Read All About It: Examining newspaper coverage of the local environmental risks posed by the Radford Army Ammunition Plant

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This study examines the factors contributing to the inclusion of scientific information in local news coverage of environmental risks. We conducted a content analysis of articles about environmental issues associated with the Radford Army Ammunition Plant, Virginia’s largest point source of toxic chemical releases. We coded 116 articles published between 2000 and 2019 according to three criteria: the inclusion of scientific information, who is making claims, and whether or not explicit risks are identified. Only 35.3% of the articles reviewed include scientific information. Logistic regression indicates that when an article includes claims made by state officials and/or explicitly asserts the existence of environmental risks, it is more likely to include scientific information. Articles that include claims from community activists are less likely to include scientific information. We examine potential explanations for these patterns.

Keywords: content analysis, risk frames, risk communication, claims-makers, environmental risks

1. Introduction

Communities learn about the presence and nature of environmental risks from a variety of sources, including news media. Despite downward trends in readership and viewership, traditional news media is still the primary source through which the public obtains environmental information (Zhang et al. 2022; Newman et al. 2021; Funk et al. 2019). Media coverage of social issues is proportionally correlated with public attention to those issues and can even alter public attitudes toward them depending on context (Culpepper, Jung, and Lee 2023; Kneafsey and Regan 2022; Barnes and Hicks 2018; Segev and Baram-Tsabari 2012). Journalists can play an influential role in shaping public understanding of and attitudes toward issues through the processes of representing issues and relevant facts, recognizing and elevating the expertise of some and not others, and prioritizing some issues and not others (Schäfer and O’Neill 2017;
Allan, Adam, and Carter 2013). The influence can be even more significant when reporting environmental risks that are associated with complex scientific information. Various scholars have found that failing to provide the public with the scientific context of environmental issues in news media can distort public understanding of those issues and benefit other political interests (Reed, Hiles, and Tipton 2019; Romps and Retzinger 2019; Boykoff 2005). For instance, there are cases in which news media has contributed to the spread of environmental skepticism by not providing sufficient information about the solid scientific consensus over climate change (Merkley and Stecula 2021; Stecula and Merkley 2019; Xie 2015). Without appropriate scientific information, substantial environmental risks threatening society can be portrayed only as conflicts of interest among parties, leading to significant public misunderstanding on those issues. An important caveat is that scientific information, particularly when not properly translated into language that makes it broadly accessible, can alienate readers and paradoxically decrease their interest and attentiveness to issues (Shulman et al. 2020).

This study explores how local newspapers frame and deliver information regarding environmental risks. The case study examined is the Radford Army Ammunition Plant (RAAP), which is the largest point source of toxic chemical releases in the Commonwealth of Virginia (Virginia Department of Environmental Quality 2021). We conducted a media content analysis to explore how the press in the surrounding region of Southwest Virginia covers scientific information about the environmental risks associated with the RAAP. This paper presents the findings, examines various factors associated with including scientific information in news articles, and considers why those relationships might exist.
2. Literature Review

2.1. Influence of environmental news coverage on public perceptions

Environmental risks are the actual or potential harms to human health and the natural environment that can result from anthropogenic activities (Henry, Dietz, and Sweeney 2020). Raw data and academic scholarship on environmental risks are often inaccessible to the public because of the use of technical terms and complex scientific methods and the enclosure of articles and other datasets behind paywalls and in hard-to-find repositories (Hansen 2013; Kranich 2007). As a result, members of the wider public tend to rely on intermediaries to evaluate environmental information instead of sorting through complex environmental data directly. Previous studies have found that news media is the primary source of environmental information for the public (Zhang et al. 2022; Newman et al. 2021; Funk et al. 2019)

Scholars have long studied how news media can frame public perceptions and attitudes toward social and political issues. Many studies have found that public perceptions of issue importance are positively influenced by increased reporting on issues (Murphy and Devine 2020; Barnes and Hicks 2018; Oehl, Schaffer, and Bernauer 2017; Dolan et al. 2012). However, one recent study found the negative estimated effect of media coverage on the public’s attitude toward the environment, which means the more the media cover environmental issues, the more uninterested the audience becomes in the issue (Bakaki, Böhmel, and Ward 2020). This discrepancy indicates that although it is clear that media coverage affects public opinions, directions may vary depending on contexts, contents, and extent of exposure. To gain a deeper understanding of the varying media effects, scholars have focused on two core elements of news media: frames (i.e., how an issue is represented) and claims-makers (i.e., those

2.2. Claims-makers in environmental reporting

Claims-makers compete for space in the media and try to frame any given issue by “select[ing] some aspects of a perceived reality and mak[ing] them more salient […] to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation for the item described” (Trumbo 1996, 52). By providing claims-makers with avenues to promote their frames, the news media signals to the public whose opinions matter (i.e., who counts as experts) and which issues are worth paying attention to (Allan, Adam, and Carter 2013).

