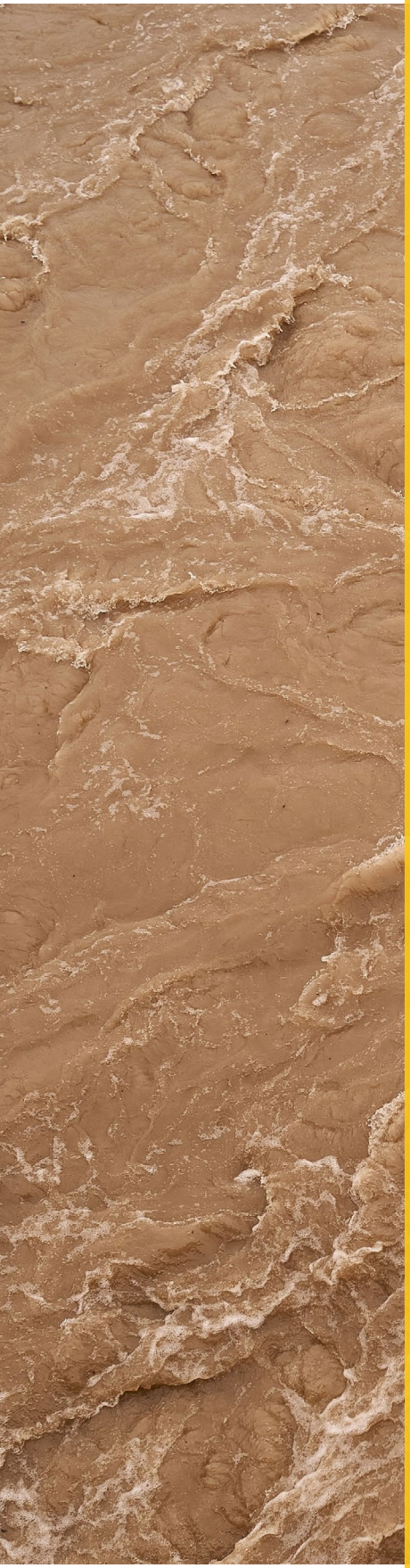

Virtual Community Engagement on Climate Change Adaptation

AUGUST 2022

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PREPARED FOR:
Fraser Basin Council

This report was produced as part of the UBC Sustainability Scholars Program, a partnership between the University of British Columbia and various local governments and organisations in support of providing graduate students with opportunities to do applied research on projects that advance sustainability across the region.

This project was conducted under the mentorship of Fraser Basin Council staff. The opinions and recommendations in this report and any errors are those of the author and do not necessarily reflect the views of Fraser Basin Council or the University of British Columbia.

We would like to acknowledge that the writing of this report took place on the traditional, ancestral and unceded territory of the Musqueam, Squamish and Tsleil-Waututh Nations. We would also like to acknowledge the lands that were the focus of the pilot project, the traditional territory of the Dunneza people and signatories of the Treaty 8 Territory. We are grateful for the ability to carry out our research on and about these lands and recognize that a more resilient and adaptive future is a decolonized and indigenized future.

We would also like to acknowledge all those who have guided and supported us through the course of this research: Karen Taylor (Sustainability Scholars), Tanya Hebron (Fraser Basin Council), Chelsea Mottishaw (City of Dawson Creek), and The Northeast Climate Resilience Network. In addition, we thank all the community members and local knowledge holders who provided both their time and invaluable insights.

Image credit: University of British Columbia

Image credit: City of Dawson Creek

Executive summary

Communities across Northeast British Columbia are increasingly recognizing the need to prepare for climate hazards and disaster risks. Over the past few decades, the region has experienced an increasing number of extreme weather events, such as floods, heat waves, and wildfires, and recent reports indicate that these will only worsen as climate change progresses. In anticipation of these growing threats, a collective of six local and regional authorities, known as the Northeast Climate Resilience Network (NECRN), came together to assess and manage climate risks in the region.

The work of NECRN identified that public engagement on climate change is relatively low in Northeast BC communities, and local government project partners identified climate awareness and floodproofing as priority actions for the region. In light of this, three Sustainability Scholars were retained by the NECRN and Fraser Basin Council to deliver the project at hand, which has two primary objectives: (1) equip local governments with knowledge on successful climate change communications and public engagement tools; and (2) raise awareness about climate risks and adaptive actions to the general public.

The project has two primary outputs: a best practice overview (Phase II) and a virtual engagement pilot project (Phase III). Following initial background research into region (Phase I), the best practice overview provides a package of information for local governments looking to lead public engagement on climate impacts and adaptation. It offers considerations for climate change communication, a description of 7 relevant virtual engagement tools, and 5 case studies of successful engagements.

After its collection, knowledge from the best practice overview was used to inform the design of the pilot project, a hybrid (online/in-person) engagement workshop on climate change awareness and personal flood preparedness in the City of Dawson Creek, BC. This workshop was developed in collaboration with a City staff partner and carried out in late June, 2022. Results from the pilot project indicated that the communication strategies adopted were successful in conveying messaging to participants. This is likely due to the preliminary research on best practices as well as the extensive research completed on community values and preferences.

This project's outputs aim to benefit both local governments and the general public of Northeast BC. The best practice overview offers immediate knowledge benefits for the region and will be actionable in future engagements that the NECRN conducts. The pilot project, on the other hand, serves not only to raise awareness and build adaptive knowledge within the City of Dawson Creek, but also acts as a case study in itself, testing the use of best practices and informing future engagement initiatives in Northeast BC.

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Introduction

In the past few decades, the region of Northeast BC has experienced an increasing number of extreme weather events, such as floods, heat waves, and wildfires. Such events are expected to become more frequent and more severe in the future, thus requiring local governments to prepare for hazards and disaster risks. As a result, several municipalities (the City of Fort St. John, the City of Dawson Creek, the District of Tumbler Ridge, the District of Chetwynd, and the Northern Rockies Regional Municipality) have decided to create a network, the Northeast Climate Resilience Network (NECRN), to address and prepare for the drastic changes expected in the near future.

The Fraser Basin Council (FBC), a non-profit organization collaborating with the Network, has been working to increase awareness of the general public on climate risks and actions that could potentially be taken to adapt. More specifically, FBC and NECRN have recognized the need to engage community members on climate impacts, since public engagement on climate change in the region is currently significantly low. Public involvement is crucial since it enhances local governments' ability to take action and successfully prepare for climate change impacts. To achieve this, municipalities in Northeast BC inevitably have to acquire knowledge on efficient and effective climate communication.

This project is intended to support local governments in Northeast BC to engage the public on climate change projections and impacts, with the aim of raising awareness and preparing for future risks. More specifically, the project illustrates a set of case studies, tools, and best practices for public engagement. Additionally, drawing on these resources and findings, the project includes the design and implementation of a pilot project on flood preparedness in the City of Dawson Creek, a local municipality which is part of the Network. The pilot project showcases lessons learned from preliminary research on public engagement and serves as a case study to inform future climate initiatives.

Image credit: City of Dawson Creek

About the Scholars

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The implementation of this project is the result a joint collaboration between three scholars at the University of British Columbia: Madelaine Parent, Margaryta Pustova and Giulia Belotti.

As graduate students enrolled in one of the most prestigious Universities in North America, we recognize that we undoubtedly come from a position of privilege. It is crucial to state that, although in this study we engage with climate adaptation and flood preparedness, none of us has ever experienced situations of stress and trauma resulting from climate change. Furthermore, as White Canadian- and European-born scholars, we acknowledge that we might not be able to fully understand local dynamics when working with a diverse community such as the one in the City of Dawson Creek.

Phase I: Background on the region

Area overview

The Northeast Region of British Columbia is comprised of two regional districts, Peace River Regional District, and the Northern Rockies Regional Municipality. Combined, these areas cover 202,502 km of land, or 22% of British Columbia's total land mass.[1] This expansive region is situated between the Yukon and Northwest Territories to the north, Rocky Mountains to the west, and Alberta to the east. The region's diverse geographical features include mountains, foothills, lakes, valleys, and major rivers such as the Peace River and Liard River.

Despite its vast area, Northeast BC makes up just 1.2% of the provincial population with 66,010 residents[2]. The area's largest cities are the City of Fort St. John (population 20,155), Fort Nelson (3,366), the City of Dawson Creek (12,978), the District of Tumbler Ridge (1,987), and the District of Chetwynd (2,503)[3]. There are also nine First Nation communities within the region, many of which are signatories to the Treaty 8 Agreement, established in 1899[1]. As of 2016, 17% of the regional population identified as Aboriginal[4,5].

This area's abundant natural resources create significant economic opportunity for the region. The economy is based primarily on natural gas production, coal mining, and the power-generating utilities that support these industries[6]. In addition, agriculture, logging, wood products manufacturing, and tourism are significant economic drivers[1]. Together, the above industries provide employment for a large proportion of the population[4,5].

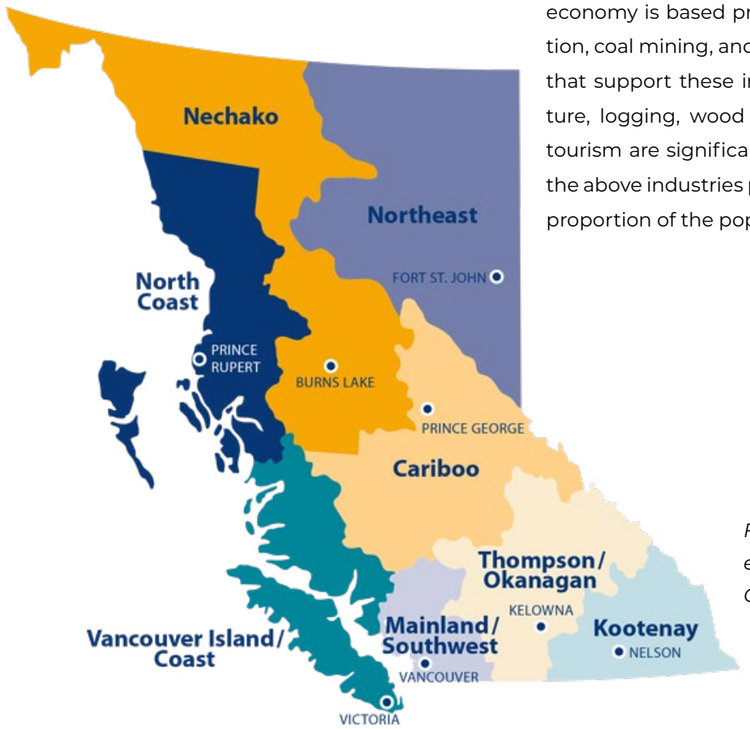


Figure 1. The map shows economic regions of British Columbia[7]

Northeastern British Columbia: statistical snapshot

Income[8,9]

Nothern Rockies median after tax household income is **2%** lower than British Columbia (BC) overall (2020)

Peace River median after tax household income is **11%** higher than BC overall (2020)

Dwelling types[8,9]

61% are detached homes
10% are low-rise apartment buildings
12% are movable dwellings (considerably higher than BC average of 2.5%)

Population & age[8,9]

66,010 residents (1.2% of provincial population)

Younger population than BC overall:
~5% more residents aged 0-14
~7% fewer residents aged 65+.

Housing affordability[4,5]

~**17%** of residents spend 30% or more of their income on shelter, which is 11% less than BC overall

Occupation[4,5]

~**25%**: Trades, transport and equipment operators and related occupations
~**21%**: Sales and service
~**13%**: Business, Finance and Admin
~**9%:** Education; law and social; community and government services
~**10.7%**: Management

Ethnicity & Immigration[4,5]

69% of residents have European origins
6% have Asian origins
16% have North American Aboriginal origins

2% of the population are new immigrants (between 2011-2016), of which 45% are from the Philippines and 16% from India

Introduction to the Northeast Climate Resilience Network (NECRN)

In the past couple of decades, communities in Northeast British Columbia have experienced a dramatic increase in extreme weather events, leading to adverse impacts such as floods, wildfires, droughts, and erosion. According to recent projections, these events are expected to become more severe and more frequent in the future, thus representing a threat to infrastructure, economy, and communities at large. Local communities in Northeast BC have recognized the need to prepare for these disruptive events by sharing knowledge on future climate trends, assessing local vulnerabilities, and planning for adequate responses.

Following this understanding, five local governments (the City of Fort St. John, the City of Dawson Creek, the District of Tumbler Ridge, the District of Chetwynd, the Northern Rockies Regional Municipality), and Northern Health have formed the Northern Climate Resilience Network (NECRN), a peer network of communities collaborating on preparation for and action against adverse climate impacts in the region.

Want to know more about NECRN's work? Here are some helpful links.

Climate projections:

- Climate Projections for BC's Northeast Region

Climate change vulnerability assessment reports:

- City of Fort St. John
- City of Dawson Creek
- District of Tumbler Ridge
- District of Chetwynd
- Northern Rockies Regional Municipality
- Village of Pouce Coupe

The Network has embarked on a project consisting of two separate phases:

1 The first phase (2018 – 2020) had the aim of providing support to communities in their effort to understand, prepare, and collaboratively address climate risks and vulnerabilities on the regional and local scale. In order to achieve this, the Network worked with the consulting agencies Pinna Sustainability and SHIFT Collaborative on the development of local climate assessments. Additionally, the Network adopted a collaborative approach and involved local communities, academia, as well as the public and private sector, to increase awareness of the adverse consequences of climate change.

During the first phase, the Network completed two crucial project components, namely the report "Climate Projections for the BC Northeastern Region", and five community-based "Climate Change Vulnerability Assessments". While the first report highlights future climate projections and expected impacts of climate change in the region, the vulnerability assessments – one for each NECRN community – identify priority items for each local government in terms of adaptation planning and preparedness.

2 The second phase (2020 – present) consists of a comprehensive review of the information gathered in the first phase of the project to incorporate climate change adaptation into planning decisions and determine potential future steps. This phase not only has the objective of facilitating collaboration and peer learning on adaptation among local communities, but it is also intended to raise community, public and private sector awareness of climate change impacts. It is precisely this last aspect that our project

To further explore the benefits of the Network's initiatives, we conducted interviews with staff working for the municipal governments and organizations partnering with the Network. During the interviews, we asked the staff to reflect on the ways the NECRN supported them in climate change adaptation. A common theme that emerged from these reflections is that participation in the Network provides member communities with an opportunity to exchange information, experiences, and best practices related to adaptation to climate change impacts. Interviewees also pointed out that this information exchange helps in finding creative solutions for challenges posed by climate change. Overall, the interviews suggest that participation in region-wide intercommunity partnerships (such as NECRN) can effectively support local governments in preparing for climate change impacts.

Climate projections for the BC Northeastern Region

As mentioned in the previous paragraph, in the first phase of the project the Network worked with external partners to assess climate risks and vulnerabilities in the region which resulted in the release of the "Climate Projections for the BC Northeastern Region" report[10]. The report outlines various projected impacts of climate change at the regional level. The main findings are listed below:

For more details on climate impacts in BC, see "Climate Projections for the BC Northeastern region" or "British Columbia Chapter of Canada in a Changing Climate: Regional Perspectives Report "

Summer temperatures

In the summer season, the region is projected to experience a significant increase in the number of days when the maximum daily temperature exceeds 30°C, which can cause heat stress in vulnerable populations. Warming summer temperatures will also contribute to the rise in cooling demands in the communities. Changes in summer temperatures will also have a significant impact on agriculture and forestry: while the growing season in the region is expected to lengthen, creating new opportunities for the agricultural sector, Northeast BC will also see an increase in the growth and reproduction of invasive species, which poses challenges for both the agricultural and forestry sectors.

Winter temperatures

Future winter daytime and nighttime temperatures are predicted to resemble past fall temperatures, resulting in a decline in energy demand for heating. The number of days when the temperature falls below zero (frost days) and when the temperature stays below zero throughout the day (ice days) is projected to decline, which could impact native and agricultural species, ecosystems, and transportation in the region. A decrease in the number of ice days could result in additional freeze-thaw cycles in some years, which can damage roads, runways, and bridges. Moreover, an increase in rain-on-snow events can also be expected, causing hazardous road conditions.

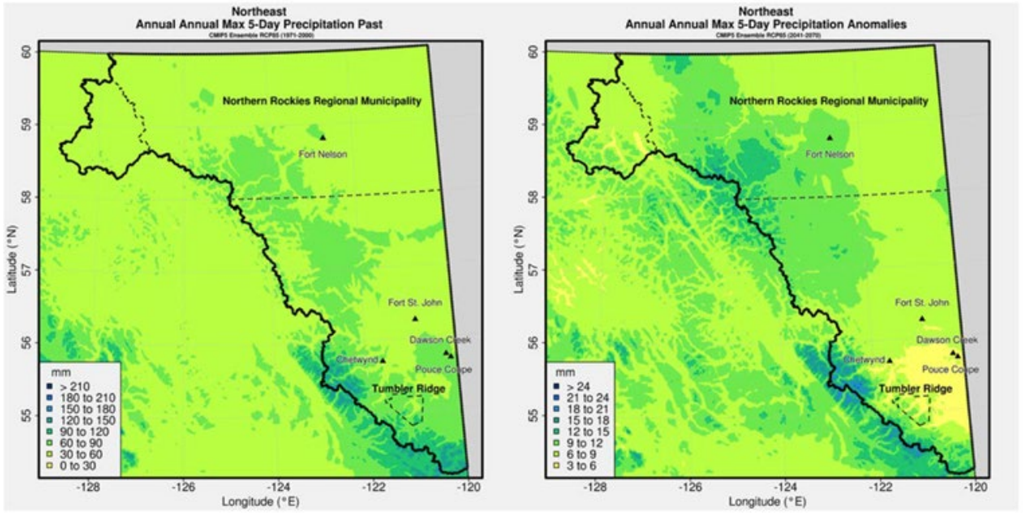


Figure 1. Five Wettest Days – Past and Future Change (2050s)

Precipitation

In Northeast BC, precipitation is expected to increase throughout the year. Rainfall precipitation increases are not going to be equally distributed through the seasons, with spring and autumn experiencing up to a 30% increase in precipitation by the 2080s. Summer is projected to remain the wettest season, but only by a smaller margin. As we highlight in later paragraphs, this has important implications for water security in local communities. Figure 1 shows projected future changes in precipitation using the "wettest 5 days indicator", which describes the largest amount of precipitation falling over 5 consecutive days in the year. This indicator provides a clear idea of the severity of future changes in climate patterns, indicating that the amount of precipitation experienced over the wettest five days is expected to significantly increase in the future. .

Hydrology

Data shows that hydrology in the Northeaster BC region is significantly changing. More specifically, as a result of increasing temperatures, more precipitation will fall as rain instead of snow, thus resulting in smaller snowpack and earlier freshet. Together, these two factors will cause reduced and earlier snowmelt contributing to summer flows. As mentioned, summers will still be the wettest seasons, but only by a smaller margin. This means that summers will experience a small relative increase in precipitation but increased evaporation due to rising temperatures. Again, these interacting elements together lead to significantly lower streamflow in summer, which inevitably raises concerns around water security. In other words, although precipitations are projected to increase, potentially leading to flooding in spring and autumn, water scarcity will still represent an issue in the summer.

Cummulative impacts

The outcomes of multiple interacting and interconnected factors, such as rising temperatures and increased rainfall, show the complexity characterizing our changing climate. The aforementioned risks lead to significant concerns for local communities in Northeast BC. These include impacts on physical infrastructure (i.e., road maintenance, buildings, stormwater, wastewater, and energy systems), impacts on social infrastructure (i.e., social and physical public health, recreation and tourism, food security), impacts on natural ecosystems (i.e., public health of ecosystems), and impacts on economic infrastructures (i.e., oil and gas sector, timber harvesting, agriculture). Preventing adverse effects of extreme weather events will require coordinated efforts in multiple sectors. Among them, it will be necessary to invest in social and physical infrastructures, but also diversify the economy. Furthermore, raising awareness among the general public and engaging local communities in adaptation and mitigation initiatives is also crucial. These efforts will allow local governments to adequately prepare to address adverse climate impacts and will foster resilience among communities.

Climate change attitudes in Northeast BC

While Northeast BC is already experiencing the effects of climate change, the residents of the region tend to be more sceptical about climate change than the rest of the province. For example, while 86% of British Columbians believe that the earth is getting warmer, only 77% of the population in the Northeast share this view. The perceived level of personal harm is also below the provincial average: only 33% of people in the region think that climate change will harm them personally, while the provincial average stands at 45%.

The interviews with local municipal governments and organizations shed further light on these tendencies. The interviewees pointed out that a large share of the population is employed in the oil and gas industry and tend to perceive climate action as a threat to their livelihood, which results in greater rates of climate change denialism. This explains why climate change attitudes in the Northeast resemble those of Albertan residents rather than climate change attitudes in British Columbia, as can be seen from figures 2 and 3[11]. However, one of the interviewees also mentioned that during previous climate change-related community engagement events, the denialists were willing to engage in a conversation on climate change with scientists in a respectful manner. This spurs hope that at least some individu-

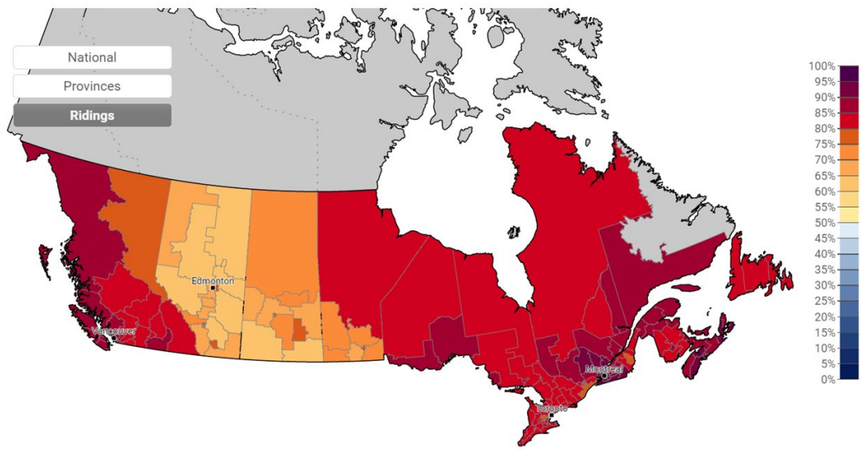


Figure 2. Estimated percentage of adults who think earth is getting warmer[11]

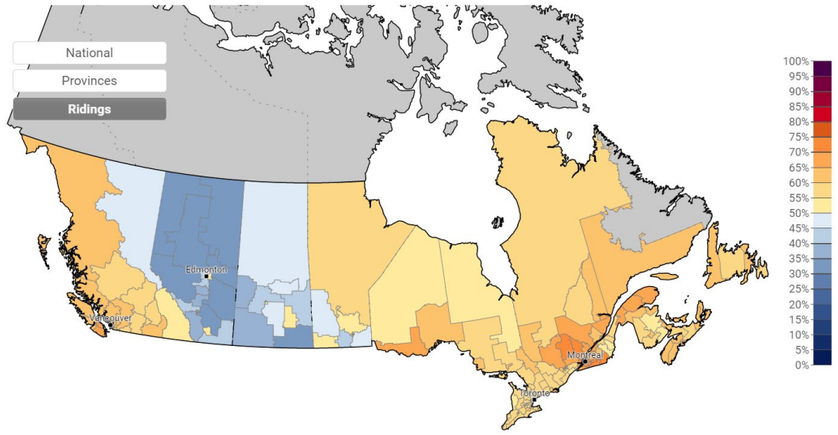


Figure 3. Estimated percentage of adults who think climate change will harm them personally[11]

als who are skeptical about climate change may be willing to reconsider their views.

The interviews also revealed that people who believe in climate change tend to think about the issue as something that is affecting faraway places and future generations. And although extreme weather events prompt conversations about climate change, they tend to diminish shortly after. Overall, the attention and engagement with the issue seem to be rather limited among the residents of Northeast BC, while projected changes in climate change call for urgent adaptation actions.

However, despite lacking climate change concerns, Northeast BC residents seem to have a great appreciation of nature and positive environmental protection attitudes. For example, one of the interviewees pointed out that the residents of their community regularly clean up beaches at the nearby lake. These positive attitudes can be built upon when engaging communities on climate change.

Background on the City of Dawson Creek

Image credit: maclean25
(retreived from Wikipedia)

Area overview

The City of Dawson Creek is a small city of 12,323 residents in the Peace River region of northeastern BC[2]. Situated within the Peace River Valley in the Interior Plains of Canada, the city is geographically characterized by mountains, foothills, lakes, and forests[6].

Prior to the arrival of fur traders in 1793, the Dawson Creek area was home to the Saulteaux (Anishinabe), Nehiyaw (Cree), and Mountain Dunne-Za (Beaver) peoples[12]. Shortly after World War II, discharged soldiers settled in the Dawson Creek area and the village slowly grew. In 1942, construction of the Alaskan highway, beginning at Dawson Creek, brought thousands of workers and marked a boom period for the town. Since its completion, the highway has attracted significant growth to the city and allowed for the development of surrounding industries[13].

Today, the economy of Dawson Creek is based on the industry sectors of agriculture, tourism, renewable energy, forestry, and oil and gas[14]. While agriculture has traditionally been important to the economy, resource extraction has more recently brought economic prosperity to the region through forestry, coal mining, and oil and gas projects. The region also plays a significant role in renewable energy generation via the Bear Mountain Wind Farm, W.A.C. Bennett Dam, and the Site C dam, currently under construction[15].

Also contributing to the local economy is tourism. Many visitors come to the region each year to travel along the scenic Alaska Highway. Bear Mountain, south of the city, also offers a variety of winter recreation opportunities attracting visitors. Amenities within the city include an art gallery, museum, events centre, arena, swimming pool, and ice rink[16]. Several annual events also take place each year including the well-known Dawson Creek Fall Fair & Exhibition. Together, the above aspects provide a high quality of life for residents.

Dawson Creek: Statistical Snapshot

Income[2]

median after-tax household income is **4.6%** lower than BC overall

average after-tax household income is **9.1%** lower than BC average

Dwelling types[2] & tenure[17]

~**61%** of dwellings are detached homes (significantly higher than BC average of 42.4%)

~**60.7%** of rhe population are owners (significantly less than BC average of 68%)

Population & age[2]

12,323 residents

Younger population than BC overall:

~4% more residents aged 0-14

~7% fewer residents aged 65+.

Dwelling condition

More homes are in need of major repairs as compared to BC overall

~9.3% require major repairs (BC average: 6.3%)

~90.7% require minor repairs (BC average: 93%)

Occupation[17]

~**24.8%**: Sales and services

~**21.2%**: Trades, transport and equipment operators and related occupations

~**13.3%**: Business, Finance and Admin

~**9.1%:** Education; law and social; community and government services

~**8.8%**: Management

Ethnicity & immigration[17]

70.4% of residents have European origins

8.6% have Asian origins

16.8% have North American Aboriginal origins

4% of the population are new immigrants (between 2011-2016), of which 48.9% are from the Philippines and 28.7% from India

Vulnerability assessment

A vulnerability assessment for the City of Dawson Creek was conducted between 2018 and 2019[18]. The process included (1) assessment of relevant climate impacts, vulnerabilities, and risks; (2) generation and evaluation of adaptation options, as well as (3) identification of near-term priority actions and exploration of opportunities for building collective capacity within the NECRN for action implementation.

