

Constructing climate change: claims and frames in US news coverage of an environmental issue

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An empirical content analysis of a decade of coverage of climate change in five national newspapers in the US is presented. The analysis is based on the perspective, drawn from social problems theory, that the content of news discourse can be understood in terms of claims-making and framing. Climate change is also discussed in terms of Downs' issue-attention cycle, a five-stage model describing the rise and fall of social attention to important issues. Climate change, as a news story, is described as exhibiting three phases that are related to the sources quoted and the frames presented in the news coverage. Results of the analysis show that scientists tend to be associated with frames emphasizing problems and causes, while politicians and special interests tend to be associated with frames emphasizing judgments and remedies. Results also show how scientists declined as news sources as the issue became increasingly politicized.

New kinds of problems

Of the great variety of environmental issues that have achieved social prominence in recent times, one stands out as perhaps a prime example of a new class of environmental problem. Climate change represents a type of environmental problem that is generally identified with the idea of *global change*. An important characteristic that issues such as climate change, ozone depletion, loss of biodiversity, and others share is their intangibility for the common person. Societies must now acknowledge environmental problems that are practically invisible, yet must be acted upon to avert global consequences at some time in the future.

An old adage holds that the first step in solving a problem is recognizing that a problem exists—and in this lies the essence of the social aspect of issues like climate change. How society comes to recognize and define something as a problem is no trivial question. And representation in the news media is an integral part of the process of social problem definition.

An important aspect of climate change as a news topic in the USA is that it has clearly and dramatically demonstrated a kind of cyclic life-course that may be common to the treatment of this variety of long-term issue. Previous research on the volume of news attention given to climate change has shown how the issue rose from virtual obscurity, became a competitively pursued story, and eventually fell from prominence—nearly disappearing altogether.¹ And work examining public understanding of the issue

has shown that the public is generally misinformed about climate change.² Together, these observations beg for a closer examination of the content of the news coverage of the issue.

Other work on this topic has examined the content of news coverage of climate change in terms of political symbology,³ in terms of values,⁴ and in terms of accuracy of reporting.⁵ This article will examine US print news coverage of climate change by focusing on a segment of the classic Laswellian communication model: *who says what*.⁶ To do this, a perspective incorporating claims-making and framing will be employed. Researchers have previously used this perspective to effectively evaluate the content of news coverage of environmental issues.⁷

Social problems: claims and frames

Because of their presumed influence, the media become, to quote Gurevitch and Levy, ‘a site on which various social groups, institutions, and ideologies struggle over the definition and construction of social reality.’⁸ The media, in this view, provide a series of arenas in which symbolic contests are carried out among competing sponsors of meaning.

Two issues are central to this symbolic contest: who gains access to media representation; and what overall themes emerge in the media treatment of an issue. Those who gain media representation can be called *claims-makers*. The themes that emerge in media representation of an issue can be called *frames*. These concepts are more thoroughly defined below, but with these general ideas it is possible here to present the two primary research questions that underlie this investigation.

RQ1 How are frames and claims-makers distributed in media coverage of climate change, and do these distributions change through time?

RQ2 Are there associations among the frames and claims-makers?

Claims-making

Spector and Kitsuse focus on the process of constructing the definition of a social problem, stating that this process is grounded in claims-making activities: ‘the activities of individuals or groups making assertions of grievances and claims with respect to some putative conditions. The emergence of a social problem is contingent upon the organization of activities asserting the need for eradicating, ameliorating, or otherwise changing some condition.’⁹

Spector and Kitsuse point out that much of the social activity surrounding the recognition of a problem goes on within and between social agencies such as the government, protest groups, professional organizations, or the news media. Probably the most fruitful manner of applying Spector and Kitsuse’s model specifically to the question of the media’s role in the definition of a social problem is to use it as a basis for recognizing the media as a social clearing-house for claims. The media serve as a conduit for communication between social agencies and as a way for those agencies to bring pressure to bear as they champion their claim. Claims that become news are those that have entered one very important arena in the struggle for legitimacy.

In this study, the idea of the claims-maker is being operationally defined as the quoted source. While journalists bring a great deal more to a story than a collection of sources—things like background and emphasis—it is in the source that the broader authority of the story resides. Attribution is the first lesson in journalism.

But sources are used for a wide variety of reasons, including their past history with both individual journalists and the media in general, prominence in their field, availability,

and their ability to provide useful material. Nonetheless, any party wishing to place a claim in the media arena has a keen interest in becoming a source or to be represented by a source. And perhaps the best indicator of success in claims-making is the quote. While journalists quote for as many different reasons as they choose sources, from the viewpoint of the claims-maker nothing signifies successful access to the media arena quite as well as a direct quote. This study will therefore define the claims-maker as the quoted source. The methods section details how claims-maker categories are developed and identified.

