



Policy framing in the press: analyzing media coverage of two flood disasters

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Abstract

Disasters focus public and political attention on environmental hazards, creating a window of opportunity to adopt new risk reduction policies. The news media can shape post-disaster policy debate by directing the attention of policymakers towards problems and solutions and framing the nature of support or opposition to policy change. For these reasons, scholars have devoted increasing attention to the policy influence of the media over public policies to address hazards, particularly floods. However, the nature of news media coverage following flood disasters is largely unexplored in Canada. Through a content analysis of newspaper coverage around two of Canada's most significant floods, this paper examines whether and how the media frame flooding as a policy problem. The results reveal that the Canadian media are focused more on the short-term impacts of hazards than on the policy problems that underpin flood risk. In addition, the study confirms relationships found in previous research between media content and the substance of policy discussions, which could inform a broader multijurisdictional comparison of media coverage and hazard policy.

Keywords Climate change · Content analysis · Flood · Media · Public policy

Introduction

In his extensive analysis of disasters and the policy process, Birkland (1997) demonstrated that media coverage of disasters can provoke questions about the adequacy of public policies intended to protect people and property. Heightened public and political attention in the post-disaster period offers a

short window of opportunity for advocates to propose alternative policies and lobby for policy change (Solecki and Michaels 1994; Johnson et al. 2005). When these efforts are successful, post-disaster policy change can range from a minor recalibration of instruments used to achieve objectives (e.g., additional funding for disaster preparedness), or a major, fundamental redesign of policy goals (e.g., shift from response-centric disaster management to a prevention-oriented model) (Sapat et al. 2011; Smith et al. 2017).

News media can influence both the likelihood and substance of post-disaster policy change, by shaping public discourse, framing issues in ways that focus the attention of policymakers on particular problem definitions and solutions, and activating constituencies that support or oppose new policy proposals (Soroka 2002; Kingdon 2003; Entwistle and Enticott 2007). Uncertain about how to respond to disaster events, policymakers are susceptible to the narratives and arguments propagated by the media, and their policy choices (including whether to act at all) are influenced by media framing of the urgency and solubility of the problem (Kaufmann et al. 2016; Valencio and Valencio 2018).

Flooding is the costliest and most common natural hazard in Canada, accounting for about 80% of disaster financial assistance costs (PBO 2016; Burn and Whitfield 2018). For

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many years, scholars and practitioners have advocated for a strategy of integrated flood risk management (FRM) that would reduce exposure and vulnerability to flood hazards, encourage individual and community flood resilience, and invest in actions that mitigate flood impacts on people and property (de Loë 2000; Shrubsole 2000; Kumar et al. 2001). Despite several flood disasters in recent years, however, there has been little discernable change in national or provincial flood management policies, which remain focused narrowly on structural defenses and post-disaster recovery assistance, with comparatively less attention paid to risk reduction strategies (Henstra et al. 2019; Jakob and Church 2011).

Analysts have identified several factors that have contributed to this apparent policy inertia, including an absence of political leadership among the federal and provincial governments (Oulahen et al. 2018), path dependence rooted in early flood prevention decisions that prioritized engineered controls (Shrubsole 2013), and a lack of public awareness of hazard-related risks, which is linked to weak political demands for prevention (Henstra and McBean 2005). One factor that has been largely unexplored in Canada, however, is the nature of news media coverage following flood disasters.

The purpose of this paper is to examine whether and how the Canadian news media frame flooding as a policy problem, as a means to measure their influence over flood management policy. It presents the results of a content analysis of newspaper coverage around two major floods, which involved coding for elements that previous studies have found to be important for influencing policy change.

The paper begins with a review of existing research on the media in the policy process, with a focus on disasters. The second section introduces the paper's methodology, and this is followed by the study results. The fourth section discusses the study's contribution to research on media and public policy and highlights implications for flood management in Canada.

The media and public policy

The news media influence the policy process in two principal ways (Crow and Lawlor 2016). First, by selectively highlighting a small number of issues (and not others), the media influence public opinion about what is important and focus the attention of policymakers on particular problems (McCombs and Guo 2014). If the media cover an issue extensively, it is generally assumed by policymakers and the public to be of some societal importance (Scheufele and Tewksbury 2007). Moreover, even if individuals lack knowledge about it, an issue's prioritization by the media combined with the frequency of coverage creates a "transmission of salience" that generates a sense of urgency to act (McCombs 1997).

