



Is bad weather good?

How extreme weather may provide an opportunity to engage Canadians on climate change

ANALYTICAL BRIEFING, MAY 2019

Erick Lachapelle, PhD
EcoAnalytics Research Partner, Université de Montreal

Contents

3	Methodology
4	Executive summary
6	Introduction
7	Perceptions of impacts, risk and social and personal efficacy
13	Assessment: How accurate are public perceptions of climate change?
20	An opportunity to engage?
23	Concluding thoughts
24	References

CONFIDENTIAL

Methodology

This briefing is based mainly on the results of EcoAnalytics' Climate of Change Survey, which was conducted between Oct. 5 and Oct. 24, 2018.

The survey used a dual frame (landline and cellphone) random digit dialing procedure to administer a 15-minute survey to a geographically disproportionate stratified sample of 1,200 Canadians, 18 years of age and older. In all, 720 respondents were reached by landline, 480 by cell-phone listings. To ensure that the data collected are representative of the Canadian population, a weighting factor based on region, age and gender was employed. The response rate (AAPOR RR3) for the study was 8%, typical for a study of this kind. Based on a random sample of this size, the results can be considered accurate to within plus or minus 2.83% 19 times out of 20.

The sample is proportionally stratified across six regions, with an oversample (n=220) in New Brunswick.

CONFIDENTIAL

Executive summary

The debate surrounding climate change in Canada is heating up. Floods, wildfires and the release in April 2019 of a major federal government report are adding fuel to this. The report, for example, indicates that climate change is warming the country at two to three times the rate of other parts of the world. EcoAnalytics research since 2016, however, suggests that most Canadians remain somewhat ambivalent about this existential threat. Nearly nine in ten believe there is solid evidence of climate change—up from eight in ten in 2011—and a large majority believe the impacts of that change are already harming Canadians, or will do so soon. But most don't care enough to modify their individual behaviour significantly.

Those who are alarmed by this ambivalence often hold out hope that as the serious impacts of climate change (flooding, drought, wildfires, etc.) are more widely felt, more Canadians will recognize the risks and take action. Unfortunately, evidence in support of this assumption is less than conclusive.

People who link extreme weather to climate change are more likely to believe they can do something about the problem, and to take action

EcoAnalytics research has recently delved into this paradox. Drawing on diverse sources—opinion dynamics from national surveys; insurance industry flood-risk data; and the EcoAnalytics fall 2018 Climate of Change Survey conducted shortly after a record flood in New Brunswick—this briefing further explores the landscape of Canadian opinion and identifies opportunities for skilled communicators.

We argue that while people are sometimes reluctant to update their beliefs about climate change, experience of extreme weather may lead people to alter their attitudes, perceptions, and behaviours. Evidence suggests that attribution of extreme weather to climate change—and motivation to act on the issue—is linked to feelings of personal and social efficacy.

We conclude that experience with extreme weather provides an opportunity to engage Canadians in productive conversations about climate change, in particular on adaptation to climate impacts and disaster preparedness. As well we make the following recommendations, based on this briefing note and earlier research.

Recommendations:

- Continue to draw links between recent local extreme weather events and global climate change, where possible using images including people to tell a story; but
- Choose your messengers and words carefully to avoid backlash in impacted communities.
- Build Canadian's belief in their individual ability to address climate change by...
- Using extreme weather events, tactfully, to engage key audiences in conversations about disaster preparedness and other measures to protect against flooding, wildfires, drought and extreme weather.
- Avoid language suggesting these changes are inevitable, focussing instead on communicating around solutions, and when necessary, how climate change is stacking the deck toward more of these extreme and costly weather events.

CONFIDENTIAL

Introduction

According to the recently released *Canada's Changing Climate* report (Bush and Lemmen, 2019), climate change is already hitting home. Authored by over 40 scientists and based on an extensive review of the peer-reviewed literature, the report finds that Canada's climate has warmed at twice the global average, and that this warming is even more pronounced in the North, the Prairies, and northern British Columbia. In addition to heatwaves, drought and wildfire risks, precipitation patterns have also become more extreme. As the climate continues to warm, it is expected that more intense rainfalls will increase urban flood risk. Meanwhile, warmer ocean temperatures and melting glaciers are expected to increase the incidence of coastal flooding and the erosion of shorelines, with the loss of sea ice making coastal infrastructure and ecosystems even more vulnerable to larger storm surges and waves.

While past research conducted by EcoAnalytics has found that Canadians increasingly perceive climate change as imminent, this sentiment has not yet translated into a sense of real urgency (Lachapelle & Martel-Morin, 2017). Generally, climate change tends to be of low salience relative to other issues, though recently it has garnered attention. Nevertheless, people are usually reluctant to accept personal responsibility for causing the problem, do not think they should be responsible for paying for its solutions and, generally, are unengaged with the climate change issue (Lachapelle, Mahéo and Neadeau, 2016; Lachapelle and Martel-Morin, 2017; Lachapelle, 2017).

In this context, one might hope that as people become exposed to more extreme weather, they would begin to think about climate change mitigation as well as adaptation. Yet the existing literature offers mixed results. To be sure, some work has found that perceptions of climate change are related to people's surroundings and experiences. In a seminal study conducted in the United States, Brody and colleagues (2008) found higher risk perceptions among people who live in low-lying coastal areas relative to those living in less vulnerable areas. However, other studies are less conclusive. In fact, researchers from the United Kingdom collected data in two communities and found that climate change risk perceptions and self-reported behaviours were very similar across those who had and had not experienced flooding (Whitmarsh, 2008). More recent work has found that flood experience influences climate change perceptions and willingness to participate in certain solutions, such as energy conservation (Spence et al., 2011). Compounding the problem of mixed results, the peer-reviewed literature has yet to explore the relationship between experience with, and attitudes toward, climate change in Canada.

Here, we examine Canadian climate attitudes, the attribution of extreme weather to climate change, and probe the idea that greater experience with climate change will increase public engagement. We draw on historical data to examine opinion dynamics, but also focus on more recent data that has been *geo-localized* for each respondent. In 2015, we asked questions related to people's perceptions of seasonal weather, and compared these to actual and historical temperature data recorded at local weather stations. This allows us to validate people's ability to recall an abnormally warm/cool summer in their local areas. In 2017, several questions were asked with respect to flood risk perceptions, and these data have been merged with flood risk vulnerability measures provided by AON Benfield Impact Forecasting. Using these data, we can compare public perceptions of flood risk to the results of high resolution flood risk modelling that is used by Canadian insurers to assess flood risk in Canada. We also focus attention on results from the 2018 Climate of Change survey, which oversampled residents of New Brunswick. With this oversample, we are able to leverage the fact that a relatively high proportion of respondents recently experienced a flooding event prior to our survey. This allows us to test the effect of experience with record flooding on climate change attitudes, engagement, and risk perception.