As a result of the assessment, climate change-related risks for the City of Dawson Creek were estimated. The level of risk was derived by considering both the impacts occurring as a result of the climate hazard, as well as its likelihood. Table 1 presents the impacts that have been identified as being associated with the highest risk for the community.

Table 1. Highest-risk climate impacts in Dawson Creek (sorted from the highest to lowest risk score within the "High" risk category).

CLIMATE-RELATED HAZARD	IMPACTS	RISK SCORE
INCREASED RIVERINE FLOOD RISK	Damage to buildings, agricultural crops, parklands, and infrastructure due to increased river flow and food events	15
WARMER WINTERS	Increased risk of street flooding, street closures, mobility challenges, and potential damage to buildings due to higher potential for rain-on-snow events and ice storms	19.5
	Decrease in the durability of infrastructures, such as roads and trails, and increase in maintenance needs, due to increasing number of freeze/thaw cycles	14.7
	Increase in localized flooding from backed-up culverts due to more rapid snow melt in spring	14
INCREASED INTENSITY AND FREQUENCY OF PRECIPITATION	More frequent localized flooding and sewer surcharges in parts of the community due to increased intensity of rainfallzZ	19.5
	Increased strain and stress on municipal wastewater infrastructure and private layout and dugouts, as well as private septic and lagoons, as a result of increased flood events	17.5
INCREASE IN OTHER EXTREME WEATHER EVENTS	Disruptions in transportation within Dawson Creek and between communities due to major events, such as landslides, floods, or wildfires. This may result in the isolation of critical services, jobs, as well as evacuation routes	13.5
HOTTER SUMMERS	Increased potential for droughts and decreased water supply in the late summer due to a combination of hotter and drier conditions.	13.3

Floods in the City of Dawson Creek

As identified in the vulnerability assessment, the City of Dawson Creek is particularly vulnerable to floods. The community already experienced a large flooding event in June 2016, causing significant social and economic impacts[10]. The 2016 flood washed away four bridges, isolating key emergency services, adding unexpected costs to the municipality[10]. The event also damaged homes, led to power losses, and precluded residents from accessing schools, workplaces, and businesses[10]. The flood of 2016 was estimated to be a 1-in-76-year event, meaning that there is a 1.3% chance of it occurring in any given year. As climate change is gaining momentum, the likelihood of floods such as the one experienced by the City of Dawson Creek in 2016 is projected to in-crease (and the return period[a] will respectively de-crease).

In 2019, the City of Dawson Creek produced a collection of maps showing riverine flood hazards affecting the City of Dawson Creek for various scenarios[20]. Specifically, flood hazards were mapped for floods with return periods of 2, 5, 10, 50, 100, and 200 years both for existing climate conditions, as well as accounting for climate change[20]. Figures 4 and 5 presents the 1-in-100-year flood depth maps that were produced by the City of Dawson Creek. As can be seen from the maps, significant areas of the municipality are expected to be inundated by a 1-in-100-year flood even under current climatic conditions, while climate change is projected to further exacerbate floods, with 1-in-100-year floods affecting larger areas and causing higher water levels compared to the current climate.

Image credit: City of Dawson Creek

Floods
in Dawson Creek
in 2016

[a] Return period is an estimated time interval between events, such as floods, of similar size or intensity[19]

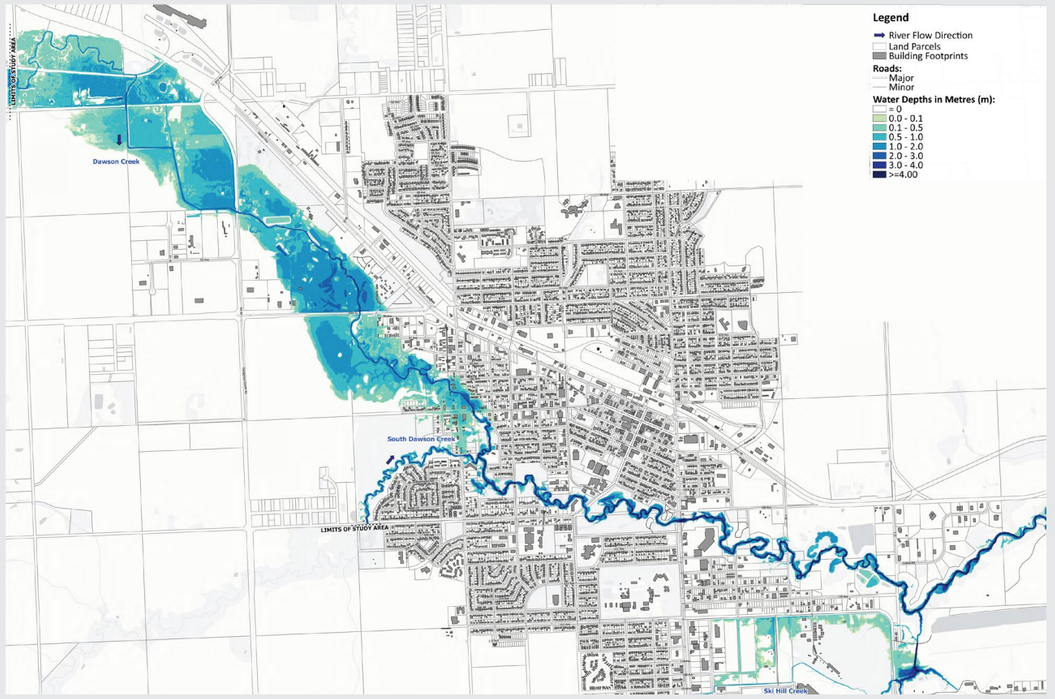


Figure 4. The maps show a flood depth map for the City of Dawson Creek for a 1-in-100-years flood under existing climatic conditions[21]

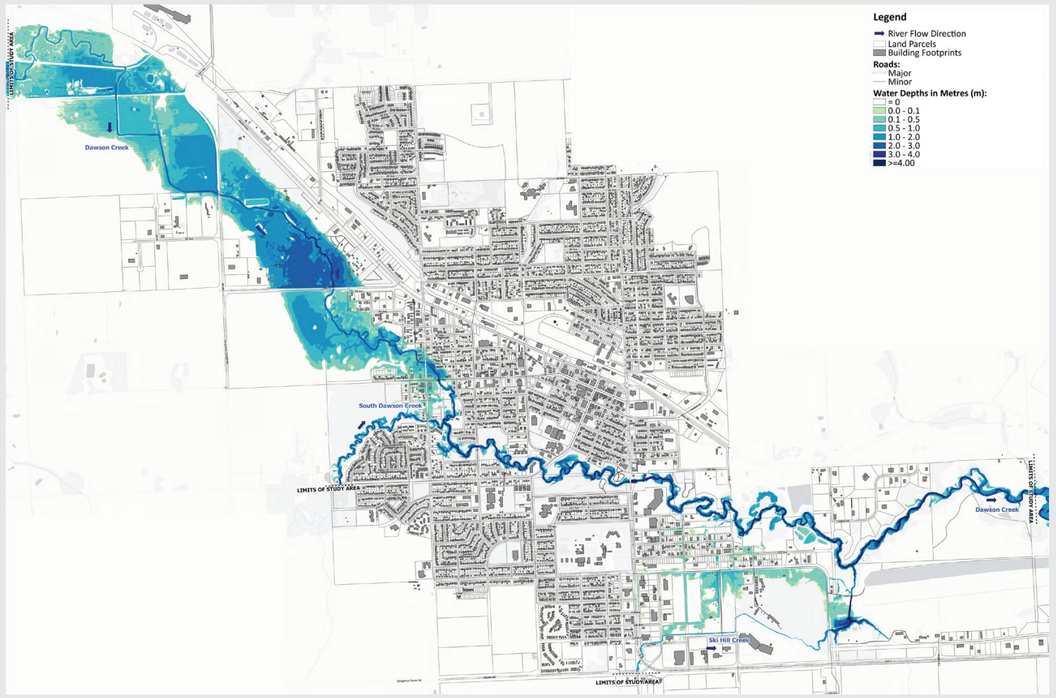


Figure 5. The maps show a flood depth map for the City of Dawson Creek for a 1-in-100-years flood under climate change[22]

Phase II: Best practices for community engagement and climate change communication

On an increasingly warming planet, where extreme weather events are becoming more intense and more frequent, there is an urgent need to adapt[23]. Although governments all over the world have started to invest significant portions of their budgets in climate adaptation strategies, local stakeholders are struggling to deal with the disruptive impacts of climate change in their communities[24]. Despite recent improvements in understanding climate-related risks, adaptation practice remains flawed, leaving many in conditions of extreme uncertainty and vulnerability[24,25].

Difficulty in predicting uncertain future events, compounded with limited resources and local governments' conflicting priorities, makes adaptation all but an easy task to achieve.

For this reason, adequate responses to climate change risks not only require improved coordination between various stakeholders, but also and especially individual and collective readiness to prepare for an uncertain future[26]. Awareness- and capacity-building activities at the community level represent a crucial strategy since they are expected to lead to increased citizen participation in decision-making on climate change adaptation and to more effective climate action[27]. Multiple studies find community-based adaptation to be a crucial element to secure local sustainability, since communities are more familiar with local realities than external actors and can thus help achieve adaptation objectives equitably. Furthermore, community-based adaptation recognizes the role of local and traditional knowledge when it comes to both conservation of ecosystems and reduction of climate change-associated risks[28].

Achieving these goals inevitably means developing a shared sense of risk within communities, which is impossible without reaching a certain degree of social learning[29,30]. Social learning is simply a process of creating knowledge and understanding collectively, which requires communities to learn together[31].

Paramount to social learning is community engagement. The concept of engagement has been widely debated in the literature as well as in practice and multiple definitions of engagement have been adopted and applied over time. While most definitions require the presence of a "two-way process of dialogue where the aspirations, concerns, needs, and values of the community are incorporated into policy development, planning, implementation and assessment"[32], broader definitions also exist. For instance, the Centre for Public Impact (CPI) interprets public engagement as "any intervention aimed at communicating with or mobilizing the public, or changing their behaviours, choices or attitudes to positively contribute to reducing emissions"[32].

It is extremely important to be transparent about the definition that one decides to adopt, since this has practical implications for the nature of the engagement. In fact, a definition that interprets engagement as a process to incorporate citizens' needs into policymaking is radically different from a broader definition perceiving engagement as wide-ranging communication and activation efforts. While both involve working with the public, the type of involvement essentially differs. The former can be understood as a facet of policymaking, while the latter has more to do with behavioural change.

Methods

Research into best practices was divided into three sections:

- Considerations for Climate Change Communication
- Case Studies
- Engagement Tools

These sections were chosen to offer a comprehensive package of information to professionals engaging communities virtually on climate change adaptation.

All secondary research was based on the review of both academic and grey literature, with the exception of one case study, which was based on an interview with a local stakeholder. In the **Considerations for Climate Change Communication** section, all practices relevant to the research scope were chosen and then organized and summarized accordingly. **Case studies** were also selected based on their relevance to the project; those that were focused on climate change engagement, virtual (or easily adaptable), participatory, unique, fun, and/or creative. They were also limited to government or non-profit initiatives and those which had adequate information available. The desire to provide a diverse range of cases also factored into the selection process. **Engagement tools** were similarly chosen based on their relevance to the research project, adequacy of information, and relative diversity.

The later definition constitutes our understanding of engagement for the purposes of this research and is what guided our considerations for Phases II and III of this report. Although the term "engagement" can be widely employed, this report focuses on engagement for communication, mobilization, and behaviour change. If engagement for decision-making purposes is what you are aiming for, this report is not for you.

Virtual engagement tools

This section describes seven interesting and participatory engagement tools that are either designed for the virtual context or can easily be adapted to it. The tools chosen are relevant to a range of time requirements, suitable uses, and intended outcomes, in hopes that they will provide an array of options to meet the unique engagement needs of differing communities across Northeast BC.

Storytelling

Storytelling is a way of understanding, processing and communicating that is highly accessible, and particularly common within Indigenous cultures[33,34]. On the community level, coherent foundational stories can help create shared meaning, tie people together, preserve culture, and envision successful futures; all of which are key to resilience[33]. At the individual level, unique stories from diverse voices can help bring new narratives to light[33]. Stories can be told through many means, such as spoken word, song, film, and photography, and engagement professionals can use storytelling in many ways, from simple icebreakers to running an online film-production program. Whatever the means, storytelling can help us communicate about adaptation in new ways and bring communities together in the face of a challenging future.

Time Required	**Uses**	**Participation Level**	**Helpful Resource**
Short (<6 weeks)	Communicating, Mobilizing, Changing attitudes	High	Digital Storytelling Overview, Tamarack Institute

Participatory community-based mapping

Participatory community-based mapping (PCBM) is an engagement method that invites community members to act as direct agents in the process of map-making. As an example, participants might be asked to pinpoint areas that they or their ancestors have considered to be of high-risk during storm events. This method has numerous benefits for engaging communities around climate change adaptation. Firstly, the process of co-creating knowledge has been shown to raise the understanding and skill of participants surrounding adaptation and increase community empowerment through the representation of diverse local voices[35–37]. Furthermore, PCBM can help bridge the gap between local and scientific knowledge[37–39]. Several online tools exist to bring this method to the virtual realm, such as the user-friendly, Google Maps Engine Lite and Padlet Map Tool, and the more technical, ArcGIS StoryMaps and QGIS.

Time Required	**Uses**	**Participation Level**	**Case Study**
Short (<6 weeks)	Communicating, Mobilizing, Changing attitudes	High	Story Mapping and Sea Level Rise[39], University of Central Florida and Old Dominion University. See Website.

Serious games: role play

Serious games are games designed for educational, rather than recreational, purposes. In the context of climate change adaptation, one type of serious game - role-play simulations (RPSs) - has shown significant potential for improving public adaptation readiness[40]. In RPSs, each player is assigned a role within a mock decision-making process (e.g., responding to flood risk), which they follow from start to finish. This activity gives players a direct window into decision-making processes around climate change adaptation, thus increasing literacy, engagement, and the understanding of multiple perspectives[40]. RPSs have been successfully adapted to virtual settings through the use of digital tools such as Zoom, Miro, and online games.

Time Required	**Uses**	**Participation Level**	**Case Study**
Short (<6 weeks)	Communicating, Mobilizing, Changing attitudes	High	Flood Resilience Challenge Game[41], Bogdan and Murdock (Fig. 6)

Community-based social marketing

Community-based social marketing (CBSM) is a method of bringing about behaviour change amongst individuals and organizations. It relies on the belief that the provision of information alone does little to affect the public's behaviour[42]. Rather, it emphasizes the research-based approaches of face-to-face contact (which can be virtual); the removal of barriers; and the use of tools, such as prompts and commitments[42]. There are four steps in the CBSM model: identifying the barriers to a behaviour; developing and piloting a program to overcome these barriers; implementing the program; and evaluating the program's effectiveness[42]. This method works best for targeting simple adaptation behaviours that require little education, such as clearing one's storm drain during high rain events[42].

Time Required	**Uses**	**Participation Level**	**Case Study**
Medium (6 weeks-6 months)	Mobilizing, Changing behaviour	High	The Better Buildings Residential Network[43], Fort Collins, Colorado

Kitchen table talks

Involve a small group of 8-10 citizens gathering to discuss specific issues with the help of a facilitator. Traditionally done in-person, this tool is easily adapted to a virtual format through online meeting software. Discussions can take place on one or multiple occasions and facilitators can be either staff or community volunteers. A strength of this tool is that it creates a comfortable and informal environment where residents may be more willing to take part in dialogue[44]. When directed toward climate change- and adaptation-related topics, this tool can help raise awareness and promote action, especially when groups set goals and/or commit to individual actions at each meeting[44,45].

Time Required	**Uses**	**Participation Level**	**Case Study**
Medium (6 weeks-6 months)	Communicating, Mobilizing, Changing attitudes, Changing behaviour	High	Energymark Kitchen Table Discussions[45], Brisbane, Australia

Photovoice

Photovoice is a creative engagement method that involves the analysis of photography. While photovoice can take many forms, when it comes to engagement for climate change adaptation, the following steps have been suggested: (1) carry out a photography workshop with participants; (2) analyze photos collectively to determine themes; (3) present the results to the public; and (4) review for next steps, such as taking action[46]. Within this context, photovoice has demonstrated beneficial outcomes, such as promoting the understanding of diverse perspectives, building common ground, eliciting meaning-making, and increasing interest, awareness and action surrounding climate change[47]. For best results, photovoice should be done over a longer timeframe and in an iterative manner, which can mean higher barriers for facilitators and participants[48]. This should be kept in mind when considering it as a potential tool.

Time Required
Medium (6 weeks-6 months)

Uses
Communicating, Mobilizing, Changing attitudes, Changing behaviour

Participation Level
High

Case Study
Field-guide for Photo Voice in Climate Change Adaptation Engagement[46], Drishti-Centre for Integral Action and Centro Bartolomé de las Casas

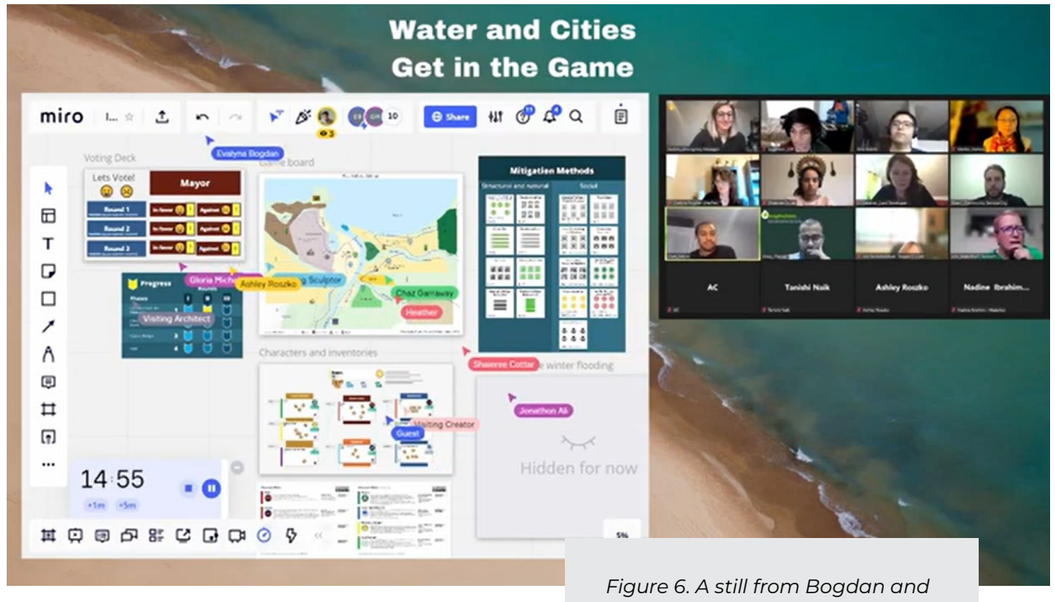


Figure 6. A still from Bogdan and Murdock's online Flood Resistance Challenge Game[41].

Landscape visualization

A growing body of research is looking to landscape visualization (LV) as a method to increase both local climate change awareness and adaptation responses[49,50]. LV is the creation of images that show the future impacts of climate change in local settings. For example, an LV could show the predicted impacts of flooding on a local shoreline in both a high and a low adaptation scenario. Research has shown that LV can lead to increased concern over climate change and interest in adaptive behaviors[51]. For many, it allows the realities of climate change to "hit home"[51]. For best results, it is recommended that visualizations are accurate, relevant, unbiased, and minimally fear-evoking[52]. Engagement with these visuals can take place virtually, for example, through an online workshop, webpage, or social media campaign.

Time Required
Medium (6 weeks-6 months)

Uses
Communicating, Mobilizing, Changing attitudes, Changing behaviour

Participation Level

Case Study
Local Climate Change Visioning[53], The University of British Columbia (Fig. 7)

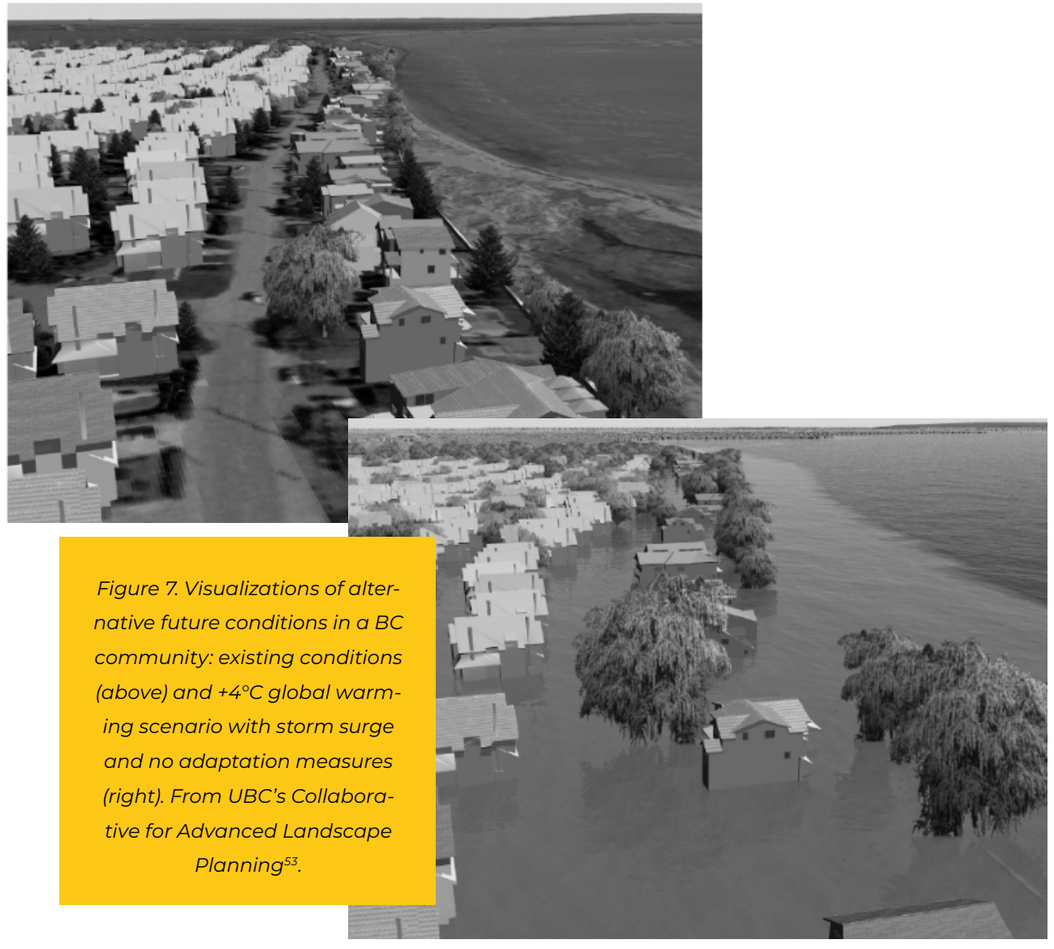


Figure 7. Visualizations of alternative future conditions in a BC community: existing conditions (above) and +4°C global warming scenario with storm surge and no adaptation measures (right). From UBC's Collaborative for Advanced Landscape Planning[53].

Case studies

1 Qathet Regional District: outreach and engagement for coastal flood hazard[b]

The qathet Regional District, in collaboration with Tla'amin Nation and the City of Powell River ,BC, is working towards the development of its Regional Coastal Flood Adaptation Strategy (RCFAS), a broad strategy to address coastal flood hazards in the region. Following some foundational work to better understand the potential risks of flooding associated with coastal storms and sea level rise in the region, qathet Regional District and its partners identified engagement on coastal flood hazards as a crucial component of the adaptation strategy. For this reason, they hired a consulting firm to develop an engagement and outreach plan consisting of four different phases:

1. Raising awareness among community members and stakeholders on coastal flood adaptation and on the Regional Coastal Flood Adaptation Strategy;
2. Gathering input on community values and preferences;
3. Gathering feedback on adaptation options proposed in the Regional Coastal Flood Adaptation Strategy;
4. Informing the public and decision-makers on the integration of feedback provided by participants in the adaptation strategy.

The engagement and awareness process was developed considering multiple specific objectives. The project team tried to ensure equal access to participation and engagement for all stakeholders and members of the public who wanted to get involved. Moreover, awareness-raising activities were considered a crucial component of the project, since they would lead to a better understanding of complex information on coastal flood and erosion risks among stakeholders, as well as community members. Lastly, gathering information on community values and preferences was considered a key element of the engagement, since it would allow for the selection of options that are deemed acceptable by the public.

A public workshop held June 22, 2022

The engagement plan was implemented throughout the course of several months and it is still ongoing at the time of this writing (March 2022 to October 2022), with most activities involving local communities delivered online due to Covid-19 concerns. While offering online workshops could potentially enhance participation and improve accessibility by reducing the barriers of technology and travel, online engagement in qathet Regional District still resulted in significantly low turnout. According to community staff, the low turnout could have been due to the older demographic composition of the population and challenges with internet connectivity in rural areas, thus making technology a deterrent rather than a draw. Additionally, coastal flooding is an issue that a vast number of the population does not consider a threat, especially since it only affects properties and infrastructures located on the coast.

Although these factors had a negative impact on the number of participants in each workshop, the activities proposed were still successful. Stakeholders and community members participating in information sessions on coastal flood risks and preparedness were engaged through various interactive activities. The application "Mentimeter" was used as a virtual tool for engagement, allowing participants to provide anonymous feedback and respond to questions like "what do you value about living in a coastal community?" and "what impacts of coastal flood risk are you most concerned about?" or to suggest preferred adaptation solutions. This allowed qathet Regional District to identify which adaptation measures were considered acceptable by members of the public as well as by stakeholders. Interactive activities were accompanied by presentations on local risks of coastal flooding and feasible adaptation strategies, which allowed the project team to raise awareness on the issue. During these sessions, workshop facilitators also shared flood maps with participants, discussing various future scenarios and highlighting the impacts of coastal flooding on infrastructure, services, and wellbeing. Asking participants to propose adaptation strategies after envisioning the effects of flooding on their region was an effective strategy and it allowed individuals to learn while feeling involved in local decision-making.

Lessons learned

- Developing a long-term engagement plan allows for the achievement of multiple objectives, engaging the public in both awareness-raising activities and decision-making processes on adaptation
- The use of interactive software like Mentimeter and maps fosters learning and enhances participation
- Online tools might act as a deterrent and hinder inclusion and participation, thus making it vital to understand the community composition (demographics, values, etc.) before proceeding with the engagement session
- The low turnout highlighted the need to offer more in-person engagement opportunities for future projects

[b] This case study was added to the report as a result of an interview conducted with city staff of qathet Regional District. For this reason, a citation is not provided.

2 Role play simulation for climate change adaptation education and engagement[40]

An efficient way to engage and educate communities on climate change adaptation is through the adoption of serious games. Serious games are exercises that encourage participants to deal with, and solve, imaginary but realistic challenges. The aim of serious games is not only to foster collective understanding of a certain problem, but also to support individuals in the identification of effective problem-solving approaches, thus giving them the ability to deal with complex issues in a safe environment. The authors of this study tested the effectiveness of Role Play Simulation (RPS), a type of serious game, as a tool for engaging local communities on climate change adaptation. The initiative, which was carried out in New England over a period of six months, resulted in the participation of around 150 individuals in each community, with the aim of helping communities prepare for climate change risks. In the RPS, each participant was assigned a certain role (town major, homeowner affected by flooding, etc.), and a realistic, yet imaginary scenario was presented, reflecting real-world climate change projections. Participants were invited to take part in an urban planning exercise for an imaginary town, considering the uncertain impact of future climate change risks.

