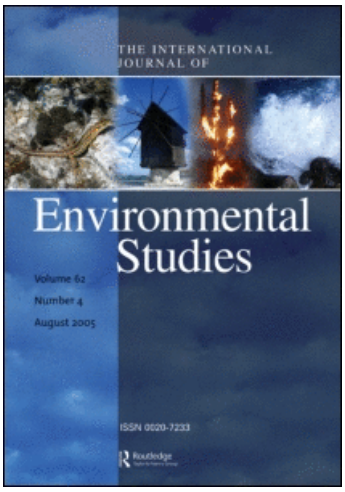

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Coverage of environmental events in US and UK newspapers: frequency, hazard, specificity, and placement

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Coverage of environmental events in US and UK newspapers: frequency, hazard, specificity, and placement

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This study analyzes how well two major newspapers – one from the US and one from the UK – cover important environmental issues. The article includes a literature review of media and the environment, problems with environmental media, and methods of assessing news quality; the research focus; methodology, with an explanation of the content categories and rationale, which applies a conceptual framework of 'technological hazard'; results; and a discussion with limitations and possible additional research.

Keywords: Content analysis; Environmental issues; Hazard assessment; Newspapers; Comparing US and UK

This study identified and compared components of the importance of newspaper articles reporting on environmental issues and events. Content analysis using 13 categories of hazard assessment compared articles published in 2006 by *The New York Times* (United States) and *The Independent* (United Kingdom). We found, in spite of the very different national efforts toward environmental issues, a different number but similar proportional coverage of environmental events. The most frequent categories were solutions, costs, concentration, and non-human being mortality (experienced, and potential). Such articles were significantly (though slightly) closer to the front in *The New York Times*, with the content categories of transgenerational, persistence, delay and population-at-risk closer to the front. The only category with significantly different proportional frequency of coverage across the two newspapers was non-human being mortality (potential). The only categories with significantly different levels of specificity were annual mortality, costs (both more specific), and solutions (more likely non-specific).

Literature Review

Media and public perception of the environment

Awareness and understanding of global warming has increased recently in the US. The percentage of adult Americans reporting that the US should reduce harmful gases only if

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other nations do dropped from 34% in 2001 to 16% in October 2007 [1]. While only 56% in 2007 believed that the phenomenon of global warming has been proven, and can be largely blamed on humanity's endeavors, the 2007 IPCC report states that 'warming of the climate system is unequivocal' [2, p. 2], so popular opinion in the US still vastly diverges from scientific conclusions.

There is very little disagreement that the media affect people's perception of the environment [3–5]. Ader's classic study on agenda setting showed media coverage and public concern about pollution increased even as empirical data showed total pollution had decreased [3]. In a study by Corbett and Durfee [5], a story about global warming was edited to have additional context or controversy. Readers were more certain about global warming after reading the extra-content story than after reading the control story (neither extra context nor controversy). Readers' environmental ideology only affected these trends when the ideology was pro-environmental (i.e., pro-environmental readers were swayed less by either treatment).

Further, the media's role as attitude changer is particularly important within the context of contemporary environmental problems. 'Many global ecological crises are so abstract as to escape immediate public notice. Therefore, it is primarily through the media that climate change is publicly represented and in this sense it is the media that construct climate change as a social problem' [6, p. 339]. In addition, Dasgupta *et al*. stated:

> Public reaction to environmental news can filter back into the media and highlight specific policy issues. The importance of the media in this respect has gained strength, particularly in developing countries, where environmental problems have become legitimate concerns, and where access to 'official' information has been historically difficult. [7, p. 351]

Problems with environmental media

Unfortunately, environmental articles are a very low proportion of all issues covered in newspapers and television. One content analysis of environmental coverage by the three TV networks and CNN found from .24 to .39 environmental stories per newscast [8], and that 70% of stories were event-driven, such as Earth Day celebrations, government announcements and book releases. The number of *New York Times* stories on environment issues closely paralleled the number of referred hearings in Congress through the mid-1990s, though they leveled off at around 2% of all topics from 1974 through 1992, and both steeply declined beginning in 1992 through 2000 [9].

Further, there are many practical influences that negatively affect media portrayals of climate change, such as reporter knowledge, misreporting or miscommunication, public misunderstanding, little training in science, time and space constraints, and commercial pressures on media to be more profitable. Further influences include event-orientation; relative inaccessibility of technical sources; the 'technophobia' of many reporters, editors and audiences; atypical time- and spatial-scales of the issues; lack of consistent reporter assignments; terminology confusion; focus on controversy rather than the underlying issue; dependence on official sources; social construction of scientific uncertainty; conventional news values such as 'novelty, recency, and factuality'; and trends in communication [6,10–14].

These factors may be multiplied as reporters often turn to newspapers, not scientists or science journals, as the primary source for knowledge about climate change [15, cited in 6, p. 350]. In particular, certain aspects of the commercial nature of television work against the

discussion of significant choices or solutions: namely, the pressures to reduce costs which has removed most specialty coverage, a related reduction in the ability to cover complex stories, and the immediacy of television (Miller, in [16]).