Four types of major claims-makers regularly appear in environmental news: governmental officials, community activists, corporate spokespeople, and news media themselves (Duan and Miller 2021; Comfort, Tandoc, and Grusczynski 2020; Nivas, Arul, and Aram 2016; Takahashi and Meisner 2013; Harrington, Elliott, and Clarke 2012; Trumbo 1996). Studies analyzing news media content have found that government officials are frequently the primary sources of environmental information (Duan and Miller 2021; Comfort, Tandoc, and Grusczynski 2020; Hedding and Riffe 2016; Benson and Wood 2015; Takahashi and Meisner 2013). Government officials may have a dominant voice because they are perceived to be the most legitimate and are often relatively easy to secure interviews with when reporting on environmental issues (M. Miller and Riechert 2013; Yang 2004). Yang’s (2004) interviews with environmental journalists found that they tend to repeatedly rely on government officials who can verify claims with what they perceive to be credibility and responsibility. Most journalists are self-aware of their lack of scientific knowledge and
training and thus seek out “authorized knowers” as news sources instead of collecting and attempting to make sense of information themselves (Yang 2004, 97). Governments also push their agendas using their authority and resources to stage events such as press conferences (Comfort, Tandoc, and Gruszczynski 2020).

Community activists are also frequent sources of claims in the news media. In the context of environmental issues, information and opinions are often sought from environmental civil society organizations or nonprofits (Hutchins and Lester 2015; Waisbord 2011). However, environmentalist claims tend to be from ‘mainstream’ environmental groups that are seen as more moderate (Poornananda 2022; Meissner 2012; Spencer 1992). The voices of would-be claims-makers that lack power and prestige are often crowded out of news representation due to difficulties in establishing their credibility as news sources (Meissner 2012). Even if they are equipped with professional press and publicity methods, community activists have a minor role as claims-makers in the daily news-gathering process compared to governments due to newsroom organization and routines (Waisbord 2011; Fenton 2009).

Corporate spokespeople are another source of environmental information preferred by journalists (Lee and Baek 2018; Waisbord 2011; Yang 2004). This is in part because information from corporate spokespeople is often organized and pre-packaged for direct inclusion in articles, in contrast with information from other sources such as ad-hoc community groups, which can require more transposition (M. Miller and Riechert 2013). Corporate public relations professionals strategically provide “information subsidies”, such as directly usable quotes and clearly articulated ‘facts’ to accommodate journalistic demands so that their claims get into news articles (Zerfass, Verčič, and Wiesenberg 2016; D. Miller and Dinan 2008; Davis 2007). However, some studies have found that media outlets still want to maintain journalistic autonomy to
some degree and thus are reluctant to fully rely on such information subsidies (D. Miller and Dinan 2008; Turk 1985).

2.3. Environmental risk framing

News framing is concerned with how issues are presented to the public (Schäfer and O’Neill 2017). It is a major topic in communication studies because of the potent impacts frames can have on how readers perceive and respond to issues (Schäfer and O’Neill 2017; Nivas, Arul, and Aram 2016; Hedding and Riffe 2016; Benson and Wood 2015; M. Miller and Riechert 2013; Hansen 2013; Harrington, Elliott, and Clarke 2012). Frames within news coverage affect public perceptions by “defin[ing] problems”, “diagnos[ing] causes”, “mak[ing] moral judgments”, and “suggest[ing] remedies” (Entman 1993, 52). Framing determines which information is delivered and which information is left out, emphasizing certain aspects of issues. For instance, the dominant framing of the Chernobyl nuclear incident in 1986 as an ‘accident’ in news reporting, describing it as a “freak accident” or “one in a million technical blunder” (Allan, Adam, and Carter 2013, 7), came at the cost of providing comprehensive information about potential systemic causes and consequences. On a similar note, Rubin (1980, as cited in Griffin and Dunwoody 1997) found that media coverage of the Three Mile Island leak so heavily used an accident frame that scientific information and knowledgeable sources were often pushed out.