The report is structured as follows. First, we set the context by reviewing how Canadians perceive the impacts of climate change and the risks involved. Next, we assess the accuracy of public perceptions by comparing them to actual temperature observations as well as the output from flood risk assessment models. Finally, we identify the potential for experience with extreme weather to provide an opportunity to engage the public on climate change, and highlight the association between experience with extreme weather, perceptions of risk and feelings of efficacy.

1. Perceptions of impacts, risk and social and personal efficacy

This section highlights general attitudes toward the timing of climate change, risk perceptions, and the attribution of extreme weather. We find that the attribution of extreme weather to climate change is positively associated with greater risk perceptions but also the belief that climate change is something that can be stopped, and that one's personal actions can have an impact.

1.1. Are perceptions of climate change impacts changing over time?

Since 2014, the Canadian Surveys on Energy and the Environment (CSEE) and EcoAnalytics have found that the proportion of Canadians who think climate change is harming Canadians now has increased by 20%, from just 35% in 2014 to 55% in 2017, where it stayed in 2018 (Lachapelle and Martel-Morin, 2017). However, further analysis of the data reveals that there is an important political dimension to these perceptions.

Figure 1.1: Perceived timing of climate change impacts across partisans, 2014–2017

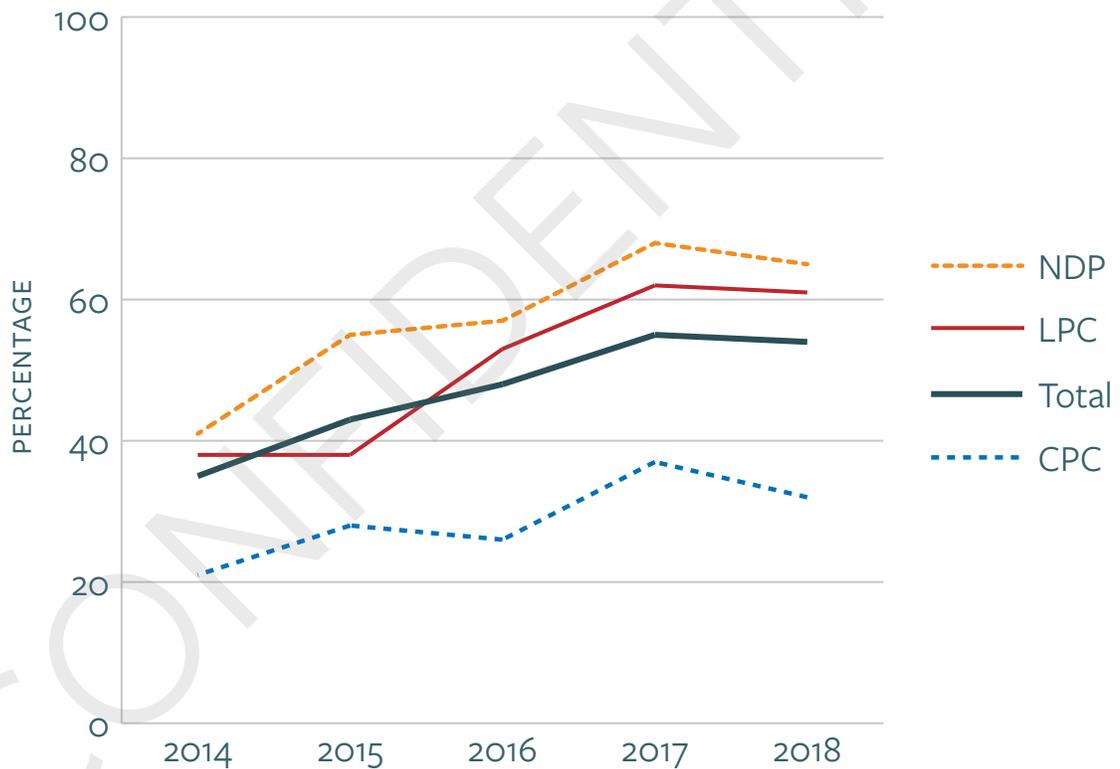


Figure 1.1 shows the percentage of respondents who report “climate change is already harming people living in Canada.” Question: “When do you think climate change will start to harm people living in Canada?”

Source: Canadian surveys on Energy and the Environment (CSEE); EcoAnalytics

For many, climate change is already harming Canadians “here and now.” For each partisan category plotted in Figure 1.1, this perception is generally on the rise. However, despite increasing impacts of climate change affecting Canada, Figure 1.1 depicts a partisan gap, with two thirds of the federal Liberal and NDP supporters

believing climate change is already harming people in Canada, compared to just 37% of those who support the Conservative Party of Canada (CPC) who felt the same way in 2018. Further analysis reveals a gender gap (50% men vs. 60% women), as well as regional differences, with residents on the coasts of Atlantic Canada (67%) and British Columbia (59%), as well as those living in Ontario and Quebec (57%) significantly more likely than residents of Manitoba and Saskatchewan (35%) to perceive immediate harm from climate change. Considering that an additional 13% report believing that climate change will harm people in Canada in 10 years (data not shown), we note that a large majority (68%) of respondents feel climate change poses an imminent—though perhaps not yet worrisome—threat.

1.2. Do Canadians see themselves as personally at risk?

While the proportion of Canadians perceiving climate change as harming Canadians “here and now” skyrocketed between 2014 (35%) and 2017 (55%), risk perceptions have held steady during this time period.

