. There is also coverage of sports, entertainment, features, local and world news.

<b>Associated Press</b>	
<b>Media Type:</b>	News Service/Syndicate
<b>Coverage Area:</b>	International
<b>Outlet Focus:</b>	International News, National News
<b>Outlet Profile:</b>	Founded in 1848, Associated Press is an international news organization offering news, photos, graphics, audio and video for 1,700 newspapers and 5,000 radio and television outlets in the United States as well as newspaper, radio and television subscribers internationally. There are bureaus worldwide representing over one hundred countries. It features a massive digital photo network, a continuously updated online news service, a television news service and one of the largest radio networks in the United States. The AP's Web site tracks changes in the media and provides breaking news like its wire service. There are various departments covering a variety of news, including international news, national news, spot news from around the United States, regional coverage, Washington, business, technology, finance, health, science, arts, entertainment and sports. The Associated Press has received 48 Pulitzer Prizes, more than any other news organization in the categories for which it can compete. It has 29 photo Pulitzers, the most of any news organization. Daybook items for New York City should go to the alternate email. The outlet offers RSS (Really Simple Syndication).

<b>The New York Times</b>	
<b>Media Type:</b>	Daily Newspaper
<b>Frequency:</b>	Daily
<b>Coverage Area:</b>	Regional
<b>Outlet Focus:</b>	International News, Local News, National News, News, World News
<b>Circulation:</b>	1,150,589
<b>Morning Circulation:</b>	1,150,589
<b>Saturday Circulation:</b>	1,202,854
<b>Sunday Circulation:</b>	1,645,152
<b>Outlet Profile:</b>	The New York Times offers the latest news from around the world. There are several different editions of the paper for Eastern and national regions. The paper gets much of its content and reporting from its many bureaus. The foreign desk is responsible for correspondents and stringers around the world. The paper offers DealBook pages Tuesdays through Fridays, with content corresponding with the DealBook blog. Daily deadlines are usually between 5pm and 6pm ET. The paper does not accept artwork. The outlet offers RSS (Really Simple Syndication).

## Appendix 5: Coding protocol

*Coding Protocol for Climate Change Technology & Market Solutions Frames*

*Introduction*

Journalistic reporting around climate change over the past five years has chronicled mankind's search for ways to mitigate climate change. There are many proposed solutions, from public policy that drastically changes our behavior to limit the amount of greenhouse gases that can be emitted, to technologies such as carbon capture and solar power that allow humans to live and conduct their everyday business – just in a more climate-friendly way.

Each media article about a climate change solution inherently carries within it a certain judgment of the validity of the solution, which is examined in this study by contrasting two different “frames.” For a reporter, “framing” involves highlighting certain keywords, metaphors, and concepts in news coverage of an issue so as to promote a particular solution. Frames encourage readers to develop certain understandings about issues and solutions, and ultimately serve as an endorsement – or criticism – of the likely success of this path forward.

This study aims to explore the pattern of U.S. media coverage from January 2007 – September 2011 around two types of solutions to climate change:

1. those that are based in the creation of new technologies or increased use of technologies deemed to be better for the climate, and
2. those that are based on creating markets, taxes or other types of financial incentives that drive more climate-friendly behaviors

Each of these represents a way that the U.S. media “frames” what a climate change solution is – either driven by technology, or driven by economics.

The study attempts to discern which type of solutions frame is more powerful – that is, covered the most often and most positively.

Steps to Coding:

3. **Determine which frame is present.** An article can either contain a technology solutions frame, or a market solutions frame.

Market solutions frames will be found in articles about the following:

- Bingaman-Specter proposal (“Low Carbon Economy Act”)
- Market caps (even without the trade – so policy-like) should be included in my def. in “market”
- Congestion pricing
- EPA emissions regulations under Clean Air Act
  - Requiring GHG emissions permits
  - Limiting air toxics
- Binding emissions targets
- Food transportation tax
- Non-binding emissions targets
  - Bush proposal in U.S. 2007
  - Chinese 2007 proposal to improve energy efficiency by 20 percent
- International pacts on emissions cuts (e.g. United Nations)
  - Copenhagen 2009
  - Cancun 2010
  - Durban 2011
  - Financing mechanisms to support compliance
- Kyoto Protocol

- Emissions targets
- Cap-and-trade
- Tariffs on energy-intensive products
- Airline “cash for carbon” proposal
- Energy efficiency upgrade rebates – “market” because it’s primarily a market mechanism (economic incentive) driving the solution
- Energy efficiency standards – this is a “market solution” when it focuses on regulating the overall amount of energy used, rather than prescribing specific types of energy technology
- U.N. ozone treaty
- Private investment in clean technology development
- Mandates for utilities to purchase renewable energy
- Fuel economy standards
- Locavore movement/Local food purchasing
- Assigning monetary values to climate change impacts
- 2006 Global Warming Solutions Act