Selective media coverage can prompt policymakers to add new issues to the agenda, particularly when advocacy

coalitions cite media attention in support of their interests and engagement strategy (Sabatier and Weible 2007). The media can also increase attention to issues already under active consideration by governments, thereby raising their relative priority on the agenda (Jones and Wolfe 2010). Indeed, increased attention has been shown to influence the agenda of major decision-making authorities such as the U.S. Congress and presidency (Jones and Baumgartner 2005).

Second, the media frame issues in ways designed to give them meaning and salience, emphasizing certain attributes in order to persuade audiences to understand them in a particular way (Entman 1993; McCombs 2004). Attributes of policy problems—causality, complexity, severity, novelty, and so on—are contested, in that actors propose measurements of these attributes that accord with their own interests and biases. As such, policy problems are socially constructed through public discourse, and the news media are central in both reflecting and shaping this discourse (Rocheffort and Cobb 1994; Peters 2005; Rose and Baumgartner 2013). Media framing also influences public opinion and attitudes. Bengston et al. (1999), for example, found that public opinion was generally congruent with media framing of U.S. National Forest policy, and Delshad and Raymond (2013) found that a change in media framing of biofuels (from positive to negative) influenced public attitudes, which shifted from support to opposition over time.

Media frames also shape perceptions about both the causes of policy problems and the efficacy of potential solutions, which narrows the scope of policy debate and can influence both the scope and nature of a government's policy response (Borquez 1993; Tewksbury et al. 2000). Korn et al. (2003), for instance, argue that the predominant framing of gambling as entertainment emphasizes its benefits (e.g., tourism; employment), thereby limiting the scope for public policy intervention, whereas an alternative framing of gambling as a public health issue would expand the scope for public policies to address its negative social and economic impacts. Similarly, Fifer and Orr (2013) examined how the framing of wildfires differed in the USA and Canada following a massive blaze in Yellowstone National Park, and demonstrate that this difference in problem definition led to disparate policy changes in the two countries.

Based on existing scholarship, media narratives are more likely to influence public policy when they incorporate certain content. First, media stories that *define an explicit policy problem* associated with a hazard, such as inadequate land-use planning or poor emergency preparedness, are more likely to influence policy change because they focus the attention of policymakers on a concrete gap that must be addressed (Jones et al. 2014). This definition of the policy problem is most conducive to policy change when it is discussed in the immediate aftermath of the disaster because public attention is focussed on the event (Olshansky and Chang 2009).

Second, *ascribing the definition of the policy problem to a particular stakeholder* (such as a flood victim or government official) makes a media narrative more compelling to policymakers than one in which a problem definition is not attributed, because policymakers pay greater attention to claims grounded in experience or expertise (Howland et al. 2006; Happer and Philo 2013). Third, *presenting credible evidence* is critical to substantiate and justify policy-relevant claims (Howland et al. 2006), so media narratives that cite scientific evidence or data to support a problem definition are more likely to influence policy than those that do not (Crow et al. 2017). Fourth, *articulating a policy solution* increases the likelihood that a media narrative will influence policy, particularly in the aftermath of a disaster, because policymakers tend to gravitate towards popular ideas when faced with uncertainty but also a sense of urgency to act (Smith et al. 2017).

A fifth factor that influences the impact of media narratives on public policy is the way in which they frame risk, because this can shape public perceptions of risk and subsequent demands for policy change (Wählberg and Sjöberg 2000; Boholm 2009). For instance, how the media frame the *urgency* of flood risk—specifically, whether it is increasing—can influence the sense of gravity to address the problem. Another dimension of this issue framing is *solubility*: media stories that argue or imply that humans are capable of reducing flood risk through policy or political actions are more compelling for policymakers than those that frame flood risk as the inevitable result of living with nature (Rochefort and Cobb 1993; Donaldson et al. 2013). Similarly, media stories that frame flood risk in terms of *personal efficacy*—by providing information that would enable a property-owner to reduce their flood risk, for example—support policy changes that encourage sharing risk with individuals, which is one of the central tenets of contemporary flood risk management doctrine (Sayers et al. 2013; Escobar and Demeritt 2014).