Figure 1.2: Partisan gap in perceived risk of climate change

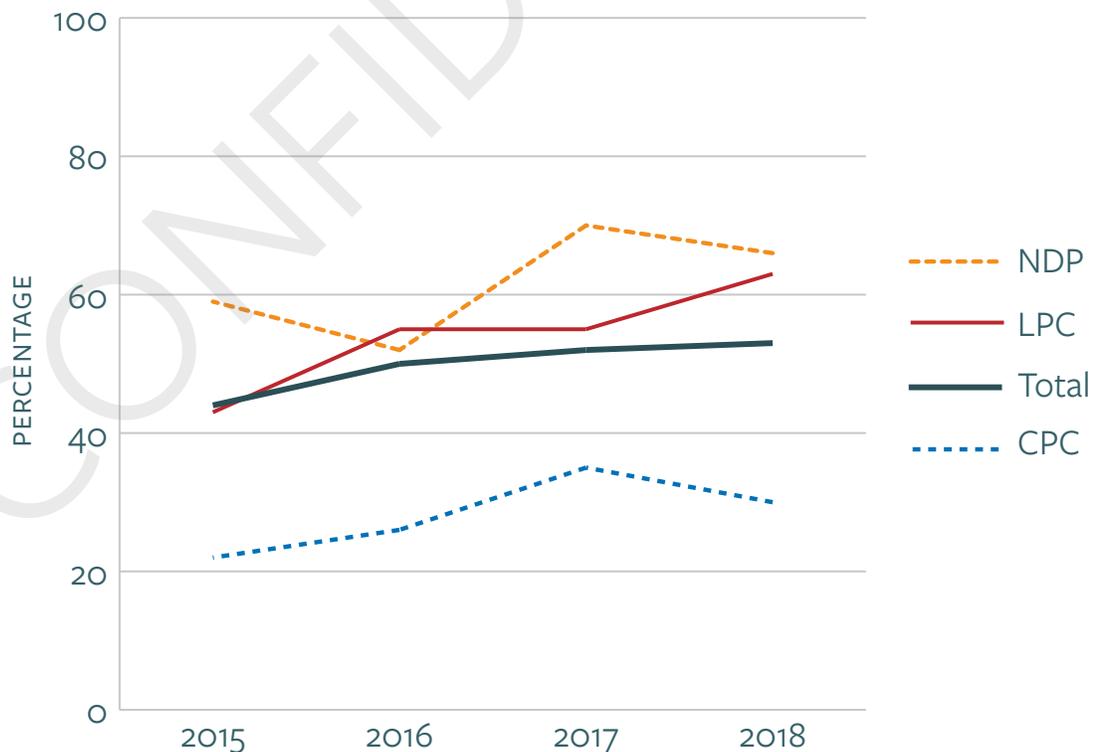


Figure 1.2 shows the percentage of respondents who say climate change will harm them personally either a “great deal” or a “moderate amount.” Question: “How much do you think climate change will harm you personally”?

Source: Canadian surveys on Energy and the Environment (CSEE); EcoAnalytics

In contrast to perceptions around the timing of climate change, personal risk perceptions are changing more slowly. In fact, Canadians continue to be split on the question of “how much” they think climate change will harm them personally. About half say “a great deal” (14% in 2015; 18% in 2018) or “a moderate amount” (30% in 2015; 35% in 2018) while the other half indicate believing climate change will harm them “only a little” (30% in 2015; 24% in 2018) or “not at all” (24% in 2015; 20% in 2018). The data in Figure 1.2 also show something of a partisan gap, with risk perceptions among CPC supporters lower than those of other political stripes, though these differences are relatively small. All of this suggests that perceiving climate change as something that is harming people in Canada “here and now” might not necessarily translate into a sense of personal risk.

In terms of demographic sub-groups, we find some differences. For instance, in 2018, more women (21%) than men (14%) perceived themselves to be at a great deal of risk from climate change. Similarly, millennials aged between 18 and 34 (22%) were significantly more likely than those aged 55 and older (13%) to feel the same way. There were also regional differences, including 24% of residents of British Columbia and Quebec compared to just 6% of residents of Alberta feeling a great deal of risk from climate change. In 2017, the largest differences were among respondents who cited their own personal observations of a changing climate when asked to justify their perception of global warming (34%), as well as among respondents living in low-income households (32%) relative to those more well off (12%). Interestingly, relative to others with English as a first language (13%), respondents with neither French nor English as a first language (i.e. new Canadians) were significantly more likely (26%) to feel that climate change posed a great deal of risk of causing them harm. Low-income might feel less responsible for causing the problem, and may be more likely to feel that they are less capable of adapting to a changing climate, while new Canadians might be more engaged for fear that their family members in distant countries are at relatively greater risk.

New Canadians were twice as likely to feel that climate change posed a great deal of risk

1.3. Are Canadians connecting extreme weather and climate change?

While communicators might assume that more extreme weather will increase public concern about climate change, the literature suggests this relationship is more complex. One important factor highlighted by existing research has to do with attribution; experience with extreme weather can alter attitudes, but only when people attribute extreme weather to climate change (Ogunbode et al., 2019).

Figure 1.3: Variation in the degree to which people attribute extreme weather to climate change

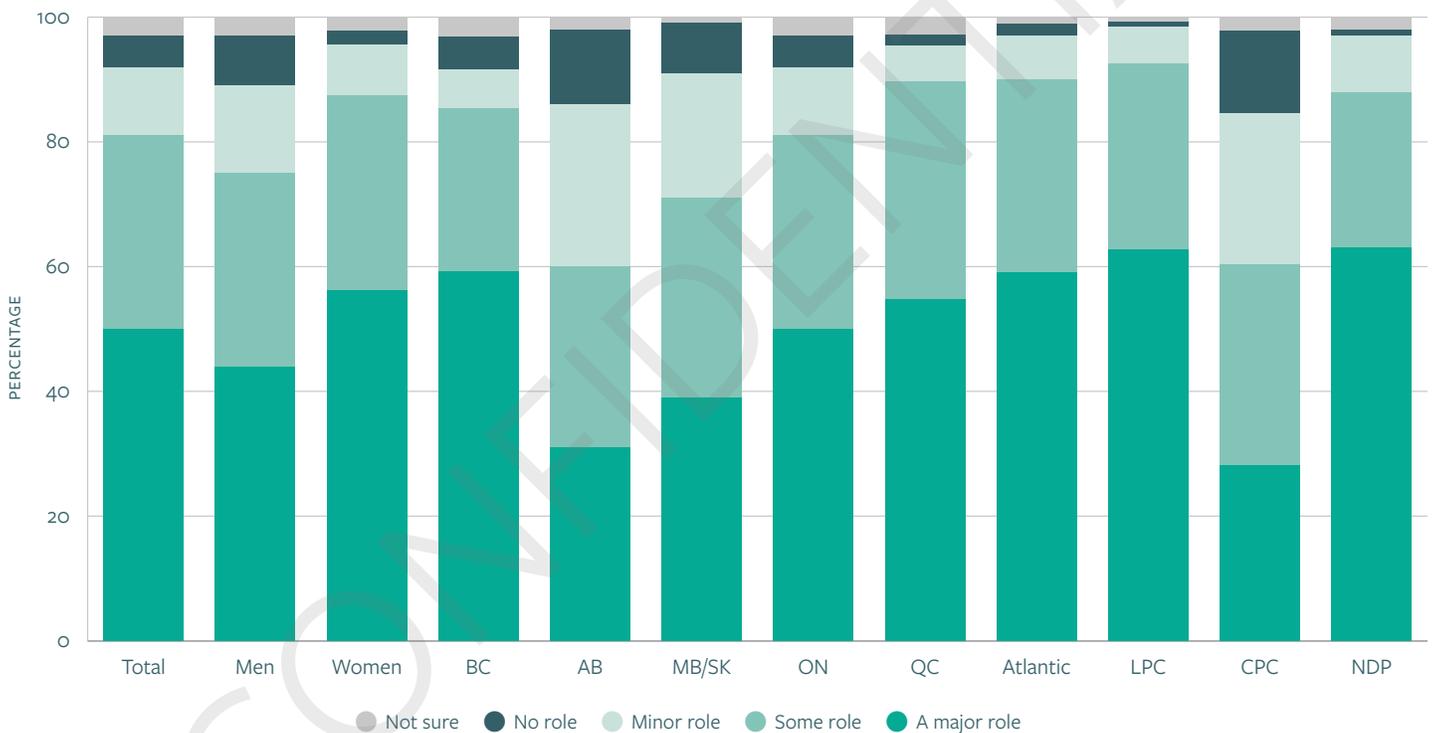


Figure 1.3 shows the distribution of responses to the question: “What role, if any, would you say climate change has played in recently experienced heat waves, flooding, wildfires, droughts, and hurricanes?”