It should not, therefore, come as a surprise that most research on the quality of environmental reporting does indeed find it to be poor. First, reporting is only weakly tied to the 'real' world [3,17–19]. As mentioned above, Ader's classic study on agenda setting showed coverage and public concern about pollution increased even as empirical data showed total pollution had decreased [3]. Brossard *et al*. [17] noted that coverage from *Le Monde*, a French newspaper of record, tended to be more event-based than was the coverage from *The New York Times*, implying that journalistic differences are responsible for the 'sustained public attention' (or lack thereof) of global climate change, not the nature of the issue. *Le Monde* focused more on the international aspect and less on minority scientific opinions, whereas *The New York Times* emphasized conflict in the debate over global warming – in spite of the overwhelming scientific consensus shown in the literature – and the negative consequences of global warming. Regional and national newspapers in many countries may not provide comprehensive sources of environmental education, journalists are unlikely to have much environmental education, and scientists provide only minor contributions to newspaper articles [20]. News is often oversimplified, polarized, and biased towards government and industry [21–23]. Lockie found that newspaper articles from Australia, the UK, and the US all oversimplified the debate about sustainable food and agriculture to a polar 'agro' versus 'organic' framework [22]. Thompson presented a thematic analysis of coverage of a wind development offshore of Massachusetts [23]. The focus was on celebrity reactions and conflict, rather than on more informing themes such as the environment, economy, or society. Archibald presented an excellent survey of these problems and their causes, concluding that 'there is a convergence of numerous problems in this beat, rather than any single, overriding problem' [24, p. 27]. Reporters battle shrinking newsholes, tabloidization, editors hostile to environmental issues, and the complexity and subtlety of environmental issues.

Identifying quality in the media

With all of these problems in environmental media, the question becomes which media source is better than others, and why? Over the years, researchers have tried to evaluate the quality of the news. They have approached this in one of four different ways: 1) source perception, 2) intra-media perception, 3) user perception, and 4) subject-specific criteria.

In source perception, researchers compare news content to 'reality', either by fact checking or by having subject experts evaluate the content. For example, Salomone [25] compared judgments of quality of journalists, scientists, industry reps, environmentalists, and government officials on over 200 TV broadcasts and newspaper stories on environmental risk. Not surprisingly, each group had different measures of quality.

More often, researchers will have journalists subjectively evaluate their own performance or the performance of their peers to determine quality of news (intra-media perception). For example, Coulson [26] compared independent and group-owned newspapers by simply asking the journalists about their commitment to quality and local news coverage. Tiffen [27] interviewed over 200 journalists and distilled their thoughts on quality into a list of 10 criteria, which he then applied to four Australian newspapers. In perhaps the best use of intra-media perception as an evaluation of quality, Plasser [28] compared interviews with 31 American print journalists to a survey of Austrian political journalists, finding a deterioration

of news quality caused by hyper-commercialization and changing interactions between journalists and politicians.

In another subjective approach, researchers evaluate news based on readers' perceptions, or simply ask media consumers to evaluate their news (user perception). Bodle [29] compared student newspapers to community newspapers along the lines of readability, interest level, and thoroughness. Although readability and interest were assessed with a content analysis, the framework behind the content analysis was based on previous research of readers' ability to finish and enjoy a newspaper article. A similar study shows the flaws of the user-perception approach. Roberts and Dickinson [30] created a 'news quality index' for local TV news that consisted of a content analysis, audience analysis, and market viewer analysis of the way the TV anchors were perceived. They found no relationship between the audience's station preference and the station's attention to news that the audience had rated as important. As such, the final criteria for the news quality index were only the content analysis and market viewer's analysis of the perception of the anchors.

In the fourth approach, a researcher will create subject-specific criteria that usually cannot be applied to other areas. For example, Smith, Wilson, and Henry [31] rated medical internet articles based on 10 criteria chosen for their particular setting (e.g., novelty, coverage of harms, reliance on press releases, etc.). This study more closely follows the fourth approach, but uses a more generic rubric. Hazard assessment is applied to news media coverage of environmental news as a conceptual basis for assessing quality that limits subjectivity and is not necessarily tied to one particular type of medium (i.e. print, TV, radio, etc.).

Research focus

This study attempts to analyze how two newspapers provide news coverage of environmental events. This is assessed in a variety of ways: the total number of articles present in the sample days (the frequency of news dedicated to environmental events), the length and location of those articles (the amount of news space dedicated to those events and the prominence given to those articles), the amount of information and detail presented in those articles (specificity), and the categories of environmental hazard. Where this study breaks from tradition is in the type of content examined, namely the 'importance' of the events covered, based on a hazard assessment.

Importance is a value-laden topic. It seems reasonable to suggest, however, that there are some characteristics of events that most people will view as important, such as the total number of people affected by the event. Global warming serves as a good example. This is an environmental issue with the ability to affect millions of people across an enormous geographical extent. Accordingly, between 1980 and 2004, the term 'global warming' was mentioned nearly 28,739 times in 842 English-text newspapers in the US and 10,529 times in 1033 English-text newspapers from the rest of the world (based on retrieved entries from the News Bank database).

Applying this common sense approach, we sought a comprehensive scheme that would identify categories explaining most potential or experienced hazards. That framework was briefly discussed in [32], on 'The nature of technological hazard'. As figure 1 shows, there are 12 categories within four phases based on a causal framework. Category one was excluded because intentionality is actually a description of whether or not an issue is environmental.