The researchers found that participation in the role-play simulation increased both individuals' and the community's ability and readiness to adapt. It did so in three fundamental ways:

(1) Cultivating adaptation literacy.

After the game, participants declared that they gained a better understanding of climate change risks and, in turn, they recognized the need for local communities to integrate adaptation into urban planning. The exercise was especially effective in increasing awareness and concern among participants who were still skeptical about climate change and its impacts. The game allowed participants to grasp the complexity of the adaptation challenge, especially when it comes to its inclusion in decision-making processes. While the RPS generally resulted in increased confidence of participants in the ability of their town to adapt, this sentiment mainly concerned those who were previously skeptical or less knowledgeable about climate change impacts. In turn, those who were previously confident about the ability of their local governments to effectively respond to climate change left the simulation with a decrease in confidence, since the simulation made them realize how challenging adaptation can be.

(2) Enhancing collaborative capacity.

The serious game not only fostered knowledge of climate change adaptation in the local communities, but also played a fundamental role in terms of growing ability to collectively manage risk and participate in decision-making processes. Additionally, participants had a chance to develop empathy towards one another and embrace different perspectives. The fact that individuals were engaging in a simulation instead of a real-life challenge made them feel 'safer' and thus more open to collaboration and consensus building.

(3) Fostering social learning[c].

The RPS represented a critical conversation starter and allowed participants to acknowledge the importance of including the public in decision-making processes regarding adaptation. More specifically, participants expressed their support for further adaptation activities, declaring that they now felt that they were not alone. Although social learning on adaptation takes time to manifest, local communities that were part of the engagement project immediately started to integrate some of the adaptation solutions that emerged from the role-play into their planning, thus indicating that social learning might already be happening.

[c] Social learning is defined as "a change in understanding that goes beyond the individual and spreads within communities or groups through social interactions between people."[29]

Lessons learned

PROS OF RPS

- Enhancing understanding of climate risks
- Building support for adaptation action
- Building support for stakeholders' collaboration in adaptation
- Providing conversation starters on climate change andadaptation strategies
- Fostering social learning and adaptation action

CONS OF RPS

- It does not lead to real-world solutions
- People might be discouraged from participating, because of a lack of time or interest
- RPS works best if applied to a specific context

3 Photovoice, design thinking and geospatial mapping for empowerment and education of communities[5]

Multiple tools can be deployed simultaneously to foster community engagement around climate adaptation. Two communities in South Florida were involved in multi-session virtual workshops that combined photovoice, design thinking, and geospatial mapping with the dual aim of educating individuals and empowering them to express their main concerns related to climate change risks and identify potential solutions.

Photovoice is a method that allows people to share stories through the use of photographs that they personally take. By doing so, individuals are free to present their direct experiences and concerns, but also produce collective knowledge when communicating such experiences to others. While photovoice can be effective in empowering and educating individuals, there is a risk is that it creates a risk of overemphasizing personal concerns, instead of prioritizing common themes and generating potential solutions. For this reason, the organizers of the online workshops decided to adopt a second tool, namely design thinking, in their engagement sessions. Design thinking is a process where people discuss main challenges emerging in a certain context and work together towards the identification ofidentifying opportunities to solve those challenges, eventually selecting a solution. Design thinking can address the limitations of photovoice by prioritizing a common understanding of a community's main concerns and enabling problem-solving. In turn, this helps build community capacity, social capital, and individuals' agency.

Furthermore, engagement sessions that merely use photovoice seldom include external data on the topic addressed, thus making it harder for participants to benefit from additional education.

To address this limitation, the inclusion of geospatial mapping was identified as a way to compensate for the lack of objective external data. In fact, through online geospatial mapping, participants were given the opportunity to access data on climate risks. The map model included 20 risk factors, which were chosen both according to existing literature and following conversations with experts and community organizations. The map tool not only allowed participants to learn more about external data on existing vulnerabilities, but it also shed light on divergences between "objective" data commonly used by policymakers to take decisions and community members' concerns, as expressed through photovoice.

Another crucial element characterizing the community engagement sessions in South Florida is that local decision-makers and community organizers were invited to participate. This meant that public representatives could not only could gain a better understanding of their constituencies' needs but could also engage with them in constructive dialogues to identify feasible paths forward. This is especially important since it ensures that engagement sessions do not represent a one-time initiative, but rather mark the beginning of continuous and ongoing communication between leaders and community members.

Lessons learned

- Photovoice and design thinking can be effectively delivered online
- The simultaneous use of multiple tools simultaneously can represent an effective way to address each tool's limitations
- Photovoice is responsive to individuals' concerns, while design thinking allows for understanding and prioritization of common concerns
- The involvement of leaders and stakeholders potentially creates opportunities for continuous and ongoing engagement

4 Exploring regional partnerships: The case of the CC2150 cross-border project[55]

Opportunities to engage communities on the local level can also be sought through the development of partnerships among different regions. Coastal Communities 2150 (CC2150) is a cross-border partnership between 7 communities from 4 different Northern European countries (UK, Belgium, France, and the Netherlands) working together to address adaptation on the local level. CC2150 developed a common framework that communities could adopt to deal with specific local contexts. More specifically, the partnership established the following common objectives for the project:

- Increase awareness about coastal change in the European coastal region
- Engage with a large number of relevant stakeholders in the communities
- Develop a set of shared communication tools and guidance that can apply to various local communities
- Learn how to effectively communicate potential impacts climate change impacts
- Establish a network of partners with the aim of sharing best practices and lessons learned

The ability to successfully achieve all the objectives widely can be attributed to the collaborative approach adopted among partner organizations. The presence of a supporting network provided local governments with an important platform to enable learning of best practices, knowledge sharing, and experimentation. More specifically, although both key topics of engagement and the target audience widely varied among communities, CC2150 partners continuously worked together through workshops and meetings to plan and share information. By doing so, they developed a sense of trust and belonging to a broader group, which significantly increased their confidence in their ability and capacity to adapt to climate change impacts and enhanced their capacity to do so. Additionally, while adopting a specific structure when it comes to the development of the project and partnership, communities were still able to keep the collaboration approach relatively flexible, in order to accommodate different community partners' needs if necessary.

Lessons learned

There are some key lessons from this case that are found to characterize successful regional collaboration for climate adaptation:

- From the beginning, create clear expectations about the scope of the project, objectives, and the roles of various partners
- Establish time and resources allocated to the project at early stages
- Organize recurrent meetings to encourage continuous sharing of knowledge and lessons learned
- Create a sense of trust and openness in meetings to encourage constructive feedback and different perspectives
- Use the network to expand climate change work across the region in the future

5 Reimagining the future through storytelling[56]

Mainstream discourses on climate change often tend to depict the future as characterized by overly negative and pre-determined scenarios. While such an approach might be effective in capturing the public's attention, the risk is eventually leaving individuals feeling powerless in their ability to enact change. For this reason, engaging people in climate change-related issues means first and foremost building confidence in their ability to create alternative futures, outside of mainstream, pre-determined scenarios.

This is precisely where storytelling can potentially play a key role as an engagement strategy, allowing individuals to go beyond negative framings of the future. Storytelling is a means through which people are given the opportunity to explore a range of different futures and the various pathways leading there, either in verbal or written form. While the field of climate change is often dominated by scientists and experts, storytelling represents an intrinsic human behaviour, thus making otherwise complex issues accessible to individuals. Furthermore, by going beyond scientific facts, stories can contemplate a wide range of scenarios exploring the meaning and values that matter most to people.

In the West Yorkshire region of the UK, a group of

researchers explored storytelling in the envisioning and creation of different adaptation futures. A series of 3 workshops with a total of 12 participants were-as organized and each writing session was preceded by a group discussion. Each individual was given specific writing instructions, in order for the story to follow a certain plot. Among them, participants were asked to:

- *"Describe the world of the story"*
- *"Describe what makes the story world good to live in"*
- *"Describe a climate-related event that disrupts the life of the world"*
- *"Describe an individual or group who decide to respond to the events"*
- *"Describe the actions they take"*
- *"Describe the immediate outcomes of the actions"*
- *"Describe what happens at the end of the story"*
- *"Describe any changes to the future"*

Results of the storytelling sessions showed that giving participants the possibility to envision their own adaptation future was a powerful tool for them to feel empowered and in control. More specifically, thanks to storytelling, individuals were able to turn disruptive climate impacts into learning experiences and opportunities for change.

Additionally, through their fictional stories, participants could reflect on what they value the most and thus want to preserve and protect from future disruptive events. While some stories highlighted the need to protect values like "family", "community", and "being able to make a livelihood", others envisioned a shift away from values like "individualism" and "materialism", thus implying a need for transformation. Transformation approaches were especially prominent in stories where local communities, and not the government, took the lead to respond to disruptive events.

All in all, storytelling represented an engaging way to approach climate change adaptation, empower communities to re-imagine their future, and help them acknowledge the choice-contingent nature of climate prospects.

Lessons learned

PROS

- Storytelling makes climate science more accessible and 'closer' to people
- Storytelling is an empowering tool, giving individuals the opportunity to envision various solutions to climate risks
- Storytelling allows a better understanding of people's values, preferences, and priorities
- Storytelling enhances community building through the narration of shared experiences

CONS

- In the case study presented, storytelling mainly represented an 'individual' task, since stories were not shared among participants, thus hindering social learning
- In the case study presented, sample sizes for the workshops were very small, hindering representation
- Storytelling allows individuals to create fictional scenarios, with the risk that solutions could be too detached from reality

Considerations for climate change communication

The following checklist guides you through key considerations for climate change communication. While these considerations can help ensure that your communication efforts are meaningful and effective, we acknowledge that not all of them may be applicable in every communication context.

1. Choosing the right messenger. Did you ...

- ☐ choose a local messenger
- ☐ choose a messenger that shares the worldviews, values, and identities of your audience

2. Getting to know your audience. Did you identify your audience's

- ☐ worldviews (see Box 1)
- ☐ identities
- ☐ mental models (see Box 2)
- ☐ motivations
- ☐ literacy and numeracy levels

3. Framing your message. Did you ...

- ☐ frame the problem in a way that aligns with the values and motivations of the audience
- ☐ frame the desired action both in terms of promotion and prevention
- ☐ emphasize local impacts of climate change
- ☐ emphasize current impacts of climate change
- ☐ highlight gains associated with taking action rather than potential losses from inaction

4. Making climate change meaningful. Did you...

- ☐ pair scientific data with personal and/or anecdotal accounts of climate change impacts
- ☐ avoid using jargon, complicated scientific terms, and acronyms
- ☐ translate unintuitive and unfamiliar statistics and numbers into more relatable terms
- ☐ use familiar concepts and metaphors to explain scientific facts
- ☐ stick to one or two key facts to avoid overloading your audience

5. Addressing uncertainties. Did you...

- ☐ acknowledge uncertainty and provide clear information on what is known
- ☐ use both verbal and numerical phrases for communicating uncertainties
- ☐ emphasize that it is better to be safe than sorry when it comes to climate action (see Box 3)

To learn more about these considerations and practical examples of their implementation, see **Appendix A**.

Box 1: Worldviews refer to people's deeply held socio-political values, attitudes, beliefs, and preferences, or, in short, their idealized "way of life"[57]. Worldviews are an important consideration in climate change communication, as information sources that convey messages that do not fit people's cultural worldviews are judged as less credible and trustworthy[57].

Box 2: Mental models describe a person's thought process of how something works (e.g., causes and effects of climate change)[58,59]. They shape how people approach a problem, what they pay attention to, and what actions and behaviours they choose to adopt in response to the problem[58,59].

- ☐ provide opportunities for people to discuss information about uncertainties in a group
- ☐ highlight potential solutions with relatively little uncertainty ("win-win" solutions)
- ☐ avoid using terms such as "1-in-100-year flood" that can mislead your audience and instead focus on presenting the impacts of the extreme events they do occur

6. Addressing skepticism. Did you...

- ☐ identify and address sources of skepticism
- ☐ use the "truth sandwitch" strategy to debunk myths (see Box 4)
- ☐ focus on solutions rather than just a problem

7. Avoiding emotional numbing and a sense of helplessness. Did you...

- ☐ combine negative emotional messages with messages that empower the audience to act
- ☐ focus mainly on the most relevant risk
- ☐ balance messages that appeal to emotions with analytical information

8. Leveraging the power of social norms. Did you...

- ☐ highlight positive social norms associated with the desired behaviour (for example, that the majority of people engage in or approve the behaviour)

9. Encouraging group participation. Did you...

- ☐ provide an opportunity for people to discuss climate change information and solutions in groups
- ☐ consider how you could mobilize climate action through existing social groups and networks
- ☐ encourage participants to reflect on and share successful and unsuccessful practices

10. Emphasizing solutions and benefits. Did you...

- ☐ lead with solutions
- ☐ align solutions with the audience's worldviews and values
- ☐ show the audience how they can become part of the solution
- ☐ highlight co-benefits of taking action
- ☐ emphasize local solutions
- ☐ frame technological solutions as an addition to, not a replacement for, the personal and local-level actions

11. Encouraging meaningful behavioral change. Did you...

- ☐ encourage people to set specific and public targets for their behavior
- ☐ provide fewer choices, not more

Box 3: Communicators should emphasize that uncertainty cannot be used to justify inaction and that it is better to be safe than sorry[58,59]. This can be achieved by bringing up examples of uncertainty from daily experiences, for example, deciding whether to take an umbrella despite uncertainties in the weather forecast[60].

Box 4:

The truth sandwich is a strategy that can be used to debunk myths. Start by stating and explaining the correct information[61]. Next, inform the audience that false information will soon be discussed[61]. Then, mention the myth once, followed by a discussion on why the myth is misleading[61]. Finally, reiterate the correct information[61]. Then, communicators can mention the myth once, followed by a discussion on why the myth is misleading[61]. Finally, reiterate the correct information[61].

- ☐ provide the audience with a checklist of different actions to avoid single-action bias
- ☐ educate the audience on the relative effectiveness of different climate actions
- ☐ appeal to people's intrinsic motivations rather than extrinsic motivations (see Box 5)

12. Using visual imagery. Did you...

- ☐ use the images of real people rather than staged pictures
- ☐ include pictures of cultural archetypes or icons
- ☐ pair dramatic images of the climate impacts with the empowering visuals of the solutions

Box 5:

Extrinsic motivations are driven by external factors, such as monetary incentives[60].

Intrinsic motivations are personal and internal sources of motivation, for example, caring about the well-being of others[60].

Phase III: Pilot project

In this phase, we worked closely with a staff partner from the City of Dawson Creek to develop a community engagement workshop on flood preparedness.

Phase III

Phase III of the research project involved the design, planning and facilitation of a community-based engagement pilot project that would make use of the best practices gathered in Phase II, Best practices of community engagement and climate change communication.

The City of Dawson Creek, BC, based on recent damaging floods, requested the delivery of a hybrid (in-person/virtual) workshop to engage the community around personal flood preparedness.

Throughout all stages of the pilot, we worked closely with a knowledgeable staff partner from the City of Dawson Creek, who was instrumental in the event's success. The following section describes the methods used in workshop development, as well as the workshop's outcomes.

Methods

Equity lens

A number of equity-based considerations were taken in the community research stages as well as in workshop outreach and design. In our project, applying an equity lens meant ensuring that everyone in the community, especially historically marginalized and vulneberable population groups, had the opportunity to participate in the workshop and thus be prepared for future flooding.

COMMUNITY INTERVIEWS	An established list of desired interviewee characteristics, which included marginalized and/or at-risk groups, was used to seek out interviewees.
COMMUNITY SURVEY	The survey included questions of ethnic identity, age, gender, and income level to support an understanding of how opinions differed amongst population groups, and to inform a more tailored workshop design.
OUTREACH	In consideration of barriers to computer access, physical workshop invitations and posters were distributed, which included options to sign up via telephone.
WORKSHOP FORMAT	The hybrid workshop format increased accessibility for those with barriers to either computer or in-person participation.
WORKSHOP TECHNOLOGY	To improve accessibility for the less technologically literate, just one engagement software was used in the workshop, and a practice period was included. The tools chosen were as simple as possible, given potential limitations.
WORKSHOP CONTENT	**Informational accessibility** – communication of scientific information relied minimally on the use of numbers and jargon.
	Different ways of knowing – a storytelling exercise was incorporated to embrace story as a different way of knowing and communicating.
	Trauma-informed approach and psychological safety – a sensitive approach was taken surrounding language and imagery to avoid evoking fear or panic.

Research into the community

Literature on best practices for communicating climate change emphasizes the importance of getting to know the target audience, including their overall values, priorities, motivations, as well as beliefs and misconceptions regarding climate change. To gain a better understanding of the community, survey and qualitative interviews were conducted prior to designing the pilot project.

The survey questionnaire was developed based on a literature review of peer-reviewed academic publications. The full text of the questionnaire can be found in Appendix B. The survey was carried out between June 27th and July 17th, 2022, yielding 82 complete responses. City staff distributed the survey through official social media accounts (Instagram, Twitter, and Facebook) and the website of the City of Dawson Creek. Additionally, it was emailed to all staff of Dawson Creek's City Hall (172 people) and local stakeholder groups.

Alongside the survey, semi-structured qualitative interviews were conducted to obtain more nuanced insights into community values, attitudes towards climate change, the perceived threat from floods, as well as degree of flood preparedness.

A list of desired interviewee characteristics was shared with the community partner, who used this to identify potential interviewees, including community leaders, local knowledge holders, and/or representatives of diverse groups. Interviewees were recruited by emails from the city staff. If a response was not received, one follow-up email was sent. In total, 3 interviews were conducted.

We initially aimed to interview community members with both settler and Indigenous backgrounds, representing a diverse range of age groups, occupations, ethnic groups, immigration statuses, and gender. This intention, unfortunately, could not be achieved due to the tight timeline of the project, outreach challenges, and limited availability of potential interviewees. Just three interviewees expressed interest and were interviewed. Two of the individuals were local adult Caucasian men; both of them were self-employed and one was an active community volunteer. Another interviewee was an adult Caucasian woman working for the local government.

Image credit: Energetic City

Outreach

Although outreach represents a crucial component of community engagement, this task did not fall within our project responsibilities, and was assigned to our city staff partner. Nonetheless, we were still able to take part in decisions concerning outreach, since the City of Dawson Creek staff partner was open to our suggestions.

Since the goal of the project was to raise awareness on personal flood preparedness measures in the City of Dawson Creek, one of our priorities was to make sure that the most vulnerable members of the community would be able to participate if interested.

We defined vulnerable individuals as those living in high flood risk areas, and also those belonging to equity-deserving groups, such as ethnic minorities and Indigenous populations, who have been historically excluded from public engagement processes.

As previously mentioned, the staff partner reached out to community members for interview recruitment and survey dissemination. As for the workshop, outreach was conducted in various stages:

ONLINE SURVEY
Survey respondents were invited to provide their emails if they were interested in participating in the workshop.

SOCIAL MEDIA
Virtual invitations were posted twice on the city's social media outlets (Instagram, Twitter, Facebook and website), respectively one week and one day before the date of the workshop.

PHYSICAL OUTREACH
City staff hand-delivered workshop invitations to properties that had been previously affected by flooding and hung posters around town.

EMAIL
Direct invitations were emailed to Dawson Creek Mayor and Council, staff of the NECRN and FBC, and various user groups (Dawson Creek Watershed Society, Peace River Regional Agrologists, and the Timberline Nature Club).

Workshop

Table 2. Description of the activities delivered throughout the pilot project.

ACTIVITY	DESCRIPTION	JUSTIFICATION
PRE-WORKSHOP MINGLING (15 minutes)	online: a question (“what do you love the most about your community?”) was typed in the chat as a conversation starter	Given the interactive nature of the workshop, the mingling session was organized so that participants could get comfortable with each other. To avoid technical difficulties, the pre-workshop mingling took place separately for people joining online and in person.
	in person: participants were provided with snacks and drinks and the same question was placed on a sign to spur conversation	
INTRODUCING THE WORKSHOP AIMS AND THE FACILITATORS (5 minutes)	The introduction to the workshop was shared on Zoom and projected on a whiteboard in the room where the engagement took place. Those participating in person sat in a semi-circle facing the whiteboard. Everyone was able to hear and see the presenters on Zoom. Participants were warned about the sensitivity of the issues under discussion, since climate change impacts could spur strong emotional reactions and feelings of anger, anxiety, and powerlessness.	Introducing the goals of the workshop was fundamental for people to understand the nature and aim of the engagement. The goal of the introduction was also for participants to recognize their power to prepare for extreme weather events and future changes. Introducing the facilitators was important for participants to identify who was delivering the message.
PRESENTATION OF CLIMATE CHANGE IMPACTS IN NORTHEAST BC AND DAWSON CREEK (10 minutes)	A presentation on the disruptive effects of climate change in Northeast BC was delivered. Regional data collected in our preliminary research was used to discuss how seasons are changing and how flood risk is increasing. In the last part of the presentation, we focused specifically on climate change impacts on Dawson Creek.	From our survey results, it emerged that a significant number of individuals perceive climate change as an issue that is distant in space and time. Delivering a presentation on climate change impacts in Dawson Creek was necessary to convey the message that climate change is already affecting the community.
STORYTELLING SESSION (25 minutes)	Phase 1 (*2 minutes*): the rules of the activity and the story prompt (“Have you ever experienced climate change in your community?”) were introduced. Participants were given 2 minutes of silence to think about their story.	The aim of the storytelling activity was to reduce the psychological distance to climate change, as our first presentation might have been perceived as abstract by participants. To fill this gap, the storytelling was designed for individuals to learn from each other’s experiences with climate change. The goal of the activity was to raise awareness around the urgency of climate change while also building a sense of community through the act of sharing, which, in turn, has positive implications on the collective capacity to deal with the disruptive effects of climate change. Finally, storytelling offered a way of communicating about climate change through a non-scientific means, which may be more digestible for certain populations.
	Phase 2 (*8 minutes*): people were divided into groups of 4 and were encouraged to share their stories within the small group. While online articipants were divided into breakout rooms, staff partner facilitated people attending in person.	
	Phase 3 (*12 minutes*): people could share their stories with all participants. People in person and online could hear each other.	
CITY STAFF PARTNER PRESENTATION (10 minutes)	Our city staff partner gave a brief presentation on the measures adopted by the city to prepare for flooding.	The goal of the Dawson Creek staff partner presentation was for participants to realize that they were not alone in facing the disruptive impacts of climate change.
BREAK AND INTRODUCTION TO THE SOFTWARE “MENTIMETER” (5 minutes)	Participants were given a small break, while the city staff partner introduced the software “Mentimeter”.	The goal of the break was for participants to avoid feeling overwhelmed by all the information provided. The software “Mentimeter” was introduced here to use the break time to troubleshoot any potential technical challenges.

ACTIVITY	DESCRIPTION	JUSTIFICATION
DELIVERY OF A SHORT SURVEY AND CHECK-LIST (5 minutes)	Participants were asked to scan a QR code and fill out a short evaluation survey. Afterward, they were provided with a checklist of actions that they could take to prepare for flooding, and they were invited to pick 3 commitments for the future.	The evaluation survey was fundamental for us to assess the outcome of the workshop. The checklist represented a way to make sure that people committed to some actions that would allow them to prepare for flooding. According to existing literature, making commitments increases the chances of undertaking actions.
DEBRIEFING SESSION (5 minutes)	Participants were given the option to openly share their feedback on the workshop.	The debriefing session gave us the opportunity to qualitatively evaluate the workshop.
PRESENTATION ON PERSONAL FLOOD PREPAREDNESS (20 minutes)	A presentation on personal flood preparedness was delivered, focusing specifically on the measures that individuals could adopt before, during, and after a flood. The software “Mentimeter” was used for activities such as brainstorming, locating one home’s on a flood map, and “truth or lie” games to test understanding.	Interactive activities were delivered to increase participation and understanding of the topics, while avoiding the delivery of a mere lecture. Sensitive topics such as flooding and the disruptive impacts of climate change were made less burdensome by engaging participants in fun games.

About the workshop design

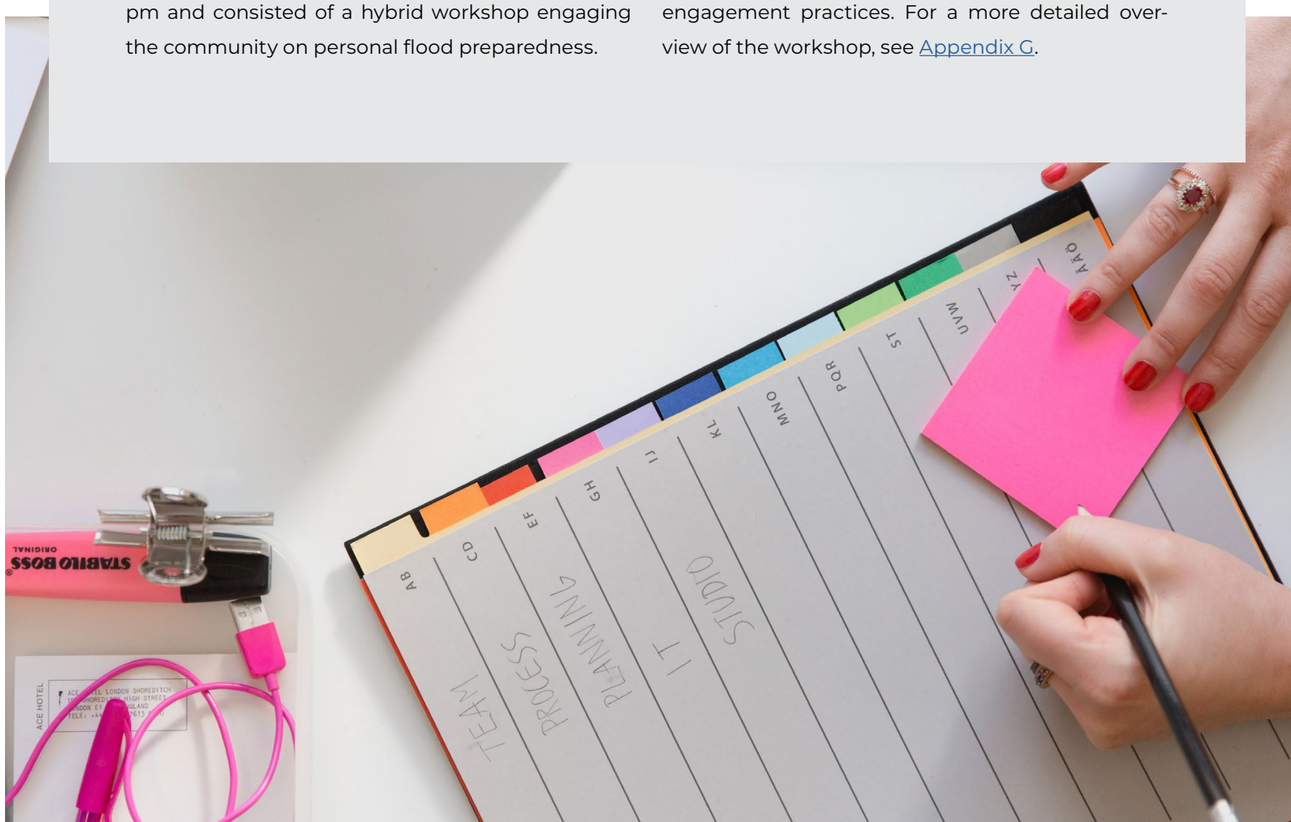
The design of the pilot project was largely guided by the information gathered through the survey and interviews, to ensurew that the workshop was tailored to the target audience. For example, it was identified that community members tend to believe that climate change is not harming Dawson Creek as much as other places within British Columbia, Canada, or worldwide. Hence, we incorporated plenty of local examples of climate change impacts, and additionally emphasized that Northern regions across the world are warming at a higher rate than Southern regions. Particular attention was given to survey responses from participants who indicated their potential interest in attending the workshop. For a more detailed overview of survey and interviewee results, see the “Results” section or Appendix C.