Finally, media narratives that link a flood disaster to climate change have greater potential to influence policy change, because they portray an individual event as indicative of a broader pattern, rather than an anomalous occurrence, thereby justifying policy intervention. Moreover, stakeholders are more likely to attribute blame and responsibility for a hazard that appears to be linked to long-term and structural causes, and therefore to demand policy change (Crow et al. 2017). Linking a flood disaster to climate change can also increase the likelihood of policy change by activating a larger constituency of stakeholders beyond those immediately affected by the hazard and by suggesting the risk will increase, which creates a sense of urgency (Escobar and Demeritt 2014). These “issue expansion” dynamics are typical in the aftermath of a dramatic event such as a disaster, as pro-change advocates seek to mobilize public opinion in support of their preferred

policy response (Sharp 1994; Boin et al. 2009). Indeed, in their analysis of media coverage of the 2011 Brisbane floods in Australia, Bohensky and Leitch (2014) found that stories that incorporated climate change were also more likely to discuss responsibility and policy solutions.

In summary, existing research suggests that policy change following a flood disaster is more likely when media narratives (1) identify a specific policy problem and solution justified with evidence in the immediate aftermath of the disaster, (2) frame the risk associated with flooding as urgent, soluble, and reducible through personal actions, (3) attribute a claim or argument in support of policy reform to a specific stakeholder, and (4) make a link to climate change. These assumptions provided the point of departure for the current study, which sought to analyze media coverage before, during, and after two flood disasters in Canada. The next section describes the study’s research design, data collection methods, and logic of analysis.

Methods

The study involved a content analysis of newspaper coverage of two of Canada’s most damaging flood events, which occurred at almost the same time in 2013. The Southern Alberta floods (June 19–July 12) and the Greater Toronto Area (GTA) floods (July 8–9) affected several communities in the two provinces, including the major cities of Calgary and Toronto (Statistics Canada 2017). These events were selected because they both meet the definition of a focusing event, in that they occurred suddenly, their impacts were concentrated in a particular geographical area, and their dramatic images were witnessed by policymakers and the public simultaneously (Birkland 1998). The effects of the events were notable at the time since they represented the country’s most costly floods to date (Calamai and Minano 2017). As such, these events created issue attention among stakeholders such as water managers, emergency responders, planners, and disaster relief organizations, and this increased attention seemed likely to support policy change that would mitigate future flood impacts and increase individual and community flood resilience.

Content analysis has long been used to explore relationships between variables by making inferences about specific message characteristics in text (Holsti 1969). The method is widely used to identify patterns of policy-relevant communication in media stories, journal articles, hearings, government documents, speeches, websites, and interview transcripts (e.g., Breeman et al. 2009; Lawlor 2015; Bennett and Manoharan 2017; Divay and Micheau 2017). In this study, manual coding was used, rather than computer-assisted coding, because it allowed the researchers to develop familiarity with the material, and therefore conduct a thorough examination of how the policy is discussed (Weber 1990; Pennebaker et al. 2003).

Newspaper articles were used as the data source for the content analysis, which is consistent with existing research on media coverage of disasters. These data are accessible, offer a wide range of views based on a multiple sources of information, and provide thorough coverage of the impacts on affected areas (Carvalho 2008). One notable limitation of newspaper data, however, is potential selection bias introduced by editorial decisions that favor “newsworthy” items, which typically include more controversial or intense events. Newspapers can also misrepresent or omit stories based on the time constraints involved in collecting information and the biases of individual reporters (Earl et al. 2004). To minimize these limitations, the sample was drawn from both regional and national newspapers, covered two distinct flood events, and two different parts of the country.

Factiva was used to collect articles published by three Canadian newspapers, which were selected because they are the most widely circulated daily newspapers in Calgary (*Calgary Herald*), the GTA (*Toronto Star*), and Canada (*Globe and Mail*), respectively (Cision 2018). We included both national and regional newspapers, with the expectation that coverage could differ based on their geographic scope. For instance, we expected that flood-related stories in the *Globe and Mail* (national) might focus on flood impacts as a national problem (e.g., total costs, total population displacement) and contain a general call for a public policy response. By contrast, we expected that flood-related stories in the regional newspapers (*Calgary Herald* & *Toronto Star*) might include more specific policy-relevant narratives, pointing to regional events as evidence of flooding as an urgent problem. Following the precedent of Crow et al. (2017), articles covered an 18-month timeframe (October 1, 2012 to March 31, 2014)—8 months before the Southern Alberta and GTA floods, and 10 months following the floods—in order to capture the evolution of policy narratives over time, since advocates supporting change typically emerge after the immediate response to the disaster.