Source: EcoAnalytics, 2018

Against the backdrop of extreme weather affecting parts of North America in the months preceding (and during) the Fall 2018 Climate of Change survey, we found most respondents thought climate change has played either a “major” or “some” role in recent extreme weather events. Specifically, a majority (81%) reported thinking that climate change has played either a “major” (50%) or “some” (31%) role in

heat waves, flooding, wildfires, droughts and hurricanes. Looking across regions, as is done in Figure 1.3, we see that views vary considerably, with residents of Atlantic Canada (59%), Quebec (55%) and Ontario (50%) significantly more likely to believe climate change is playing a major role in extreme weather than residents of Alberta (31%). Relative to supporters of the CPC (28%), significantly higher proportions of supporters of the Liberal Party of Canada (63%) and federal NDP (63%) thought climate change played “a major” role in these extreme weather events. These distributions replicate what we found in 2017 and suggest many Canadians are connecting extreme weather experienced in North America to global climate change.

Further analyzing the data, we found that attributing extreme weather to climate change is positively associated with greater risk perceptions and a sense of personal efficacy, as well as a general belief that climate change is something that can be stopped. For example, those who believe climate change has played “no role at all” are much less likely (1%) than those who attribute a “major role” (28%) to believe they are at a “great deal” of risk from climate change. Conversely, the belief that climate change will pose no harm at all is much greater among those who perceive climate change as playing no role in extreme weather (88%) compared to those who believe it has played a major (9%) or some (15%) role. These different risk perceptions may be explained, at least in part, by the fact that people who attribute extreme weather to climate change are also more likely to have a higher sense of perceived efficacy in dealing with the problem. For instance, respondents are much more likely to agree or strongly agree with the statement that “I can personally help to reduce climate change by changing my behaviour” when they perceive climate change to be playing a “major role” (88%) as opposed to “no role at all” (33%) in extreme weather. Meanwhile, perceptions that climate change is “unstoppable” are much more pronounced among those who believe climate change has played no role (47%) relative to those who believe climate change has played a major role (22%) in extreme weather. These findings mirror the international literature, which suggests that attribution of extreme weather to climate change is crucial for engaging the public on this issue.

2. Assessment: How accurate are public perceptions of climate change?

In this section, we provide evidence of some biases at play, which can mute the effects of climate signals in terms of updating public perceptions.

2.1. Do Canadians accurately perceive changes in local temperature?

Canada is warming at a faster pace than many other parts of the world. In this sense, it is a good test case for examining how people are reacting to and interpreting changes in local temperature. Past research examining the role of local temperature in shaping climate beliefs has found that the link between local temperature anomalies and views about global climate change is more complex than a simple 1:1 relationship. In fact, several studies suggest that the causal relationship is ambiguous. For instance, while it is possible that the “signal” from local experiences leads to changes in attitudes toward the existence and severity of climate change, it is also possible that people interpret these signals through their prior beliefs (Borick and Rabe, 2018). This pattern is consistent with theories of “motivated reasoning,” or the tendency for people to accept new information that reinforces their pre-existing values, beliefs and identity, while discounting information that challenges these (Druckman and McGrath, 2019).

Figure 2.1.1: Recollections of a warmer summer in 2018 affected by views on the existence of rising global temperature

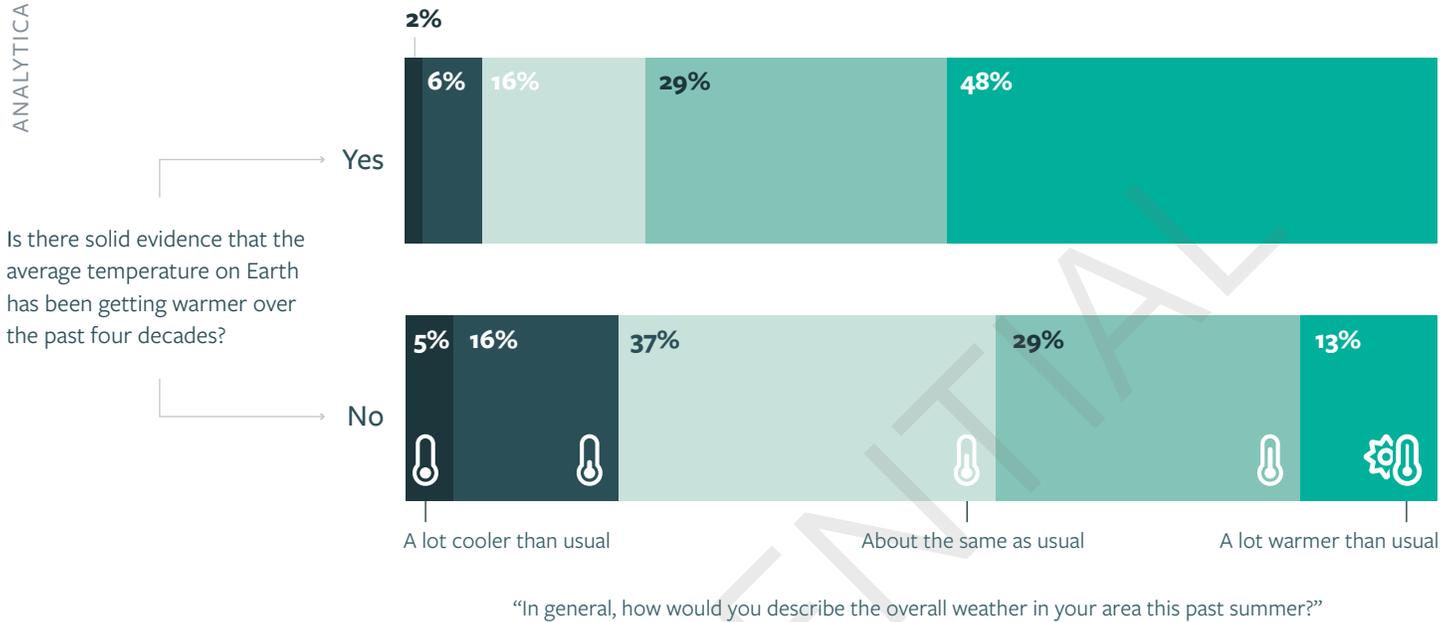


Figure 2.1.1 highlights differences in recollections of abnormally warm/cool weather among Canadians who perceive and who do not perceive “solid evidence” of rising global temperatures. Source: EcoAnalytics, 2018.