Framing

In terms of looking at media content, the commonly cited roots of framing extend to Goffman's dramaturgical perspective that frames are 'schemata of interpretation' that people use to 'locate, perceive, identify, and label.'¹⁰ Framing is subsequently linked to Tuchman's derivation that assigns frames the role of an organizing device that allows the journalist to more efficiently net, sort, and transmit information.¹¹

More recent formulations include the work of Gitlin, who writes that media frames 'are principles of selection, emphasis, and presentation composed of little tacit theories about what exists, what happens, and what matters.'¹² Gamson and Modigliani consider frames as being embedded within 'media packages' that can be seen to 'give meaning to an issue. A package has an internal structure. At its core is a central organizing idea, or *frame*, for making sense of relevant events, suggesting what is at issue.'¹³ And according to Dunwoody, when framing is applied to the content of messages it is 'a schema or heuristic, a knowledge structure that is activated by some stimulus and is then employed by a journalist throughout story construction.'¹⁴

A recent perspective on framing offers significant guidance toward a clearer conceptual definition and a useful operationalization. Entman argues that:

Framing essentially involves *selection* and *salience*. To frame is to *select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation* for the item described. Frames, then, *define problems*—determine what a causal agent is doing with what costs and benefits, usually measured in terms of common cultural values; *diagnose causes*—identify the forces creating the problem; *make moral judgments*—evaluate causal agents and their effects; and *suggest remedies*—offer and justify treatments for the problem and predict their likely effects. (original emphasis)¹⁵

For this study it is held that the frame is essentially the claim being made by the media at the top of the inverted pyramid—in the headline and the lead paragraph (issues of measurement are addressed below). Frames of this form are held to have the four functions specified by Entman: to define problems, diagnose causes, make moral judgments, and to suggest remedies.

Locating the frame at the top of the inverted pyramid draws from Entman's emphasis of salience in his definition of framing. Within that emphasis, salience 'means making a piece of information more noticeable, meaningful, or memorable to audiences. An increase in salience enhances the probability that receivers will perceive the information, discern meaning, and thus process it, and store it in memory.'¹⁶

Restricting the operationalization of the frame to only the headline and lead places this analysis firmly on the macro-level, but at the cost of a rather blunt instrument. This is a trade-off. Generally, frame analysis has utilized a more sophisticated evaluation of the nuances

of content. It must be admitted that this project is more akin to a standard content analysis than it is to a 'frame analysis.' But this is appropriate. Journalistic tradition holds that the headline and lead should be written to inform the reader as to what is most important about the story. While styles vary and there are exceptions to the inverted pyramid, journalists and their editors are aware of the fact they are competing for the reader's attention. The top of the story is generally the point of the readers' first contact with the story and often the substance of what the reader retains from the story.

Methods

Sample

The newspaper story is the unit of analysis, based on a set of newspapers chosen to represent national-level media in the USA. Selecting a set of newspapers to represent the national media is always a somewhat debatable matter. This study follows the lead of others in selecting the *New York Times*, the *Washington Post*, the *Los Angeles Times*, the *Christian Science Monitor*, and the *Wall Street Journal*.¹⁷

Only news stories are used in this study. News stories are defined as content (excluding editorials, opinion columns, letters to the editor and advertisements) containing references to global warming, the greenhouse effect, or climate change. The selection of stories was done using a computerized version of the *National Newspaper Index*.

Across the period of the study approximately 500 items on climate change appeared in these newspapers. Only about half that number was determined to be necessary to empower statistical analysis. The final sample yielded a total of 252 stories.¹⁸

Measurement: claims-makers

As discussed above, claims-makers are being operationalized as quoted sources. Examination of the full content of the *Washington Post* coverage revealed the following categories of individuals quoted: university scientists, government scientists (NASA, NOAA, etc.), other scientists (including those from other nations), Congresspersons, Presidential administrations, officials of other nations, environmental interest groups, and business and industry interest groups. All but six, or 98 per cent of all quoted sources, fell into these categories. For analysis, categories were collapsed to scientists, politicians, and interest groups.¹⁹

The number of quotes for each category were summed by story for an interval level measure. Distributions were found to be highly skewed, so a nominal level measure was also computed as the presence or absence of each source category in a story.

Measurement: frame

Frame is being conceptualized as the claim presented in the headline and the lead. A reading of all headlines and lead paragraphs in the *Washington Post* revealed four prominent categories that agreed well with Entman's four purposes of frames:

- 1 *Define problems: impacts of climate change.* These stories deal with what will happen as a consequence of this phenomenon. Impacts may be negative (coastal flooding), positive (improved regional agriculture), or debated.
- 2 *Diagnose causes: evidence as to the reality of climate change as a problem.* These are typically presentations of scientific findings that support the idea that there is a problem

(evidence of rising sea level), refute the idea that there is a problem (evidence that changes are within limits of natural variance), or present the argument that the nature of the problem is unknown.

- 3 *Make moral judgments: action statements.* These stories present general statements calling for action or reporting action taken (the USA should sign a treaty, did sign a treaty), arguing against action or reporting action blocked (emission standards not needed, scientific testimony altered), or present the argument that a course of action is not clear.
- 4 *Suggest remedies: provide specific information about how solutions should be implemented.* These stories report specific solutions that have been proposed or implemented (tougher emission standards), solutions that have been rejected or deemed inadequate (voluntary programmes), or present a debate about a specific solution or solutions. Note that the specificity of the solution—a statement of exactly how the solution should be carried out—is an important distinction between an action statement and a solution statement.

All but 17, or 93 per cent, of all stories fell into one of these four categories. Most of the stories could be classified by reading only the headline. When headlines were ambiguous (often because they were too short) the first paragraph was read. Most stories were classified by this point. In a few cases it was necessary to read into the story by an additional paragraph or two (typically when the story begins with an anecdote). The goal of the classification is to identify the most immediately salient characteristic of the story with respect to the four categories.²⁰

Discussion of the results

Before looking at the empirical results, it is worth examining the nature of the news coverage of climate change in the USA from a more qualitative perspective. An interesting social process model will also be introduced. This model will be used to aid interpretation of the empirical results.