To find relevant articles, we conducted three independent searches of the Factiva database: (1) *Calgary Herald*, search terms “Calgary” AND “flood” OR “flooding”; (2) *Toronto Star*, search terms “Toronto” AND “flood” OR “flooding”; and (3) *Globe and Mail*, search terms “Toronto” OR “Calgary” AND “flood” OR “flooding.” These searches resulted in 3,647 articles across the three newspapers. To reduce the size of the dataset to a manageable number and maximize the relevance of articles that would be analyzed, two researchers conducted an initial scan of all the articles, discarding those that did not focus primarily on flooding or flood issues relevant to the Southern Alberta and GTA disasters (e.g., the word “flood” was used as a figure of speech). The final dataset comprised 1,108 news articles (Table 1). We acknowledge the disproportionate distribution of articles between region and publisher and examine any variation

Table 1 Number of selected articles and publication date

Newspaper	Article count by publication date		
	Pre-flood Oct 2012 to May 2013	Post-flood June 2013 to March 2014	Total count
Calgary Herald	10	877	887
Toronto Star	9	61	70
Globe and Mail	3	148	151
Total count	22	1,086	1,108

between the results accordingly. Of the news articles analyzed, 1,005 (90.7%) are coverage of Alberta flooding, 84 (7.6%) are coverage of the Greater Toronto Area (GTA) flooding, and 19 (1.7%) refer to both. Second, of the newspaper sources analyzed, 887 (80.1%) are from the regional *Calgary Herald*, 70 (6.3%) are from the regional *Toronto Star*, and 151 (13.6%) are from the national *Globe and Mail* (Table 1).

An initial codebook to identify and classify media narratives was adapted from existing research that used content analysis to examine media coverage of disasters (Heikkilä et al. 2014; Bohensky and Leitch 2014; Escobar and Demeritt 2014; Crow et al. 2017). The codebook was then pre-tested and modified four times in order to establish inter-rater reliability. The final codebook contained 25 items (including sub-items), of which seven covered basic information about the article (e.g., date; publisher), thirteen had binary responses about the content of the article, and five were open-coded answers. The codebook contained variables such as whether an article identified an explicit policy problem or specific solution, whether and what evidence is cited to support policy claims, how flood risk is framed (e.g., urgency, solubility, personal efficacy), whether accountability for flood management is assigned to a particular actor, and whether flooding is related to climate change in some way (e.g., confirming or denying a link, or expressing uncertainty about the relationship). In addition, if the article was found to define an explicit policy problem, then coders recorded whether this definition was ascribed to a set of mutually exclusive actor categories (e.g., municipal government, flood victim) who would be likely to support a change in policy. Each of these coding items was structured as a binary response (0 or 1) except for the identification of stakeholders when a policy problem was found.

To establish inter-rater reliability, two researchers applied the codebook to the same set of randomly selected 40 articles, after which they met to discuss the results and resolve problems such as lack of clarity and specificity in the coding items. After refining the codebook four separate times and coding a total of 160 randomly selected articles (~ 14.4% of the dataset), inter-rater reliability was established using Cohen’s

Kappa, a commonly used measure of the degree of consensus between coders (Hallgren 2012). The score ($K > 83\%$) was considered “substantial” based on foundational research on this topic (Landis and Koch 1977).

Results

This section describes the key results of the study, including evidence of narratives that discuss policy problems, the stakeholders involved in defining those problems, the urgency and solubility of flood risk and individual capacity to manage it, and relationships between flooding and climate change. Statistical tests including chi-square and Cramer’s V were also conducted to measure the relationships between key variables. In instances with an insufficient sample size for chi-square, the Fisher’s exact test (FT) was used.

Policy problems and flooding

The codebook defined an “explicit policy problem” as a clear statement of action required by government or other stakeholders, which is identifiable to a lay audience. Policy problems were found in 26% of the articles reviewed, whereas 74% of articles contained no identifiable policy problem. Policy problems were slightly more prominent among GTA articles at 28.1%; however, the variation is not statistically significant between regions ($p > 0.505$, Cramer’s $V = 0.02$) and between news publishers ($p > 0.648$, Cramer’s $V = 0.028$).

Policy problems varied by region (Fig. 1a). In Alberta, the most commonly discussed policy problems included public flood mitigation (23.2%), disaster assistance used to support recovery (21.7%), and land-use planning (20.5%). In the GTA, the most commonly discussed policy problem was

infrastructure (58.3%). The variation between the top policy problems (public flood mitigation and insurance) in Alberta and GTA is statistically significant by region and by news publisher (FT $p < 0.001$). Although there is variation in the policy problems discussed, the frequency was a low percentage of the national, regional, and newspaper samples.