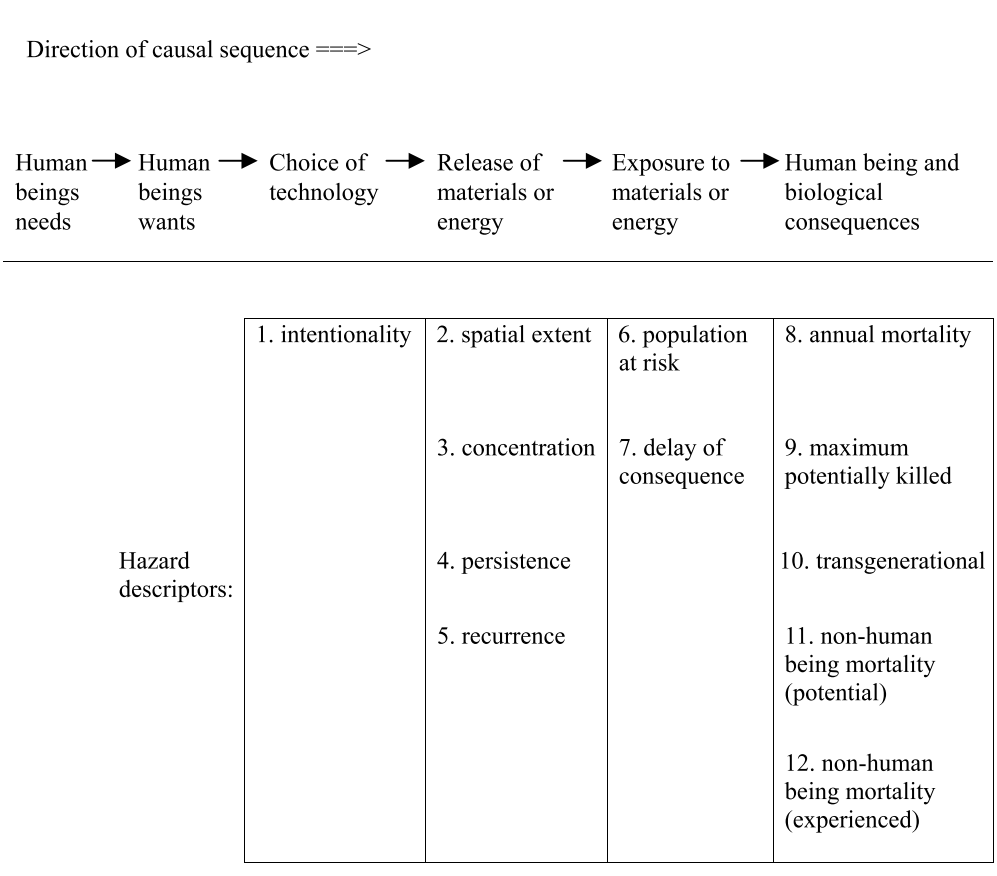

Figure 1. Simplified causal structure of technological hazards (Hohemenser *et al*., 1983).
Note: The complete content codes included two additional, developed for this study: 13, 'economic costs', and 14, 'solutions', as part of a seventh phase, 'management'.

It is important to note that this framework describes hazard and not risk. As defined by Hohemenser *et al*., 'hazards are threats to humans and what they value, whereas risks are quantitative measures of hazard consequences that can be expressed as conditional probabilities of experiencing harm' [32, p. 379]. Thus, the measure is based on events that have already happened and whose damage is assessable. Hohemenser *et al*.'s framework was designed for hazards, which are events that have already occurred, as opposed to the layman's view of risk, which is a future threat. Newspapers present information for both, and so the framework was applied to both past and future hazards.

This is well-suited to newsmaking process and story suitability. Herbert Gans [33], in his classic book *Deciding What's News*, lists four main criteria to determine importance, including impact on large numbers of people, and significance for the past and future. Anderson's [34] book *Media, Culture and the Environment* summarized similar findings by Galtung and Ruge [35]. Of eight key factors that shape the news, number two is 'amplitude or size – the degree of amplification (or issue threshold) that an event has to reach before being viewed as newsworthy' [34, p. 120].

In the following research, this concept of hazard assessment has been applied to newspaper stories on environmental topics to create a way of measuring amount of information,

contextualization of that information, and, finally, the magnitude or 'importance' of the events reported.

Methodology

Selecting countries for the study

Some research suggests that environmental reporting is fairly similar across the US. Sachsman [36] surveyed journalists from four regions in the US on problems with reporting, story approaches, sources, and other issues to find that reporting was the same across the nation. Because of this, it was decided that an international comparison would better illuminate possible differences in coverage of environmental issues.

The US and the UK have similar journalistic norms (more similar, at least, than US and French, Indian, etc. [17,37]). Of all English-speaking countries, the UK has arguably the best environmental record and it might be assumed that its media should reflect this.

The US and UK provide very different amounts of greenhouse gases, both absolutely and relatively. The US contributes 25% of carbon dioxide, but 5% of world population, and 5.4 metric tons per capita per year; UK contributes 2.3%, with 2.5 metric tons per capita, but is already committed to reducing emissions, by 2008–2012, of six main greenhouse gases to 12.5% below 1990 levels [38,39, both cited by 40, p. 266]). In the UK (more so than in other English-speaking countries such as Australia or Canada) public opinion and government action are far more favourable to the environment. Yale's Environmental Performance Index is designed to measure a country's effort of 'reducing environmental stresses on the human population and promoting ecosystem vitality and sound natural resource management' [41, p. 1]. In this index the US ranks 28th, while the UK is fifth. The Climate Change Performance Index, from the German environmental group GermanWatch, ranks 56 countries on their greenhouse gas emission trends and levels and climate policy. Britain was in second place, while the US placed 53rd [42].

A public opinion poll published in early 2006 by World Public Opinion asked 33,237 people in 30 countries if they thought that climate change was a serious problem [43]. Only 76% of people surveyed in the US said climate change was a serious problem, compared to a 90% global average, and 91% in the UK.