Climate change: the life of the issue

At the heart of climate change is the proposition that human activities are altering the composition of the planet's atmosphere to a degree sufficient to affect the natural processes that play fundamental roles in shaping global climate. Many, perhaps even most, scientists agree that the release of gasses such as carbon dioxide, CFCs, and methane will have the consequence of raising the average temperature on Earth. In late 1995, the UN's Intergovernmental Panel on Climate Change (IPCC) released a consensus statement to that effect. Even so, a considerable amount of contention exists over issues such as when this might happen, how quickly it might come about, and the degree and nature of the consequences.

How can the history of climate change in the news be summed? Figure 1 (see page 276) shows the amount of news coverage given to climate change in the five major newspapers over the past decade (other details of Figure 1 are addressed below). It is easy to understand the spike of attention associated with NASA scientist Dr James Hansen's Congressional testimony (during the North American drought summer of 1988) that climate change had manifested itself. But the overall build-up and eventual decline of news coverage presents a more complex problem. The existence of a cycle of attention is clear. But in a broader

sense it is important to ask what social forces might drive such a cycle and how these forces might exert themselves through the news.

Transient attention to specific issues may be typical of American public opinion, policy, and media coverage. Downs offers his 'issue-attention cycle' as an explanation for such comings and goings of news coverage and public concern. In this model he suggests that there are typically five stages to the life of a given issue.²¹

- 1 *Pre-problem*. 'This prevails when some highly undesirable social condition exists but has not yet captured much public attention, even though some experts or interest groups may already be alarmed by it.'
- 2 *Alarmed discovery, euphoric enthusiasm*. 'As a result of some dramatic series of events, the public suddenly becomes both aware of and alarmed about the evils of a particular problem.' This is combined with a reaction of overconfidence, 'euphoric enthusiasm,' in society's ability to discover a solution.
- 3 *Realizing the cost*. 'A gradually spreading realization that the cost of solving the problem is very high indeed.' The public and policy makers also realize that the problem is being caused by a condition which is providing benefits to society.
- 4 *Gradual decline of interest*. Three reactions occur. Some people become discouraged. Some suppress attention out of fear. Others simply get bored. Often, all three reactions operate to varying degrees. Meanwhile, another issue is on the rise and attention shifts.
- 5 *Post-problem*. 'A prolonged limbo—a twilight realm of lesser attention or spasmodic recurrence of interest'

Looking at the issue of climate change in terms of Downs' issue-attention cycle is a useful way to present a brief history of the issue, and will serve as a useful tool for approaching the results of this investigation.

The time prior to 1988, when climate change was primarily the concern of scientists and top policy-makers, can easily be characterized as the pre-problem stage. During this time there was considerable scientific activity, extending back to the 1750s in fact. The policy attention that the early science produced caused some mild controversy that served to earn the issue prominent display in the news on a couple of occasions. But public awareness of the issue remained low in the absence of any sustained media attention. Wilkins and Patterson point out that climate change failed to become a hot topic in the US media during this period of time partially because it did not become associated with a political symbol.³

An important aspect of the pre-problem stage involves the preparation of the issue for its alarmed discovery. For climate change, much of this preparation was in the form of the generally rising level of environmental concern in society²² and the linkage of climate change to the related atmospheric problem of ozone depletion.²³ This linkage gave climate change added legitimacy and plausibility.

This preparation is also political. Between 1985 and 1988 a number of influential US Congresspersons adopted climate change as an important concern. The scientists who were becoming increasingly concerned about climate change therefore had excellent access to an important public arena as conditions became favourable for the issue's alarmed discovery.

It takes little imagination to see the alarmed discovery heralded by Hansen's Congressional testimony that climate change was under way. Hansen's statements were set against the backdrop of the severe North American drought of that summer and the intense fires in Yellowstone National Park. The spectre of natural disaster provided by that summer's heat and fire finally provided the symbols that Wilkins and Patterson argue were necessary for climate change to gain social prominence. It is interesting to speculate how the issue might have behaved if there had not been a circumstantial heat-wave that summer,

and if Yellowstone had not become so engulfed.

But Downs' second stage has an inherent dualism as it is also characterized by a euphoric optimism over solutions. This contrast was abundantly clear in the headlines of late 1988: 'Calculating the consequences of a warmer planet earth'; 'Major greenhouse impact is unavoidable, experts say'; 'Scientists dream up bold remedies for ailing atmosphere'; 'Fighting the greenhouse effect.' But perhaps nothing captured this dualism better than the contrast between Hansen's testimony and President Bush's pledge to counter the greenhouse effect with 'the White House effect'.²⁴

Public opinion polls asking questions about climate change clearly show that there was also a dramatic rise in the level of public concern over the issue at this time. Previous research has shown that there was a linkage between news media attention and public concern over climate change.²⁵

The third stage, a realization of the true cost, gradually replaced this optimism and alarm. This change came about primarily through actions in the political sphere. The science-bashing carried out by then White House Chief-of-Staff John Sununu served to promote the idea that solving the problem of climate change would bear an enormous price-tag, even though many experts disagreed. It was a fear of the economics of preventing climate change that motivated Bush to non-action and prompted Sununu to order that Hansen's written Congressional testimony be watered down.