The pilot project in Dawson Creek was conducted on Wednesday, July 20th, 2022, from 7:00 to 9:00 pm and consisted of a hybrid workshop engaging the community on personal flood preparedness.

The date and time of the workshop were established through consultation with city staff, who identified the middle of the week outside of conventional working hours an optimal timeslot.

The hybrid format represented a way to increase the equity and accessibility of the engagement, since we recognized that some community members might not be able to leave their homes for an extended period of time. On the other hand, the possibility to attend in person was intended to support those who do not have access to electronic devices like computers or tablets, or do not feel comfortable using them.

The workshop consisted of three different presentations and various engagement activities. Each section had a specific goal and was designed considering the various lessons learned from the preliminary research on the Dawson Creek community and on engagement practices. For a more detailed overview of the workshop, see Appendix G.



Results

Survey and interviews

Through the survey and interviews, we identified that healthcare, mental health and addiction, crime and security, economic growth, and natural disasters constituted five of the most significant issues for the community. Interestingly, despite the history of devastating floods and significant vulnerability to these events, only 2 out of 82 respondents selected flooding as their top concern. However, it may be assumed that the participants concerned about floods could have identified natural disasters (selected by 19 respondents) as one of the most significant issues.

As far as climate change beliefs and attitudes are concerned, the majority of survey participants (86.6%) believed that climate change is happening. Most of the respondents (44.2%) also believed that climate change is caused partly by natural processes and partly by human processes, followed closely by those that believed that it is mainly caused by human activity (35.1%). The interviews confirmed that there are somewhat mixed opinions on this issue within the community; two interviewees attributed climate change primarily to human activity, while another discussed both natural and human causes.

The majority of the interviewees and survey respondents indicated that they are concerned about climate change and believe that Dawson Creek has already experienced climate change impacts. When asked to reflect on the past changes in extreme weather events, most survey participants believed that they have observed an increase in either the number or severity of heat waves (68%) and floods (72%), while droughts were perceived to have stayed about the same (56%). As far as future changes are concerned, the respondents had a mostly accurate perception of the direction of change, expecting an increase in the number or severity of heat waves (74%), floods (59%), and droughts (65%).

Image credit: maclean25
(retreived from Wikipedia)

The majority of the interviewees and survey respondents indicated that they are concerned about climate change and believed that the City of Dawson Creek has already experienced climate change impacts. However, the survey revealed that community members tend to believe that climate change will harm developing countries the most.

The survey also revealed that community members tend to believe that climate change will harm developing countries the most, followed by British Columbia, Dawson Creek, the economy, and finally the respondent personally. This aligns with academic research showing that people tend to exhibit spatial optimism bias and perceive climate change as a psychologically distant phenomenon that affects primarily far-away places affects primarily far-away places [63,64].

Our research also suggests that many Dawson Creek residents do not perceive floods as a major personally significant threat in the near term. Most survey respondents believed that floods will only harm them a little (45%) or by a moderate amount (29%) within the next decade. Community members also seemed confident in their ability to prepare for floods, with 53.7% saying that they strongly agree and 37.7% indicating that somewhat agree that there are things they can do to prepare for future floods.

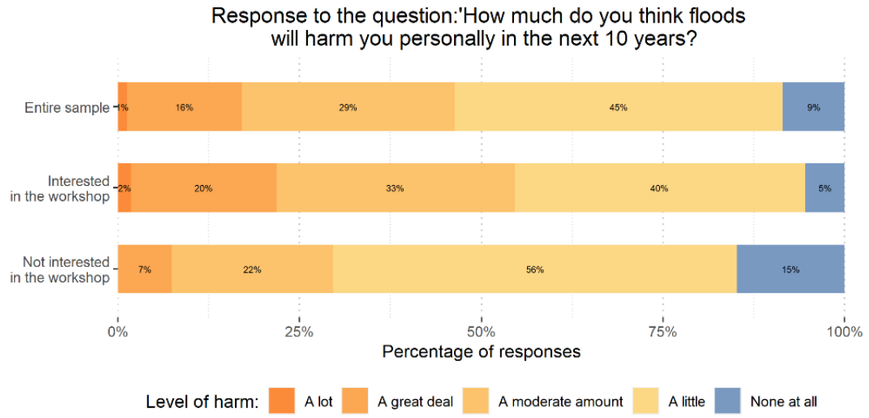


Figure X. The figure shows participants beliefs on whether floods will harm them personally in the next 10 years differentiating between the entire sample, as well as subsets of participants interested and not interested in the workshop.

Importantly, survey responses differed significantly between participants who were interested in attending the workshop and those who did not express interest in the event[d]. For example, respondents interested in the workshop were more likely to report that the intensity or frequency of heat waves and floods increased in the past than respondents that were not interested. The results were not surprising, since participants who do not believe that the severity or intensity of the floods will increase in the future are likely to be less interested in a flood preparedness workshop. In line with this, one of our interviewees pointed out that many community members believe that the flood experienced by Dawson Creek in 2016 is the most severe flood that can occur in the city, which translates into a false sense of security among the residents. For more details on the differences in survey responses between participants interested and not interested in the workshop, see Appendix C.

It is important to note that the sample of survey respondents may not have been representative of the broader community. Women were significantly overrepresented while Indigenous individuals and visible minorities other than Chinese respondents were underrepresented.

Moreover, survey respondents reported significantly higher income than the average for Dawson Creek. For a more detailed comparison between the survey sample and the census data, see Appendix D.

Another key finding that came from the interviews with community members is that a significant proportion of residents are employed in the natural gas and oil industry and feel that climate action could threaten their livelihoods. Climate psychology research suggests that individuals that are threatened by climate change solutions may be prone to denying the existence of the problem[57]. This may pose a challenge for engaging these residents on climate change adaptation. Moreover, our research has shown that residents often confuse mitigation and adaptation actions. For example, when asked about the actions they take to prepare for climate change, some interviewees brought up actions aimed at reducing greenhouse gas emissions. This raises concern that community engagement events aimed at building adaptive capacity may fail to attract residents who feel threatened by climate change mitigation actions. In light of this, the word “climate change” was not used in the outreach, and the event was framed as a workshop on “Personal Flood Preparedness”. A similar approach can be utilized in future community engagement if the primary goal is to help residents to prepare for the effects of climate change.

The results of the survey provided valuable insight into the community’s concerns and climate change attitudes, which informed the design of the engagement workshop. The number of responses (114 responses of which 82 were complete) significantly exceeded the team’s expectations, especially considering that the municipality carried out a different (not climate change- or flood-related) survey immediately prior to our survey. This raised concerns that limited responses would be obtained due to survey fatigue. Moreover, we have found that open-ended questions (if used in moderation) yield elaborate responses from the participants, providing rich data to build on when planning the workshop.

The willingness of a large number of residents to engage with short (5-min) surveys may be utilized in future engagements. Besides data collection, surveys can also serve as an educational tool, for example, if participants are asked to read paragraphs with information before providing their opinion, which would serve a dual goal of data collection and education. Moreover, surveys could be used to provide residents with tailored climate change information. For example, if the aim is to educate residents on flood preparedness, the survey may ask respondents to provide information on whether they are a renter or a homeowner, their income, and their age, following which respondents could receive targeted information on how to prepare for future floods.

Attendance and participation in engagement

Attendance in the workshop was low with just seven participants, nearly all of whom were staff from stakeholder organizations and local governments. Based on this, workshop outcomes must be assessed with an understanding that participants were not representative of the ‘general public’.

The chosen online meeting software, Zoom, was generally effective. All participants seemed comfortable with the program and demonstrated no difficulties in its use. Three out of four online participants chose to leave their cameras off throughout the workshop. This allowed for limited observation of their participation.

The storytelling activity garnered a strong level of engagement, with participants taking part at each stage. Rather than sharing personal stories, however, participants’ contributions were more akin to local observations of climate change by lessons or implications for policy and practice.

This led the exercise to be quite conversational. A number of factors could be attributed to this outcome, such as the professional nature of the audience and/or their cultural backgrounds. Nevertheless, many of the activity’s intended outcomes were achieved, such as the sharing of participant knowledge by attendees, the use of a non-scientific mode of communication, and the group’s acknowledgement of the existence of climate change.

The virtual games (brainstorming, mapping, truth or lie) were also generally successful. All audience

[d] Respondents were considered “interested in the workshop” if to the question “Would you be interested in attending the upcoming workshop "Personal Flood Preparedness for Dawson Creek" on July 20th, 7pm at the Kiwanis Performing Arts Center or via Zoom (please provide email to receive invitation)?”, they replied “Yes”, “Maybe”, and “No, the date/time does not work for me”. Respondents who selected “No, I am not interested” in response to this question were classified as “not interested in the workshop”.

members participated in nearly all activities and demonstrated a high level of comfort with the software used (Menti). This overall technical success may be attributable to the time given for participants to practice using Menti and the fact that only one engagement software was used. A contributing factor may also have been participants' prior experience with online engagement tools.

We expected some technical difficulties to arise in the workshop during the mapping exercise, due to a higher degree of dexterity and eyesight required, but eventually it did not pose significant challenges

While only four participants completed this activity (the Dawson Creek-based attendees), all seemed to enjoy the subsequent discussion of proximity to the flood plain and relative risks. In future mapping exercises of this nature, a more accessible mapping tool is recommended.

The brainstorming activity was completed as planned, with participants contributing flood preparedness measures they were aware of, including "emergency kit" and "watch for alerts". With a variety of responses from participants, the activity demonstrated the knowledge contained within the group.

Feedback results

Feedback from the workshop attendees was collected through an anonymous 3-min long survey (attached in Appendix E) at the end of the session. Following this, we intended to facilitate a 7-min long discussion. However, the discussion did not occur due to time limitations and miscommunication[e] between the speakers.

The feedback collected through the survey suggests that the workshop was effective in fostering participants' knowledge of climate change and individual flood preparedness actions. All the attendees indicated that they learned a lot about the ways they can prepare for floods and that following the workshop they felt more confident in their ability to prepare for floods. Moreover, most participants (83%) agreed that they learned a lot about climate change, with another 17% indicating that their neither agree nor disagree with this statement. A somewhat conflicted opinion on this question could be due to the fact that the workshop was designed for a general audience, while the participants were mostly professionals who have work experience or interest in the field of sustainability.

We also sought feedback on the effectiveness of the engagement tools and activities incorporated in the workshop. All the attendees thought that the engagement tools were effective in facilitating learning. Most participants (83%) also agreed that the workshop was a good mix between listening and engagement activities. Some attendees even indicated that the interactive aspect is what they liked most about the workshop. Positive feedback on the engagement techniques (storytelling, brainstorming of solutions, interacting with flood maps, quizzes) and tools (Mentimeter, breakout rooms) employed in the workshop suggest that these methods could be effective in future community engagements on climate change. Furthermore, one of the attendees indicated that they enjoyed the use of everyday analogies to explain the difference between climate and weather, which suggests the utility of this technique when communicating scientific concepts.

When asked about what they liked the least about the workshop, one participant responded that the length was not ideal. Although they did not provide further explanation for this comment, considering the length of the workshop was 2 hours, it can be assumed that they would have preferred a shorter event. Another attendee pointed out that they experienced technical glitches, adding, however, that it "wasn't a huge issue". While the speakers were experienced with the software tools used (i.e., PowerPoint, Zoom, Mentimeter), technical difficulties are a common risk of hybrid workshops, and this should be taken into consideration when deciding on the mode of delivery of the workshop. To know more on feedback results, see Appendix F.

[e] The speaker responsible for this part of the workshop asked participants to reflect on their take-aways and the flood preparedness actions that they committed to take instead of asking for participant's feedback on what they enjoyed the most and the least about the workshop, as was initially intended.

Lessons learned

The pilot project on personal flood preparedness designed for the City of Dawson Creek can serve as a case study to inform future engagement initiatives in local communities.

After a thorough evaluation of our project, the following conclusions can be drawn:

- **Knowing the community** before designing the engagement session helped to tailor the message according to community preferences and values, thus making it more credible and appealing to individuals

- While we thought that a hybrid engagement (online and in-person) would be ideal from an equity perspective, **designing a hybrid workshop represented a highly time-consuming task** and entailed multiple challenges which would not have been present if only delivering an online session. Alternatively, an in-person session would also have been less challenging

- The low turnout of the engagement indicates that **further research should be conducted on how to effectively reach out to people, raise local interest in climate change adaptation, and ensure that equitable participation is actually achieved**, particularly in rural communities. A strategy to identify the ideal time for the workshop could be including a question around preferred times (morning, afternoon, evening) in a preliminary survey

- The substantial number of responses to our pre-engagement survey might indicate that **surveying the population could represent an effective engagement strategy**, especially if questions include an educational component

- The **engagement tools and communication techniques used were the result of a thorough evaluation of existing literature** on engagement practices. Storytelling allowed us to reduce the psychological distance to climate change, while the software “Mentimeter” was effective in conveying complex scientific information in a fun, interactive way

- The **feedback and de-briefing session at the end of our workshop was extremely useful** for us to assess whether the pilot project was successful. Participants’ feedback should inform future engagement sessions

- **Sending a follow-up email with resources from the workshop to participants** is especially important, since it allows them to review the information at their own time and potentially share them with community members who could not attend.

Limitations

A number of limitations impacted the outcomes of the pilot project. Firstly, co-developing and co-facilitating the workshop with a City staff partner was absolutely essential to the workshop’s success, however, it made for a challenging level of coordination. For example, with the responsibility of workshop outreach falling on the city staff partner, the level of influence the scholars had over this task was reduced. Also, co-facilitation of the workshop, especially in a hybrid capacity, meant that there were some inevitable miscommunications. For example, the debriefing session was delivered differently than initially designed.

A second limitation involved the low number of community interviewees retained, which meant a limited amount of data was gathered and in a less equitable manner than planned. Because of this, information gathered from the interviews cannot be interpreted as reflective of overall community attitudes and opinions. Finally, workshop attendance was very low and comprised mostly of stakeholders and professionals. This means that the participant group cannot be considered the “general population”, and, thus, the workshop’s outcomes must be assessed with this caveat in mind.

Conclusion

Local governments around the world are increasingly dealing with the disruptive effects of climate change. Public engagement is becoming an important component of many adaptation measures, with municipalities trying to raise awareness on climate change impacts among the population and involve individuals in decision-making processes around adaptation options.

This report supports municipalities in Northeast BC and elsewhere in North America in their efforts to engage the population around climate change projections and risks, thus further enabling them to take climate action. More specifically, preliminary research was conducted on best practices for climate change communication, tools for public engagement, and existing case studies on community engagement. Knowledge acquired in the first stage of the research was then applied to a pilot project designed with the aim of preparing the population for future climate impacts.

The City of Dawson Creek – a member of the Northeast Climate Resilience Network – volunteered to host a hybrid workshop on personal flood preparedness. Within the past few years, the city has experienced some of the worst flooding events to ever occur in the area, which caused disruptions and significant infrastructural damage. As a result, city staff started to adopt various measures to deal with future uncertainties, including raising awareness among the population.

The pilot project results indicated that the communication strategies adopted were successful in conveying the message to participants. This was due to the extensive research on community values and preferences, as well as our preliminary research on best practices for community engagement and communication.

Although our workshop might inform future climate initiatives within the network, thus representing an important case study itself, it is crucial to consider that each local community is unique and engagement practices adopted in our project might not apply to a different context. Additionally, further research is needed to assess best practices for community outreach. In fact, while our survey received a significant number of responses, participation in the workshop was extremely low and the audience was limited to local experts and stakeholders, rather than community members who might be affected by flooding in the future.

As public engagement becomes increasingly important for municipalities to act on climate change impacts, practitioners require more cases from which best practices for climate change communication and community involvement can be drawn. This report takes a step in this direction, as we hope to contribute to climate adaptation action that is both effective and considerate of local needs.

Appendix A. Considerations for climate change communication

CHOOSING THE RIGHT MESSENGER

Communication efforts should ideally be carried out by local messengers (individuals or institutions), as people are more likely to respond to calls for action if they feel a strong sense of affiliation with the communicator[58]. Moreover, communication is likely to be more effective if the messenger's values, identities, and worldviews align with that of the target audience and if the communicator is someone the audience trusts and respects[59,65].

KNOWING THE TARGET AUDIENCE

Gaining a comprehensive understanding of the audience is crucial in designing effective communication efforts. The key aspects that communicators should consider are:

- **Worldviews.** Worldviews refer to people's deeply held socio-political values, attitudes, beliefs, and preferences, or, in short, their idealized "way of life"[57]. Worldviews are an important consideration in climate change communication, as information sources that convey messages that do not fit people's cultural worldviews are judged as less credible and trustworthy[57].
- **Values.** Communicators should aim to identify what values their target audience holds (e.g., honesty, loyalty, hard work, privacy, patriotism, fairness, or interdependence), and craft their message in a way that appeals to these values[59]. This will ensure that the audience recognizes climate change as a personally meaningful issue[59].
- **Identities**. Identities – including political, religious, occupational, and place-based – can have a significant impact on how people perceive and respond to climate change[59]. Hence, communicators should assess which relevant identities their target audience holds. Building on this knowledge, communicators should attempt to help the audience identify how taking climate actions align with their identities[59].
- **Mental models.** Mental models describe a person's thought process of how something works (e.g., causes and effects of climate change)[58,59]. They shape how people approach a problem, what they pay attention to, and what actions and behaviors they choose to adopt in response to the problem[58,59]. Individuals' mental models are derived from their intuitive beliefs, past experiences, and often-incomplete facts, and, hence, can deviate from scientific facts[58]. Communicators should aim to identify the inaccuracies in climate change-related mental models of their target audience and use strategic messaging to replace incorrect beliefs with scientific facts[58,59].
- **Motivations.** Communicators should also aim to understand their audience's motivations at the time of communication and present information in a way that connects climate action with people's personal goals[60]. Strategies to understand what the audience care about includes, among others, surveys, media monitoring, top-of-the-mind topics, social groups, and town hall meetings[66].
- **Literacy and numeracy.** The literacy and numeracy levels of the target audience should be identified, and the communication should be adapted accordingly[67].

WHAT ARE WORLD VIEWS?

Understanding the worldviews of the target audience will help to frame climate change information and solutions in a way that aligns with these worldviews. For example, people who believe that the world should operate through a hierarchical structure and that individuals should be responsible for securing their own well-being are unlikely to support climate change actions that require greater governmental regulation (e.g., introduction of a carbon tax)[59]. On the other hand, people who believe that inequalities in society need to be reduced dramatically and that the government has the obligation to secure welfare even at the expense of individual freedom would be more likely to support stringent environmental regulations. Importantly, if solutions proposed do not align with individuals' worldviews, they may refuse to believe in the existence of the problem itself (i.e., deny climate change)[59,65].

FRAMING

Framing refers to the way an issue or a question is described to ensure that the audience arrives at the preferred interpretation and to achieve the desired response[68]. Some of the most important framing considerations are:

- **Content frames.** Content frames highlight a specific aspect of climate change, e.g., climate change effects on public health or national security[59]. The choice of a content frame should be guided by the values, identities, worldviews, and motivations of the target audience[59,65,67]. For example, research finds that framing climate change in terms of climate justice resonates well with liberal audiences while framing it in terms of patriotism (e.g., preservation of nations' heritage) is more effective when communicating with more conservative groups[67].
- **Promotion versus prevention frame.** Different individuals tend to have a more promotion-oriented or prevention-oriented mindset[58]. The former category is motivated by progress and is eager to act to maximize gains[58]. The latter, on the other hand, prefers to take actions that minimize losses and maintain the status quo[58]. In order to appeal to a broader audience, communicators should employ both promotion and prevention-oriented messages[58].
- **Local versus global frame.** People tend to perceive climate change as harming far away locations more so than their own community, which may not generate sufficient concern for the issue to motivate action[62]. Highlighting current local impacts of climate change can, thus, raise the audience's engagement with the issue[58,59,62]. Hence, communicators should help the audience identify local and personally relevant consequences of climate change, for example, property damage due to intensified extreme weather events[58,59,62].
- **The now vs. future frame.** Climate change is commonly perceived as a future threat that is distant in time[62]. This poses a challenge for climate action, as people tend to discount the importance of future events and judge future costs to be lesser than the costs of today[58,59]. Communicators should try to reduce this perceived temporal distance by highlighting climate change impacts that are already occurring[62]. The tendency to discount future costs, however, can also be utilized in communication. For example, people are more likely to sign up for cost and/or time-intensive actions (e.g., weathering their homes) if these actions are several months away rather than in the immediate future[58,59].
- **Gain vs. loss frame.** Research shows that the negative feeling associated with losses tends to outweigh the positive feeling associated with equivalent gains[58]. This suggests that highlighting negative consequences (losses) associated with inaction can motivate people to take action to prevent the threat[58]. However, research also reveals that people are willing to take greater risks in loss domains than they are in gain domains[62]. Considering that climate change impacts (losses) are inherently uncertain, people may be prone to take the risk of future uncertain losses rather than suffer immediate sure losses associated with climate action (for example, financial investment or efforts needed to change the behavior)[62]. This suggests that, in the presence of uncertainty, highlighting gains rather than potential losses

- could be a more effective approach for encouraging actions.

MAKING CLIMATE CHANGE MEANINGFUL

- **Pair scientific data with concrete experiences.** Climate change communicators should combine analytical information (e.g., scientific forecasts) with personal and anecdotal accounts of climate change experiences (e.g., vivid images, metaphors, recollections of personal experiences, etc.). However, communicators should beware of evoking strong negative emotions in the audience, as this can lead to emotional numbing and denial (see more in the "Avoiding emotional numbness and sense of helplessness" section)[58].
- **Avoid using jargon, complicated scientific terms, and acronyms**[58].
- **Translate unintuitive and unfamiliar statistics and numbers into more relatable terms**[59]. For example, the fuel efficiency (L/km) of the vehicle can be translated into the estimated annual fuel costs for average usage[59].
- **Use familiar concepts and metaphors** to explain scientific facts[59].
- **Stick to one or two facts.** Communicators are advised against overloading the audience with too many facts. Instead, communication should focus on one or two most important facts or figures that come from the sources that the audience perceives as reputable and trustworthy[59].

ADDRESSING UNCERTAINTIES

Climate change projections are intrinsically associated with uncertainties, for example, due to the inability to predict human behaviour and future emissions[58]. Unfortunately, perceived and real uncertainty is often used by people as a justification for inaction[69]. To effectively communicate climate science despite the uncertainties, communicators are advised to:

- **Acknowledge uncertainty.** Being honest about the uncertainty involved in climate predictions can increase the audience's trust in the communicator and result in a greater willingness to engage with the issue[59,70].
- **Use both verbal and numerical phrases for communicating uncertainty.** People tend to interpret uncertainty phrases, such as "likely" or "very likely", differently than scientists. Hence, communicators should combine verbal (e.g., "very likely") and numerical (e.g., "99% confidence") descriptions of uncertainty[71,72].
- **Invoke the "precautionary principle".** Communicators should emphasize that uncertainty cannot be used to justify inaction and that it is better to be safe than sorry[58,59]. This can be achieved by bringing up examples of uncertainty from daily experiences, for example, deciding whether to take an umbrella despite uncertainties in the weather forecast[60].
- **Present information in groups.** Providing participants with an opportunity to discuss probabilistic information in the group can foster a greater understanding of the information[58].
- **Highlight potential solutions that are associated with relatively little uncertainties**[59]. For example, communicators can highlight "win-win" climate solutions that have non-climate-related co-benefits.
- **Focus on the "what" rather than "when".** When describing extreme weather events, scientists often use terms such as "1-in-100-year flood", which may provide the audience with a false sense of security, especially if they have just been affected by such an event[59]. Hence, communicators are advised to avoid these terms and instead focus on presenting the impacts that the event can have on the community once it does occur[59].

ADDRESSING SKEPTICISM

- **Identify and address sources of skepticism.** Climate change communicators should, first, try to identify the underlying reasons for skepticism in their target audience, which will then guide the choice of an optimal strategy to address the source of doubt[59]. For example, a common source of climate change skepticism is that people interpret scientific uncertainty as a sign that there is no scientific consensus around climate change and hence no action should be taken[59]. In this case, communicators are advised to highlight that good-faith skepticism is healthy while also reiterating that the majority of scientists agree on the core science of climate change[59]. For other examples of sources of skepticism, see "Connecting on Climate: A Guide to Effective Climate Change Communication" (pp. 62-67).
- **Gaining your audience's trust.** When dealing with skepticism, it is crucial that the messenger is someone whom the audience trusts[59]. This can be achieved by choosing the right person or organization as a communicator (see "Choosing the right messenger"). Additionally, to gain the audience's trust, communicators can show that they are also part of the community and that they share the audience's concerns and challenges[59].
- **Use the "truth sandwich"** strategy to debunk myths. When debunking myths, communicators should start by stating and explaining the correct information and informing the audience that false information will be discussed[61]. Then, communicators can mention the myth once, followed by a discussion on why the myth is misleading (for example, by pointing out logical fallacies underlying the myth)[61]. Finally, the correct information should be reiterated, preferably multiple times[61].
- **Focus on solutions, not just problems.** Communicators should focus on discussing solutions that can be or already are being implemented on individual and collective levels to address the problem[59]. This can prevent denial as a coping mechanism in face of negative emotions[59].

AVOIDING EMOTIONAL NUMBING AND A SENSE OF HELPLESSNESS

The feeling of helplessness and/or fear in face of climate change could prevent behavioural change or even motivate people to ignore or deny the problem as a way of coping (also known as "emotional numbing") [58-60,70]. Emotional numbing could be avoided by:

- **Combining negative emotional messages** (such as messages evoking worry and fear related to climate change impacts) **with messages that empower** the audience to take action and to be part of the solutions to the problem[59,67].
- **Focusing on the most relevant risks**[58].
- **Balancing messages that evoke emotional responses with analytical information**[58] (see "Making climate change meaningful" section of this appendix).

LEVERAGING THE POWER OF SOCIAL NORMS

Social norms exert a powerful influence on individuals' actions, as people tend to conform to the behaviour of the majority (or social norms)[62]. People often have an incorrect perception regarding their group's norms[73]. For example, they may falsely believe that other members of their group do not engage in any climate actions. Hence, when possible, communicators should highlight positive social norms associated with the desired behaviour, for example, that the majority of people take actions to prepare for floods and that this behaviour is approved by others.