Figure 2.1.1 illustrates the relationship between beliefs about global temperature rise and perceptions of local weather. As shown, people who report seeing “solid evidence” of a warming planet (48%) are more than three times as likely than those who do not (13%) to recall local temperatures in their area being “a lot warmer than usual” in the previous summer. Conversely, those perceiving insufficient evidence of rising global temperature are nearly three times as likely (16%) than those who perceive “solid evidence” (6%) to recall local temperatures being “slightly cooler” than usual. Meanwhile, the likelihood of recalling that local temperatures were “about the same as usual” is over two times greater for those who do not report seeing solid evidence of warming global temperature (37%) relative to those who do (16%). This provides some initial evidence for the idea that people interpret abnormal weather through the lens of their climate change beliefs.

Figure 2.1.2: The effect of actual temperature deviations on the probability of recalling an unusually warm summer is moderated by beliefs about climate change

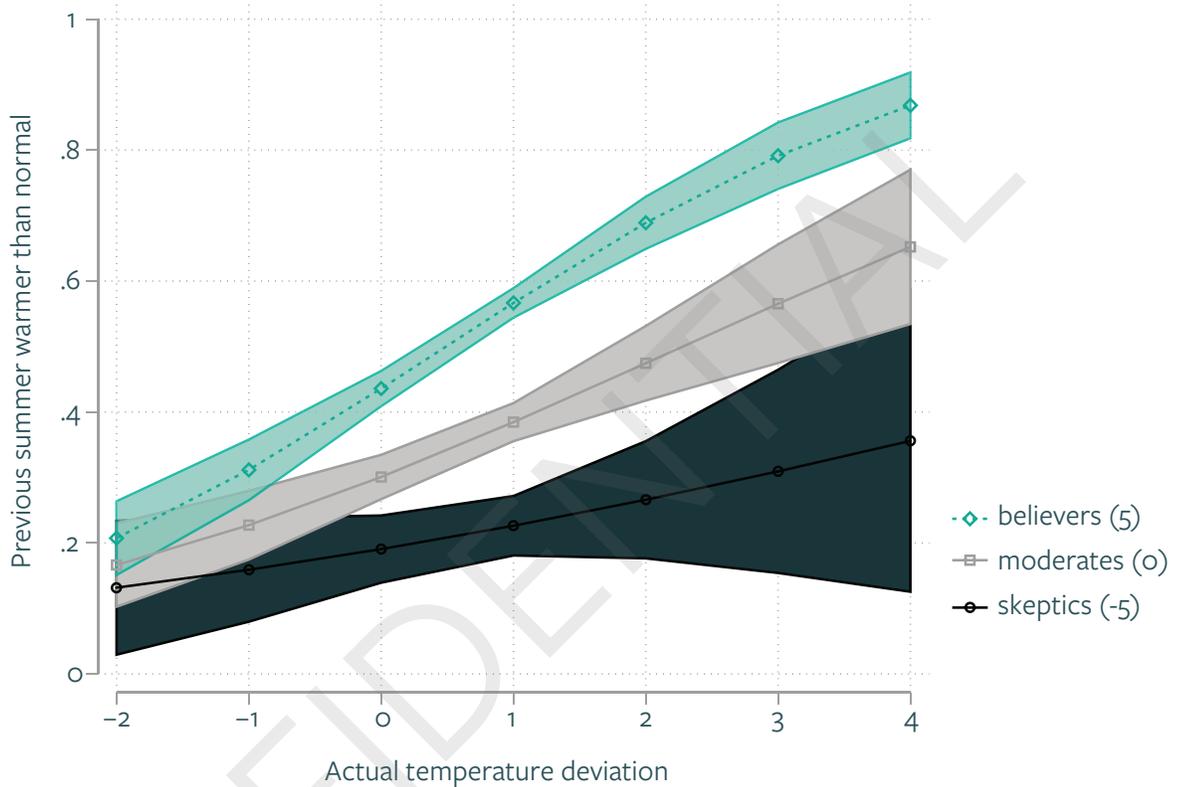


Figure 2.1.2: Results of model predicting probability of reporting previous summer as being “warmer than usual.” The lines show the predicted probability of recalling a warmer summer conditional upon actual temperature deviation across skeptics (-5), believers (5) and moderates (0). Shaded areas are the 95% confidence interval. The graph shows that believers are more able to accurately recall a warmer and cooler summer; skeptics are less likely to report local temperatures being warm, even when they are objectively warmer, but are equally able to recall a cooler summer when it is in fact cooler.

Source: Canadian Surveys on Energy and the Environment, 2015

Digging deeper into some historical data collected under the Canadian Surveys on Energy and Environment, we generated a variable called “belief certainty,” which is computed by adding scores from two survey questions—is there “solid evidence” of rising global temperature; and, “how confident are you that temperature on Earth has been increasing [has not changed]”? The variable has a range from -5 (very confident that global temperature has not changed) to + 5 (very confident that global temperature is rising). We then merged Environment Canada temperature observations recorded at the nearest weather station for each respondent, and

People who are convinced that climate change is occurring are more able to accurately recall a warmer than usual summer

computed the actual temperature deviation (averaged over June–August) from the 30-year normal. We found, as one would expect, that as the average temperature becomes unusually warm, the probability of recalling warmer temperatures in the preceding summer increases. But, as shown in Figure 2.1.2, this effect is contingent upon people’s prior beliefs about the existence of climate change. Those who are strongly convinced that climate change is occurring are more able to accurately recall a warmer summer. Meanwhile, people who are less certain, and those who are more skeptical, of global climate change are less likely to report warming temperature, even when the temperature was objectively warmer in their local area. In other words, pre-existing beliefs shape public reactions to experience with local weather, and objective fact. This provides additional evidence to suggest that the relationship between experience with abnormal weather and updating climate change views is more complicated than one might expect.

2.2. Are Canadians aware of their actual level of flood risk?

Insurance industry people like to say that if you live in a house, you are vulnerable to flooding. There are indeed a variety of ways that homes are flooded: e.g., by coastal flooding (from surges), fluvial flooding (from rivers and heavy snow-melt), and pluvial inundations (surface water flooding from run-off or saturated urban drainage systems). Yet, when the Fall 2018 Climate of Change Survey asked respondents whether or not they perceived themselves to be at risk of flooding, the vast majority (74%) said “no,” categorically, while relatively few (24%) reported believing that they live in an area that is vulnerable to flooding. While this question does not distinguish between the different types of flooding (which may account for the high degree of “no” responses), it is noteworthy that people tend to believe they live in relatively safe areas, even when they may be vulnerable.