Risk assertion framing, which explicitly claims or denies the existence of risks, can precipitate the provision of information in environmental reporting because the frame inherently requires scientific information to support claims-makers’ assertions (Chu and Yang 2020; Pjesivac, Hayslett, and Binford 2020). Griffin and Dunwoody (1997) found a positive association between adopting a risk frame and including scientific information in news articles about environmental issues. This suggests that
journalists are more likely to seek and convey scientific information that backs up risk assertion claims. However, risk framing is not common in environmental news. Sandman (2017) found in their analysis of environmental risk news stories that nearly 70% of articles did not discuss any risk information but focused more on conflict, blame, cost, and other immediate issues associated with the specific events being covered. Major and Atwood’s (2004) content analysis found a similar result; 63% of the news stories they examined did not mention risk within the context of the environmental issues. Kristiansen’s (2017) literature review of studies about media coverage of nuclear energy across countries suggests that the tendency to focus on immediate events rather than scientific information continues. Most media reports focus on the dreaded image of nuclear accidents rather than the probable benefits and detriments of the technology based on scientific information (Kristiansen 2017). A possible reason for the dearth of risk framing is that claims-making about environmental risks involves scientific uncertainty around the connections between present risks and future harms. It is challenging to acquire expertise on risks and translate the language of risk probability and likelihood into news content (Hansen 2013).

3. Research Design

3.1 Research Question

This paper builds on previous research to better understand how local news media covers environmental risks and what factors contribute to the inclusion of scientific information in that reporting. In particular, it examines the relationships between claims makers, the inclusion of explicit risk claims, and the inclusion of scientific information in environmental news stories.
Based on the literature, we hypothesize that there is a positive relationship between the inclusion of specific risk claims and the provision of scientific information; and that government officials are more likely to use scientific information in their claims than other claims-makers.

3.2. Case: Radford Army Ammunition Plant

The Radford Army Ammunition Plant (RAAP), located in Radford, Virginia, is the case study used for this analysis. The RAAP is an interesting and important case because it is the largest point source of toxic releases in the Commonwealth of Virginia, and has been since at least 2001 (U.S. Environmental Protection Agency 2021b).

The RAAP is a propellant-manufacturing facility for the U.S. Department of Defense, built in the 1940s to meet military ammunition requirements during World War II. Today, the plant is the only active military propellant manufacturing facility in the country. The RAAP is a major employer in the New River Valley region, with approximately 1,800 employees (Moxley 2021).

According to the U.S. Census Bureau’s American Community Survey (2014-2018), as reported through the EPA’s EJSCREEN, which is a screening tool that provides demographic profiles of the areas surrounding EPA-regulated facilities, about 29,214 people live within a 5-mile radius of the plant (U.S. Environmental Protection Agency 2021a). 89% of the population is white, and 96% are English-only speakers (U.S. Environmental Protection Agency 2021a), reflecting very low racial and ethnic diversity. Per capita income within that 5-mile radius was $25,950 in 2018, which is lower than the national average of $32,621 (U.S. Environmental Protection Agency 2021a; U.S. Census Bureau 2020) Employment in the three adjacent municipalities (the City of Radford, Pulaski County, and Montgomery County) is dominated by the
Government (28%) and Manufacturing (17%) sectors (Virginia Employment Commission 2019).

According to the plant’s own community relations plan released in 2004, more than 40% of community members interviewed (13 out of 30) said that their primary source of environmental information regarding the plant is conversations with RAAP staff and contractors, followed by news media (12 out of 30) (WPI 2004). While it is hard to generalize from those interviews due to the small sample size and time that has passed since they were conducted, these findings suggest that the neighboring communities considerably rely on informal and interpersonal communication channels when it comes to making sense of environmental issues associated with the RAAP facility.

The RAAP has been the top polluter in Virginia since 2001 (U.S. Environmental Protection Agency 2021b). According to the Virginia Toxics Release Inventory (TRI), the plant released 9.23 million pounds of chemicals in 2019, accounting for 33.7% of Virginia’s total release to the air (fugitive and stack), water, and land (Virginia Department of Environmental Quality 2021). The majority of chemicals released on-site are nitrate compounds (9.1 million pounds). The plant’s EPA Risk Screening Environmental Indicators (RSEI) score, which integrates surrogate dose data with toxicity weighting and the demographic characteristics of the surrounding area, was 1,972,476 in 2019. This score is exceptionally high compared to the national security industry median (33), Montgomery County median (313), Virginia median (9), and U.S. median (14) (U.S. Environmental Protection Agency 2019). The extreme difference between the risk score of the RAAP and the state and national medians is in part because a very small proportion of the TRI reporting facilities account for most of the environmental risks. In the last 13 years of TRI-reported data (2007-2019),
approximately one-third of TRI facilities have risk scores of zero, despite chemical releases, while only 2.3 percent of facilities, including the RAAP, have risk scores of over 1 million (U.S. Environmental Protection Agency 2020). Nonetheless, it is clear that the RAAP is a major source of pollution.