Public flood mitigation captured any discussion around problems associated with structural flood defenses, such as dams, dikes, and reservoirs, and included arguments for investing in improvements, but also critical questions about whether such defenses would be effective against flooding in the long-term. Articles that centered on disaster assistance typically focused on the total costs of the damage and which level of government should bear primary responsibility, but some criticized whether public funds should be used to rebuild homes in high risk areas (Fraser 2013). Media narratives around land-use planning often criticized governments for allowing development in high-risk areas. Flood warnings and communications were also a source of criticism, specifically the need for more accurate forecasting of flash floods that impacted some of Calgary’s surrounding communities. Discussion of infrastructure was prominent in the GTA coverage due to the source of the flooding, which occurred as a consequence of overwhelmed stormwater systems. Insurance was discussed mainly as a source of significant confusion, because many property owners were unaware that existing coverage was limited to damage caused by sewer backup and not overland flooding. Table 2 provides sample text to illustrate these dominant policy problem narratives.

Policy problems in the disaster cycle

Another point of analysis was the timing of when media stories identified policy problems. It is clear that most of the

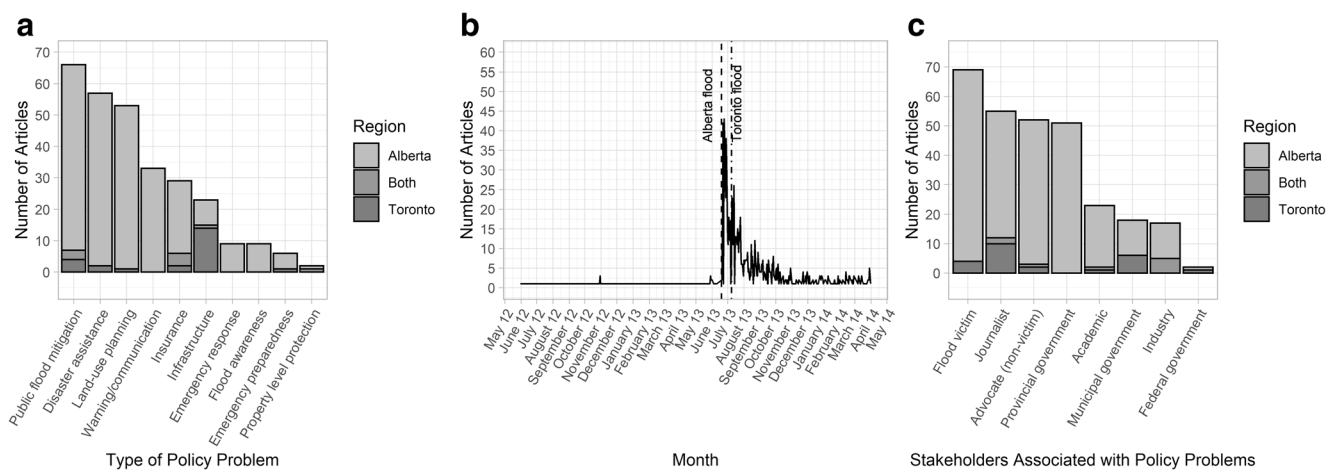


Fig. 1 a Policy problems identified in media articles and their frequency by region, October 1, 2012 to March 31, 2014. b Frequency of articles before, during, and after the Alberta and Greater Toronto Area floods by

month, 2012–2014. c Stakeholders associated with policy problems identified in media articles related to the Alberta and Greater Toronto Area floods, by region

coverage occurred in the immediate aftermath of the flood for both Alberta and GTA (Fig. 1b). To detect if policy problems were more likely in the aftermath of the flooding, the coverage was divided into monthly intervals before, during, and after the flooding. July was the only month relative to June and August within this 3-month period where there was a positive relationship to a discussion of policy problems ($p < 0.001$, Cramers $V = 0.14$).

More specifically, we analyzed how the media stories containing policy problems related temporally to three phases of the disaster policy cycle, including *planning for future flooding* (e.g., residential property protection, government policy to protect from flooding), *response to a specific flood* (e.g., short-term actions for safety, evacuation, sand-bagging, volunteers, temporary housing), and *recovery from a specific flood* (longer-term actions to return to normalcy, rebuilding, infrastructure restoration, fundraising). A total of 500 articles focused on the recovery phase (45.1%), followed by 249 articles on the planning phase (22.5%) and 86 articles on the response phase (7.8%). Policy problems were more likely to appear in articles discussing planning for future flooding ($p < 0.001$, Cramer's $V = 0.496$) than those that focused on response and recovery. Relative to Alberta, articles from the GTA were statistically more likely to mention planning and response over recovery ($p < 0.001$, Cramer's $V = 0.164$); however, they were no more likely to mention specific policy problems (FT $p = 0.75$).