Technology solutions frames will be found in articles about the following:

- Green building standard
- Ethanol technology & standard
- Regulations mandating best available technology
- Standards for carbon dioxide emissions from automobiles, because these regulations legislate the development of clean technologies
- Increase in fuel efficiency MPG
- Regulations barring purchase of electricity from coal plants that don’t meet emissions standards
- Programs supporting research
- Policies that increase the flow of technology to developing nations
- Legislation mandating a percentage of energy generated from clean sources
- Clean coal (aka carbon capture & sequestration)
- Solar energy
- Wind energy
- Geothermal energy
- Smart grid
- Biomass energy
- Green building
- Sustainable city planning
- Nuclear energy
  - Includes loan guarantees for nuclear, because this is funding directly to support development of a technology solution
- Pure funding of technology development, R&D investments
  - Greentech
  - Google’s “Renewable Energy Cheaper Than Coal” project
  - C40 member cities financing for climate change reduction projects
- Geoengineering (e.g. injecting sulfur compounds into the atmosphere might help ease global warming by increasing clouds and haze that would reflect sunlight)
- Technology solutions referring to climate adaptation were removed

- Advancements in cattle feed to reduce methane emissions

Technology solutions do **NOT** include:

- Nature, such as forests to absorb carbon, were not included in this study as technology solutions
- Natural gas
- Reusable shopping bags or other green products or technologies used by environmentalists unless the product or technology was specifically linked to mitigating climate change in the article.

The frame is considered to exist in a piece if at least one sentence in the piece describes either a market mechanism or technology in the context of it being a solution to climate change.

Oftentimes, both frames will be included in an article. In this case, chose the frame that is dominant in the article.

If both frames seem to be evenly represented in the article, the article is given two scores – once for each frame.

Articles about climate change would receive a “1” score if they include a frame, a “0” score if they do not.

The article would receive a “2” score if the frame is “highly prominent” – meaning, it is described in the headline, subhead or first paragraph of the article.

#### 4. **Assign tonality**

The analysis aims to evaluate whether or not a market or technology solution is reported as being an effective tactic (positive tonality) or ineffective tactic (negative tonality). In order to separate out the tone of a particular solutions frame, rather than the reporter’s tone toward other pieces of information in the article, the content analysis focuses on sentences that contain the “solutions” keyword, as well as the “technology” and “market” keywords.

Tonality is defined as the overall impression left with the reader, and the tonalities are as follows:

- Negative
- Mixed – mostly negative
- Neutral (e.g. balanced or “mixed”)
- Mixed – mostly positive
- Positive

Due to the fact that most individuals skim headlines and lead paragraphs without reading the entire article, where the market or technology frame exists in the headline or lead paragraph, tonality around the frame in those key pieces of article “real estate” is marked as the dominant tone.

A positive tonality does not necessarily mean that the solution needs to be presented as a stand-alone “silver bullet.” The fact that a solution is presented as being part of a necessary mix of approaches does not take away from its positive tonality. It is reasonable to expect that other factors (e.g. funding, policy) are needed to enable a solution.

However, if an article notes current policy, funding, etc. as being an impediment to the solution, then the solution is assigned negative tonality. Articles that paint a solution as good, but impractical or difficult to implement leave an overall negative impression of the solution.

Many articles present both pros and cons of a solution, and in this case, a “mixed” tone is granted to these articles. However, “mixed” is only granted if at least 25% of the article shows an opposing tonality – otherwise, this opposing tonality is considered negligible.

If the physical article space for both positive and negative points of view is equal, then the article is coded as “mixed” or “neutral.”

## Appendix 6: Intercoder reliability test

I used an intercoder reliability test to evaluate the extent to which my evaluation of frame existence, dominance and tonality could be validated by a second researcher using the same coding process. Following (Riffe et al., 2005), I selected 44 random articles of the 444 total framed dataset for a second researcher to re-code, meeting the 10% - 25% sample threshold recommended by (Wimmer & Dominic, 2003) and exceeding the 5% - 7% sample recommended by (Kaid & Wadsworth, 1989).