In addition to underreporting their emissions prior to 2008 (Hammack 2008), the RAAP has a history of repeated violations of environmental permits. An article published in ProPublica in 2017 investigated the enforcement history of the plant through a Freedom of Information Act request and found that hazardous waste permit limits were violated at least 50 times between 1980 and 2017 (Lustgarten 2017). While planning is underway for a new incinerator, the plant successfully renewed its permit in 2021 for the open burning of waste, which is conducted roughly 2 miles away from a local elementary school (Hammack 2021; Lustgarten 2017).

Despite the seemingly high potential risks associated with the plant, more than 50% of the 451 respondents from the area that participated in a survey conducted as a part of a Virginia Tech Appalachian Community Research class said that they do not have any concerns about the RAAP and have trust in its risk management (Adams 2019). These favorable attitudes toward the plant may be associated with its history and stature as one of the primary employers in the region, employing over 23,000 workers at its peak during World War II (BAE Systems n. d.; Lustgarten 2017; WPI 2004). Positive perspectives on the RAAP may also be associated with the tone and tenor of news reports covering the plant’s environmental issues, given that news articles were identified as a primary information source for residents. This case study of the RAAP provides an opportunity to empirically explore the relationships between news media, community, and a facility that is a major source of local environmental risks.
3.3. Data Collection

This study uses individual full news articles as the unit of analysis. We conducted an extensive search to collect news articles reporting on environmental issues associated with the RAAP. We used a search string that included different combinations of words, including the plant’s old name, in order to exhaustively capture all news articles about the plant while excluding irrelevant ones to the degree possible: “Radford Army Ammunition Plant” OR “Radford Army Plant” OR “Radford Ammunition Plant” OR “Radford Arsenal.” News articles from 2000 to 2019 were gathered from a comprehensive newspaper database providing web-based access information (Access World News from News Bank).

This initial scan yielded 2,315 results. Approximately two-thirds of the articles mentioning the plant were removed because they were either syndicated news or duplicated online versions. We then manually removed articles irrelevant to the plant’s environmental issues, such as articles referring to the plant as the former employee’s previous career, or a landmark to locate other places such as the City of Radford (e.g., ‘Radford is home to the Radford Army Ammunition Plant’), habitats of fauna and flora, deer hunting, other community events, car accidents, articles related to the military bases without the plant-specific information, and articles about the plant’s union.

One hundred sixteen relevant articles were ultimately identified for further inclusion in the analysis. We developed a codebook based on three essential elements of news articles identified through the literature review and two basic elements: the inclusion of scientific information claims-makers, types of risk frame, the number of words, and publishing year. The codebook was further revised based on a pilot review of 12 randomly chosen articles. The codebook is attached as an appendix. After the codebook was confirmed, one of the researchers conducted manual coding on all 116
articles. Coding reliability is deemed acceptable even with a single coder because of all of the coding variables that have only two possible states sharply differentiated (McHugh 2012). Furthermore, all articles were coded on three separate occasions to ensure intrarater reliability with a six-month gap between the first and second, and one-year gap between the second and third round. During the second coding round, the category of claims-makers was modified due to one of the claims-makers type lacking across the articles. During the third round of coding, a few more articles were added as we decided to extend the timeframe from originally ending mid-December in 2019 to the full December 2019. Between rounds 2 and 3, 98% of the articles (112 out of 114, 2 articles added in round 3) were coded in the same way. The remaining 2% discrepancy is attributable to the expanded definition of one code. This is within the percent agreement of the minimum accepted reliability lever for intercoder reliability (Lombard, Snyder-Duch, and Bracken 2002). A news article was coded as ‘including scientific information’ if it refers to scientific information and data to support claims. We define scientific information as any scientific context that assists the public understanding of environmental issues portrayed in news articles. It will be difficult for the public to fully grab environmental issues if journalists only report confrontations between the plant and community members over certain chemical discharges without the potential health impact of those chemicals. Therefore, the inclusion of scientific information here broadly ranges from simplistic descriptions of causal-relationships, such as ‘It is generally known that exposure to lead compounds produced can cause serious health problems,’ to detailed scientific explanations mentioning academic research. For example, when an article attributes the claim that there is no risk of chemical materials migrating off the RAAP site to specific research studies.
Another example is an article reporting that the plant is the largest polluter in the Commonwealth, citing the DEQ’s TRI data. Articles were also coded as including scientific information when they mention the types of chemicals. An example of an article coded as not including scientific information is one that reports a claim that there is no risk of an accidental chemical leak without providing any source to support that assertion such as details about the type or quantity of leakage.