Figure 2.2: Most people in Canada believe they do not live in an area that is vulnerable to flooding

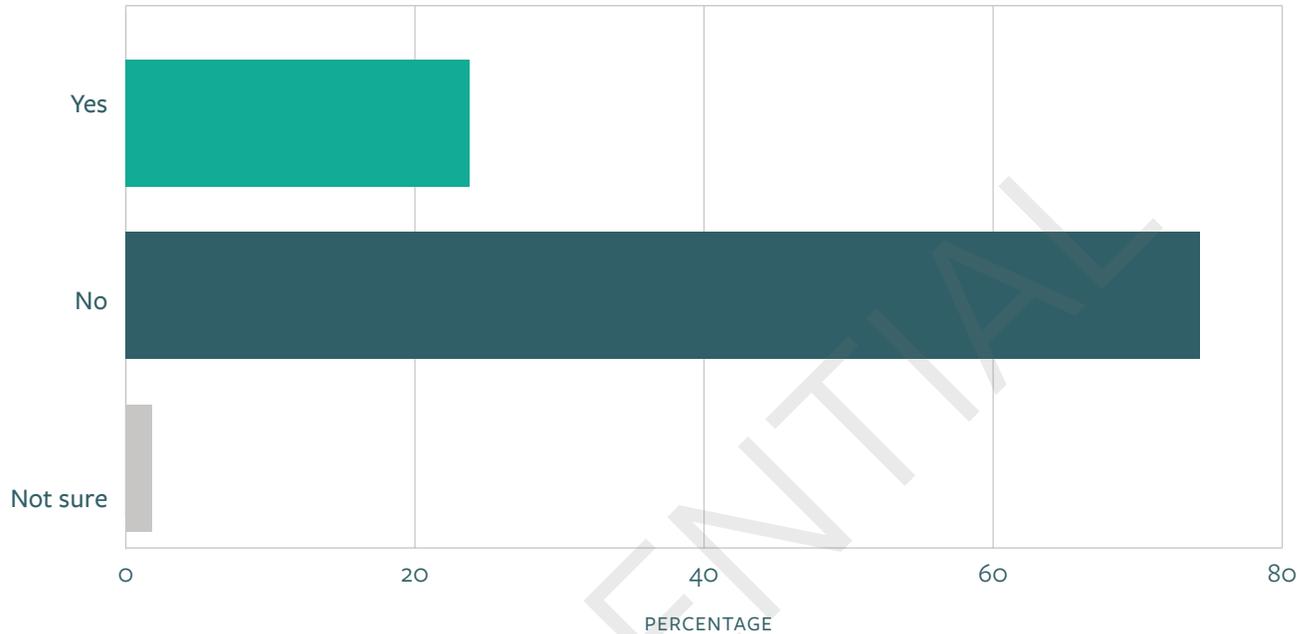


Figure 2.2 shows the distribution of responses to the question: “As far as you know, do you live in an area that is vulnerable to flooding?”

Source: EcoAnalytics, 2018

To ascertain the accuracy of people’s perceptions, we examined flood-risk exposure data obtained from AON Benfield Impact Forecasting. This company conducts hazard analysis for insurance companies around the world, including detailed flood maps of Canada. While flood maps for Canada are notoriously difficult to find, these maps provide detailed estimates of the Average Annual Loss (AAL) cost due to flooding. These estimates are based on a database of 120,000 realistic flood events that are simulated by a computer model that takes into account local flood severity as well as correlations and co-dependencies across all waterways in Canada. The resulting estimate of the average annual loss facing a property provides one of the most sophisticated measures of exposure and severity of a hazard for a given resident. An AAL value of, say, 0.0136 means that a house will lose an average of 1.36% of its value per year due to flooding. It is an annual metric that accumulates over time, so that if a single flood event occurs in a ten-year period, then the cumulative expected loss can be calculated as $(10 \times 1.36\% = 13.6\% \text{ loss})$.

Comparing what the insurance industry believes to be one’s exposure to a hazard with survey responses collected in 2017, we assessed the validity of people’s sub-

Incorrect perceptions of flood risk can be very costly

jective perceptions of their own risk relative to results from flood models. Using these data, we conducted a simple “difference in means” test and found a significant difference in the AAL across people who believe they live in an area that is prone to flooding ($M=0.000316$, $SD=0.00071$) and those who do not ($M=0.000117$, $SD=0.00046$), $t(1187)=-1.83$, $p=0.03$. As one would hope, people living in areas prone to flood risk (as expressed by the AAL rate) are more likely to perceive themselves to live in an area that is vulnerable to flooding. Indeed, respondents who believe they do not live on a floodplain will on average have to pay about 0.0117% of their property value in flood damage, for a given year. This rate nearly triples to 0.0316% for respondents who believe they live in an area that is prone to flood risk. Given the size of these differences in AAL, erroneous perceptions around flood risk are likely to be very costly.

2.3. Are perceptions of flood risk related to experience with flooding?

One possible explanation for the alignment of public perceptions with actual risk exposure may be that residents in areas prone to flooding have in fact had experience with flooding, are therefore more aware of their actual level of risk. To test this hypothesis, the 2018 Climate of Change survey asked respondents whether or not they had experienced flooding recently. We looked at whether people who reported recent experience of flooding believe they live in an area that is vulnerable to flooding. The results were surprising.

Figure 2.3: Many people in Canada who report a recent experience of flooding believe they do not live in an area that is vulnerable to flooding