Evidence

Two additional tests were conducted based on the finding that articles containing evidence and information to help property owners reduce risk are more likely to include policy problems. Evidence was defined as information attributed to a specific study or recognized expert. Information on risk reduction included language that would instruct residents on how to reduce the risk of flood damage to their property. For example, some coverage identified government recommendations for risk reduction through the use of water-resistant materials in basements, sealing gaps in exterior piping, and protecting the electrical system (Trotter 2013). Evidence (5%) and information on risk reduction (3%) were not frequently discussed within the sample set. Articles that included evidence were more likely to include policy problems ($p > 0.001$, Cramer's $V = 0.245$), whereas those that included risk reduction were less likely to discuss a policy problem ($p > 0.032$, Cramer's $V = 0.03$). The former is consistent with existing research, but the latter is not.

Stakeholders

To determine if some stakeholders were more likely than others to advocate for policy change, we identified stakeholders in articles where a policy problem was discovered. Flood victims were the most frequently involved in defining

Table 2 Policy problems and sample text

Policy problem	Sample text
Public flood mitigation	"...history has shown, however, that dams are no panacea. A new dam on the Elbow could actually deliver the worst flooding in Calgary's history..." (Van Tighem 2014)
Disaster assistance	"Even Mayor Naheed Nenshi has noted the province faces a quandary: how to structure an aid program that could end up helping the richest people in the city in the wake of the disaster." (Cryderman 2013)
Land-use planning	"...2006 report called on the province to, among other things, stop selling floodplain land for development. But the report sat idle and was released only last year with nothing more than minimal flood -mitigation efforts from the province..." (Wingrove 2013)
Warning/communication	"... the lessons that can be learned from the floods are that Canada needs to use higher resolution forecast models to improve the forecasted precipitation..." (Derworiz 2014)
Insurance	"... nearly 70 per cent of Canadians mistakenly believed they were insured for damages from overland flooding." (McClure 2013)
Infrastructure	"Toronto must overhaul its aging infrastructure to adapt to dramatic new climate change projections - at a cost of billions - say some councillors and environmentalists..." (Kane 2013)
Flood awareness	"Keeping this information locked up from the public only serves to keep them uninformed of the risks a flood poses, and the only reason I can think that it's being kept secret is that it reflects badly on the agency." (Gates 2013)
Emergency response	"... the uncomfortable truth is that emergency-response authorities in Canada generally feel they're short of capacity to face a big disaster..." (Clark 2013)
Emergency preparedness	"...the city's emergency management agency warns that many Calgarians aren't ready to deal with disaster." (Weismiller 2013)
Property level protection	"How about some code changes that we do not allow basements in floodprone areas and require foundations to be above the flood line, with steps up to the house? There can also be a change to code in these areas to allow three-storey homes to compensate for the new conditions." (Payne 2013)

policy problems (24%) followed by journalists (19%), provincial government (18%), policy advocates (8%), academics (8%), municipal government (6%), industry (including insurance) (6%), and the federal government (1%) (Fig. 1c). There is some variation by region ($p = 0.024$, Cramer's $V = 0.203$) between the top stakeholder in Alberta (flood victim, 25.6%) and GTA (journalist, 41.7%). Similarly, there is some variation by publisher (FT $p = 0.017$), in that journalists were more likely to define policy problems in the Globe and Mail and Toronto Star.

Common policy problems defined by flood victims included the failure of structural defenses to protect property and the failure of elected officials to act on existing knowledge that flood risk is a problem (e.g., Nino Gheciu 2013; Varcoe and Howell 2013). Journalists frequently echoed these positions arguing that local councils and provincial governments simply did not prioritize flooding as a risk that requires policy change (e.g., Wood 2013; Hartman 2014). Provincial governments typically defined the policy problem as a lack of resources, while offering solutions such as appointing advisory committees or supporting more investment in public flood mitigation or mapping (e.g., Fraser 2013; Howell 2013).