Articles were also coded according to the claims-makers quoted. Any article could have multiple claims and claims-makers. We used Robinson’s (2002) typology of four groups of claims-makers appearing at the community level around local environmental issues: community activists, the news media, local corporate interests, and governmental officials. Although all four categories were used initially, only community activists, local corporate interests (the Radford Army Ammunition plant in this case), and government officials (Virginia DEQ) have appeared as claims-makers with representative numbers of claims. The news media rarely made independent claims (i.e., editorialized on issues of environmental impacts). Thus, while we believe that the news media still had significant influence in this case by selecting whose claims are reported and what topics are discussed, we ultimately are not considering them as separate claims-makers for our purposes.

Articles were also coded according to the types of risk assertion frames applied. In the scientific community, risk is often understood to be the probability of dangerous events that could potentially harm people (Slovic, Fischhoff, and Lichtenstein 1980). However, news articles typically do not frame risk this way; news reporting of environmental risks tends to translate those probabilities into more simplistic causal relationships that are clearer to the public. For instance, articles replace probability with simple adjectives such as high, moderate, or low instead of specific figures, or discard
the notion of probability altogether and only convey causal relationships like ‘air pollution causes asthma in children.’ Considering the unique nature of the risks reported in news articles, this paper uses Major and Atwood’s (2004) definition: risk means both actual and potential harm. Articles are coded as risk-claiming when those actual or potential harms are explicitly claimed to exist. Such claims are distinct from general scientific claims, which are coded as the inclusion of scientific information. Articles are coded as risk-claiming only when claims-makers clearly argue that such actual and potential harms exist in the case area. For instance, an article is coded as ‘risk-claiming’ when it includes claims made by community activists pointing out the potential health impacts associated with the plant’s discharge of toxic compounds. Another example is an article that reported findings from a drone test that revealed levels of metal compounds higher than established health standards in the smoke from the plant’s open burning.

Similarly, articles are coded as risk-denying when actual or potential harms are explicitly claimed not to be present in the region. For instance, the article about the accidental chemical leaks noted above is coded as ‘risk-denying’ because the plant spokesperson claims in it that there is no danger to anyone outside the plant. Another example of ‘risk-denying’ is a claim made by the RAAP that all of the plant’s discharges are permitted under the laws that create discharge limits that are protective of human health and the environment. It is also coded as ‘risk-denying’ when a scientist claims that the level of metals and volatile organic compounds in the air and soil downwind of the plant’s open burning site are lower than existing health-based standards.

3.4. Data Analysis

Coded articles were examined using exploratory analysis and logistic regression
models. The exploratory analysis provides a descriptive summary of how local news outlets report environmental risks, including how many articles reporting on environmental issues include scientific information, whose claims are reported, and what types of risk assertion frames are used.

In addition to the exploratory analysis, we employed a logistic regression model to estimate the relationships between predictors and the inclusion of scientific information in local news articles. Logistic regression models are used when dependent variables have dichotomous outcomes instead of continuous values. This model estimates two important factors influencing the inclusion of scientific information in environmental risk reporting: Claims-makers and risk frames. In our analysis, the dependent variable is the inclusion of scientific information, which is represented as 1 (including scientific information) and 0 (not including scientific information). Claims-makers and types of risk assertion frames are included as independent variables because claims-making and framing are core components of the social construction of environmental risks. We separate types of risk framing into claiming and denying to see if they have discrete relationships with the inclusion of scientific information.

The number of words is included as a control variable because articles tend to report more information when they are longer. We also considered whether an article was published before or after 2008, as environmental concerns about the RAAP have been raised more frequently and specifically since 2008, when the plant was initially identified as the top polluter in Virginia after rectifying prior underreporting (Hammack 2008).
4. Results

4.1. Summary Statistics

Only 35.3% (41 out of 116) of news articles reviewed include scientific information and data in their reporting on environmental issues associated with the RAAP (see figure 1). Some articles include more than one piece of scientific information, resulting in 51 instances across the articles reviewed.

Figure 1. Inclusion of scientific facts and information.

63% of the news articles reviewed include a claim or claims explicitly made by at least one claims-maker. As illustrated in figure 2, 44.8% of the articles include claims from the Radford Army Ammunition Plant and Army spokespeople. 32.8% include claims made by officials with the Virginia Department of Environmental Quality (DEQ). Only 25.0% include claims from community activists. 17.2% of the articles include claims from others, including unaffiliated local residents interviewed, various local officials and organizations (e.g., a member of the Montgomery County Board of Supervisors, an official at the Montgomery County Public Service Authority, the president of the Virginia Manufacturers Association, and a Blacksburg Mayor-elect), individual scientists including university scholars, and federal officials. 37% of the articles do not explicitly cite any claims-makers; most of those articles are short, briefly
reporting on events or announcements without including direct claims from claims-makers.