A recent Pew survey [44] found a general increase in the percentage of people citing pollution and environmental problems as a top global threat. Worries have risen sharply in Latin America and Europe, as well as in Japan and India. Many people blame the United States – and to a lesser extent China – for these problems and look to Washington to do something about them. In the US, the percent naming environmental problems at a top global threat rose from 23% in 2002 to 37% in 2007, while in the UK the percent rose from 30% to 46% ([44] Pew, 2007). Other public surveys in both countries also report high levels of public concern and awareness of climate change, but it is still secondary to other issues such as personal and social, and seen as more of a threat to distant locations and communities [45,46, both cited in 40, p. 267]. Further, while majorities in such surveys report a willingness to take actions to reduce the effects, that willingness depends on personal benefits, convenience, and trust in government [40].

Lorenzoni *et al.*'s [40] comparative analysis, based on national surveys in US (2002–2003) and UK (2002), asked respondents to name their top three images or things that come to mind in response to 'global warming' (US) or 'climate change' (UK), and to rate their affect about

those (negative/bad to positive/good). In the US, the most frequent were melting ice, heat and rising temperatures, ozone depletion, disaster, sea level rise and flooding, climate change, and (barely mentioned in UK responses) skepticism. In the UK, the most frequent responses related to weather, global warming/climate change, ozone, increasing temperatures, pollution, and rainfall (not mentioned in US responses), and disaster. All images were perceived as negative. Health impacts on human beings, and 'causes of, and solutions to, climate change were rarely mentioned' [40, p. 272]. The most frequent US images also seemed to reflect those topics emphasized by US media. They noted that the lack of awareness of or concern for health impacts was particularly worrisome, as implications for the health of human beings are one of the greatest consequences of climate changes, especially for the poor and children in developing countries, and that over 150,000 people died in 2000 due to climate change [47].

Lorenzoni *et al*. [40] concluded that more detailed and accurate information is not sufficient to foster needed changes in population attitudes and behaviour; rather, affect and emotion play a major role in changing attitudes and behaviours. Lorenzoni *et al*. referred to Nicholson-Cole [48] in concluding that 'if climate change communicators were to associate negative affect with specific localized impacts and with enabling personal solutions linked to those effects, these together could exert a significant positive influence on behavioural intentions' [40, p. 277]

Selecting media. Covello *et al*. [49] found that news media, particularly television and newspaper, were the greatest source of information about environmental information for people in a range of socio-economic levels living in different communities across the nation. In a study of northern New York state residents, newspapers and television were the most frequently used media for environmental information, with television used less and perceived as a less reliable source by those with greater education [50].

Newspapers offer more news space than the typical 30 minute broadcast or 10 minute radio segment. Steel *et al*. [51] surveyed 1233 citizens nationwide on their awareness of coastal issues and compared these to their news source. Consistent with previous research, newspaper readers and internet news consumers were more knowledgeable about environmental issues than TV or radio news consumers. A study by Brothers *et al*. [52] found that respondents who cited newspapers as their primary information source scored significantly higher on environmental knowledge items than those who cited television. An analysis of several years' of General Social Survey data found that after applying statistical controls, greater television viewing was associated with less donating or petitioning on the behalf of environmental concerns; and greater newspaper reading in 2000 was associated with greater trust in science and technology, and greater environment knowledge [4].

In addition to the fact that newspapers inform readers on environmental issues better than the alternatives, newspapers were also chosen for this study because they are simply easier to analyze. Based on text, they are easier to reference and code, and they are also more readily available through online news databases.

Selecting newspapers. Newspapers were considered across three main dimensions: credibility, focus and readership. Johnson and Scileppi noted that 'high credibility sources elicit more attitude change than do low credibility sources is one of the most consistent findings in the attitude-change literature' [53, p. 31, cited in 49].

The New York Times and the *Los Angeles Times* were initially chosen as the US newspapers. Although *USA Today* and the *Wall Street Journal* both surpass *The New York Times* and the *Los Angeles Times* in circulation, *USA Today* is generally not considered the newspaper of

record and the *Journal* has a predominantly financial focus. Both *The New York Times* and the *Los Angeles Times* have a general focus on the news and are third and fourth, respectively, in circulation across the country. As of March 2006, *The New York Times* had a net circulation of 1,683,855, while the *Los Angeles Times* had a circulation of 1,231,318 [54]. *The New York Times* is frequently considered to have a liberal slant, with an openly liberal editorial section and strong coverage of liberal social issues, such as gay marriage. The *Los Angeles Times* is considered slightly more conservative, as well as more sensational in recent years.

Among UK newspapers, *The Independent* was chosen to match *The New York Times*, and *The Times* was chosen to match the *Los Angeles Times*. Again, while not the leading newspapers in Britain in terms of circulation, both are considered quality newspapers. *The Independent* has a circulation of 238,756 on weekdays and Saturday, while *The Times* has a circulation of 635,777 for the same days. *The Independent* is a relatively young newspaper – started in 1984 – and has established itself as a politically independent paper. *The Times*, bought by Rupert Murdoch in 1981, has recently changed to a slightly more conservative and sensational slant. Unfortunately, *The Times* and the *Los Angeles Times* both had to be dropped later in the research as their coverage in the database used was insufficient for statistical comparison, and less consistent than for the two other newspapers (for more detail, see Searching and sampling below).

Defining 'environmental'. An environmental issue has two basic components: the human being element, and the natural element. The natural is anything not made by mankind, domesticated, or cultivated. The human being element includes humanity, and everything not 'natural' as previously described.