Flood risk

We coded the coverage to determine how flood risk is framed in terms of urgency (i.e., flood risk is described as increasing) and solubility (i.e., humans are capable of reducing flood risk). Only 5 and 14% of articles were framed with urgency and solubility, respectively. A statistically significant relationship was confirmed between the presence of a policy problem in the article and framing of flooding as urgent ($p < 0.001$, Cramer's $V = 0.224$) and soluble ($p < 0.001$, Cramer's $V = 0.439$). Urgency was evident in articles that argued previous strategies are unlikely to work given they were designed in an era when flood risk was expected to be constant, rather than increasing in response to climate change. Links to policy problems were also common with some coverage arguing that investment should not be put into structural defenses that could fail over time, but rather into measures such as rezoning and buyouts (Bascaramurty et al. 2013). Framing with solubility also often included references to policy problems, as illustrated in one article that stated, "... effective disaster mitigation would mean gradually encouraging people to move homes and business out of areas most at risk" (Clark 2013).

Only 2.8% of Alberta articles, relative to 22.6% of GTA articles, were framed with urgency (FT $p < 0.001$). Articles from the Globe and Mail and Toronto Star were more likely to be framed with urgency (Fisher exact test $p < 0.001$), and to present a policy problem. Comparably, 14% of total articles were framed with solubility with 12.3% from Alberta and 22.6% for GTA ($p = 0.007$). Articles from the Globe and Mail and Toronto Star were more likely to be framed with solubility ($p = 0.003$). There was,

however, no significant variation in the presentation of policy by region or publisher among articles that discuss solubility.

Climate change

The codebook adapted Bohensky and Leitch's (2014) framework to code for references to climate change, categorizing articles using four criteria: (1) no mention of climate change; (2) linking the flood to climate change; (3) demonstrating confusion about whether the flood is related to climate change; and (4) denying the flood is related to climate change. The vast majority of the articles made no mention of climate change (94%), with 95.8% of articles regarding Alberta and 79.8% of GTA articles making no mention of climate change. There is some evidence that articles focused on the GTA (FT = $p < 0.001$) and those published in the Globe and Mail and Toronto Star (FT = $p < 0.001$) were more likely to mention climate change relative to those focused on Alberta or published in the Calgary Herald.

Of those articles that did mention climate change, linking was the most frequent relationship (91%), followed by confusing (7%) and denying (1%). Although most articles did not mention climate change, those that did were much more likely to discuss policy problems ($p < 0.001$, Cramer's $V = 0.197$). No articles from the GTA denied or confused the link with climate change.

Discussion

The results reveal that Canadian media stories rarely include content that is likely to influence public policy. Media discourse is focused more on reporting the short-term impacts of hazards, rather than exposing the policy failures that underpin flood risk. Only 26% of all articles discussed a policy problem and even fewer (5%) provided evidence to justify this problem. In fact, the coverage of policy problems is less frequent than that captured in similar studies in comparable jurisdictions. For instance, an analysis in the UK adopted a narrower set of search criteria focusing on specific terms (e.g., insurance, public policy critical, public policy positive) and yet found a higher rate of discussion of these terms in coverage (42%) (Escobar and Demeritt 2014). Since the analysis in this paper adopted a broader framework that captured these concepts in addition to others as policy problems, it suggests policy problems are covered less often in Canada. Although focused on Colorado wildfires, Crow et al. (2017) also found more coverage of policy problems (44%) despite a narrower set of search criteria.

Indeed, analysis of the media's framing of flooding as related to risk supports this conclusion. Despite a correlation to the discussion of a policy problem with urgency and solubility, the relationship between risk and flooding was not commonly

discussed in the data sample. Risk has emerged in many media and policy narratives as a means of justifying a shift towards risk-based governance and policy (Krieger 2013), but it was not apparent as a trend in these Canadian media stories. More specifically, only 5% of articles framed flood risk as increasing, only 14% discussed human capacity to manage risk, and only 3% provided information on how to reduce risk. In the absence of media framing of flood events as indicative of increasing risk, it is unlikely property owners and other interested constituencies will link the flood event to recurring policy problems that create vulnerability to disaster risk.

The coverage revealed little evidence that policy change advocates leveraged the post-disaster increase in public attention on flooding to promote their interests through the media. At the time of the floods, for example, the Canadian insurance industry was actively promoting policy changes to reduce costs, including tighter land-use regulation, stricter building codes, and the adoption of property-level flood protection (ICLR 2007; IBC 2012; ICLR 2012). However, only 6% of the articles that included a policy problem involved industry, which included insurance. The federal government's limited involvement in defining policy problems (1%) is also somewhat surprising given overland flood losses represent the largest contributor to publicly funded disaster assistance costs (PBO 2016). That the provincial governments were more frequently involved in defining policy problems (18%) is expected given that they are responsible for most flood risk management policy.