The first area of agreement tested was which frame was dominant in the article: market solution, technology solution, both equally present, or neither present. The two researchers coded the sample independently utilizing the same coding guidelines (included in the Appendix), agreeing that the same frame was present in 69.8% of the articles:

Level of agreement (2 researchers)	Number of articles	Percentage*
Total agreement – Researchers detected same dominant frame	26	60.5%
Some agreement – One researcher detected both frames equally	4	9.3%
No agreement – One researcher did not detect either frame	4	9.3%
Disagreement – Researcher detected opposite dominant frames	9	20.9%

\*Of 43 articles used to test reliability, a sample representing 10% of total articles in study

Figure 8: Intercoder reliability test for frame presence

The lack of agreement on frame presence points to the complexities around frame discernment in this study. Riffe et. al (2005) state that 80% agreement is a general minimum threshold intercoder reliability in media analysis. However, in the “no agreement” category, one researcher noted a certain frame while the other did not detect any frame at all. In 3 of those articles, the researcher who noted a frame also coded that presence as that frame as minor (a “1” in terms of article presence rather than “2”), indicating that the lack of agreement as to the frame’s

existence is likely due to it being too weak to be noticed by the other researcher, rather than that the two researchers actively disagreeing as to which frame is present. Only 20.9% of the articles received conflicting dominant frame codes, and given the fact that researchers were instructed to assign only the more dominant frame to the article unless both were equally present, it is possible that where is more agreement underlying frame presence than this percentage shows. The pie chart below illustrates the role of these less certain areas of agreement and disagreement in the overall agreement profile between the two researchers:

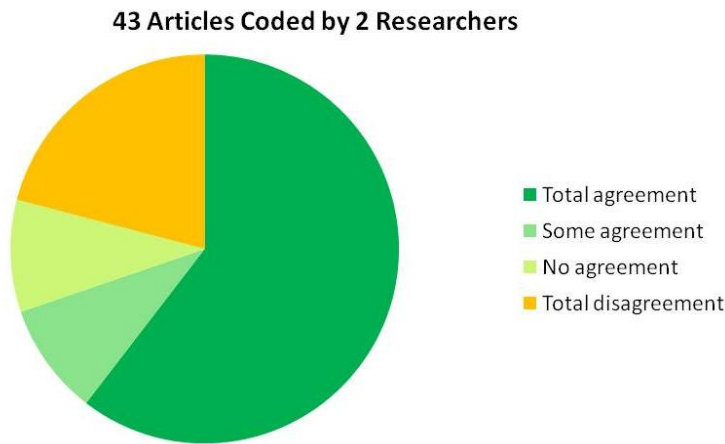


Figure 9: Intercoder reliability test for frame presence

The level of agreement between the researchers in terms of the prominence of the frame within each piece was stronger, with more than 92% agreement:

Level of agreement (2 researchers)	Number of articles	Percentage*
Total agreement – Researchers detected same frame strength	24	92.3%
Some agreement – One researcher detected the frame more strongly	2	7.7%

\*Of 26 articles in sample that showed total agreement on the existence of a particular frame

Figure 10: Intercoder reliability test for frame dominance

Tonality was measured along a 5-point scale, and thus offered a greater chance for inter-coder variability than either frame existence or dominance. However, researchers assigned more than half of the articles the exact same tonality rating, and an additional 41.7% of articles showing a more general level of agreement in tonality where: one researcher assigned a “mostly” positive or negative where the other assigned a strict positive or negative; or for

articles that included a more balanced mix of positive and negative frame description, one researcher assigned a “mostly positive” while the other “mostly negative.”

Level of agreement (2 researchers)	Number of articles	Percentage*
Total agreement – researchers agree on tonality rating**	13	54.2%
Some agreement – researchers vary between degree of positive, negative or neutral tonality***	10	41.7%
Disagreement	1	4.2%

\*Of 24 articles in sample that showed total agreement on existence of frame

\*\*Includes 4 articles researchers agreed lacked either frame

\*\*\*Variance of 1 tonality point

Figure 11: Intercoder reliability test for frame tonality

The pie chart below illustrates the role of these less certain areas of agreement and disagreement in the overall agreement profile between the two researchers:

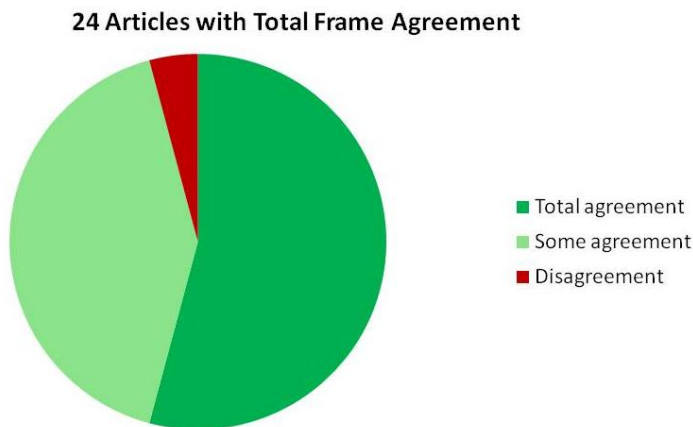


Figure 12: Intercoder reliability test for frame tonality

For 8 of the 11 articles that showed tonality variance, a certain researcher was more positive in tonality rating assignments than the other, indicating a difference in personal perspective and hinting at the role psychological differences between researchers can play in assigning subjective value judgments.