ENCOURAGING GROUP PARTICIPATION

- **Leverage the benefits of group participation.** When people make decisions and interpret information as part of a group, they engage more deeply with an argument, are willing to consider a wide range of solutions, and are more prone to take decisions that benefit the collec

- tive rather than advancing their self-interest[59]. An effective way to achieve long-term group engagement on climate change is to mobilize existing social groups and networks, such as religious groups, clubs, or neighborhood associations[59]. People are more inclined to engage on climate change if it is brought to their attention by a group to which they belong[59]. For more practical information on mobilizing social networks and groups see "Connecting on Climate: A Guide to Effective Climate Change Communication" (pp. 17-20).
- **Encourage reflection, learning, and sharing of best practices**. It is important to encourage participants to reflect on and share successful and unsuccessful practices and learn from each other[74]. This can be facilitated through workshops or online platforms[74].

EMPHASIZING SOLUTIONS AND BENEFITS

- **Lead with solutions.** Leading with a solution before presenting the problem promotes greater acceptance of climate change[59]. "Solution-first" messages evoke a positive feeling in the audience and can serve as a buffer against otherwise paralyzing negative emotions, hence leading to a greater engagement on the issue[59].
- **Show the audience how they can become part of the solution.** Communicators should promote a sense of efficacy in their audience – i.e., individuals' beliefs that they have the capacity to successfully confront the challenge[59]. This can be done, for example, by emphasizing the impact of individual or community-level solutions and helping communities feel a part of a bigger picture[59,74].
- **Highlight co-benefits of taking action.** Highlighting the co-benefits of climate actions can foster people's support for the solutions and willingness to take actions[59]. For example, when discussing the advantages of switching to a heat pump, communicators could emphasize that besides being environmentally sustainable, heat pumps result in lower energy bills and can be used both for heating and cooling.
- **Emphasize local solutions.** Local solutions should be emphasized whenever possible, to make sure that proposed solutions match the audience's decision-making authority and capacity[59].
- **Prevent technosalvation.** Communicators should frame technological solutions as an addition, not a replacement for, personal and local-level actions[59].

ENCOURAGING MEANINGFUL BEHAVIORAL CHANGE

- **Encourage people to set specific goals and commit to them publicly**[59].
- **Provide fewer choices.** Since a large number of choices can be paralyzing, communicators are advised to limit the number of options/solutions (for example, providing just three options for flood-proofing their home) to maximize the chances that the audience will take action[59].
- **Avoid single-action bias.** People tend to take only one action in response to climate change, even if it is not the most effective option and does not provide sufficient protection against the risk[58]. To prevent this bias, communicators could raise awareness of this phenomenon and educate the audience on the relative effectiveness of different climate actions[58]. Moreover, providing the audience with a checklist of different actions which can be placed in a visible place in their home (e.g., on the fridge) can help to motivate people to take more than one action[58].
- **Appeal to intrinsic motivations.** Research shows that extrinsic motivations (i.e., motivations driven by external factors, such as monetary incentives) are only effective as long as they are maintained. Moreover, they undermine the individual's intrinsic motivations (i.e., personal and internal sources of motivation, for example, care about the well-being of others)[62]. Hence, against the common assumption, communicators should focus on appealing to intrinsic rather extrinsic motivations to ensure long-term engagement on climate change[62].

USING VISUAL IMAGERY

Images are a powerful persuasive tool[67]. Visual imagery can be utilized, among others, to:

- **Help the audience to identify climate impacts.** Vivid images can be used to help the audience to identify relevant local climate change impacts that they may have already experienced[59]. Furthermore, visualization of future impacts, such as flood maps, can also be effective in conveying the local consequences of a changing climate[59].
- **Attract attention and empower people to act.** Dramatic images of climate change impacts are effective in attracting the audience's attention, while the visuals of climate action can help to empower the audience to take climate action[59].
- **Explain the relative effectiveness of the actions** (e.g., comparing greenhouse gas emissions associated with the production of a burger with light-bulb minutes)[73].
- Make information more memorable. Including pictures, cartoons, logos, or other images can make the message memorable[59].

Generally, communicators are advised to:

- Pair dramatic and attention-grabbing images of climate change impacts with the visuals of solutions that empower the audience to act[59].
- Use the images of real people rather than staged pictures[67].
- Use more photos of people and household items, rather than bar charts and pie charts, as the former is more memorable and effective in drawing people's attention[59,67].
- Include images of cultural archetypes or icons that appeal to the audience[59]. For example, for communities that pride themselves on being a cultural mosaic, pictures of ethnically and religiously diverse groups may work best.

Appendix B. Climate change attitudes and flood preparedness survey: Survey questionnaire

We are a group of three researchers investigating community engagement strategies for flood preparedness in the City of Dawson Creek. We would appreciate your participation in this survey to allow us to gain a better understanding of your views.
The information you disclose will be kept confidential and your email, if you provide it later in the survey, will be stored separately from your responses.

[page break]

Q1. What are the most important concerns that your community is facing? Select up to three options.

Economic growth
Housing crisis
Healthcare
Immigration
Supply chain disruptions
Crime and security
Natural disasters
Mental health and addiction
Other (please specify) [input box]

[page break]

Q2. As far as you know, do you personally think the world's climate is changing, or not?

- O Yes
- O No
- O Don't know

Q3. Thinking about the causes of climate change, which, if any of the following best describe your opinion?

- O Climate change is **entirely** caused be **natural** processes
- O Climate change is **mainly** caused by **natural** processes
- O Climate change is **partly** caused by **natural** processes and **partly** caused by **human** activity
- O Climate change is **mainly** caused by **human** activity
- O Climate change is **entirely** caused by **human** activity
- O None of the above, because climate change is not happening
- O Don't know / Other

[page break]

Q4. How concerned are you about climate change?

- O Very concerned
- O Somewhat concerned
- O Not very concerned
- O Not at all concerned
- O Don't know / No opinion

[page break]

Q5. How often do you discuss climate change with your friends and family?

- O Often
- O Occasionally
- O Rarely
- O Never

[page break]

Q6. How strongly do you agree or disagree with the following statement:

"Dawson Creek has already felt negative effects from climate change"

- O Strongly agree
- O Somewhat agree
- O Somewhat disagree
- O Strongly disagree
- O Don't know

Q7. Over the past few decades, how, if at all, do you think that the number or severity of the following has changed in your community?

	Decreased	Stayed about the same	Increased	Don't know
Floods	○	○	○	○
Droughts	○	○	○	○
Heat waves	○	○	○	○

[page break]

Q8. How much do you think climate change will harm each of the following in the next 10 years:

	Not at all	Only a little	A moderate amount	A great deal	Don't know
People in developing countries	○	○	○	○	○
People in British Columbia	○	○	○	○	○
People in Dawson Creek	○	○	○	○	○
Local economy	○	○	○	○	○
You personally	○	○	○	○	○

[page break]

Q9. Over the next few decades, how do you think that the number or severity of the following **will change** in your community?

	Will decrease	Will stay about the same	Will increase	Don't know
Floods	○	○	○	○
Droughts	○	○	○	○
Heat waves	○	○	○	○

[page break]

Q10. How much do you think floods will harm you personally in the next 10 years?

- O None at all
- O A little
- O A moderate amount
- O A great deal
- O A lot

Q11. What actions, if any, have you taken to prepare your home for floods? *[input box]*

Q12. How strongly do you agree or disagree with the following statement:

"There are simple things that I can do to prepare for floods"

- O Strongly agree
- O Somewhat agree
- O Somewhat disagree
- O Strongly disagree

[page break]

Q13. What gender do you identify as?

- O Male
- O Female
- O Non-binary
- O Transgender
- O Two-spirited
- O Other
- O Prefer not to say

Q14. Select your age group

- O under 18
- O 18 - 24
- O 25 - 34
- O 35 - 44
- O 45 - 54
- O 55 - 64
- O 65 - 74
- O 75 - 84
- O 85 or older
- O prefer not to answer

Q15. With which of the following do you identify? You may select one or more.

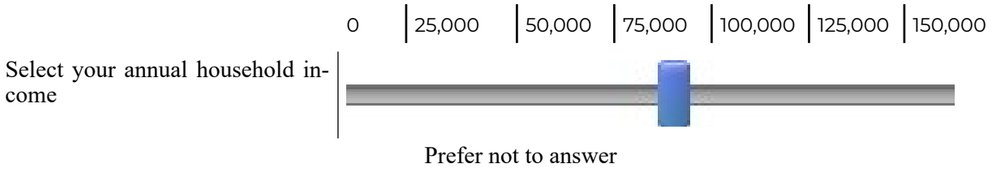
Indigenous people of North America
Indigenous (outside of North America)
Arab
Black
Chinese
Filipino
Japanese
Korean
Latin, Central or South American
South Asian
Southeast Asian
West Asian
White
Prefer not to say
Other (please specify) *[input box]*

Q16. Which of the following best describes your political views?

Strongly liberal			Middle of the road			Strongly conservative	None of the answers/ Prefer not to answer
○	○	○	○	○	○	○	○

[page break]

Q17. What is (approximately) your annual household income?
If your income is above the provided range, please select 150,000.



[page break]

Q18. Would you be interested in attending the upcoming workshop “Personal Flood Preparedness for Dawson Creek” on July 20th, 7pm at the Kiwanis Performing Arts Center or via Zoom (please provide email to receive invitation)?

- O Yes
- O No, I am not interested
- O No, the date/time does not work for me
- O Maybe

[page break]

Q19. If you are interested, enter your email below to receive updates about this event (optional) [input box]

Appendix C. Climate change attitudes and flood preparedness survey: Survey results

The aim of the survey was to assess:

1. respondents` opinions regarding the most pressing issues that are affecting their community,
2. beliefs, attitudes, and perceptions of risk related to climate change,
3. beliefs regarding past and future changes in intensity or frequency of floods, heatwaves, and droughts.
4. risk perception related to flooding,
5. actions that participants have taken to prepare for floods,
6. perceiving ability to effectively prepare for floods (self-efficacy),
7. interest in attending the workshop.

Presented below figures provide a more detailed insight into the results of community-wide survey, which have largely shaped the design of the workshop.

Some of the figures show the proportion of responses for the entire sample, as well as separately for the subset of the sample that is interested and not interested in the sample. Respondents were considered “interested in the workshop” if to the question “Would you be interested in attending the upcoming workshop “Personal Flood Preparedness for Dawson Creek” on July 20th, 7pm at the Kiwanis Performing Arts Center or via Zoom (please provide email to receive invitation)?”, they replied “Yes”, “Maybe”, and “No, the date/time does not work for me”. Respondents who selected “No, I am not interested” were classified as “not interested in the workshop”. In total, the survey yielded 82 complete responses, of which 55 respondents were classified as “interested in the workshop”, and 27 fell into the “not interested in the workshop” category.

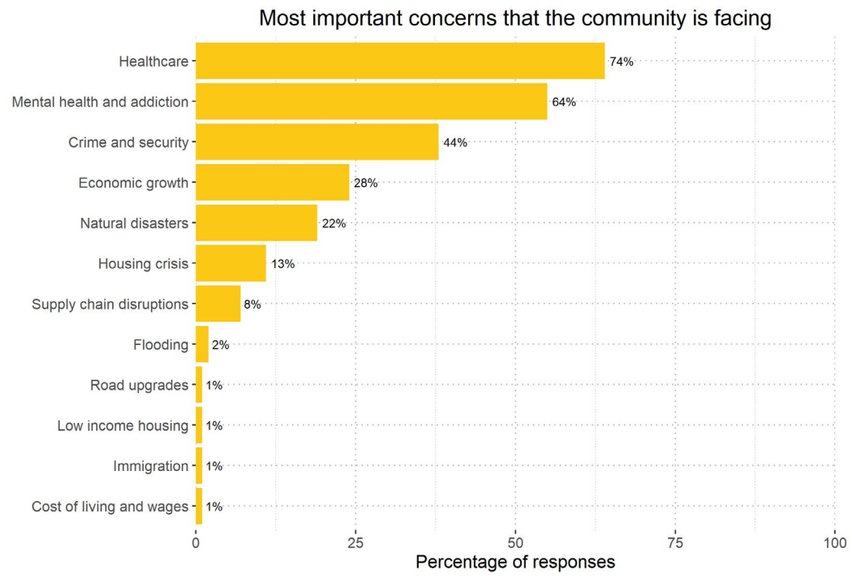


Figure C1. The figure shows the respondents’ beliefs regarding the main concerns that Dawson Creek is currently facing. Participants were presented with a list of concerns, which was developed collaboratively by the Scholars and the city staff to ensure that it is relevant to the local context. From the list, they could either select up to 3 issues or select up to 2 concerns and type in additional concerns that were not found on the list.

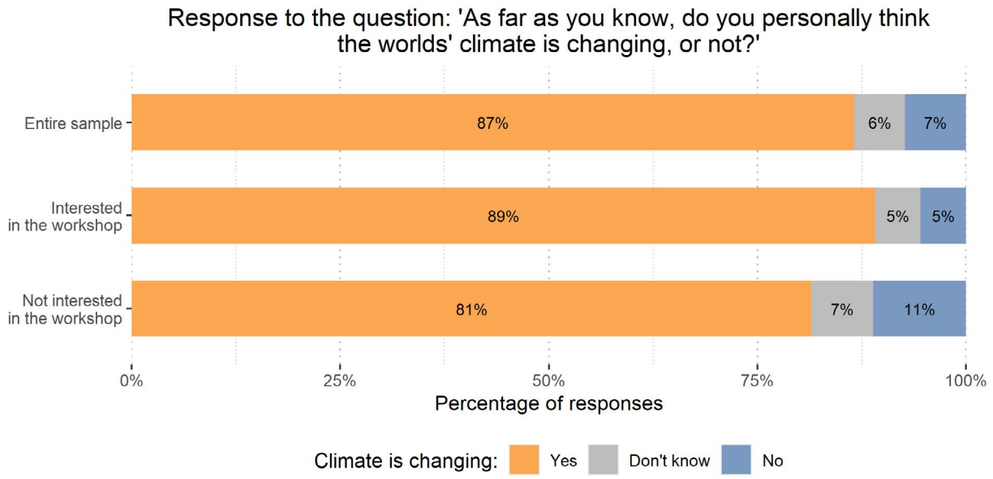


Figure C2. The figure shows the beliefs in whether the world's climate is changing among the entire sample, as well as subsets of participants interested and not interested in the workshop.

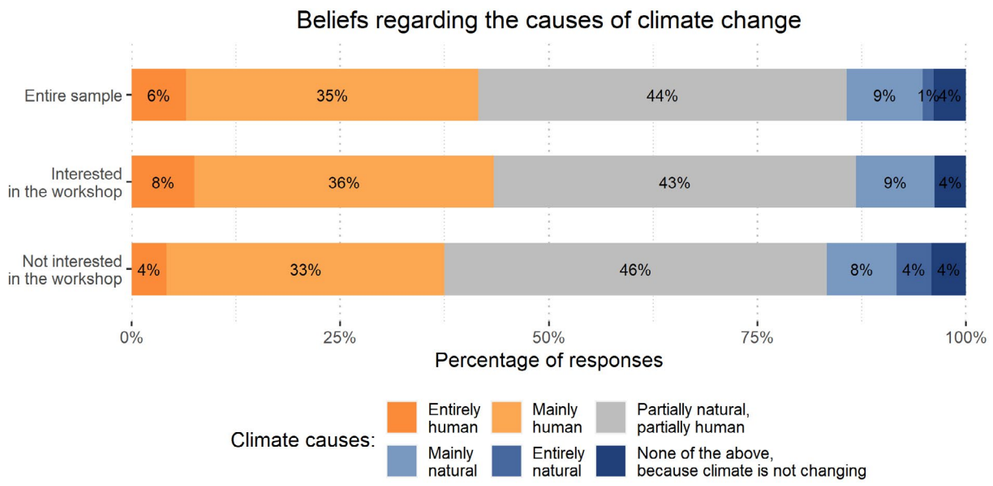


Figure C3. The figure shows the beliefs regarding the causes of climate change among the entire sample, as well as subsets of participants interested and not interested in the workshop.

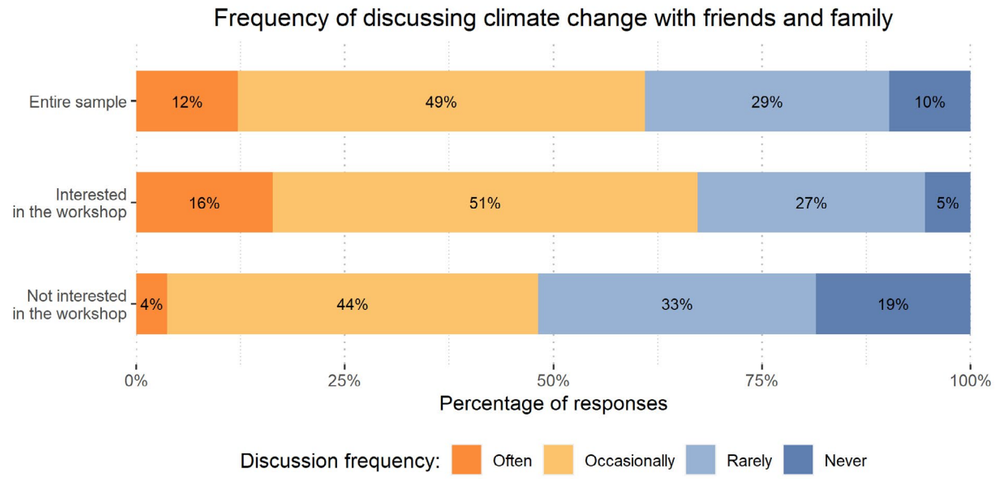


Figure C4. The figure shows how participants discuss climate change with their friends and family, differentiating between the entire sample, as well as subsets of participants interested and not interested in the workshop.

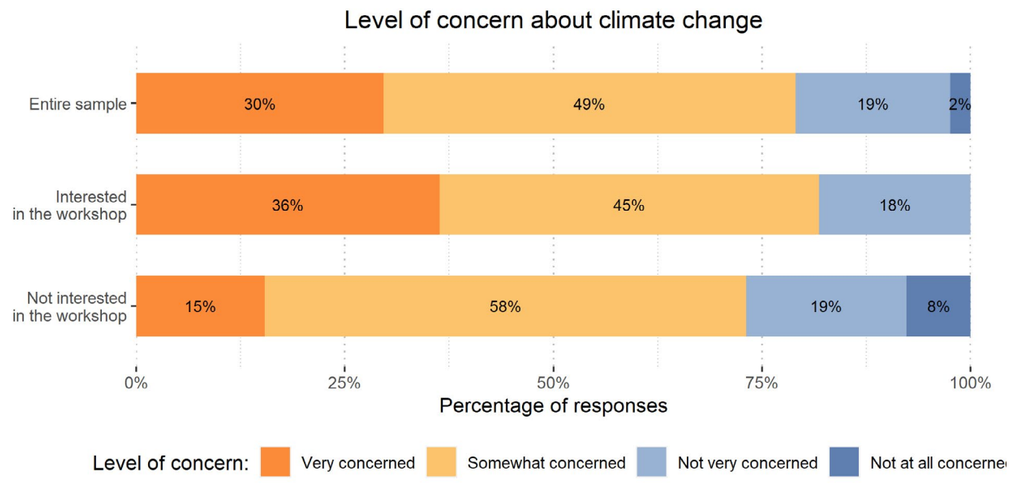


Figure C5. The figure presents the level of concern about climate change among the entire sample, as well as subsets of participants interested and not interested in the workshop.

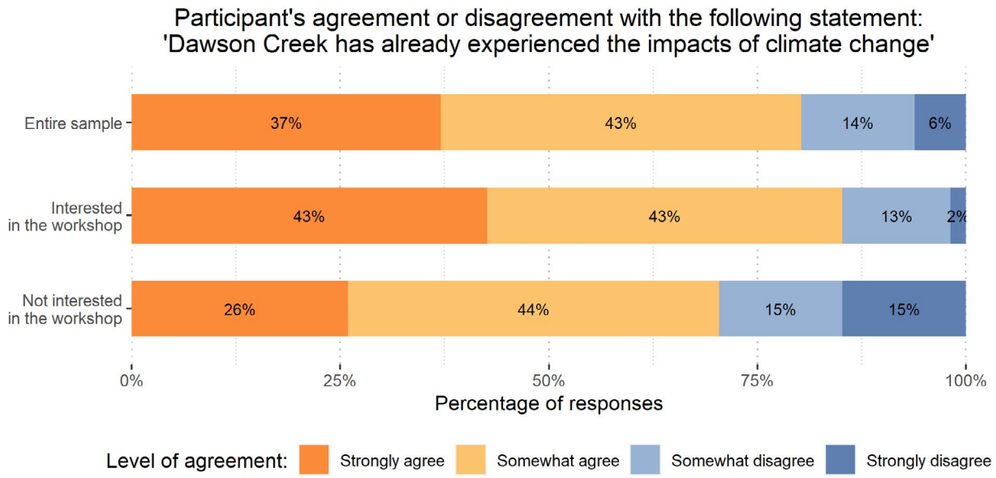


Figure C6. The figure shows participants beliefs on whether Dawson Creek has already experienced the impacts of climate change differentiating between the entire sample, as well as subsets of participants interested and not interested in the workshop.

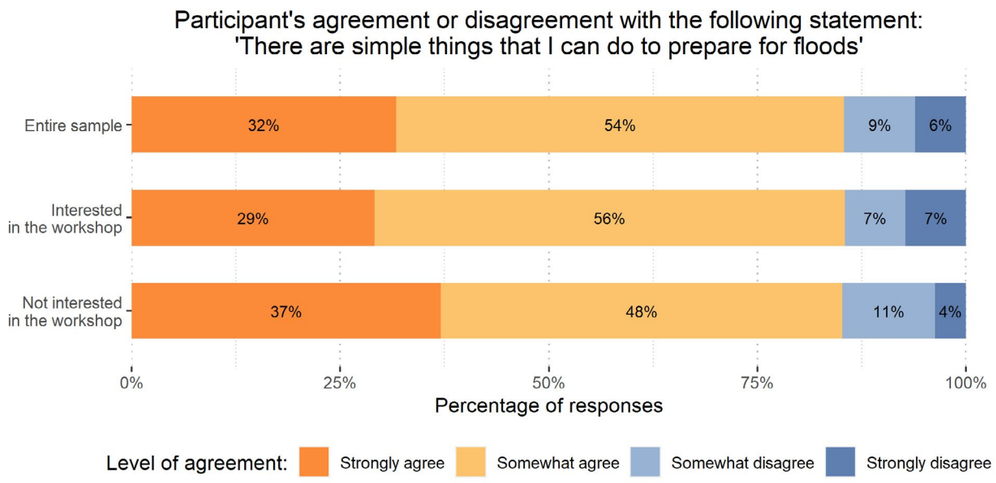


Figure C7. The figure shows the beliefs in the individual ability to prepare for floods (self-efficacy) among the entire sample, as well as subsets of participants interested and not interested in the workshop.

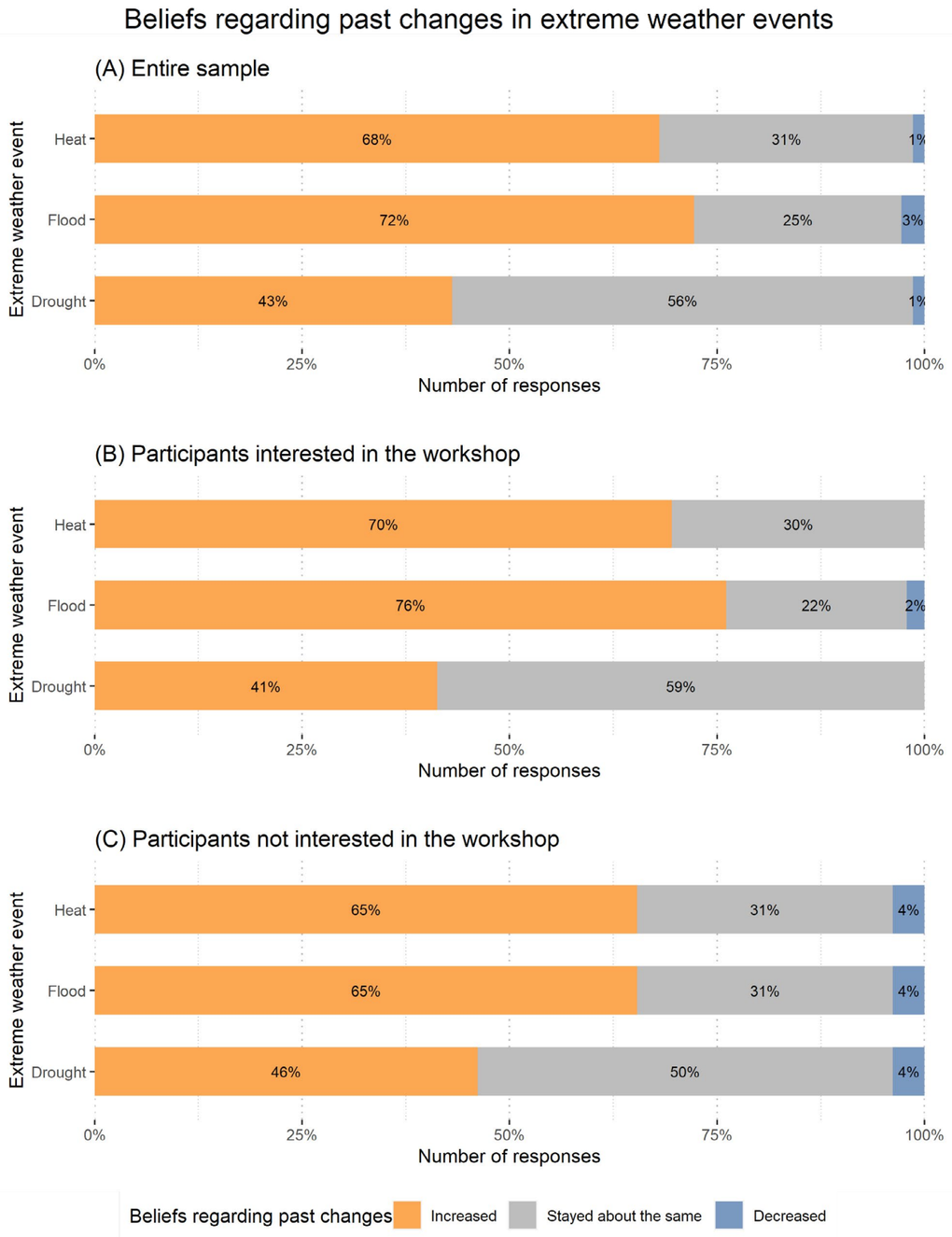


Figure C8. The figures show the beliefs regarding past changes in extreme weather events among the entire sample (A), as well as subsets of participants interested (B) and not interested (C) in the workshop.