### Figure 2. Claims-makers quoted in news articles.

40.5% of the articles examined include claims explicitly asserting the existence or non-existence of risks, while 59.5% report on environmental issues without any risk assertions (see figure 3). Of those that do address risks, an equal number (11.2% each) include explicit claims that the RAAP’s environmental issues pose an actual or potential risk, or voices both asserting and denying risks. 18.1% of articles include claims that the issues pose no or very minimal risk to the general public.

### Figure 3. Risk assertion frame.
4.2. Binary logistic regression

Table 1 shows the statistical significance of individual regression coefficients. State officials as claims-makers is a significant variable (p<0.05) and the risk-claiming assertion is highly significant (p<0.001), both positively associated with the inclusion of scientific information. Community activists as claims-makers is a significant variable (p<0.05) negatively associated with the inclusion of scientific information. When an article includes claims made by state officials, it is 4.5 times more likely to include scientific information. When an article includes claims made by community activists, it is 84% less likely to include scientific information. The inclusion of claims from RAAP officials does not significantly associate with the inclusion of scientific information. When an article includes claims asserting the existence of environmental risks, it is 12 times more likely to include scientific information.

Table 1 Logistic Regression analysis on inclusion of scientific information (n = 116)

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Estimate</th>
<th>Standard Error</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Claims made by RAAP</td>
<td>0.5505</td>
<td>0.6028</td>
<td>1.734</td>
</tr>
<tr>
<td>Claims made by Community Activists</td>
<td>-1.835</td>
<td>0.7482</td>
<td>0.160**</td>
</tr>
<tr>
<td>Claims made by the State government</td>
<td>1.5047</td>
<td>0.6100</td>
<td>4.503**</td>
</tr>
<tr>
<td>Claims asserting the existence of risk</td>
<td>2.4808</td>
<td>0.7288</td>
<td>11.951***</td>
</tr>
<tr>
<td>Claims denying the existence of risk</td>
<td>1.2141</td>
<td>0.6598</td>
<td>3.367</td>
</tr>
<tr>
<td>Published after 2008</td>
<td>0.7718</td>
<td>0.7715</td>
<td>2.164</td>
</tr>
<tr>
<td>Number of words</td>
<td>0.0031</td>
<td>0.0010</td>
<td>1.003***</td>
</tr>
<tr>
<td>Intercept</td>
<td>-3.9510</td>
<td>0.7084</td>
<td></td>
</tr>
</tbody>
</table>

Note: **significant at p < 0.05; ***significant at p < 0.01.
5. Discussion

The way news media reports on local environmental risks plays an important role in shaping public perceptions of those risks. This study analyzed environmental news reporting on the largest point source of pollution in the Commonwealth of Virginia, the Radford Army Ammunition Plant (RAAP).

Only about a third of the news articles on environmental issues associated with the RAAP (35%) examined in this study include scientific information. This relative dearth of scientific information is somewhat surprising, given that environmental issues, including those associated with the RAAP, are typically scientific in nature. The lack of scientific and technical information on environmental risks in the news media could jeopardize public understanding (Reed, Hiles, and Tipton 2019; Romps and Retzinger 2019; Boykoff 2005). It may suggest that the consumers of such stories are not being provided comprehensive and scientifically-grounded coverage of the issues purportedly being reported upon. Environmental reporting may be improved through the provision of more accessible scientific and technical information, and through increased scientific literacy and expectations among the public that such information will be present.

Previous studies have found that governments and corporations are preferred sources of environmental claims due, at least in part, to their ability to organize and pre-package scientific information, which is often not as easy for ad-hoc and community organizations (Duan and Miller 2021; Comfort, Tandoc, and Gruszczynski 2020; Hedding and Riffe 2016; Benson and Wood 2015; Takahashi and Meisner 2013). Our findings further underscore this; 32.8% and 44.8% of the articles include a claim or claims made by the Virginia Department of Environmental Quality (DEQ) and the Radford Army Ammunition Plant, respectively. It is clear that journalists heavily rely on government and corporate sources when reporting on environmental risks. However,
this may not necessarily reflect the ability to provide scientific information. Our logistic regression shows that when articles quote claims made by the Virginia Department of Environmental Quality (DEQ), they are 4.5 times more likely to include scientific information. Meanwhile, quoting claims made by the Radford Army Ammunition Plant does not make a significant difference. This shows that there might be a gap between the perceptions of corporations as eloquent scientific information providers and the actual use of their scientific claims. However, it is difficult to conclude it with the case of a single facility.