But it was more than just politics. By 1992 the true complexity of the problem was becoming evident as nations of the world began contemplating a treaty to slow the release of greenhouse gases. Downs points out that it is during this part of the cycle that society becomes aware that the problem at hand is related to things that are held dear, things that provide benefit.

A 25 May 1992 *New York Times* business-page article tells how 'the price of driving a car has never been lower' because of the plummeting cost of oil.²⁶ It goes on to say that, worldwide, automobiles are reproducing faster than people and this poses dire consequences for climate change. Another *Times* article, on the same day's front page, reveals how China's 'contribution to global warming may be rising more quickly than that of any other country.'²⁷ This is due to the fact that one fifth of Earth's population is entering a period of economic growth fuelled by coal. Once again, the consequences are related to climate change. On a more fundamental level what is becoming increasingly evident is the utter complexity of climate change, both scientific and social.

It is unlikely that the stages of Downs cycle operate independently or in any strict linear sense. There should be considerable overlap between the grim realizations of stage three and the declining attention of stage four. The transition from stage three to stage four might distinguish itself in terms of other demands being made on the public's attention. As the difficult nature of climate change became news—and the volume of media attention began to decline—the United States was also sliding into increasingly difficult economic conditions, was captivated by Operation Desert Storm, and began anticipating the upcoming presidential election. As Downs suggests, there were new issues to attend to.

And what of the fifth stage in the cycle? Did the issue of climate change enter 'a prolonged limbo—a twilight realm of lesser attention?' News coverage of climate change had a brief comeback in mid-1992 thanks to the Earth Summit. However, the amount of media attention to climate change during the first six months of 1993 is similar in volume to that of the first half of 1988.²⁸ Clinton's announcement of his 'Climate Change Action Plan' in late 1993 received cursory coverage and no follow-up. Coverage in 1994 was scant. And while outside of the formal bounds of this analysis, another recurrence of attention occurred in early 1995 as a large segment of the Antarctic ice shelf coincidentally went to sea while

the Earth Summit treaty was being reviewed in Berlin. The end of 1995 and early 1996 also saw a modest rise in attention in response to the consensus statement made by the IPCC.

But Downs holds that an issue in the fifth stage of the cycle is not a simple return to its earlier state. In the wake of its rise and fall, climate change has entered the popular lexicon—even being featured in television and film drama—and has created significant international agreements. Downs points out that such factors ‘almost always persist and often have some impact even after public attention has shifted elsewhere.’²⁹ So may be the case with climate change. Still, opinion polls showed the US public becoming much less concerned about climate change as news media attention declined.

While examining the volume of media attention and the nature of the news story can inform many questions about the life-course of this issue, much of the knowledge to be gained about the history of climate change as a socially defined problem lies embedded in the content of the news.

Claims-making and framing

Figure 1 presents the distribution of the sample through time. Inspection of this distribution supported the idea that the attention paid to this issue might be divided into distinct phases for analysis.

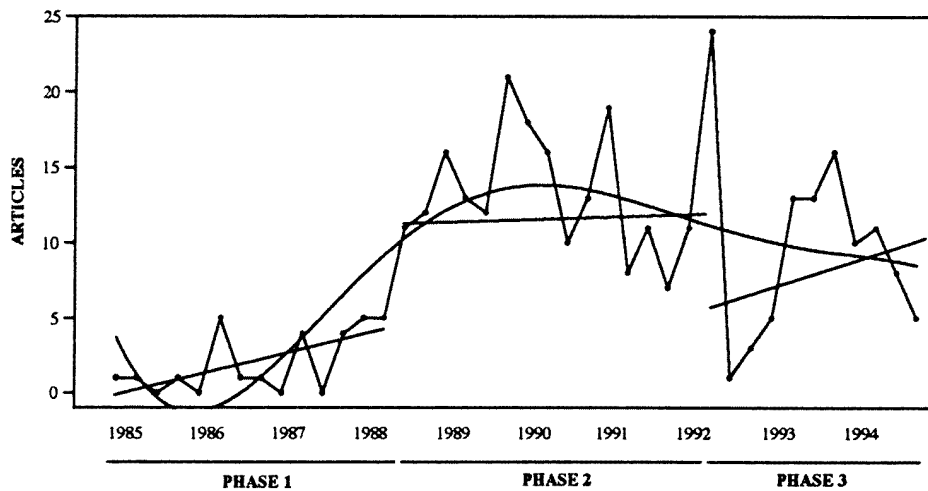


Figure 1. Items in five newspapers, by quarters 1985–1995. Based on a 50 per cent sample, divided into three phases with linear fits compared. The full curve fit is fifth-order polynomial. The linear components are: phase 1: $y = -0.14 + 0.29x$, $\mu = 2$; phase 2: $y = 13.7 + 0.01x$, $\mu = 14$; phase 3: $y = -9.9 + 0.5x$, $\mu = 8$.

Using the ideas of Downs, three distinct phases were identified. The overall distribution shown in Figure 1 fits Downs’ five stage model fairly well. Downs proposes that attention to an issue will remain low until a dramatic discovery brings a sudden increase in salience. While the issue–attention cycle does not offer specific predictions about changing salience during the middle three stages it does suggest general aspects of the content of these stages and also suggests that salience during these stages should be at its highest before feathering into a decline. Finally, Downs directly predicts that the final stage will involve a lowering

of the salience of the issue, but not a lowering to the levels seen in the first stage.