Between these two elements there are two types of interaction. The first is *human being to nature*. Any action by human beings that affects the natural world is an environmental issue. The second type of interaction is *nature to human being*, which is more complicated. When nature affects human beings it is only considered an environmental issue when there is a human being element that either causes the natural event or somehow amplifies it. A flood that kills a hundred people is not an environmental issue unless the flood occurred because of human beings' actions (e.g. the flood was caused by global warming) or the flood was amplified by human beings' actions (e.g. clear-cutting the nearby forests increased run-off and the intensity of the flood).

As a preliminary review, the four newspapers were examined with this general framework in mind. The topics addressing the second type of environmental problem (i.e. nature-to-human being) were very limited. Most articles covered well known environmental problems such as endangered species, climate change, or pollution. Because of the limited scope of topics, a keyword list was developed to identify environmental articles.

Creating a keyword list and lexicon. The keyword search was also appropriate because of the public's familiarity with many environmental issues. A journalist need not define what 'smog' is, or explain how it negatively affects the natural and human being world. So articles could use such terms without having to define them, and our online searches could retrieve such articles without having to code the entire article as to its environmental coverage.

A lexicon was developed defining the keywords and the context in which those words could be considered 'environmental'. For example, 'threatened' is used in a wide variety of contexts; however, it is only considered here when referring to a species, habitat, and ecosystem. Table 1 provides the keyword list, with asterisks marking wildcards, and qualifying definitions.

Table 1. Keyword list and qualifying definitions

Climate change	Changes to the climate caused by human beings' action
Conserv*	Conservation: a careful preservation and protection of something; *especially*: planned management of a natural resource to prevent exploitation, destruction, or neglect.[a] Used only when in association with species, habitat, or ecosystem
Contaminat*:	Contaminate: to corrupt a natural resource with foreign materials or energy (e.g. radioactive waste, lead, etc.)
DEFRA	Department for Environment, Food, and Rural Affairs. British equivalent of US EPA
Deplet*	Deplete: to lessen [a natural resource] markedly in quantity, content, power, or value[a]
Eco*	Habitat or environment; ecological or environmental[a] (e.g. eco-friendly, ecology)
Endangered	To bring into danger or peril.[a] Used only when in association with species, habitat, or ecosystem
Environmental*	Environmentalism: advocacy of the preservation, restoration, or improvement of the natural environment; [a] OR environmental: referring to the natural world
EPA	US Environmental Protection Agency
Extinct*	Extinct: no longer existing.[a] Used only when in association with species, habitat, or ecosystem
Global warming	Changes to the climate caused by human beings' action
Habitat	The place or environment where a plant or animal naturally or normally lives and grows[a]
Natur*	Nature: anything not made, domesticated, or cultivated by human beings
Organic	Of, relating to, yielding, or involving the use of food produced with the use of feed or fertilizer of plant or animal origin without employment of chemically formulated fertilizers, growth stimulants, antibiotics, or pesticides[a]
Pollut*	Pollute: to contaminate (an environment) especially with human being-made waste[a]
Preserv*	Preserve: to keep safe from injury, harm, or destruction; to keep alive, intact, or free from decay.[a] Used only when in association with species, habitat, or ecosystem
Recycl*	Recycle: to process (as liquid body waste, glass, or cans) in order to regain material for human beings' use[a]
Renewable	Capable of being replaced by natural ecological cycles or sound management[a] (e.g. renewable energy)
Smog*	Smog: a fog made heavier and darker by smoke and chemical fumes; *also*: a photochemical haze caused by the action of solar ultraviolet radiation on atmosphere polluted with hydrocarbons and oxides of nitrogen especially from automobile exhaust[a]
Species	A category of biological classification ranking immediately below the genus or subgenus, comprising related organisms or populations potentially capable of interbreeding.[a] Not used when referring to human beings
Sustainable	Of, relating to, or being a method of harvesting or using a resource so that the resource is not depleted or permanently damaged; of or relating to a lifestyle involving the use of sustainable methods[a]
Threatened	Having an uncertain chance of continued survival; *specifically* likely to become an endangered species.[a] Used only when in association with species, habitat, or ecosystem
Toxi*	Toxic: containing or being poisonous material especially when capable of causing death or serious debilitation[a]
Wildlife	Living things and especially mammals, birds, and fishes that are neither human beings nor domesticated[a]

[a] Taken from Miriam Webster Online Dictionary (2007).

Defining an environmental article

An *environmental article* is an article that contains one or more of the keywords in either the headline, sub-headline, or within the first two paragraphs. This criterion was used because of the journalistic tendency to start a story with the main focus and theme (i.e. an article with a keyword in the beginning was more likely to be about that keyword, than one with a keyword towards the end). An article was considered to be anything with a headline and more than two

sentences of text. Editorial page opinions, reviews, notices, advertisements, cartoons, weather forecasts, paid obituaries, or commercial and real estate listings were excluded because of their non-news quality. Summaries were excluded because their content was repeated in the full article later in the newspaper issue. Staff-written obituaries were included, however. Many important people die each day, but a reporter can only choose a very few or even one, possibly to highlight an important issue that would otherwise have no 'event' to make it newsworthy. In some cases, this issue was the environment. Briefs were included because they were prominently located and otherwise fulfilled the specifications of an article.

Searching and sampling

The electronic database Lexis-Nexis was used because it is the most comprehensive and easy-to-use database available. It is important to note that some exemptions were discovered when comparing the print paper to the database. Four sample days were chosen for this initial comparison by selecting one day at random from each three-month season (January–March, April–June, etc.), obtaining a copy of each of the newspapers for that day, and then identifying environmental articles in those issues. Of the total of 24 articles found in these days, eight articles were not found in Lexis-Nexis. These absences were limited mostly to the *Los Angeles Times* and *The Times*, which is why these two newspapers were ultimately dropped from the search. Absent articles in *The New York Times* and *The Independent* could not be explained by any pattern such as author (e.g. freelance), source (e.g. in-house), or type of article (e.g. briefing or feature). Lexis-Nexis was used in spite of this drawback because it significantly reduced the time needed for article selection, allowing more time for coding.