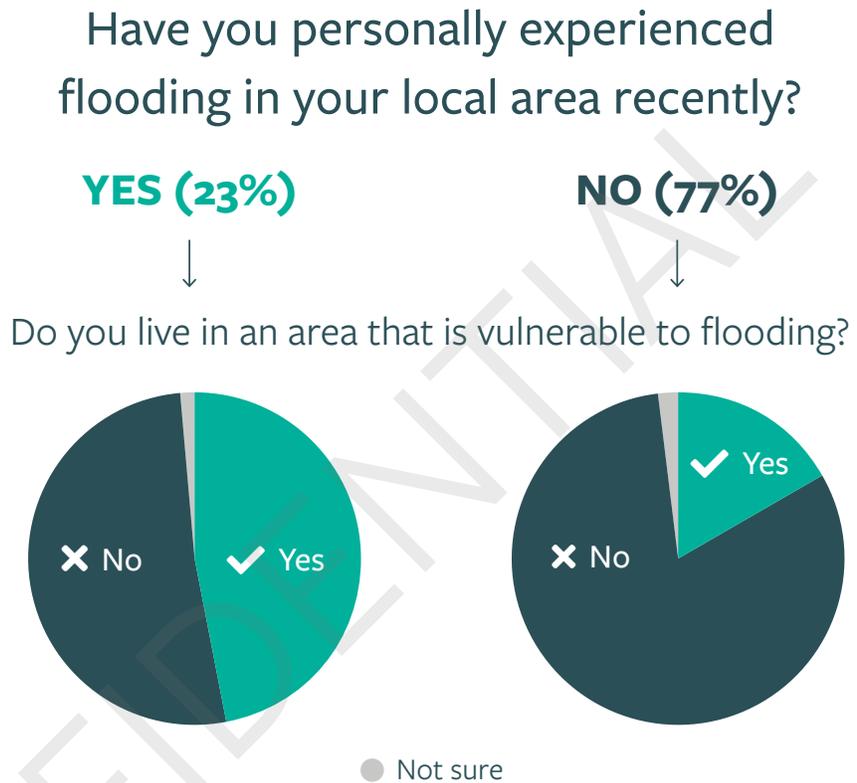


Figure 2.3 shows the percentage of people in Canada who believe they live in an area that is vulnerable to flooding by whether they report having recently experienced a flood event (23%) or not (77%).

Source: EcoAnalytics, 2018

Figure 2.3 first identifies people who reported recent experience with flooding (23%) and those who did not (77%). It then looks at the distribution of responses to the flood risk perception question for each of these groups. As shown, the vast majority (81%) of those who reported having no recent experience of flooding reported they do not live in area vulnerable to flooding (right pie chart). Paradoxically, of the 23% of respondents who reported having recently experienced a flood, more than half (52%) believe they do not live in an area vulnerable to flooding. To be sure, this question does not account for the type of flood experienced, and some types of flood events (e.g. coastal flooding) might be more associated with perceived flood risk than others (e.g. sewer backflow). Moreover, people have difficulty understanding probabilities, especially the probability of exceedance, and

may believe that a flood won't happen again, or if it does, it won't affect them again, or that they are no longer vulnerable after flood-proofing their home (Gigerenzer et al., 2005; Comeau, 2017). The power of inertia may extend to people denying their exposure to risk because they are attached to where they live (De Dominicis et al., 2015). Whether due to the type of flood experienced, some form of optimism/single-solution bias or to place attachment, the results shown in Figure 2.3 point to a worrisome trend; people are reluctant to update their perceived level of flood risk even after experiencing a flood.

3. An opportunity to engage?

While the evidence reviewed in section 2 may provide some cause for concern, on further analysis of the data, we find evidence that experience of extreme weather may provide an opportunity to engage the public in conversations about climate change mitigation and adaptation. In this section, we examine some of the relationships just described, but with a focus on the oversample (n=214) of residents from New Brunswick, where record flooding had occurred a few months prior to the fielding of the 2018 Climate of Change survey, in October 2018. We also explore the relationship between experience with flooding and adaptation behaviour. Overall, the evidence reviewed here suggests that experience with extreme weather—in this case, a highly salient and record-breaking flood—is in fact altering people's perceptions, attitudes, and behaviours.

3.1. Are perceptions of flood risk related to flood experience? Evidence from New Brunswick

Here, we replicate the same analysis as we did in Figure 2.3, but this time, using only the data from New Brunswick (n=214). As noted, we leveraged the fact that residents living near the Saint John River had just experienced record flooding. In this way, we are able to zoom in on a specific flood event to examine relationships between variables in this particular context.

Figure 3.1. Relative to the Canadian average, more New Brunswickers believe they live in a flood-prone area after reporting recent experience of flooding in the province

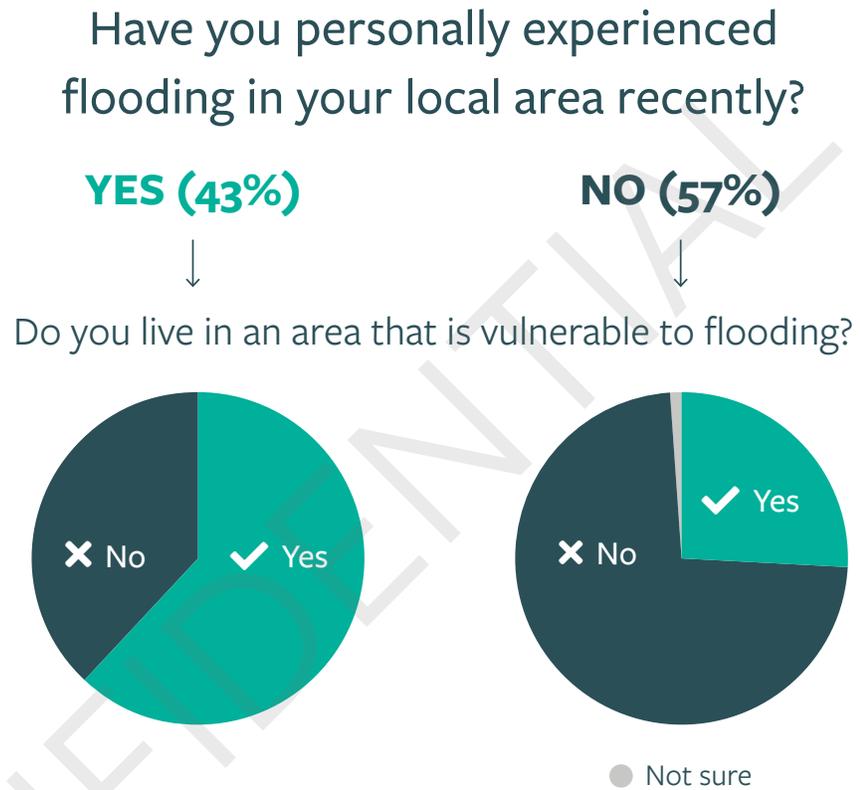


Figure 3.1 shows the percentage of people who believe they live in an area that is vulnerable to flooding by whether they report having recently experienced a flood event (43%) or not (57%) in New Brunswick.

Source: EcoAnalytics, 2018

Comparing Figures 2.3 and 3.1, it's obvious that the relationship between experience of flooding and perceptions of whether or not one lives in an area vulnerable to flooding differs in New Brunswick. Indeed, among those who reported having a recent experience of flooding (43% of people polled in this province), no less than 62% felt they live in an area that is vulnerable to flooding, compared to the 38% who believe they do not. This difference in flood risk perceptions between New Brunswickers and the rest of Canada was not found in 2017, when roughly the same proportions of flood risk were found across New Brunswick (17%) and the rest of Canada (16%). In other words, the difference in flood risk perceptions among New Brunswickers and other Canadians in 2018 are likely the product of recent experience of flooding in New Brunswick.