An examination of the time distribution of stories clearly suggests two important points in the series: mid-1988 when Hansen testifies before Congress and mid-1992 when the Earth Summit concludes. A fifth-order polynomial was found to fit the time series so that these important points in the issue's life fell near the curve's inflections. The curve clearly suggests Downs' overall propositions as they would be applied to the volume of media attention. Dividing the series into these three segments and fitting linear functions to each segment shows that the means and the slopes vary between the phases (analysis of variance significant at $p < 0.001$). Stories were thus coded as being in phase 1, 2, or 3. Because of the content of the news, the three phases are being labelled as pre-controversy, controversy, and post-controversy.

Regarding the relationship between frames and claims-makers, it is first necessary to report the obvious: political and special interests are strongly associated with the judgment frame while scientists are strongly associated with the causes frame. This is true across the full span of the decade, as shown in Figure 2.

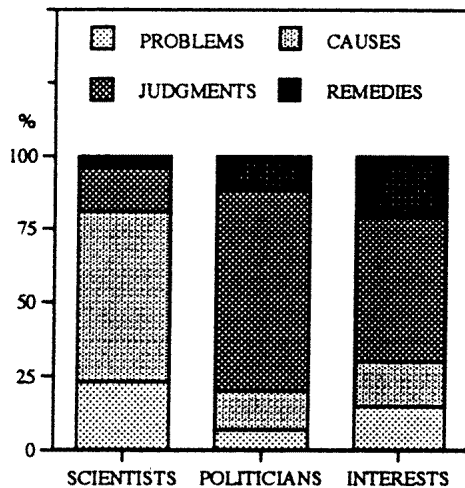


Figure 2. Sources by frames: presence or absence of each source for each frame during the full time span. $N = 252$ in each of three cross-tabulations. Chi-square is for scientists 96, for politicians 66, and for interests 27; $p < 0.001$.

More interesting results are found by examining changes across phases in the prevalence of each claims-maker and each frame. Figure 3 shows that, despite an increase in the overall volume and the absolute number of stories, there was a significant decline in scientists as a percentage of all claims-makers quoted across the decade. Quotes of political and special interest claims-makers both increased slightly in percentage, but not significantly. Previous research on climate change has shown that scientific sources were being crowded out by political sources during the late 1980s.³⁰ This analysis of a full decade supports that observation and shows that it is part of a longer-term trend.

It is an open question as to why scientists declined as a percentage of quoted sources. Although not statistically significant, special interests made the second largest gain across the decade. Mazur and others have noted that as the issue of climate change matured, the Cold War was simultaneously coming to an end. This allowed a number of scientifically

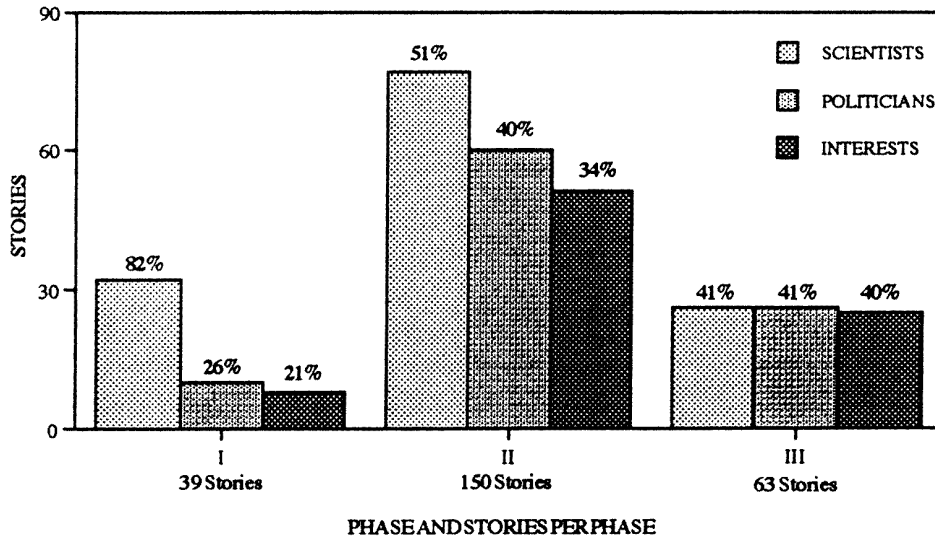


Figure 3. Number and percentage of stories in each phase containing quotes from three sources. Bars indicate the number of stories; percentages are per phase and do not sum to 100 per cent because many stories contain quotes from multiple source categories. Separate cross-tabulations for each source by phase shows the change across time for scientists is significant (Chi-square = 16, $p < 0.001$) while the change across time for politicians (Chi-square = 3) and interests (Chi-square = 4) are not significant.

oriented special-interest groups (for example the Union of Concerned Scientists) to shift their attention from nuclear weapons issues to environmental issues such as climate change.