Environmental articles throughout 2006 were sampled. Sampling was stratified by month and day of the week for a total of 336 cells for a proportionate number of weekdays and weekend days. (Two sample batches taken from two weekend days and five weekdays over 12 months for two newspapers equals 336.) A preliminary search found an average of three articles per day per paper. Many days had no articles, while a few days had many articles. Because of this varying frequency, only up to two articles were coded per cell. US Federal holidays and British National holidays (10 each) were excluded because it was thought that coverage might be skewed on these days.

Defining importance

Hazard phase: environmental content. Returning to the conceptual framework introduced in the Research focus section, Hohemenser *et al*.'s hazard assessment [32] was modified to encompass the greater number of ways in which hazard information is translated for the public.

Based on the preliminary review of the retrieved articles, 'economic costs' (category 13) and 'solutions' (category 14) were added in a seventh phase, titled 'management'. Management is often the aspect of a hazard most obvious to the audience.

Some people may find it difficult to grasp the fact that nuclear waste must be contained for hundreds of thousands of years, but they can understand that the billions of dollars slated to be spent on nuclear storage is a 'big deal'. Along these lines, the lowest common denominator of all damages is usually expressed in dollars. Mortality rates are generally the standard measure for comparing hazards [32]. Within policy, on political, legal, and corporate levels, this is translated to dollars (take for example life insurance, compensation for loss of life in civil murder trials, or 'condolence payments' for lives lost in war). Economic costs were

coded when there was any mention of a tax, fine, compensation, fee, or other loss. In addition to dollar amounts, other economic costs such as the number of hours of work lost, lost productivity, and number of jobs lost were also recorded.

Solutions are another integral part of management. This was coded as a number of things such as number of lives saved, money saved, increases in quality of life, or reductions in toxicity or potential harm. Solutions were only coded when mentioned in association with their possible or present effectiveness or likelihood of being put in place. This puts the solutions at an equal level with the hazards recorded, which can only be recorded when there is some mention of hazard. For example, an article that discusses the flu without mentioning its consequences (death, lost work days, etc.) cannot be considered a hazard without outside knowledge. From the same standpoint, solutions cannot be considered solutions without mention of efficacy or likelihood.

The framework in [32] was designed for hazards, which are events that have already occurred, as opposed to risks, which are potential future events. Newspapers present information for both, and so the framework was applied to both. For articles describing possible future hazards, the highest estimated potential for damage was recorded. Because the environmental issues being examined are from the most well respected newspapers with access to the most credible sources, all estimates were treated as having equal credibility. Thus, the highest estimate for one of the categories (such as number of deaths, or extent of financial damage) sets the tone for the overall importance of the article, regardless of the range of uncertainty, because the issue has already crossed the issue threshold based on the perceptions of the journalist. Table 2 provides the coding categories with definitions, and example text from the articles.

Table 2. Coding worksheet: Categories, definition, and example

2.	Spatial extent: maximum distance over which a single event has a significant impact. *While bird flu has become a huge problem in poultry on farms in a few African countries, including Egypt, Nigeria and Sudan*
3.	Concentration: concentration of released energy/material relative to natural background. Can include an increase in wind or storms. Does not include animal or human being populations. *studies of water, sediment and fish and showed no elevated levels of PCB's*
4.	Persistence: time over which release remains significant threat. *the half-life of plutonium is 24,000 years*
5.	Recurrence: mean time interval between releases.
6.	Population at risk: number of people potentially or actually exposed. Does not need to refer to exact number, just a type ('small children') or a group ('the Malenge tribe'). HUMAN BEINGS ONLY *[Those most at risk are] small children and people who consume chicken at a higher rate than what is considered average* *only 134 people are known to have received dangerously high doses of radiation*
7.	Delay: time between exposure and occurrence of consequence. *'You will not know the true impact of that soil contamination for years to come'*
8.	Human being mortality: annual or ongoing. *[This results] in tens of thousands of deaths annually from both respiratory and coronary disease*
9.	Human being mortality: maximum in single event. *A leak at a chemical plant in Bhopal, India, killed more than 2,500 people in December 1984*.
10.	Trans-generational: hazard affects generation. *Exposed; Exposed and children; more than one future generation*
12.	Non-human being mortality (potential): No potential mortality; Significant potential mortality (a species is 'threatened'); Potential extinction (a species is 'endangered'). *''If we carry on with business as usual, in all likelihood three out of every five species will not be with us at the dawn of the next century.'*

Table 2. *(Continued)*

12. Non-human being mortality (experienced): No experienced mortality; Significant experienced mortality; Extinction.
Dozens of hippos lie decomposing in the stifling heat. Elsewhere, the thin delicate frames of the rare Grevy's zebras lie on parched grass, felled by anthrax
13. Economic costs: Specific mention of current or foreseeable loss (jobs, work hours, loss of resource such as soil, water, or property). Includes the cost of an investment, funding, taxes, fees, etc. Does NOT include money *saved*.
The $260 million Venus Express mission is intended to study the planet for at least two Venus days
14. Solutions: Specific mention of a solution with a high probability of occurring or ostensibly practiced by someone, somewhere. Does not need a clear statement of the problem or why the solution is necessary. Includes money *saved*.
Shell also claimed to have changed the route of the pipeline to avoid the feeding area of the whales

Length. The length of the article and its location in the newspaper were also recorded for analysis. It is assumed that if an article is longer than other articles, it is more newsworthy, and there is more information in it. The length of an article could then be compared to the type of hazard information provided in it, or the average length could be compared across newspapers. Newspapers with longer environmental articles would signify better environmental news coverage. Concerning length, the number of words in each article was determined by using the figure provided by Lexis/Nexis.