The DEQ is a key regulatory agency overseeing the RAAP, as well as the major producer of scientific information regarding the plant’s environmental risks, including the TRI data and quarterly lead concentrations monitoring. The department also plays an intermediary role in providing information about the plant by posting and translating scientific documents about the RAAP’s risks on its website. For instance, the department’s website provides answers to frequently asked questions about the plant’s open burning, which cannot be found on the plant’s own website. Another example is a technical report about the multi-pathway risk assessment of the plant’s incinerators (BAE Systems 2020) posted on the DEQ website. While RAAP operator BAE Systems prepared and revised the technical document, the DEQ is the agency that reviewed it, asked for revisions, approved it, and posted it for public access. State officials and documents are the major claims-makers providing scientific information, even when generated by the plant.

In contrast, the logistic regression found that articles including community activists’ claims are 84% less likely to include scientific information. This does not necessarily mean that community activists are less scientific or default to non-scientific claims by choice. Community activists in the area have regularly proposed the
installation of air and drinking water monitors at the local elementary school to investigate the impact of chemical releases and open burning (Gangloff 2017; Mastrangelo 2017). This suggests that they are very aware of the importance of scientific information to the understanding and addressing of environmental risks but do not have access to the information or the capacity to produce it by themselves.

Unequal access to scientific information—or the means to generate it—may be rectified through the provision of scientific assistance or support for community activists. There is significant room to improve the ability and capacity of stakeholders—and in particular community groups—to contribute scientific and technical information, which can both generate new data and richer understandings and elevate such organizations’ voices given the journalistic norms of pursuing factuality and neutrality. More robust community or citizen science programs could go a long way toward helping groups to generate the scientific information necessary to advance their advocacy work. Involving community members and organizations can expand discussions about scientific evidence, generate new data, and contribute to evidence-based decision-making (Riesch and Potter 2014; Elwood and Ghose 2001). A study examining citizen science initiatives found that well-designed processes for involving communities and providing resources to assist them are vital in generating scientific information and impactful results (Cox et al. 2015).

However, an increase in the provision and sources of scientific and technical information in news media may not be sufficient if the overarching goal is to not only improve public understanding but also provide venues for deliberation and sense-making. In fact, a laser focus on increasing technical information may have unintended negative consequences; if the conveyance of scientific information becomes the sole best criterion for evaluating environmental news, it may come at the cost of the already
unequal access other claims-makers have to news coverage. Beyond its role in conveying ostensibly factual information from government agencies and other stakeholders to the broader public, the media plays a critically important role as an arena for indirect and public deliberation among actors (Peters 1994). That is, the media must balance its roles in fostering both more informed and democratically-derived perceptions of environmental risks. This underscores the tug-of-war between the informing and public arena functions of journalism on environmental risks.

A re-examination of the centrality of traditional environmental risk frames could also contribute to improving the real-world risk communication reflected in news coverage by altering journalistic practices and activists’ strategies. In this study, articles are 12 times more likely to include scientific information when they explicitly assert the existence of environmental risks. This concurs with previous studies’ conclusions that adopting risk frames correlates with the inclusion of scientific information in environmental news reports. When environmental news is framed as a story of risk, reports are more likely to concentrate on explaining the wider background and implications of those risks while, in contrast, when framed as an accident story coverage is more likely to focus on what happened in the immediate course of the incident (Ryan, Dunwoody, and Tankard 1991). The application of a risk lens by the media can precipitate more comprehensive and informative coverage of issues associated with environmental risks.

However, as noted previously, community activists, such as those concerned with the RAAP, are more likely to be under-resourced, and thus could be excluded from news coverage if risk frames are adopted, even though they are the major claims-makers asserting the existence of those risks. Instead of adopting a risk frame in an evidential way to prove how risky a situation is, community activists and other under-resourced
claims-makers could use alternative or overlapping frames to draw attention to risks. Corner, Richardson, and Fenton (1990) found that audience responses to media messages about nuclear power are informed by not only the evidential frame, assessing arguments and evidence, but also other overlapping interpretative frames, including the civic frame, which judges according to balance and fairness. In other words, claiming risks does not always have to be underwritten with scientific evidence to prove those risks. Even if the RAAP’s discharge of toxic chemicals is within regulatory standards, procedural violations, unreliable actions, and insufficient communication efforts may still be framed as potential threats by overlapping risk and civic frames.

Overall, the findings of this study largely concur with the findings of previous studies on governmental and risk frames. This study is significant in adding an empirical case to the small number of existing studies about the coverage of environmental risk in the news media. In addition, the results of this study give researchers caution that focusing on the provision of scientific information in the media to foster better public understanding can come at a cost, particularly when there is a lack of well-established environmental organizations or the capability of communities to access and produce risk knowledge. The disparities between governmental and industry claims-makers and community groups in their ability to generate scientific information imply that enhancing risk information in the media could stymie the inclusion of community voices and diverse perspectives.