An equally interesting question looks at how the prevalence of frames shifted as the issue evolved. Figure 4 shows that the framing of the issue moved away from defining problems and diagnosing causes and toward making judgments and suggesting remedies. These results can again be seen as a situation in which a set of perspectives must compete for finite space in a limited number of stories. The relationship that exists between the results in Figure 2 and the results in Figure 3 can be seen in terms of the impacts reported in Figure 4. As politicians and interest groups were increasingly successful in making their claims (Figure 3) they brought along their associated frames (Figure 2) in a process that (Figure 4) influenced the make-up of the content of the news.

These results beg the interesting question of the relative role of scientific and political forces in the changing amount of attention that the media give to the issue. To address this question a secondary dataset was extracted as a time series. The unit of analysis was set as two month periods ($n = 60$) and interval level variables were created as: number of stories per unit, number of quotes for each claims-maker category per unit, and number of stories for each frame in each unit. Each unit was assigned to one of the three phases.

It is reasonable to ask if the set of claims-maker and frame variables form interpretable factors that could describe their relationship and that might be useful in looking at the relative role of scientific and political forces. Table 1 presents a factor analysis of the frame and claims-maker variables that provides an interesting solution. The associations previously found in the cross-tabulations are upheld here as it is shown that political and special interest claims-makers group together with their associated frames to form one factor while scientists and their associated frames group to form another. This suggests that the

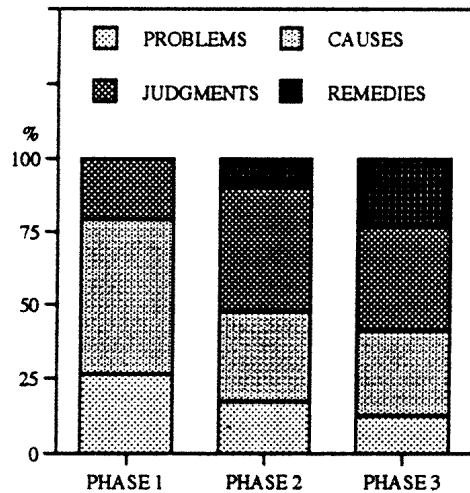


Figure 4. Frames by phase: percentage each frame type in each phase. Chi-square for the full table is 22; $p < 0.001$; $n = 235$.

two concepts of frames and claims-makers are part of a larger single concept relating to the content of news discourse.

Table 1. Factor analysis: claim and frame variables. Principle components analysis with varimax rotation. Two factors explain 71.8% of total variance, $n = 60$.

Variable	Mean	SD	Factor 1 Political debate	Factor 2 Scientific proclamation
Claims-maker: Special interest sources	2.4	3.5	0.85*	0.12
Frame: Remedies for problem	0.5	1.1	0.84*	-0.33
Claims-maker: Political sources	3.2	4.8	0.76*	0.48
Frame: Moral judgments about problem	1.5	2.2	0.70*	0.55
Claims-maker: Scientist sources	5.5	5.4	0.22	0.87*
Frame: Causes of problem	1.3	1.3	0.19	0.86*
Frame: Problem definition	0.7	0.9	-0.09	0.53*
Percentage of total variance explained			48.5	23.3

Discriminant analysis was used to evaluate the relationship between the two derived factors and to use them to judge the validity of the three proposed phases. Table 2 reports the results of three discriminant analyses. In the first two analyses each factor was evaluated by itself before the two were used together in the third analysis.

The scientific factor does a somewhat better job than the political factor in correctly classifying cases into the three phases, presenting classification rates of 50 per cent and 45 per cent respectively. Both rates are moderately successful as compared to the 33 per cent rate that would be expected by chance. An examination of the relative success rates for each phase (on the diagonal in each matrix) shows that the political factor did an excellent job in correctly classifying phase but did a poor job of distinguishing between phases 2 and 3. On the other hand, the scientific factor did an equally good job of distinguishing between phases 1 and 2 but a poor job classifying phase 3. This can perhaps be explained by the

Table 2. Discriminant analysis: comparison of political and scientific factors. For the case of a 3 group analysis, $n = 60$.

Actual phase	N	Predicted phase		
		Phase 1	Phase 2	Phase 3
Independent variable: Factor score political				
Phase 1: Pre-controversy	20	100.0% (20)	0.0% (0)	0.0% (0)
Phase 2: Controversy	25	44.0% (11)	12.0% (3)	44.0% (11)
Phase 3: Post-controversy	15	46.7% (7)	26.7% (4)	26.7% (4)
Prior probability = 33%; correct classification = 45.0%				
Canonical correlation = 0.39; Wilks' Lambda = 0.85, $p < 0.01$				
Independent variable: Factor score scientific				
Phase 1: Pre-controversy	20	55.0% (11)	5.0% (1)	40.0% (8)
Phase 2: Controversy	25	20.0% (5)	60.0% (15)	20.0% (5)
Phase 3: Post-controversy	15	46.7% (7)	26.7% (4)	26.7% (4)
Prior probability = 33%; correct classification = 50.0%				
Canonical correlation = 0.46; Wilk's Lambda = 0.79, $p < 0.01$				
Independent variables: scientific and political				
Phase 1: Pre-controversy	20	95.0% (19)	5.0% (1)	0.0% (0)
Phase 2: Controversy	25	36.0% (9)	48.0% (12)	16.0% (4)
Phase 3: Post-controversy	15	33.3% (5)	20.0% (3)	46.7% (7)
Prior probability = 33%; correct classification = 63.3%				
Scientific: canonical correlation = 0.27; Wilks' Lambda = 0.66, $p < 0.001$				
Political: canonical correlation = 0.54; Wilks' Lambda = 0.79, $p < 0.01$				

changing prevalence of claims-makers and frames in each of the phases.