Location. The location of an article is also another sign of its newsworthiness. Articles located closer to the front page are judged as more newsworthy and more likely to be read. Newspapers with more environmental articles closer to the front page would signify better environmental news coverage. Concerning location of the articles in each newspaper, *The New York Times* uses a section/page number system (e.g. A 17), while *The Independent* uses a continuous numerical system (e.g. pages 1 through 72, etc.) even though the paper is printed in sections. In order to compare the two, *The New York Times* section/page numbers were converted into ordinal numbers. For example, the largest number recorded for the A section was 28, so B1 became page 29. Then all page numbers were calculated as a percent of the largest page number for each paper, with A1 being 99% and the last page being 1%.

Specificity. Each mention was also categorized as specific versus nonspecific. Specificity was an important characteristic to measure as the first step in exploratory analysis, but also for what it says about the newspapers. Specific information helps readers contextualize their world, which is particularly important as the media that informs them is already very flawed, as discussed in the literature review. A specific mention is any use of numeric information while nonspecific is information given as only a generalization. Table 3 provides an example of both the hazard coding and the non/specific coding of one article.

Coding and intercoder reliability

The most difficult part of this project was achieving high intercoder reliability. One coder coded all articles, while a second coder was used to develop coding and test intercoder reliability at the beginning, middle and end of the overall coding process to prevent agreement drift.

Coding results from each stage – where the two coders provided a matched coding, provided mismatched codings, or where one provided a code and the other did not – were put into a matrix to compute reliability with Scott's pi.

Table 3. Example article coding

Category	Mention	Specific *vs* nonspecific
2: spatial extent	Roughly a third of China is exposed to acid rain …	Specific
3: concentration	… and about 70 per cent of the country's rivers and lakes are polluted.	Specific
8: human being mortality annual	The World Bank says 16 of the world's 20 most polluted cities are in China and more than 400,000 people die prematurely each year from pollution-related illnesses.	Specific
12: non-human being mortality (experienced)	… which adds up to 1.7 million cubic meters of timber or 25 million fully grown trees.	Specific
13: economic costs	The new taxes …	Nonspecific
14: solutions	…which come into force on 1 April, are aimed at boosting the use of environmentally friendly small-engined cars and motorcycles while slapping hefty new levies on luxury items such as gas-guzzling four-wheel drive vehicles and flashy watches …	Nonspecific

Mismatches (when each coder assigned a different category) were infrequent. The greatest difficulties in coding were errors of omission (where one coder assigned a category but the other did not): batch 1, omission 63%, inclusion 95%; batch 2, omission 76%, inclusion 100%; batch 3, omission 60%, inclusion 90%. Omissions were random across categories with no obvious pattern of frequency. Each mismatch or omission was discussed by the two coders to arrive at a final decision, with any resulting clarifications added to the coding

Results

Number of articles

The total number of articles with any environmental category content in the sample set was 156 for *The New York Times* and 234 for *The Independent*. Only the first two articles found in each paper on any particular sample day were chosen for coding; so the total number of environmental articles found in a one year period is actually higher. As the keyword list was developed, the total number of environmental articles was recorded for the four sample days chosen to be reviewed on hard copy (to be compared to the Lexis-Nexis search of the final keyword list). *The New York Times* had an average of 1.5 articles per day (distributed as 1,4,0,1), while *The Independent* had an average of 1.75 articles per day (0,5,1,1). The total number of articles in the sample set would be approximately 252 and 294 for *The New York Times* and *The Independent*, respectively. This implies a more even spread of environmental articles over the course of the year in *The Independent* than in *The New York Times*.

Length of articles

The overall word count (article length) was 731.7 (SD 606.8), with a range from 38 to 5889. The average word count (article length) was 785.7 (SD 677.1) for *The New York Times* and 695.6 (553.4) for *The Independent* (n.s.; also no significant difference for any content category).

Location of articles

Overall, environmental stories occur about a quarter of the way into the newspaper, but with wide variation (76%, SD 20%). *The New York Times* placed environmental articles slightly closer to the front page, at 79.0% (SD 18%), than *The Independent* at 73.8% (21%) ($t = 2.5$, $p<.01$). The pagination conversion described above makes results questionable, however, because of measurement error associated with converting a section/number system to a numerical one, and because sections are themselves categorizations of content used to represent the nature and importance of the content. Although some categories did appear earlier than average (especially transgenerational, 95%; persistence, 92%; delay, 83%; population at risk, 81%; all the others were located between 73% and 80%), the sample sizes were too small to allow for tests of statistical significance. The location percentages for each content category also did not statistically differ between *The New York Times* and *The Independent*.

Hazard phase: environmental content

The overall mean frequencies (percents) of each of the categories without regard to the newspaper type (i.e. the total 390 articles) were distributed as follows, from most frequent to least: solutions (50%), costs (35%), concentration (23%), non-human being mortality: experienced (17%), non-human being mortality: potential (14%), area (9%), population at risk (6%), mortality: maximum (5%), mortality: annual (2%), persistence (1%), transgenerational (1%), recurrence (0%), and delay (0%). Only the proportional frequency of non-human being potential mortality content was significantly different between *The New York Times* (8%) and *The Independent*, (18%), $p<.005$.