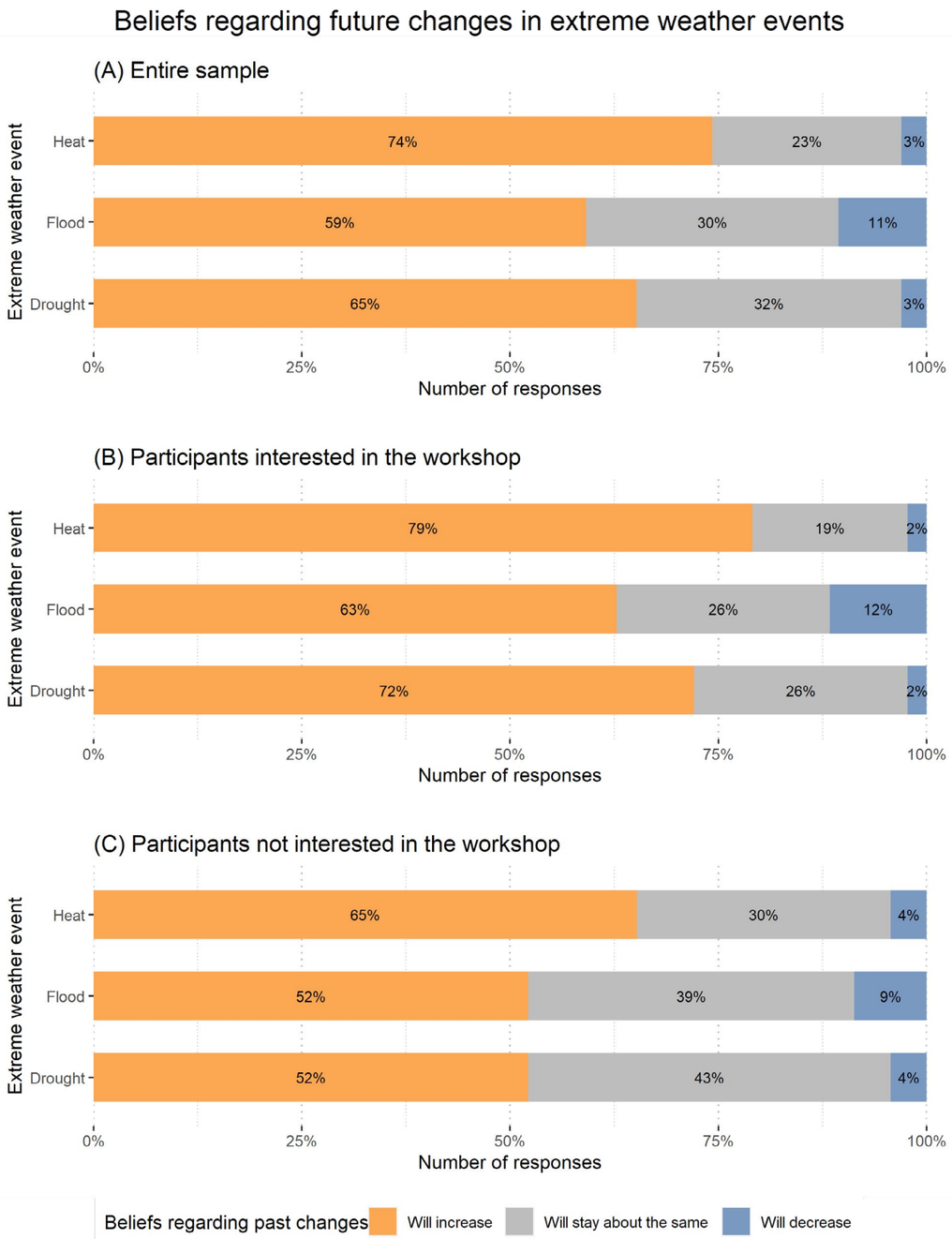


Figure C9. The figures show the beliefs regarding future changes in extreme weather events among the entire sample (A), as well as subsets of participants interested (B) and not interested (C) in the workshop.

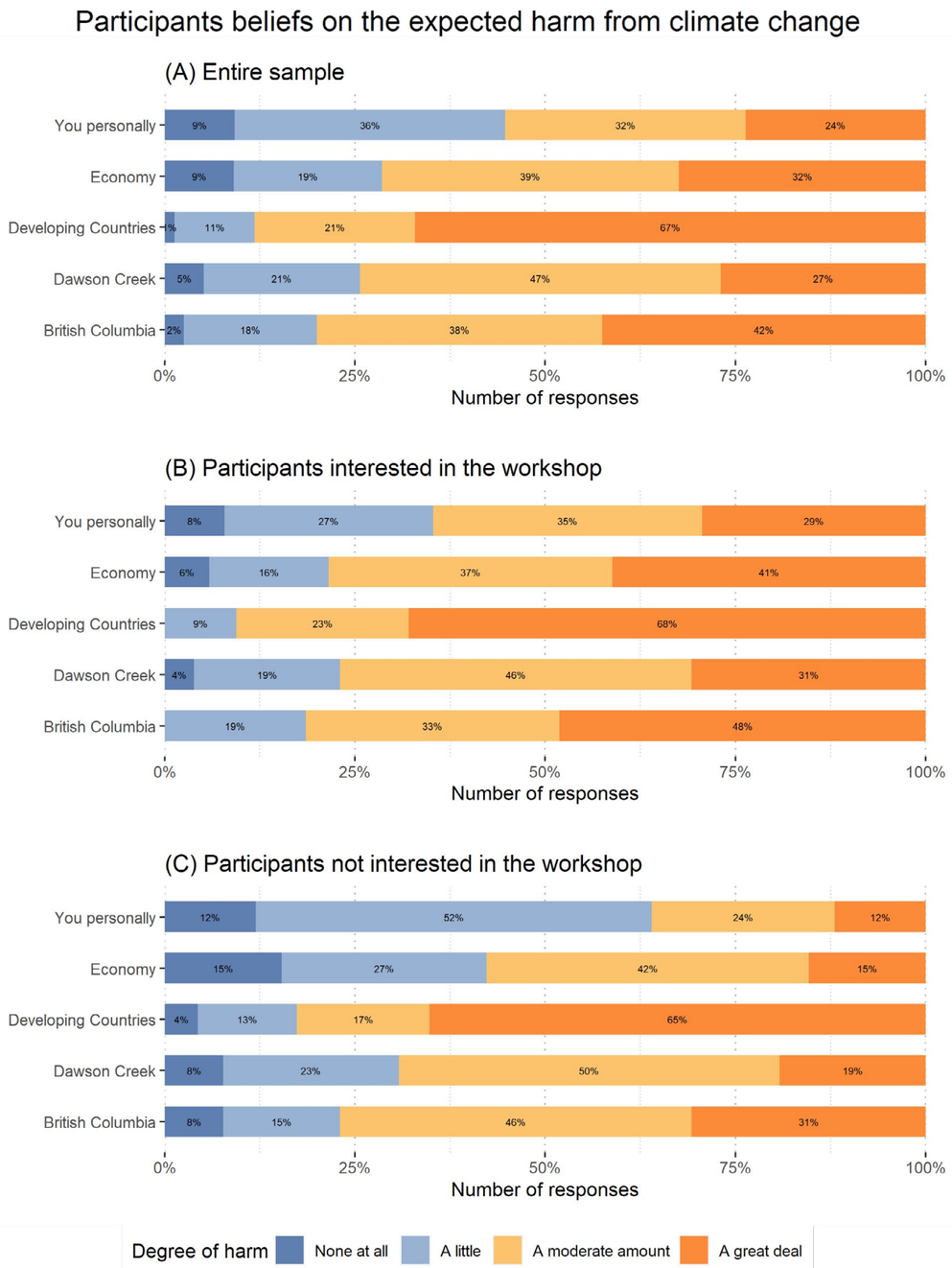


Figure C10. The figures present participants expectation regarding the level of harm from climate change to them personally, the economy, developing countries, Dawson Creek, and British Columbia. Responses are shown for the entire sample (A), as well as subsets of participants interested (B) and not interested (C) in the workshop.z

Appendix D. Climate change attitudes and flood preparedness survey: Sample demographics

The following table shows the responses of survey participants to the demographic questions. The responses are compared with Dawson Creek census data, where available.

Category	Percentage of respondents	Dawson Creek census data
Gender		
Female	72%	-
Male	27%	-
Age		
Under 24	0%	33.2%
25-34	16%	17.7%
35-44	28.4%	12.4%
45-54	25.9%	12.6%
55-64	24.7%	11.3%
65-74	4.9%	6.6%
75-84	0%	4.2%
85 and more	0%	2%
Indigenous identity		
Indigenous	8.8%	16.3% (Aboriginal identity)
Visible minorities		
South Asian	0%	2.9%
Chinese	1.5%	0.3%
Black	0%	1.3%
Filipino	0%	3.9%
Latin American	0%	0.3%
Arab	0%	0.1%
Southeast Asian	0%	0.4%
West Asian	0%	0.3%
Korean	0%	0.2%
Japanese	0%	0%
Non-visible minority (white and indigenous)	98.5%	90.2%
Income		
mean	109,865 ($)	91,491 (2015, before tax)
median	110,070 ($)	79,211 (2015, before tax)
Political identity		
Liberal	31.5%	-
Conservative	27.4%	-
Middle of the road	41.1%	-

Appendix E. Pilot project feedback survey

Thank you for deciding to provide your feedback. This survey should take no more than 3 min of your time. Your responses are anonymous and will be used to assess the success of today's event and to design the next workshops.

[page break]

Q1. How much do you agree or disagree with the following statements:

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
The workshop content was relevant	○	○	○	○	○
The information provided in the workshop was easy to understand	○	○	○	○	○
I have learned a lot about the ways I can prepare for floods	○	○	○	○	○
I feel more confidence in my ability to prepare for floods	○	○	○	○	○
I have learned a lot about climate change	○	○	○	○	○
The workshop was a good mix between listening and activities	○	○	○	○	○
The virtual engagement tools used (e.g., Menti, Zoom) were effective in facilitating learning	○	○	○	○	○
I would recommend this workshop to a friend or a colleague	○	○	○	○	○

Q2. What did you like most about the workshop? *[input box]*

Q3. What did you like least about the workshop? *[input box]*

Q4. Overall, how would you rate this workshop?

- ○ Excellent
- ○ Good
- ○ Fair
- ○ Poor

Q5. Is there anything else you would like to add? *[input box]*

Appendix F. Pilot project feedback survey results

Pilot project evaluation survey yielded 6 responses. The following figures present attendees' responses to Question 1 and Question 4 of the survey. Discussion of the responses to the open-ended questions can be found in section X of this report.

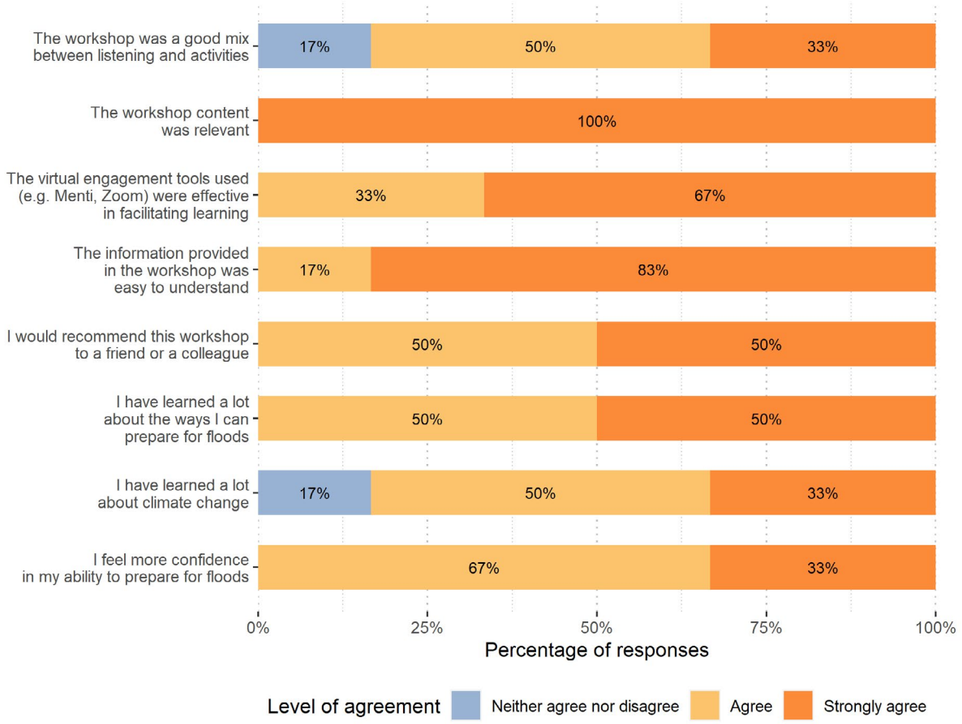


Figure F1. The figure shows the attendees' agreement with each of the presented statements. Attendees could indicate their agreement on a 5-point Linkert scale ranging from "Strongly disagree" to "Strongly agree". None of the respondents selected "Disagree" or "Strongly disagree" options.

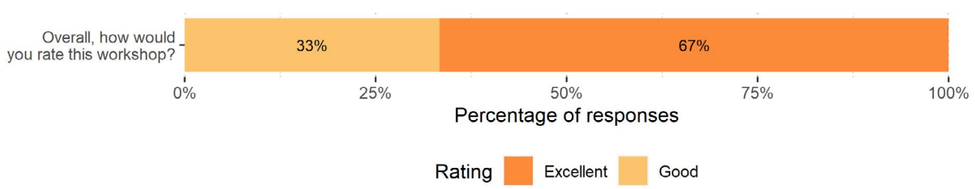


Figure F2. The figure shows the attendees' rating of the workshop. Attendees could indicate one of the following options: "Excellent", "Good", "Fair", and "Poor". None of the respondents selected "Fair" or "Poor" options.

Appendix G. Workshop presentation slides

SLIDE 1

Personal flood preparedness workshop

UBC SCHOLARS
Giulia Belotti
Margaryta Pustova
Madelaine Parent

[Job title, name, and surname of the city staff partner]

We started with an image of a local recent flood event to immidiately tie the workshop content to the local context

TRANSCRIPT

Good evening, everyone, and thank you so much for joining us online and in-person. We know you probably had other fun plans for your Wednesday night, but we appreciate to see you all here. We really hope we are going to make this worth it for you and we're sure you'll also have some fun at this worksho p.

As you probably already know, we are three scholars from UBC and today we are going to talk about personal flood preparedness in Dawson Creek.

Among the topics that we will address tonight, we will talk about the changing climate that we have all been experiencing in our communities, no matter where we come from or where we are now.

And, of course, we will be focusing specifically on flooding and flood preparedness in your community, in Dawson Creek.

Before getting started, we find it important to state that we are aware of the fact that these issues can be overwhelming to some of us, they can make us feel anxious, angry and powerless. And it is okay to feel that way. But what's even more important and what we want for you is that you leave this workshop being fully aware of the fact that you are not powerless, that there are multiple things that we can do, by working together, to adapt to these changes and build a better future for ourselves and for generations to come.

So we hope this workshop will be an opportunity for you to feel empowered and to feel that you really have the ability to make a change. After this important premise, we can now get started.

EXPLANATION

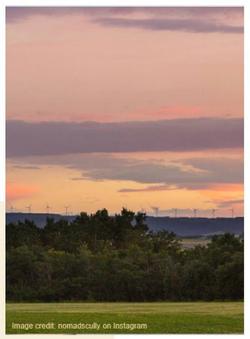
When introducing the workshop, we had two primary goals. Firstly, we wanted both online and in-person participants to feel comfortable and sec-ondly, we wanted to give them a general overview of the topics that we were going to address. Additionally, as found in the literature, it is better for individuals to not be overwhelmed by climate change. Rather, they should feel confident about their ability to make a change. For this reason, we decided to mention that, although the topics presented might generate negative emotions as a reaction, eventually the goal is for people to feel empowered and more confident about their ability to make a difference.

Personal flood preparedness workshop

UBC SCHOLARS
Giulia Belotti
Margaryta Pustova
Madelaine Parent

[Job title, name, and surname of the city staff partner]

SLIDE 2 *[no transcript]*



Land acknowledgment

We would like to acknowledge that we three scholars come to you from the traditional, ancestral, and unceded territory of the **Musqueam, Squamish and Tsleil-Waututh peoples.**

We would like to acknowledge that this workshop takes place on the traditional territory of the **Dunneza people and signatories of the Treaty 8 Territory.**

SLIDE 3 *[no transcript]*

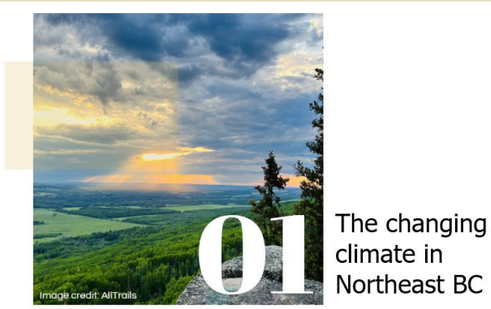
Workshop outline


The changing climate in Northeast BC


Dawson Creek flooding context


Personal flood preparedness

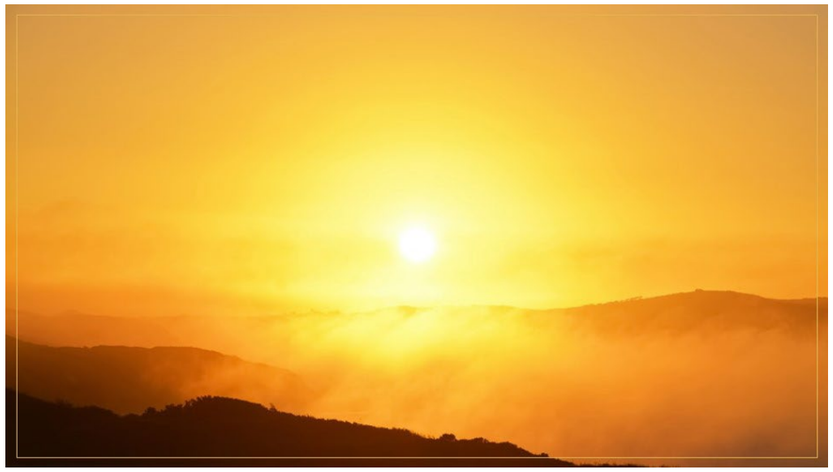
SLIDE 4 *[no transcript]*



01 The changing climate in Northeast BC

SLIDE 5 *[no transcript]*

SLIDE 6



We used an impactful, but non-frightening image to introduce our discussion of climate change.

TRANSCRIPT

I'm sure many of you have heard that the global climate is changing. Scientists have undisputable evidence that the average temperature around the globe is rising. And, while it may sound somewhat counterintuitive, Northern regions are actually warming faster than southern regions. While this means that our harsh winters are getting milder (which some may think is a good thing), we also see many undesirable changes that come with warming climate. We see more intense and frequent weather extremes, for example floods or heatwaves.

In the next few slides, we will talk about some of the changes that Northeast BC in general, and Dawson Creek specifically, have already seen and are expected to experience in the future and how they can affect things that we care about, such as our homes or our health.

But before we get into it, I want to warn you that thinking about future changes in climate can be emotionally overwhelming. And it is completely normal. But if you find yourself feeling this way, please keep in mind the goal of why we are talking about it today. We need this knowledge to be able to prepare better for the changing conditions.

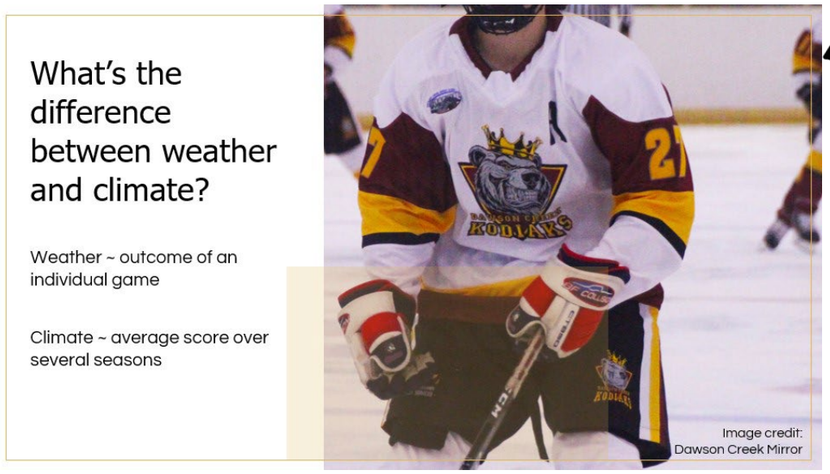
We should not feel hopeless about the future. There are many different approaches we can take individually and collectively to prepare for these impacts. Later today we will focus on the approaches that can be taken to prepare to floods, but there are things that can be done to also prepare for other changes.

EXPLANATION

Before jumping into the main topic of the workshop, namely flooding and flood preparedness, we decided to give a brief presentation on climate change, starting with a quick mention of climate change as a global problem, and then focusing more on the local context. This was done in order to provide some contextual information and for people to draw the connection between floods and climate change more in general.

Once again, we also found it relevant to reiterate that the topics we were going to address were sensitive ones and we warned people of the risk of feeling overwhelmed.

SLIDE 7



Images of local icons help the audience relate to subject matter.

TRANSCRIPT

Before getting started with climate issues, we'll clarify one point, which is... What do we mean by climate and how does it differ from weather?
To begin, I have a question for you: How many of you like hockey? (Raise your hand) Cheering for the Dawson Creek's Kodiaks, right??
Hockey can actually help us understand the difference between climate and weather. If we assume that weather is an outcome of a single game, then climate would be an average score of a team over several seasons. So weather is what's outside of your window on a specific day. Climate is the average weather conditions over 30 years.
Coming back to our hockey metaphor, imagine the team you are cheering for gets better over years. Their average score over past, let's say, 3 seasons goes up. Based on this, you can now expect that there is higher probability that your team will do better in individual games in the upcoming season, but it does not mean they might not have a bad game once in a while.
Similarly, change in climate means that the average conditions are changing. So, there are higher chances that summer days will be hotter and that extreme weather events, such as heatwaves or floods, will be more extreme and happen more often. If it happens so that one summer is mild, it does not undermine the fact that the climate is warming, because it just shows the weather in that specific year. If another year is unusually hot, the temperature average would still be increasing.
So weather and climate are connected concepts, but they are not the same. In today's presentation, unfortunately we won't focus on hokey. But we will focus on changes in climate of Northeast BC and Dawson Creek and we hope that's equally entertaining.

EXPLANATION

In this slide, we tried to adopt a simple metaphor to explain a scientific concept, namely the difference between "climate" and "weather". Choosing a topic that the community identifies closely with (hockey) brings people closer to complex climate concepts and makes the message easier to convey. To attract participants' attention, we made sure to use a picture of local hockey team.

SLIDE 8

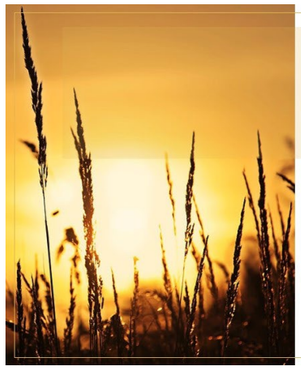
TRANSCRIPT

How many of you have noticed that summers have been getting hotter? (Raise your hand).
Indeed, Northeast BC has been seeing an increase in the number of days when the temperature goes over 25°C and even over 30°C. Between 1971 and 2000, the lowlands of Northeast BC (including Dawson Creek) on average experienced 16 days per year when the temperatures exceeded 25°C and about one day when it would cross 30°C mark. Currently, we can expect about 26 days per year when the temperature goes over 25°C, and about 3 days per year when it exceeds 30°C.
Based on scientistic modeling, in 3 decades (in 2050s), we can see on average 40 days per year with temperatures above 25°C and 10 days when it crosses the 30°C mark.

EXPLANATION

In this slide, we introduced past and future changes in summer temperatures in Northeast BC. Past changes were discussed to show that climate change is already affecting the region and it is not merely a threat for next the generations.
In this slide, we started to discuss climate projections in Northeast BC. To make this more interactive, we asked people to raise their hands if they had experienced hotter summers recentlyw. This is not only a way to engage participants, but also for them to perceive climate change as something closer to their community and to their lives. Furthermore, it allows participants to acknowledge that others have had similar experiences.
Once again, we also found it relevant to reiterate that the topics we were going to address were sensitive ones and we warned people of the risk of feeling overwhelmed.

SLIDE 9



What to expect?

- Hotter and drier summers
- More extreme heat events
- Higher cooling demands
- Greater potential for droughts in late summer
- Higher risk of wildfires

Source: (Fraser Basin Council, 2019)

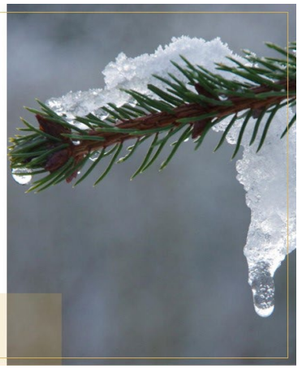
TRANSCRIPT

So what do these numbers really mean for us and the things we care about?
First of all, it means that Dawson Creek can expect hotter and drier summers. We will also see more frequent and more extreme heatwaves.
Cooling demands will increase. This means that, if someone already has an AC, it may take more energy (and thus money) to cool a house or an apartment to reach comfortable temperature. Also, more people may want to install air conditioning the future.
There will also be a greater potential for droughts in late summer. This is partially because more water evaporates as temperature increases. But it is also tied to warming winters, which we will talk about in the next slide.
Finally, hotter summers lead to higher risk for wildfires in the region.

SLIDE 10

Warmer winters

- Less frost and ice days
- Greater potential for beetle infestation
- More frequent rain-on-snow events
- Less snowpack
- Earlier and more rapid snowmelt
- Increase in floods and droughts

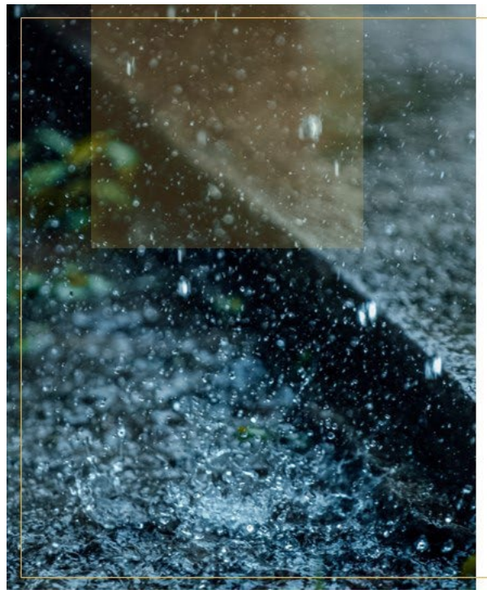


Source: (Fraser Basin Council, 2019)

TRANSCRIPT

Another change that Dawson Creek will continue to see in the future is warming winters.
In the future, there will be fewer frost and ice days. Frost days are when the temperature at any point of the day drops below 0 and ice days are when the temperature stays below 0 for the entire day.
In the future, winters will look more like what autumns used to look in the past.
This trend will also impact agriculture because these conditions are favorable to invasive species. This means a greater potential for beetle infestation.
The region will see more frequent rain-on-snow events, increasing the risk of street flooding and street closures.
With warmer winters, we will also see reduced snowpack.
This snowpack will melt earlier and more rapidly, leading to increase in flooding during the snowmelt.
Additionally, this will also cause more droughts later in summer, because the snowpack will have melted earlier and will not supply as much water to the rivers at this time.