If both factors are entered into the analysis together they combine to do a quite respectable job of correctly classifying the matrix, hitting the mark 63 per cent of the time, a good improvement over the 33 per cent chance rate. The combined analysis failing to achieve a 95 per cent classification rate (50 per cent + 45 per cent) suggests that the two factors overlap considerably in their relationship with the three-phase model. Further, it is again seen that the classification rates on the diagonal decline across the phases with phase 1 being perfectly classified while phase 3 is less well classified.

Conclusion

This project does not hold as an express purpose the operationalization of Downs' issue-attention cycle. But the model can be used as a more general basis for a division of the decade's media coverage of climate change into three distinct phases. It must also be emphasized that the issue-attention cycle is a social process model and is not specifically designed to evaluate news media attention to an issue. Nonetheless, elements of the issue-attention cycle do seem to fit a reading of the news coverage of climate change. This, combined with the good fit between the observed quantity of news attention and the expectations of the Downs model, suggests that it might be reasonable to interpret the three phases used in this study as a partial expression of the issue-attention cycle.

Overall, these results suggest that the most appropriate way to relate Downs' model to the changes observed in media coverage of climate change is to argue that what has been observed across this decade is just the first three stages of the cycle. This would predict that the years following 1994 should present a continued decline of media attention to the

issue punctuated only by a 'spasmodic recurrence of interest,' as Downs puts it. A casual observation of the issue during 1995 suggests that this may be happening. As 1996 opens, some additional attention is being given to climate change in US news media, including the 22 January cover of it Newsweek. The growing scientific consensus on the reality of an anthropocentric warming seems to be serving as the emerging news peg. A follow-up study may in future years provide interesting insight into how an issue 'returns' to the media agenda.

The results from the first research question show that, while scientific and political forces are both important to the debate, scientists become less dominant sources as the issue matures. As this occurs, the emphasis of the news coverage concurrently shifts away from a presentation of the issue in terms of its causes and problematic nature and toward a presentation more grounded in political debate and the proposal of solutions. These observations seem to dovetail most closely with the first three stages in the issue-attention cycle. The progression from the pre-problem stage, to alarmed discovery, and then to a realization of the costs strongly suggests that there should be a politicization of the issue, an increase in its level of controversy, and a shift toward judgments and solutions. That progression was observed in this study.

The results from the second research question apply less to the issue-attention cycle and more to the theoretical basis of this investigation as it relates to news media coverage of environmental controversies. To answer the second research question: yes, strong associations do exist between the claims-makers and frames observed in this study. While these associations cannot support a causal interpretation it is possible to speculate what these associations might suggest about journalistic coverage of this environmental issue.

Since frames were expressed solely through journalistic license (creation of headlines), the strong association between frames and the prevalence of claims-makers suggests that changes occurring in the life-course of this issue apparently involved shifts linked to who was getting their message into the media rather than how the media was choosing to present the information. It may be reasonable, at least in this case, to argue that a good deal of the journalistic discretion that goes into shaping media coverage of an environmental issue occurs by way of deciding which sources to use and how much overall attention to give the issue.

The more alarming aspect of the results of this study is that, relatively speaking, scientists left the debate as it heated up. In fact, scientists found themselves sharing a shrinking proportion of growing media attention during an important part of the public debate over climate change. Whether they were squeezed out by other sources or chose to become distanced from an increasingly political debate remains an open question. Presently, there is a growing international consensus among scientists in the climate change community that an anthropocentric warming is real and has begun to display itself. It will be interesting to see, as attention returns to this issue, if scientists can retake a share of the media coverage from special interests and politicians. The scientist's role as a news source is critical. As the scientific evidence of climate change grows, it is becoming quite clear that this is an issue over which it will be imperative to have an accurately and completely informed public.

References

- 1 Ungar, S, 1992, The rise and (relative) decline of global warming as a social problem. *The Sociological Quarterly*, **33**(4), 483-501; Mazur, A., and Lee, J., 1993, Sounding the global alarm: environmental issues in the US national news. *Social Studies of Science*, **23**, 681-720; Trumbo, C., 1995, Longitudinal modeling