Specificity

Specificity was analyzed by only one coder, so its reliability is unknown. There were a total of 617 mentions of any category across the two newspapers (22.0% *The New York Times* non-specific, 18.3% specific; 33.5% *The Independent* non-specific, 26.1% specific), with no statistically significant association between newspapers and specificity. Overall (without regard to newspaper), three categories showed statistically significant differences in specificity. Information about annual mortality ($p< .01$), and costs ($p< .001$), were more likely to be written using specific content, while information about solutions was more likely to be nonspecific ($p< .001$). Examples of specific mentions include: area in acres (six mentions in *The New York Times* – including 5 million acres and 200 million acres – five in *The Independent*); maximum human being mortality in a single event (nine mentions in *The New York Times*, with highest of 2500; seven mentions in *The Independent* with highest being two mentions of 35,000); experienced non-human being mortality (11 mentions in *The New York Times*, with highest of 131 million; 10 mentions in *The Independent* with highest of 100 million); and cost (in US dollars) (with 40 mentions in *The New York Times*, with highest of $200 billion; 40 mentions in *The Independent*, with highest of $1 trillion).

Discussion

If we can assume that newspapers still shape public perception as in Ader's classic 1995 study [3], these results would imply that the media are focusing the public on three main

issues: solutions to environmental problems, the costs associated with these problems and their solutions, and the particular problem of pollution (including greenhouse gases which contribute to climate change). That the British seem to be more concerned with these issues than Americans, based upon the rankings of the US and the UK on attention to environmental issues as assessed by the several reports noted earlier, might imply that British newspapers are doing a better job of shaping public perception.

And indeed, from an environmental perspective, *The Independent* did do a better job of comforting the afflicted and afflicting the comfortable. *The Independent* sustained public attention with more articles evenly spread throughout the year, echoing the conclusions reached by Brossard *et al*. [17] that the French newspaper *Le Monde* was better at maintaining focus on the environment than *The New York Times*. *The Independent* also focused more on potential non-human being deaths, or in other words, the threat of extinction facing many plants and animals on this planet. Most environmentalists would view this as a noble attempt to edge away from the common anthropocentric bias most frequently represented as the battle between the economy and the environment. This also agrees with the body of research that finds American newspaper environmental coverage to be biased and/or superficial in a variety of ways [22,23].

Both newspapers presented nearly equal proportions of information about environmental hazards in their stories. The average *word count* was not statistically different between the two papers, although the general *location* relative to the first page was significantly (though only slightly) earlier for *The New York Times*. This study cannot determine whether this difference reflects cultural differences, policy differences, or differences in journalistic standards between the US and the UK. Finally, the *specificity* of information was the same for the two newspapers.

Perhaps the *number* of articles is more important than the type of coverage in influencing the public's knowledge of and attitudes toward environmental hazards. Or maybe *quality* American newspapers are no longer playing a role in agenda setting, in which case future research should compare environmental coverage by newspapers varying in quality and circulation. Or, possibly, newspapers are playing a diminishing role in setting the agenda for their readers and nations.

On a more theoretical level, the content analysis did show noticeable differences in the proportional frequency of hazard phase covered in environmental articles, with solutions, costs, concentration, and non-human being mortality (experience and potential) the most frequent and delay and transgenerational information the least. It is difficult at this point to argue that these differential emphases represent possible contributions to agenda setting, or reflect attempts to frame environmental issues in particular ways. This might be a productive approach for future research.

The original study intended to include an additional US and an additional UK newspaper, but the news story database did not provide equal or consistent retrieval of some kinds of content, such as stories by freelancers (because different copyright and payment arrangements apply to those). There may be a more subtle and pervasive bias in analyzing newspaper coverage of environmental issues, based solely on news stories, since editorials and advertisements were not included. Editorials may provide strong support, agenda-setting, or debate about environmental issues; at the least, it would be informative to apply the same coding framework to editorials to see if certain hazard topics are covered differently than in news stories. Possibly much more influential than specific news stories or editorials are the massive and continuous representations of and implications for environmental issues in advertisements. These are still the main revenue source (though declining) of most newspapers. The very commercial nature

of advertising is likely to shape, mediate, contextualize and suppress the public's conceptualization and knowledge of 'nature' and the 'environment' [55–57]. A similar argument may be made about the content and framing of photographs accompanying environmental stories.

The original motivation for this research was to evaluate the magnitude of environmental events covered in newspapers in the US and the UK by applying hazard assessment. The project developed analysis for types (hazard category) and characteristics (location, length and specificity) of environmental story coverage, as well as a method to sample and analyze such stories from two major newspapers. Even defining the concept of an 'environmental article' was a relatively unexplored challenge confronting this research. The vast majority of research in this field relies on case studies (such as [23] on a proposed Massachusetts wind farm) or issue specific searches (such as [22] on agriculture and [17] on global warming) to guide their expedition into the 'environmental'.

Conclusion

This study has provided two modest contributions: *defining* an 'environmental' newspaper article, and *judging* importance or newsworthiness with a reliable and valid system based on a theory of environment hazard assessment. The results presented here are only a preliminary attempt to develop a useful and unbiased assessment framework. Although previous frameworks that defined quality by accuracy [58,59] or professional assessment [28,31] are useful, the method used in this study is an environmentally oriented conceptual framework for assessing news story importance in an increasingly trivialized and tabloidized news world. This approach offers standards by which readers can appraise newspapers in regard to their coverage of environmental issues.

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