SLIDE 11



Increased precipitation

- Increase in total precipitation, particularly in spring and fall
- Increase in intensity and frequency of precipitation
- This can lead to more frequent:
  - sewer back-up
  - flooding

Source: (Fraser Basin Council, 2019)

TRANSCRIPT

Increased precipitation is another change that Dawson Creek has already been experiencing and will continue to see in the future.
- We can expect an increase in total precipitation, particularly in spring and fall. Summer will still be the wettest season but by a significantly smaller margin
- We will also see more intense and frequent precipitation.
- This can lead to more frequent sewer back-ups and floodings

EXPLANATION (SLIDES 9-11)

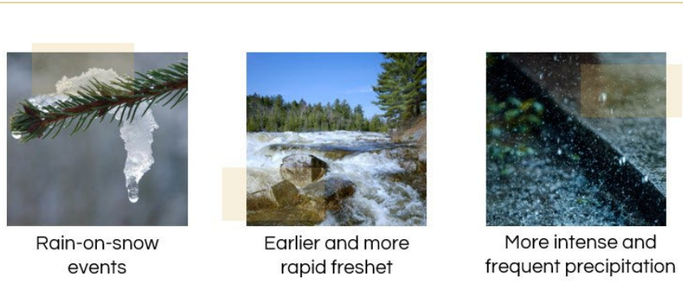
In the previous 3 slides, we attempted to convey the message that climate change is having an impact on the things that people care about. We used some examples for participants to help communicate how extreme heat will impact their daily lives, for instance through increased need for air conditioning units and, thus, increased financial expenditure.

SLIDE 12

TRANSCRIPT

So far, we have talked about hotter summers, warmer winters, and more intense and frequent precipitation. But these impacts do not happen in isolation from each other, they also have interactive effects....

SLIDE 13



TRANSCRIPT

For example, we can expect that the floods will get more frequent and intense because of a combination of more rain-on-snow events, earlier and more rapid freshet (by freshet here I mean the river flood from snowmelt), and more intense and frequent precipitation. These individual impacts add up.

SLIDE 14

Here we inserted a striking image of a local flood to increase the impact of the message. This was done with caution, however.

TRANSCRIPT

This means that future floods will be more intense and frequent than those that Dawson Creek has experienced so far.

I am sure you remember the devastating floods of 2016 and perhaps other flooding events that happened to Dawson Creek. The picture that you see here was taken during that 2016 flood. It is tempting to think that we have seen the worst, but, unfortunately, a changing climate means that we can no longer judge the future based on our past experiences.

And, unfortunately, there is no way to predict with 100% certainty when the next flood will happen and how strong it will be. But we do know the overall trend that Dawson Creek will be seeing more intense and frequent floods, and we should try out best to prepare despite these uncertainties.

EXPLANATION

Here, we mention the devestating Dawson Creek floods of 2016 and include an image of this event. This inclusion of this serves to help participants link climate change impacts to their local community, thus increasing the effectiviness of the message. Such tactics must be used with extreme caution, however, as such imagery and subject matter may bring up harmful memories. To prevent such harm, were were sure to begin the workshop with a safe and gentle discussion of climate impacts.

SLIDE 15

Impacts of floods

- Damage to buildings
- Mental health effects
- Increased stress on private layouts and sanitary sewer
- Street flooding and road closures
- Sewage backups
- Power outages

Source: (SHIFT Collaborative, 2019)

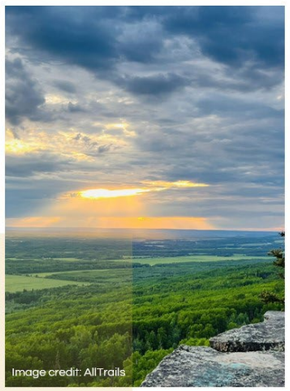
After mentioning the 2016 floods, we list the impacts of floods to encourage acknowledgement of their implications.

TRANSCRIPT

In light of what Margo just said, it is important to be aware of the potential impacts of floods:

- *Firstly, floods lead to damage to buildings*
- *There are also mental health effects, such as elevated levels of anxiety*
- *Floods increase stress on private layouts, dug-outs, septic, and lagoons*
- *Street flooding and closures are other risks, which can lead to limited ability to travel between and within communities. Intense floods can also lead to isolation of critical services.*
- *There is also risk of sewage overflows, as well as power outages*

SLIDE 16



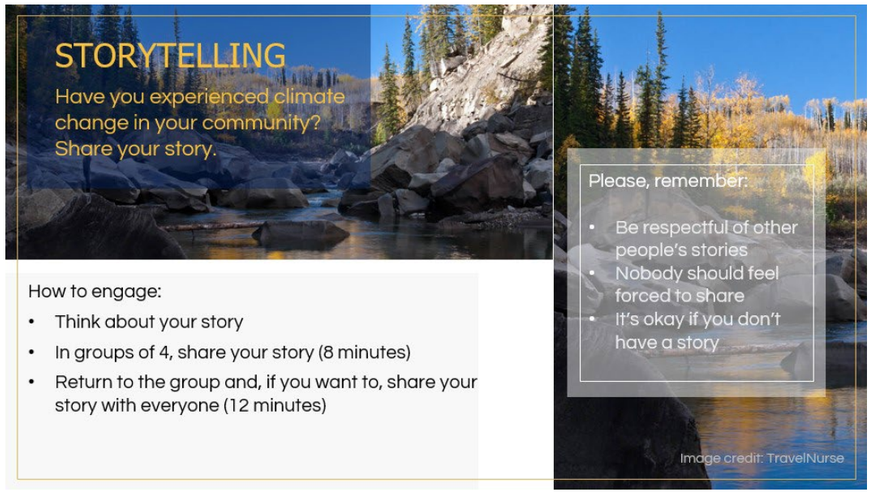
Main takeaways

- Dawson Creek has already experienced the impacts of changing climate
- In the near future, the region is expected to experience hotter summers, warmer winters, and increased precipitation
- Extreme weather events (including floods) will increase in frequency and intensity
- Future can no longer be judged by past experience

TRANSCRIPT

It is important to note that what we discussed so far is not a comprehensive list of potential impacts, but some highlights of the most relevant risk. If you want more information about this, we will send more resources to explore by email after the workshop. Finally, let's keep in mind that there are uncertainties about what the future holds. The future will depend on how we as humanity deal with climate change. Future predictions we present here are based on extending the current state of things into the future. That's the best thing we can do. We have to learn to deal with this uncertainty and be flexible and adaptive.

SLIDE 17



Instructions were written on the slide and kept there throughout the exercise to make it easier to follow

TRANSCRIPT

Now that we've concluded this very science-based discussion of climate change, we'll turn it over to you, the audience, to share your experiences of climate change so far. So, for the next 20 minutes or so, we're going to take you through a story telling activity that will allow you to share a story about experiencing climate change in your community, either on behalf of yourself, your family or even your ancestors. This will involve a few steps:

- *First, we will put on some music and give you a few minutes to silently think about a story*
- *Secondly, we'll ask everyone to get into groups of 4 to share with each other. Chelsea will facilitate this in person, and, on zoom, we will put you into breakout room*
- *Third, we'll all return to the group and those of us who want to can share their stories with everyone*

We'll ask you to remember a few things during this exercise:

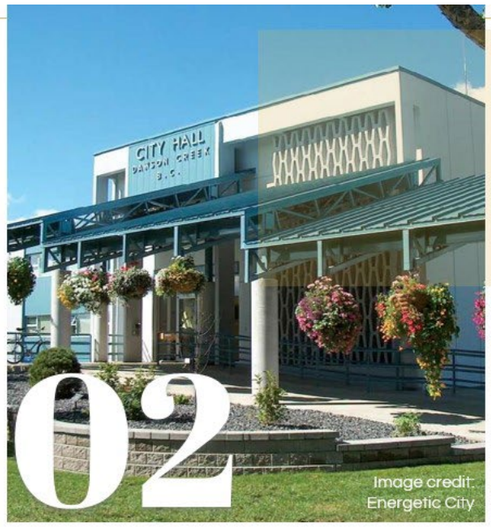
- *Be respectful of other people's stories*
- *Nobody should feel forced to share*
- *It's okay if you don't have a story*

So, we'll enter into a few minutes of silent thinking now, and then we'll pass it over to Chelsea

EXPLANATION

In this slide, we intentionally added storytelling rules for people to remember the steps to follow during the activity. To ensure psychological safety, we reminded participants to be respectful of other people's stories and honor their reality and we reminded them that it is not necessary to have a story to share. By creating room for ancestral and traditional stories, we hoped to help decolonize the exercise and to acknowledge that science is not the only way of knowing and communicating.

SLIDE 18

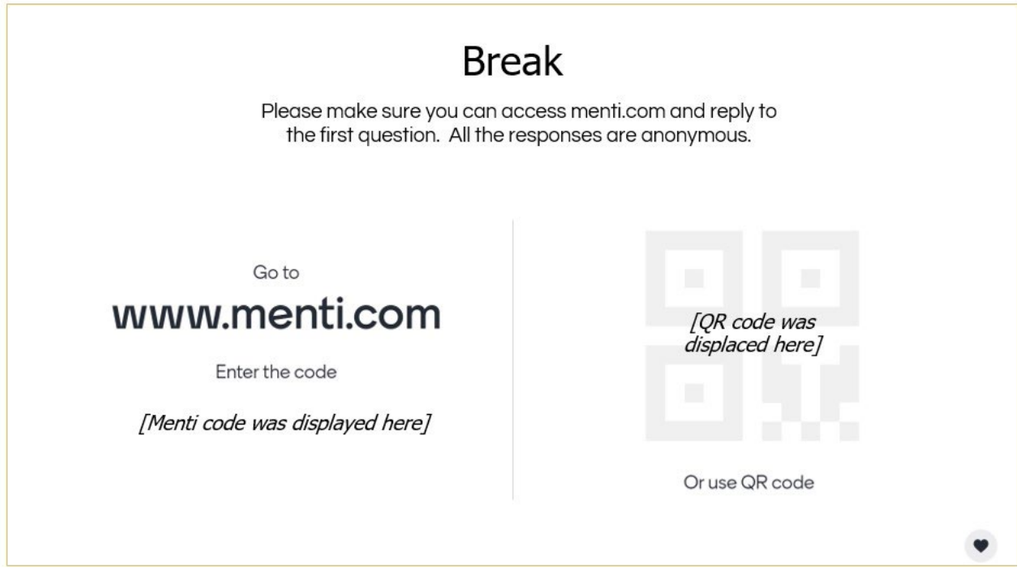


NOTE: In Section 2, Local Flooding Contect, City staff gave a presentation on flood preparedness measures adopted by the city of Dawson Creek, then she introduced a short break. This presentation helped people to understand that they are not alone in preparing for flood events. We did not append this presentation.

SLIDE 19

[This section included presentation by the city staff partner about the local flooding context and the actions that the municipality has taken to prepare for floods. Presentation slides for this section are not attached as they were not developed by Scholars as part of this project.]

SLIDE 20



SLIDE 21

EXPLANATION (SLIDES 20-21)

During the break, participants were encouraged to try out Menti by answering a word cloud question. This allowed them to take their time in getting comfortable with the application. The word cloud results were shared at the end of the break.

SLIDE 22

Personal Flood Preparedness

Before the Flood

TRANSCRIPT

Thanks to Chelsea's presentation, we now know a bit better what the city of Dawson Creek has done to address flooding.
Often, in front of extreme weather events like flooding or wildfires, it is easy to think that we are personally uncapable of changing things. Feeling powerless is normal, but we should not let this stop us from trying to do our part to prepare for these events. In fact, there are many things that we can do as individuals to address disruptive events like flooding.

EXPLANATION

Here, we communicate to participants that it is not only the government who can prepare for flooding. We remind them that they as individuals are powerful and they can complement the measures taken by their municipality. This helps them feel more empowered to address potential future challenges.

SLIDE 23

BRAINSTORMING

What measures can you adopt to *prepare* for flooding?

After logging into Mentimeter, anonymously share your ideas by typing them in the app!

TRANSCRIPT

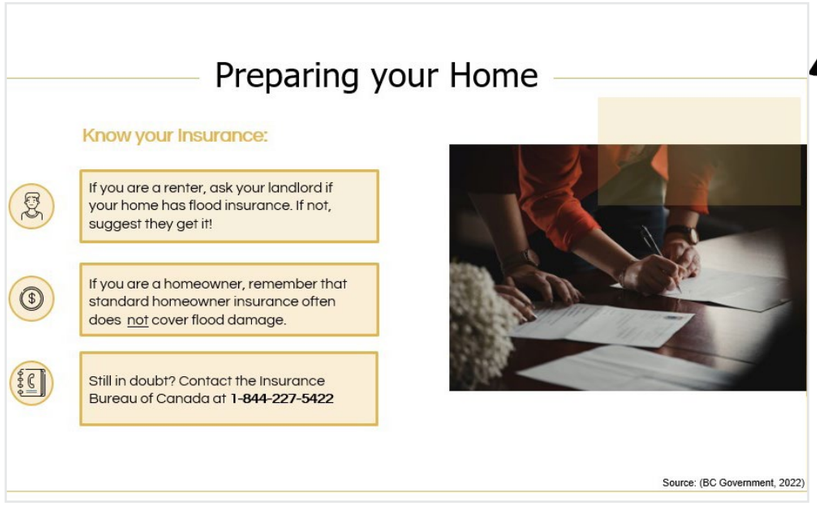
Now, we'd like to brainstorm what possible measures we can adopt as individuals to prepare for flooding. You should all be logged into Menti by now. In a second, you will see a new question on there asking for your input. Here, you can anonymously share your ideas. [Wait 2 minutes].

Great! I bet you all identified a lot of great solutions and measures that we can adopt to prepare for flooding, but for now we won't share them. We will come back to this later. And please, do not close Menti – we will be using it later today.

EXPLANATION

The Brainstorming exercise had two goals. First, we wanted participants to feel engaged in the presentation and to actively contribute to it. Second, we wanted them to start realizing that there are measures they can personally adopt to prepare for flooding.

SLIDE 24



We tried to make the slide easier to read and understand by using visuals and including brief pieces of information in little boxes

Here, we included information for both homeowners and renters to ensure equity.

TRANSCRIPT

Now, we'll jump to measures that you can adopt to prepare for flooding before it happens. We'll start here with the measures you can adopt for your home.

A first thing you can do is know your insurance.

If you are a renter, be sure to call your landlord and ask if they have flood insurance. If they don't simply but a drum set and threaten to play every evening until they get it.

If you are a homeowner, one thing to keep in mind is that often standard homeowner insurance does not cover flood damage. For this reason, you might have to add flood insurance to your package

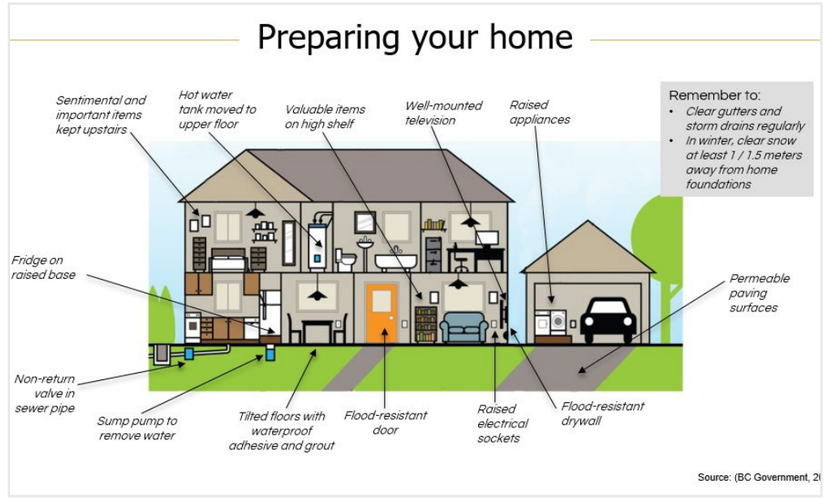
If you have more questions about insurance, the Insurance Bureau of Canada is a great resource for more information.

EXPLANATION

When addressing home preparedness, we found it crucial to include both house owners and renters. While tenants often believe that they don't have an ability to influence the landlord's decision to buy insurance, they could still discuss their options with house owners.

SLIDE 25

To avoid overwhelming workshop participants, we used Powerpoint transitions so that every piece of information would appear subsequently



TRANSCRIPT

Preparing your home involves more than just insurance. Now we'll talk about some more tangible solutions you can adopt.

A first simple step involves storing valuable items on higher floors and shelves.

Similarly, you should raise your appliances, like fringes and washing machines. You can also raise electrical sockets and move your hot water tank to the upper floor.

For homeowners, if you want to adopt more structural measures, you can also get flood-resistant doors and drywall, or even waterproof floors. Outside of your home, you can install permeable paving surfaces.

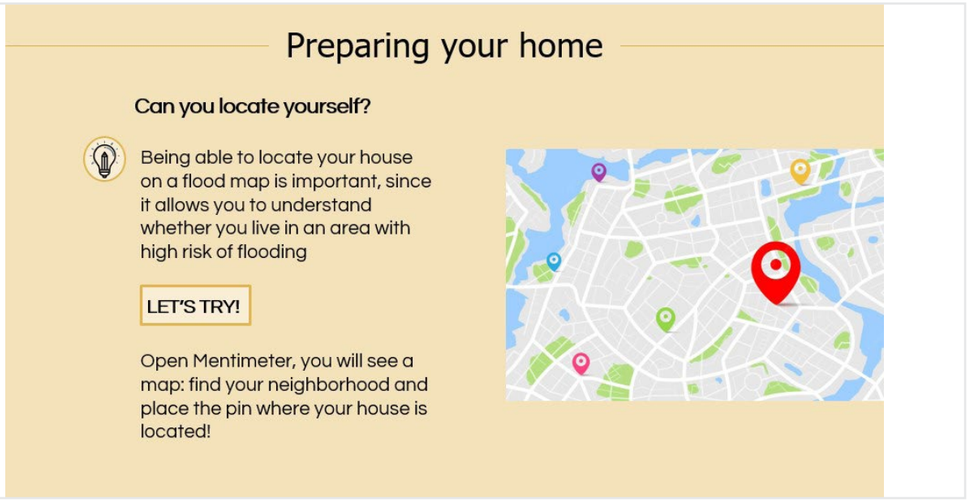
Another structural solution you can adopt is installing a sump pump to remove water, as well as non-return valves in the sewer pipe. Of course, remember that it's important to clear your gutters and storm drains. As this prevents water pooling along the foundation of your home.

One last thing you should do, and this is because we want to keep you all in shape, is clear out snow in the winter, keeping it at least 1 meter away from the foundation.

EXPLANATION

We tried to make this slide visually appealing so that the audience could understand the topic without being too overwhelmed. We used PowerPoint transitions to make the information on the slide appear subsequently and we tried to relate the information provided to day-to-day experiences of the audience, for instance, telling participants that clearing out snow could also keep them in shape.

SLIDE 26



TRANSCRIPT

But there is another thing you can do to prepare your home for flooding, which is as simple as knowing where your house is located. This is important because it helps you understand whether you are in a high flood risk area or not. Maybe some of you are already familiar with flood maps or have seen one before. If not, it's okay, because you are about to see one.

What we are going to do now is a fun exercise where you have to locate yourself on a map. If you open Mentimeter on your phone, in a minute you will see a small map of Dawson Creek and most of you should be able to identify their neighborhood and their homes. This map shows a possible future flooding scenario and it allows us to determine which areas of the town will be at risk. And personally, I find these maps so useful because they really give us an idea of how the future will look like within the next few decades.

[open Menti]

So, on the app you can pin your location by tapping on the screen of your phone. You can also zoom into the picture by using two fingers just in case you cannot find your place. And if you pinned the wrong location, you could always change that by pinning again. I'll give you some moments to locate yourselves and you can help each other or ask Chelsea for some help. We understand that this activity is a bit tricky, we are also secretely testing your eye sight, so don't worry if you can't locate yourself on the map.

[give one minute for the activity]

Great! It seems most of you have located yourself on the map.

[Comment on what you see]

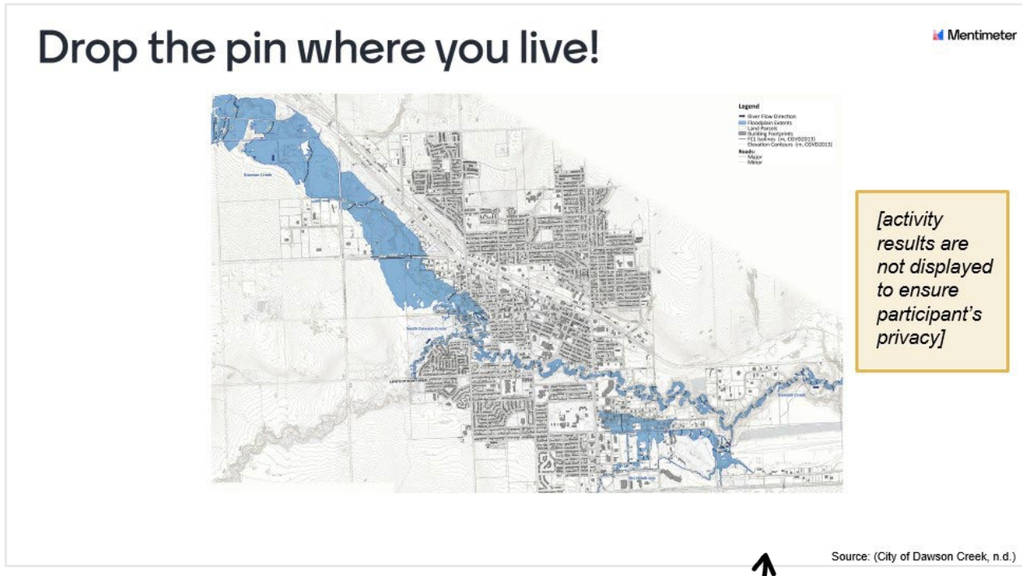
Again, this activity is helpful because it shows what our future might look like, so that we better prepare.

EXPLANATION

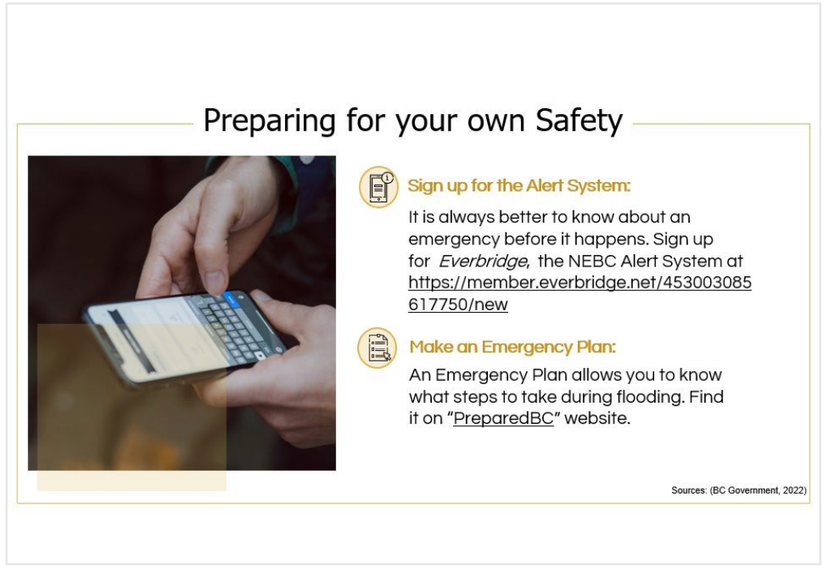
Through this activity, we wanted participants to learn how future flooding might impact their community through visuals. Existing literature mentioned the importance of visuals and photos for individuals to learn and reflect on various topics. For this reason, we provided a flood map of the city where people could locate themselves and understand their risk in case a flood event would occur.

We have decided to show participants a flood map for 1-in-200-year flood under current condition assuming 1.6m freeboard. However, we did not explicitly mention that 1-in-200-year flood was presented, as research shows that such probability statements is commonly misinterpreted by the general public, often providing participants with a false sense of security that the flood like this will not happen within their lifetime.

SLIDE 27



SLIDE 28



Similarly to slide 22, we tried to make the information presented easier to understand through the use of visuals and short sentences

TRANSCRIPT

And talking about preparedness, although we know that we all care about our homes, we also need to think about our own safety.

Even in this case, the first thing we can do to prepare is very simple. If we want to prepare for a flood, we first need to know when one is coming. And technology makes this relatively easy, because all you have to do is signing up for an alert system. This way, when a flood is imminent, you will be notified on your phone and you will keep receiving updates. Here, we added the link to sign up to the alert system and you will have access to it at the end of this workshop.

While the alert system tells you when a flood is coming, it is also important to know what to do when it happens. For this reason, you and your family should create an emergency plan. An emergency plan is a playbook where you can record important information and steps to take if a flood happens. And in this case BC got you covered; you don't have to create an Emergency Plan from scratch. If you google «Make your emergency plan BC» you can find one that you can fill out with the information that applies to you.

SLIDE 29

TRANSCRIPT

And this leads us to the next thing we can do to prepare. How many of you have ever watched one of those movies where there's the apocalypse, like aliens or the end of the world, and the main characters have to pack everything important in a bag and go fight a bigger evil? Well, I want you to pretend to be a movie character when taking these next measures to prepare. Or, on a brighter note, you can also pretend you are going camping, which might be an activity we are slightly more familiar with than saving the world.

Anyways, during a flooding event, you might be asked to do one of these two things: staying home or evacuating. Either way, you want to have all you need to stay safe. For this reason, you should always have an emergency kit or a grab and go bag with you. If you have to stay home, an emergency kit is what you need, while if you need to evacuate, then a grab-and-go bag is the best option. But what should you put inside? Luckily, an emergency kit and a grab and go bag should contain more or less the same items. Let's go through them.

First and foremost, it's always good to have a first-aid kit and medications.

Second, you need to have important documents with you. Remember we talked about the emergency plan and the home insurance? Well, those should be part of the important documents.

As for this next one, I told you it's like preparing for camping. You will need a battery-powered flash light, a whistle, but also extra batteries. Personal toiletries and personal hygiene items are clearly important.

Remember we were testing your eye sight with the flooding map? Well, if you wear glasses, you should always have an extra pair of glasses or contact lenses in these bags. And since we live in the 21° century and our entire lives are now often stored in our phones, having a phone charger and a battery bank is always a good idea. However, in case phone service is down, having a battery-powered radio is a great backup. As for money, it is always better to have some cash in small bills. Always have an emergency blanket in your bag. If you're staying home, you might think «of course I have a blanket» but remember to keep it on higher shelves and of course, also store your emergency kit and bag on high shelves.

SLIDE 29 (CONTINUING)

Then, as trivial as it might sound, pack seasonal clothing and remember to bring sturdy footwear with you. We know you always want to be stylish, but sandals are not allowed.
When it comes to food and water, there is a slight distinction between the emergency kit and the grab-and-go bag. If you stay home, you'll need to pack non-perishable food (remember to have a can opener for that), while if you have to evacuate, pack ready-to-eat food. Water is also extremely important, as you might need to use it both for drinking and for sanitation, so pack enough liters. Remember to have enough food and water for it to last 72 hours.
If you stay home, also include garbage bags, dust masks, and an «okay» and «help» sign in your emergency bag. The sign is for you to hang on your those, so that others know if you are doing okay or if you need help.
Instead, if you have to evacuate, it's always good to pack a pen and a notepad.

EXPLANATION

As in the previous slide on home preparedness, we decided to use visuals to aid our message. We used a "camping metaphor" to reduce psychological distance to the topic, since in our community interviews we found out that camping is a familiar activity for Dawson Creek residents. Additionally, we acknowledged that talking about evacuation might be overwhelming, thus making it preferable to use an analogy. Lastly, even in this case, Power Point transitions were used so that information would appear subsequently.