- of public issues: an application of the agenda-setting process to the issue of global warming. *Journalism and Mass Communication Monographs*, 152.
- 2 Kempton, W., 1991, Lay perspectives on global climate change. *Global Environmental Change. Human and Policy Dimensions*, 1(3), 183–208; Bostrom, A., Morgan, M. G., Fischhoff, B., and Read, D., 1994, What do people know about global climate change? (1) Mental models and (2) survey studies of educated laypeople. *Risk Analysis*, 14(6), 959–982.
 - 3 Wilkins, L., and Patterson, P., 1991, Science as symbol: the media chills the greenhouse effect. *Risky business: Communicating Issues of Science, Risk and Public Policy* (Westport, CT: Greenwood), pp.159–176.
 - 4 Wilkins, L., 1993, Between facts and values: print media coverage of the greenhouse effect, 1987–1990. *Public Understanding of Science*, 2, 71–84.
 - 5 Bell, A., 1994, Media (mis)communication on the science of climate change. *Public Understanding of Science*, 3, 259–275.
 - 6 Lasswell, H. D., 1948, The structure and function of communication in society. *The Communication of Ideas*, edited by L. Bryson (New York: Harper and Row), pp.37–51.
 - 7 Burgess, J., and Harrison, C. M., 1993, The circulation of claims in the cultural politics of environmental change. *The Mass Media and Environmental Issues*, edited by A. Hansen (London: Leicester University Press), pp.198–221; Anderson, A., 1993, Source-media relations: the production of the environmental agenda. *The Mass Media and Environmental Issues*, edited by A. Hansen (London: Leicester University Press), pp.51–68; Dunwoody, S., and Griffin, R. J., 1993, Journalistic strategies for reporting long-term environmental issues: a case study of three Superfund sites. *The Mass Media and Environmental Issues*, edited by A. Hansen (London: Leicester University Press), pp.22–50.
 - 8 Gurevitch, M., and Levy, M. R., 1985, *Mass Communication Review Yearbook*, Vol. 5 (Beverly Hills, CA: Sage), p.19.
 - 9 Spector, M., and Kitsuse, J., 1977, *Constructing Social Problems* (Menlo Park, CA: Cummings), p.75.
 - 10 Goffman, E., 1974, *Frame Analysis: an Essay on the Organization of Experience* (New York: Harper & Row).
 - 11 Tuchman, G., 1978, *Making News: a Study in the Construction of Reality* (New York: Free Press).
 - 12 Gitlin, T., 1980, *The Whole World is Watching* (Berkeley, CA: University of California Press), p.6.
 - 13 Gamson, W. A., and Modigliani, A., 1989, Media discourse and public opinion on nuclear power: a constructionist approach. *American Journal of Sociology*, 95(1), 3.
 - 14 Dunwoody, S., 1992, The media and public perceptions of risk: how journalists frame risk stories. *The Social Response to Environmental Risk*, edited by D. W. Bromley and K. Segerson (Boston: Kluwer Academic), p.78.
 - 15 Entman, R. M., 1993, Framing: toward clarification of a fractured paradigm. *Journal of Communication*, 43(4), 55.
 - 16 Entman, R. M., 1993, Framing: toward clarification of a fractured paradigm. *Journal of Communication*, 43(4), 53.
 - 17 Reese, S., and Danielian, L., 1989, Intermedia influence and the drug issue: converging on cocaine. *Communication Campaigns About Drugs*, edited by P. Shoemaker (Hillsdale, NJ: Erlbaum), pp.29–46; Merrill, J., 1990, Global elite: a newspaper community of reason. *Gannett Center Journal*, 4(4), 91–102; Trumbo, C., 1995, Longitudinal modeling of public issues: an application of the agenda-setting process to the issue of global warming. *Journalism and Mass Communication Monographs*, 152.
 - 18 Subsequent analytic needs involving time-series construction necessitated over-sampling of the early and late phases of coverage (determination of the phases is discussed later). Therefore, for this work a random half of the stories that fell in phase 2 were selected and all of the stories that fell in phases 1 and 3 were selected. This weighted sampling has no effect on the relative percentages of frames and claims-makers discussed in the results.
 - 19 While it must be recognized that interest groups (both environmental and industry) utilize scientists, an interest group represents a clearly vested interest.
 - 20 Coding for the other variables involved manifest content and required very little (if any) judgment, so reliability was not evaluated. Coding for the frame variable does involve judgment so an inter-coder reliability test was executed. A value for Scott's pi of 0.78 was achieved and deemed acceptable.
 - 21 Downs, A., 1972, Up and down with ecology: the issue-attention cycle. *The Public Interest*, 28, 38–50.
 - 22 Dunlap, R. E., 1992, Trends in public opinion toward environmental issues: 1965–1992. *American Environmentalism. The US Environmental Movement 1970–1990*, edited by R. E. Dunlap and A. G. Mertig (Philadelphia: Taylor and Francis), pp.89–115.
 - 23 Mazur, A., and Lee, J., 1993, Sounding the global alarm: environmental issues in the US national news. *Social Studies of Science*, 23, 681–720
 - 24 Bush's campaign comments are reviewed on the ABC News, 27 December 1989.
 - 25 Trumbo, C., 1995, Longitudinal modeling of public issues: an application of the agenda-setting process to the

- issue of global warming. *Journalism and Mass Communication Monographs*, 152.
- 26 Wald, M. L., 1992, Cheap fuel hurts goal for climate. *New York Times*, 25 May, pp.A-35, A-38.
 - 27 Dunn, S. L., 1992, Difficult algebra for China: Coal = growth = pollution. *New York Times*, 25 May, pp.A-1, A-5.
 - 28 During the first six months of 1993 there are approximately 350 column inches of copy devoted to global warming in the five newspapers; during the first six months of 1988 there were approximately 400 column inches. For comparison, during the peak in attention in the last six months of 1989, the five papers devoted approximately 1200 column inches.
 - 29 Downs, A., 1972, Up and down with ecology: the issue-attention cycle. *The Public Interest*, **28**, 41.
 - 30 Lichter, R. S., and Lichter, L. S., 1992, The great greenhouse debate. Media coverage and expert opinion on global warming. *Media Monitor*, **VI**(10), 1-6; Miller, M. M., Boone, J., and Fowler, D., 1990, The emergence of greenhouse effect on the issue agenda: a news stream analysis. *News Computing Journal*, **7**(4), 25-38.

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