3.2. Does flood experience affect attitudes about and engagement on climate change?

Though we find evidence of cognitive barriers to people updating their beliefs (section 2), we also find grounds for optimism. Indeed, even in Figure 2.3 above, the proportion of Canadian respondents who believe they live in a flood-prone area is 30% greater among those who reported recently experiencing a flood (47%) relative to those who did not (17%). Analyzing the data further, we found that those who report having recently experienced a flood are substantially more likely (by about 10%) than those who did not to report thinking that climate change is a “very serious” problem and more likely to believe climate change is already harming Canadians or will do so within the next 10 years. We further find higher levels of certainty that climate change is happening between those who report recent experience with flooding and those who do not, at a significant level. Finally, we note that perceptions that climate change will cause “a great deal” of harm to an individual are about 10% greater among recent flood victims relative to those who were not. This suggests that people pay attention to extreme weather, and that this experience is changing public attitudes toward the urgency of dealing with climate change.

3.3. Does experience with flooding affect adaptation behaviours?

The 2018 Climate of change survey also included a number of questions to measure adaptation behaviours. We asked respondents the extent to which they agreed or disagreed with the following statement: “I have personally taken actions to help reduce my vulnerability to climate change.” Analyzing the data, we found nearly a 10% difference in this personal action measure between those affected and not affected by recent flood events. We also found that those affected by a flood were more inclined to report that they would “very likely” purchase flood insurance for their home relative to those who did not report experiencing a flood event. Furthermore, this difference remained when respondent were told that such flood insurance coverage would cost them an additional \$10 to \$20 per month. Overall, these results suggest that experience of flooding makes people more likely to alter their behaviour in favour of adaptation to climate change impacts. However, the assumption here is that people know what these adaptation solutions are, which may not necessarily be the case.

Concluding thoughts

Floods are the most common natural hazard affecting Canadians, and also the costliest. Though not the only event expected to increase in frequency and severity because of climate change, analyzing public responses to flood events provides a window into understanding how attitudes and behaviours might evolve in a changing climate. Indeed, scientists predict that flooding linked to climate change will increase as the 21st century progresses, especially in coastal areas (Cunderlik and Ouarda, 2009; Bush and Lemmen, 2019). Though specific to flood risk, the inferences drawn here might extend to other natural catastrophes amplified by climate change.

People with experience of the impacts of climate change are more receptive to communications about climate action, done carefully

Our findings are somewhat mixed, but provide some initial evidence to suggest that greater experience with the effects of climate change provide opportunities to engage people to encourage action, particularly when such extreme weather events are salient (i.e. when the event occurs). However, such strategies ought to be undertaken with care. We note that some people are reluctant to update their prior beliefs and may actively defend against efforts to engage them following a traumatic event, particularly if the engagement is seen as coming from an outside group with political motives (e.g. a response seen following efforts by some to link the Fort McMurray fire of 2016 to rising global emissions).

We also show that people are more likely to change behaviour following experience with an extreme weather event. Rather than focus on risk communication, communicators might want to emphasize solutions and empowering messages around disaster preparedness so that people can better protect themselves, their families, their property, and the things they love. This kind of engagement is already gaining traction within the insurance industry and across some proactive municipalities. Given the importance of trusted messengers, however, whether environmental groups have a role to play here—and for which audiences—should be tested in future research.

References

- Borick, C. P., & Rabe, B. G. (2016). Personal experience, extreme weather events, and perceptions of climate change. In *Oxford Research Encyclopedia of Climate Science*.
<https://doi.org/10.1093/acrefore/9780190228620.013.311>
- Brody, S. D., Zahran, S., Vedlitz, A., & Grover, H. (2008). Examining the Relationship Between Physical Vulnerability and Public Perceptions of Global Climate Change in the United States. *Environment and Behavior*, 40(1), 72–95. <https://doi.org/10.1177/0013916506298800>
- Bush, E. and D.S. Lemmen (2019). Canada’s Changing Climate Report. Environment Canada.
- Comeau, L. (2017). Healthy water, healthy people: New Brunswickers’ concerns and attitudes about fresh water and preparedness for extreme weather events. Conservation Council of New Brunswick.
- Cunderlik, J. M., & Ouarda, T. B. M. J. (2009). Trends in the timing and magnitude of floods in Canada. *Journal of Hydrology (Amsterdam)*, 375(3/4), 471–480.
- De Dominicis, S., Fornara, F., Ganucci Cancellieri, U., Twigger-Ross, C., & Bonaiuto, M. (2015). We are at risk, and so what? Place attachment, environmental risk perceptions and preventive coping behaviours. *Journal of Environmental Psychology*, 43, 66–78. <https://doi.org/10.1016/j.jenvp.2015.05.010>
- Druckman, J. N., & McGrath, M. C. (2019). The evidence for motivated reasoning in climate change preference formation. *Nature Climate Change*, 9(2), 111–119.
<https://doi.org/10.1038/s41558-018-0360-1>
- Gigerenzer, G., Hertwig, R., Broek, E. V. D., Fasolo, B., & Katsikopoulos, K. V. (2005). “A 30% Chance of Rain Tomorrow”: How Does the Public Understand Probabilistic Weather Forecasts? *Risk Analysis*, 25(3), 623–629. <https://doi.org/10.1111/j.1539-6924.2005.00608.x>
- Lachapelle, E. (2017). Communicating about Carbon Taxes and Emissions Trading Programs. *Oxford Research Encyclopedia of Climate Science*.
- Lachapelle, E., Mahéo, V.A., & Nadeau, R. (2016). *Climate of Change: Analysis of a national survey of Canadian opinions about climate and energy issues*. EcoAnalytics.
- Lachapelle, E., & Martel-Morin, M. (2017). *Engaging the Five Canadas of Climate Change: Analytical Report*. EcoAnalytics.
- Ogunbode, C. A., Demski, C., Capstick, S. B., & Sposato, R. G. (2019). Attribution matters: Revisiting the link between extreme weather experience and climate change mitigation responses. *Global Environmental Change*, 54, 31–39. <https://doi.org/10.1016/j.gloenvcha.2018.11.005>
- Spence, A., Poortinga, W., Butler, C., & Pidgeon, N. (2011). Perceptions of climate change and willingness to save energy related to flood experience. *Nature Climate Change*, 1(1), 46–49.
<https://doi.org/10.1038/nclimate1059>
- Whitmarsh, L. (2008). Are flood victims more concerned about climate change than other people? The role of direct experience in risk perception and behavioural response. *Journal of Risk Research*, 11(3), 351–374. <https://doi.org/10.1080/13669870701552235>