One limitation of this study is that we cannot establish causality. In particular, we cannot verify whether journalists explicitly seek scientific information and obtain it most readily from the government, or seek information from governments and that happens to be scientific information. That is, are government officials often regarded as the most creditable and reliable sources due to the nature of their claims providing
scientific information and evidence, or are they inherently viewed as more credible and happen to provide information that is scientific in nature? This limitation suggests a need for future studies that include qualitative interviews with environmental journalists to better understand their practices when reporting on environmental risks.

Furthermore, news coverage of scientific information is seemingly affected by a variety of journalistic elements ranging from macro-level factors, such as ownership and cultural atmosphere, to micro-level factors, such as the practices of particular journalists (Hansen 1994). Understanding how journalistic factors and the provision of scientific information on environmental risks are intertwined can support better risk communication through the media.

Future research is also needed to identify the needs of community activists and organizations to increase their access to scientific and technical information or the ability to generate that information. Better knowledge of how to support claims-makers who are pushed out of the news representation of scientific arguments can benefit public communication and understanding of environmental risks by strengthening the role of media as a venue for both knowledge-building and social deliberation.

References


radford-arsenal-commander-says-his-emphasis-will-be-on-safety/article_43174ae6-c495-11eb-adb6-b38f257e1eab.html.


Poornananda, D. S. 2022. *Environmental Journalism: Reporting on Environmental Concerns and Climate Change in India*. New Delhi, India ; Thousand Oaks, California, USA ; London, United Kingdom ; Singapore: SAGE Publications India Pvt Ltd.


## Appendix A. News Article Codebook.

<table>
<thead>
<tr>
<th>Code Name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inclusion of scientific information</strong></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>The claims made in the article refer to scientific information and data</td>
</tr>
<tr>
<td></td>
<td>1. Reference to general scientific knowledge or facts about causal relationships</td>
</tr>
<tr>
<td></td>
<td>2. Reference to data</td>
</tr>
<tr>
<td></td>
<td>3. Reference to scientific studies/literature</td>
</tr>
<tr>
<td></td>
<td>4. Reference to expert knowledge</td>
</tr>
<tr>
<td></td>
<td>5. Any other scientific information</td>
</tr>
<tr>
<td>No</td>
<td>None of above</td>
</tr>
<tr>
<td><strong>Source of scientific information</strong></td>
<td></td>
</tr>
<tr>
<td>Expert interviews</td>
<td>Scientific information provided by interviews from individual experts</td>
</tr>
<tr>
<td>Academic research</td>
<td>Scientific information cited from academic literature</td>
</tr>
<tr>
<td>Government announcements &amp; publications</td>
<td>Scientific information provided by government officials’ interviews, announcements, and publications</td>
</tr>
<tr>
<td>Other</td>
<td>Other sources of scientific information</td>
</tr>
<tr>
<td>Missing</td>
<td>No explicit source</td>
</tr>
<tr>
<td><strong>Claims-makers</strong></td>
<td></td>
</tr>
<tr>
<td>Radford Amy Ammunition Plant</td>
<td>The article quotes claims made by the Radford Army Ammunition Plant: Plant spokesperson, plant officials, plant operating company</td>
</tr>
<tr>
<td>Virginia State Government</td>
<td>The article quotes claims made by the Virginia Department of Environmental Quality</td>
</tr>
<tr>
<td>Community Activists</td>
<td>The article quotes claims made by community members who claim themselves as community activists or those who affiliated with</td>
</tr>
<tr>
<td>Other</td>
<td>The article quotes claim from claims-makers other than the plant, State government, and community activists</td>
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</tr>
<tr>
<td><strong>Risk assertion</strong></td>
<td></td>
</tr>
<tr>
<td>Risk-claiming only</td>
<td>The article includes claims asserting the existence of any actual or potential harm posed by the plant</td>
</tr>
<tr>
<td>Risk-denying only</td>
<td>The article includes claims denying the existence of any actual or potential harm posed by the plant</td>
</tr>
<tr>
<td>Both claiming and denying risk</td>
<td>The article includes both claims asserting risk and denying risk</td>
</tr>
<tr>
<td>No claiming</td>
<td>No risk claims made in the article</td>
</tr>
<tr>
<td><strong>Etc.</strong></td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>Date of the article published</td>
</tr>
<tr>
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</tr>
<tr>
<td>Headline/title</td>
<td>Headline/title of the article</td>
</tr>
<tr>
<td>Author</td>
<td>Author of the article</td>
</tr>
</tbody>
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