The relationship between climate change and flooding was not a frequent theme in Canadian media coverage. Establishing a link between climate change and flooding can attract a broader constituency of actors who leverage media attention to advance their policy interests by framing flood disasters as part of a broader pattern rather than anomalous events. Indeed, articles that discussed climate change were more likely to include a policy problem. In addition, the proportion of articles that link climate change to flooding relative to denying the relationship was much higher than a similar study found in Australia (Bohensky and Leitch 2014). In the Canadian sample, 91% of articles that mentioned climate change linked it to flooding and only 1% denied the relationship. By contrast, Bohensky and Leitch (2014) found that 39% of the articles linked flooding to climate change and 40% denied the relationship.

Although flood policy problems, risk, pro-change stakeholders, and climate change were not frequently discussed, the timing and substance of the coverage was found to be more conducive to policy change. The results did confirm that coverage in the immediate aftermath of the flood events was more likely to discuss a policy problem. Most of the coverage also focussed on the response phase of the disaster cycle (45%), but interestingly, policy problems were less likely to be discussed in these articles than those that focussed on

planning, which is a departure from existing literature (Crow et al. 2017).

A closer examination of the substance of the policy problems discussed in the coverage revealed a connection between the flood and solutions that are recognized as effective in achieving risk reduction. The focus on public flood mitigation and land-use planning illuminated an important link to policy mechanisms commonly identified by Canadian experts as critical for reducing flood risk (Kumar et al. 2001). For example, one advocate argued "...it is difficult for local municipalities to stop developers from building homes in the 'beauty areas' once they have purchased the land, but a provincial law would give the local councils the backing they need to stop them" (Henton 2013). This recommendation reveals an important insight into a noted weakness in Canada's approach to flood risk management, specifically, that municipalities lack incentives to limit development in high-risk areas due to the benefits generated through property taxes.

In addition, the discussion of insurance focussed on a gap in coverage for damage caused by overland flooding. Unlike its developed counterparts, Canada has not historically had a market for overland flood insurance. The media response to the Calgary flood in particular focused on this gap in coverage as a source of significant confusion that linked to a broader policy problem, namely a lack of public awareness about how insurance coverage works (McClure 2013). The provincial government used this attention as an opportunity to argue in favor of expanding insurance to include overland flood damage.

In summary, these findings are consistent with studies that find the media focus on "newsworthy" aspects of an event itself (e.g., individual stories of flood damage) without attention to broader issues of policy (Gavin et al. 2011).

Conclusion

This content analysis of newspaper coverage around two major floods in Canada was designed based on existing scholarship that identifies media content likely to encourage policy change through its capacity to disseminate and frame policy agendas. Canadian media coverage of flooding infrequently discusses the policy problems that underpin flood risk. Similarly, public discourse appears to lack discussion of policy change agendas that might focus policymakers on problems and solutions (e.g., Kaufmann et al. 2016).

These findings contribute to existing research, providing an insight into media coverage of flooding in Canada, which to date represents an unexplored case. In particular, media coverage of flooding in Canada is less focussed on policy problems than studies conducted in similar jurisdictions (Bohensky and Leitch 2014; Escobar and Demeritt 2014; Crow et al. 2017). There is evidence, however, that an increase in the frequency of coverage on policy problems could

increase the potential for influencing flood management. Other factors supportive of policy change were confirmed, including strong relationships between policy problems and framing conducive to policy change, the timing of such coverage, and substance of the policy problems. These findings reveal evidence that the media are covering a public discourse that contests the existing policy approach to flood management and supports new solutions.

It is important to note several limitations of the study that warrant future research. First, the definition of policy problems and solutions may have been too broad to capture aspects of the narrative that are likely to influence flood management policy change. Future analysis could focus on more specific policy objectives identified by governments and researchers, such as the embrace of flood risk management. Second, media coverage may not represent an accurate reflection of public discourse on public policy. The opinions and perspectives of stakeholders on policy could change over time, particularly as more information on the flood and its sources are revealed through inquiry in the years after the event. Longitudinal studies that compare media coverage of more recent floods could confirm whether and how media coverage tracks with changing public discourse over time.

The comparability of media analysis on natural hazards between jurisdictions represents the final limitation of this research. Despite an effort to synthesize different approaches in the research design based on common elements of media content likely to influence policy, most studies adopt distinct approaches to codebook design that limit comprehensive comparison. Collaboration between scholars could facilitate the adoption of consistent codebooks to apply in multiple jurisdictions as the results confirm existing relationships between media content and policy substance. Such comparisons would benefit this field by identifying variables conducive to increasing attention on the public policy failures that underpin disaster risk.

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