SLIDE 30

TRANSCRIPT

For now, we have seen what measures you can adopt to prepare your house and yourself for flooding. However, during an emergency we cannot only think about ourselves and our own safety. We need to help others. For this reason, it is also important to help your community prepare.
How many of you know their neighbors… (and potentially get along with them)? Well, we know that the neighbor's grass is always greener, but now is not the time for competition. Instead, it is a good thing to start building relationships with your neighbors!
Also, in a community no one should be left behind. Elders and other vulnerable individuals might face challenges to prepare for emergencies like flooding. Giving your support to them is important, so that if something happens, they know what to do!
Another simple thing you can do, especially since you're probably having a lot of fun at this workshop, is to invite your friends and family to attend flood preparedness events like this. And let's be honest, who doesn't like games and free snacks!
Last but not least, if you feel like you could do more to help your community, you can sign up to volunteer. You can just google «Emergency Support Services» and find out more about what you can do. We will also provide you with the link to sign up later.

EXPLANATION

In this slide, we tried to highlight the importance of community building to prepare for extreme events like flooding. Again, we engaged the audience through questions relating to their daily lives, such as "how well do you know your neighbor?" and "Do you get along with them?". These questions also aimed at strengthening community building during the workshop itself.

SLIDE 31

BRAINSTORMING
REVEAL

TRANSCRIPT

So now that we have presented some of the things you can do to prepare for flood, let's come back to the results of the brainstorming that we did in the beginning of this presentation and see what some of the solutions are that you identified. I am sure there are going to be some that we haven't covered yet.

[opens Menti, goes through results]

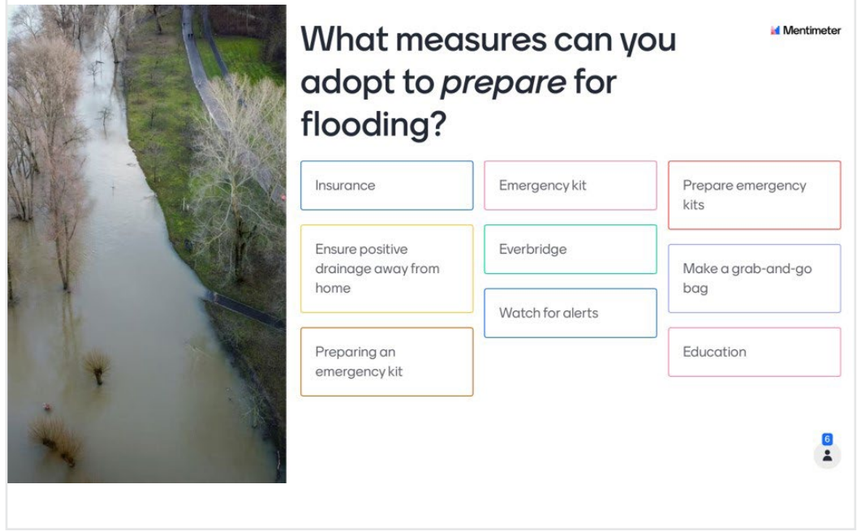
Thank you again for sharing your idea. You all identified a lot of great solutions.
And while preparing for floods are extremely important, we also want you to know what to do if the flood is already happening.

EXPLANATION

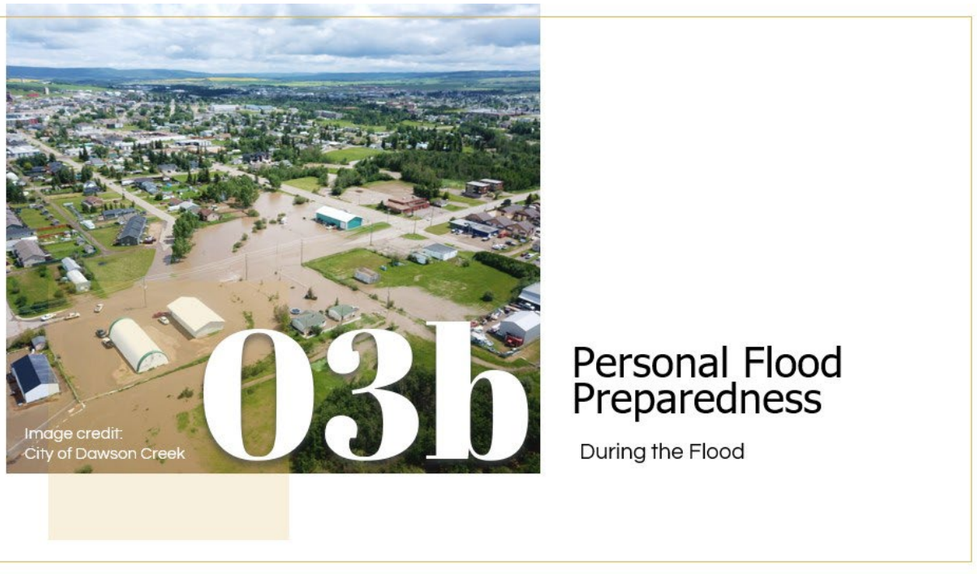
In this slide, we revealed the results of the brainstorming activity. The goal was for participants to appreciate that they and their fellow community members already have significant knowledge on individual-level flood preparedness actions. By revealing brainstorming results, we also hoped to enhance participatory knowledge-building within the community. We hoped that participants would not feel 'lectured', but rather an active part of the workshop.

SLIDE 32

This slide shows the flood preparedness measures identified by participants in the brainstorming activity.



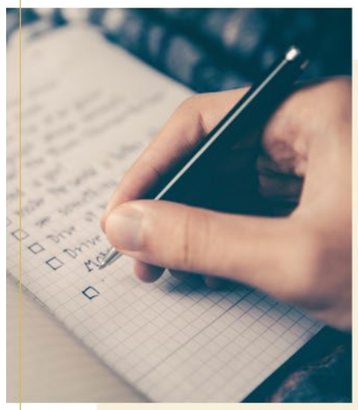
SLIDE 33



TRANSCRIPT

We'll now go over some actions you can take during flooding events, when the flooding is happening.

SLIDE 34



Imminent Flooding

- Stay updated through City website
- Notify loved ones, friends, neighbours
- Follow recommended driving routes
- Limit toilet flushing and washing

Source: (BC Government EBook Collection & Emergency Management BC., 2018)

TRANSCRIPT

So, if flooding is imminent, meaning it's likely on its way, what can you do?
First, it's highly important to stay up to date on flood information.
The best place to do this is the City of Dawson Creek website, which will be your main hub for local flood information. The River Forecast Centre website and Emergency Info BC are additional resource.
Notify your loved ones, friends and neighbors as they may not be aware of recent conditions.
Follow recommended driving routes: use the routes designated by your local officials, and do not drive through barriers.
Limit flushing the toilet and using your washing machine, as the sewer system may be close to capacity

SLIDE 35

Again, we tried to make the slide easier to read and understand by using visuals and including brief pieces of information in little boxes.

Flood Advisories and Warnings

- High Streamflow Advisory
- Flood Watch
- Flood Warning

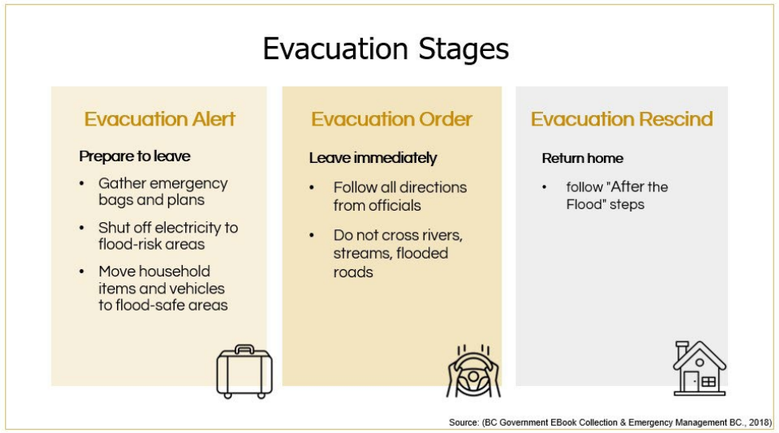
Website: River Forecast Centre

Source: (BC Government, 2022)

TRANSCRIPT

The River Forecast Centre issues advisories and warnings about current or expected flood risks. There are three degrees of notification.
High streamflow advisory means that river levels are rising rapidly, but no major flooding is expected. Instead, minor flooding in low-lying areas is possible.
Then, there is flood watch. In this case, river levels are rising and will approach or may exceed the river bank. Additionally, flooding of areas adjacent to affected rivers may occur.
Lastly, flood warning means that river levels have already exceeded the river bank or will exceed the river bank imminently, and flooding of areas adjacent to affected rivers will result.
This is the level that poses the most risk to the Dawson Creek community and thus the one that all of you should be most concerned of.

SLIDE 36



Again, visuals helped us convey our message. Additionally, the information was presented in a logical manner, to enhance learning.

TRANSCRIPT

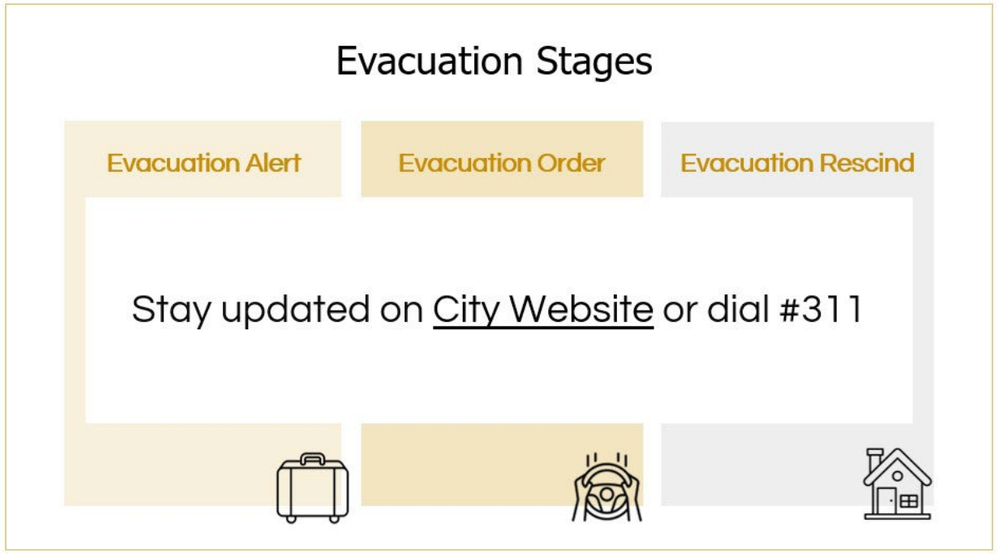
When the risk of flooding is becoming quite serious, there is the possibility of evacuation. When it comes to evacuation, there are three different stages.

The first is evacuation alert: this stage means you should begin getting ready for a possible evacuation. Some things you're going to want to do are gather emergency bags, plans, documents and put them in an accessible area, shut off electricity to flood-risk areas, move any easily moveable items away from flood-risk areas, so upstairs or high on shelves, and move vehicles away from outdoor areas that may become flooded.

The second stage of evacuation is an evacuation order. This means that you are ordered to leave your home immediately. When it comes time to leave, some things you should be sure to do are follow all directions from local officials, such as safe driving routes, do not cross rivers, streams or flooded roads. It takes just 30cm of rushing water to sweep away a vehicle!

The last stage of evacuation is evacuation Rescind. This means the order is lifted and you may now return home. We'll talk more about returning home in the coming slides.

SLIDE 37



TRANSCRIPT

Most importantly, stay up to date during all stages of evacuation. The city website will provide the latest local updates throughout all stages, such as next steps, reception centers and more. You can also dial #311 for up-to-date information. This line is available 24/7 during emergencie.

EXPLANATION

We used PowerPoint transitions to highlight the most important information. In this case, we wanted participants to know that, although understanding and following evacuation stages is important, they should always stay updated on City Website.

SLIDE 38

Manage Stress

- Take care
- Reach out
- Help others

Source: (BC Gov EBook Collection & Emergency Management BC., 2018)

TRANSCRIPT

In addition to impacting our physical health and safety, flood can impact mental health as well.
If you find yourself feeling stressed from flood events, there are a few actions you can take.
First, take care be kind to yourself during this time. Be sure to rest, eat well, exercise, and do things your enjoy.
Second, reach out. Reaching out to those who can support you during this challenging time is important, whether it's family, friends, your doctor or your counsellor. Crisis lines are another way to speak with someone. The BC Mental Health Support Line and the Indigenous Crisis Line are two options available 24 hours a day.
. Last but not least, help others: offering assistance to others or helping out within your community can be a great way to relieve stress.

EXPLANATION

When addressing climate change adaptation, it is important to discuss not only practical measures that individuals could adopt, but also include aspects like mental health and wellbeing. Through this slide, we also wanted participants to understand the importance of community building and of taking care of others.

SLIDE 39

Truth or lie?

Test your knowledge!

Open Mentimeter and try to guess whether the statements you see are true or false!

TRANSCRIPT

Now that we have discussed some of the ways to prepare to floods, let's do a quick game of True or False to test our knowledge.

[open Menti]

If you still have Menti opened, you should see the following statement on your phone and you can try to guess if it is True or False.

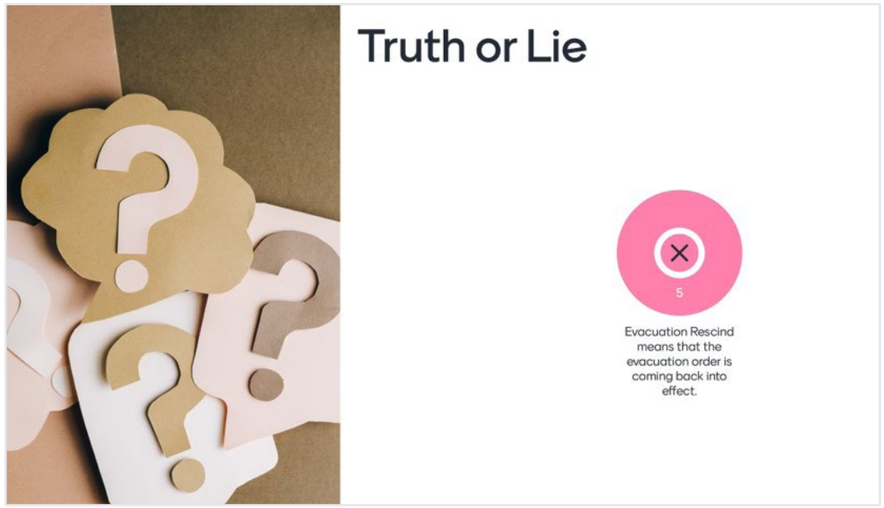
[at the end of the game]

I hope you enjoyed this little quiz. We will not be using Menti anymore today, so you can close it now.
While it is crucially important to know what to do before and during the flood, what perhaps is being talked less about is what should be done after the flood. And we are hoping to fill in this gap.

EXPLANATION

We decided to involve participants in a "truth or lie" game where they were given the opportunity to answer some questions on the topics addressed in the presentation on "flood preparedness – during the flooding". The goal was to assess participants' understanding of the topics presented, but also help participants feel more confident in their knowledge regarding flood preparedness, as well as provide them with an opportunity to interact and actively participate in the presentation.

SLIDE 40

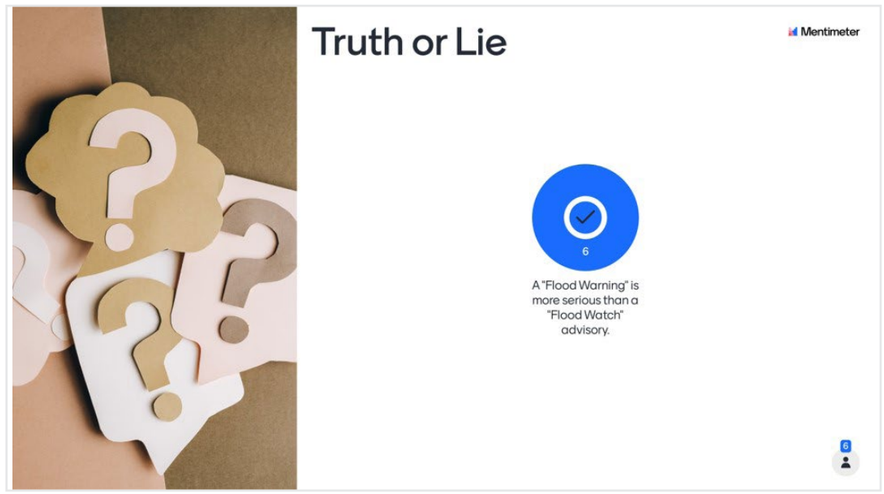


TRANSCRIPT

Evacuation Rescind means that the evacuation order is coming back into effect.

FALSE. Evacuation Rescind means the evacuation order is lifted and you may return home.

SLIDE 41

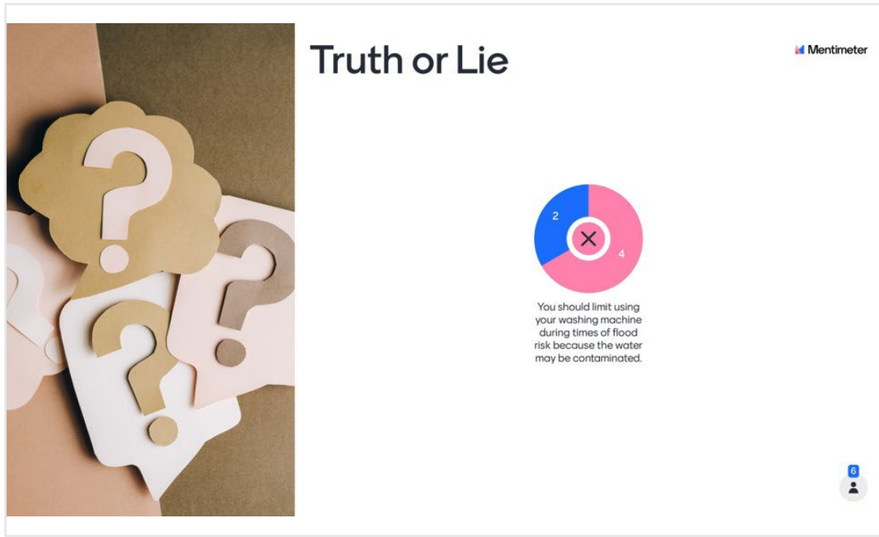


TRANSCRIPT

A "Flood Warning" is more serious than a "Flood Watch" advisory.

TRUE. The order of flood advisories from least to most serious is "High Streamflow Advisory" --> "Flood Watch" --> "Flood Warning"

SLIDE 42

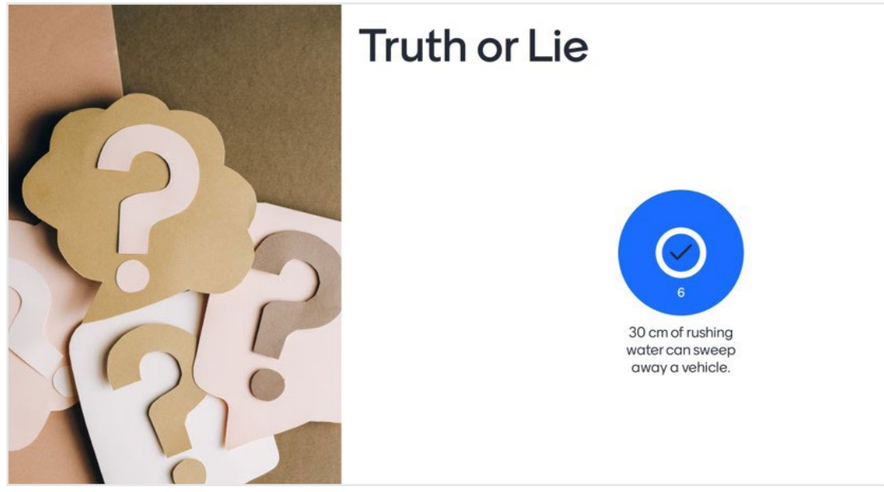


TRANSCRIPT

You should limit using your washing machine during times of flood risk because the water may be contaminated.

FALSE. You should limit using your washing machine because storm sewers may be at risk

SLIDE 43



TRANSCRIPT

30 cm of rushing water can sweep away a vehicle.

TRUE. Always avoid driving across flooded roads.

SLIDE 44

Personal Flood Preparedness

After the flood

TRANSCRIPT

We are now going to talk you through some steps involved when flooding comes to an end and it's time to you to start the recovery process and, in some cases, return home.

SLIDE 45

After the Flood

- Make an insurance claim
- Visit the City's website for Recovery information
- Psychological care
- Reach out to friends, loved ones and neighbours

Source: (BC Gov EBook Collection & Emergency Management BC., 2018)

TRANSCRIPT

A first step you can take after flooding is making an insurance claim. Call your insurance company and provide them with information including listing all damaged items.

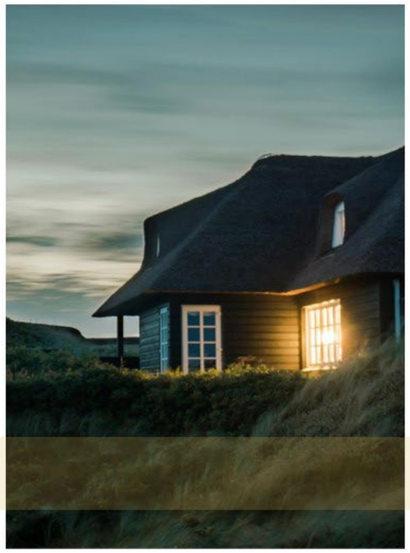
You'll also want to keep all receipts related to clean up and living expenses if you've been displaced, as these may be covered and, importantly, ensure that all claims are made before you start cleanup.

A next step you can take is visiting the city's website for recovery information.

Third, remember to take care of your mental health as we discussed earlier

Lastly, as mentioned, it's always recommended to reach out to friends, loved ones or neighbours.

SLIDE 46



Returning Home

- Take caution
- Clean your home
- Manage mould and other health risks

Source: (BC Gov EBook Collection & Emergency Management BC., 2018)

TRANSCRIPT

As mentioned, some floods lead to evacuation. If you are returning home after flooding, there are some important steps you should take.

The first is, take caution when returning. Don't return until authorities say it is safe and your home has been cleared of any hazards.

And also, don't turn your electricity back on until a professional gives you the okay.

The next step is cleaning your home. Before you begin cleaning up, be sure to open all your doors and windows and don't use fans if mould is present. Speaking of which, a huge aspect of cleaning up, is managing mould.

This is a big concern after flooding, as mold grows in damp conditions. However, it's less likely to grow if items are dry within 48 hours, so be sure to start drying things out immediately.

If mould does grow, it can be cleaned off of non-porous surfaces, such as counter tops. But all porous items, such as drywall and mattresses, cannot be cleaned of mould and should be disposed of.

A final note on mould is, if you rent your home, speak to your landlord about it as it may be their responsibility to address the issue.

SLIDE 47

Sharing Feedback

Scan the QR code to complete a short survey

[QR code was placed here]

TRANSCRIPT

Now that we are slowly nearing the end of the session, we would like to ask you to provide your feedback. If you scan this QR code, you will see a short evaluation survey for today's workshop. It should take about 3 minutes and is completely anonymous. In a bit, we will also have a short discussion where you will also have an opportunity to share your thoughts with ourselves and everyone else and to perhaps elaborate more on some things that you will answer in the survey.

I will return to this slide in a second, so you all have time to scan the QR code.

EXPLANATION

Approaching the end of the workshop, we provided participants with the opportunity to anonymously share their feedback on the personal flood preparedness session. The feedback collected was crucial for our evaluation of what went well and what can be improved, as well as ensure that participants understood information provided during the workshop.

SLIDE 48

TRANSCRIPT

When you are done filling in the survey, you can right away get started on the next activity. Those who joined in person today can grab a handout with the checklist of actions that can be done in preparation for floods and a highlighter or a pen. We are asking you to select 3 actions that you would commit to doing after today's workshop and highlight them. You can also add additional actions [if applicable: for example some of those that came up during brainstorming] if you would like. This handout is for you to take home.

For those of you joining online, please write down three actions from this checklist on a piece of paper. You can also add additional actions that are not listed here if you would like. And we will send you this handout by email so you will have access to all of these later on.

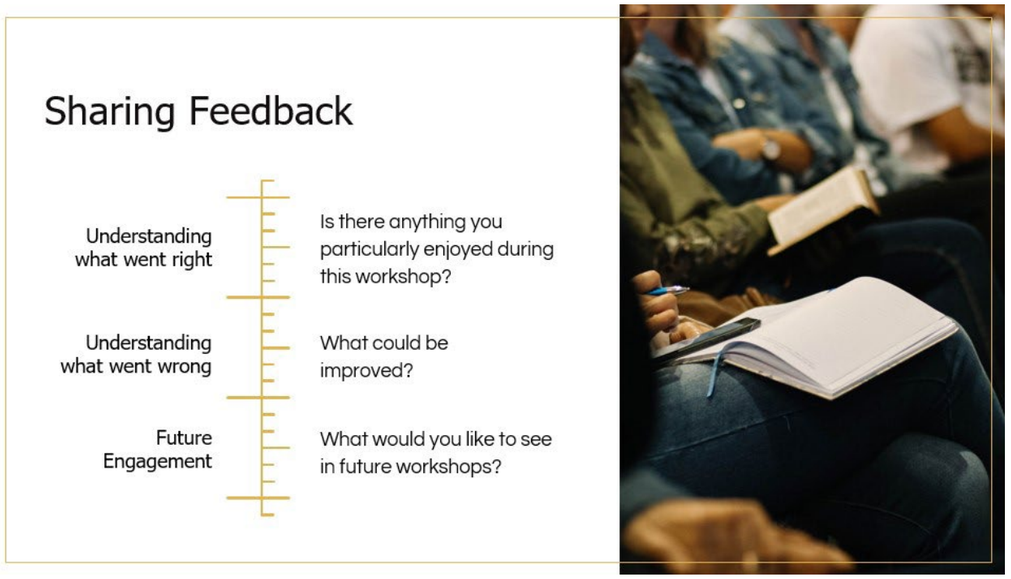
[come back to QR code – so now that we discussed this, you can scan the QR code and get started on the survey. After about 1 min, switch back to this slide]

I hope you all had a chance to choose the actions you would like to take. After you actually do these actions, I encourage you to revisit the checklist and see what else you could do.

EXPLANATION

According to existing literature, when individuals explicitly make commitments, they are more likely to honor them. For this reason, we asked participants to select three actions from the checklist and commit to them in the near future. Furthermore, this activity was meant to address single action bias. According to the existing literature, people are prone to take a single action to address a problem, even if this action is not the most effective (for more information, see p. X of this report). To counteract this phenomenon, we have provided participants with a checklist of action they can take to prepare for floods and asked them to commit to taking three of them.

SLIDE 49



TRANSCRIPT

Thank you for bearing with us until now. We are aware of the fact that you just filled out an evaluation survey to express your opinion on this workshop, but we would also like to hear from you how you found this presentation and the activities you completed.

EXPLANATION

The aim of this session was for participants to openly share qualitative feedback on the workshop, hence providing us with greater details for pilot project evaluation. We wanted them to focus on what they enjoyed the most, what could be improved in the future, but also on main takeaways and lessons learned in the workshop. This activity was intended for participants to feel free to exchange opinions and discuss the outcomes of the workshop together.

NOTE

As mentioned in the report, this activity was eventually not carried out as intended. Due to a misunderstanding, participants did not share their feedback on the workshop, but rather discussed the action items they selected from the checklist we provided.

SLIDE 50

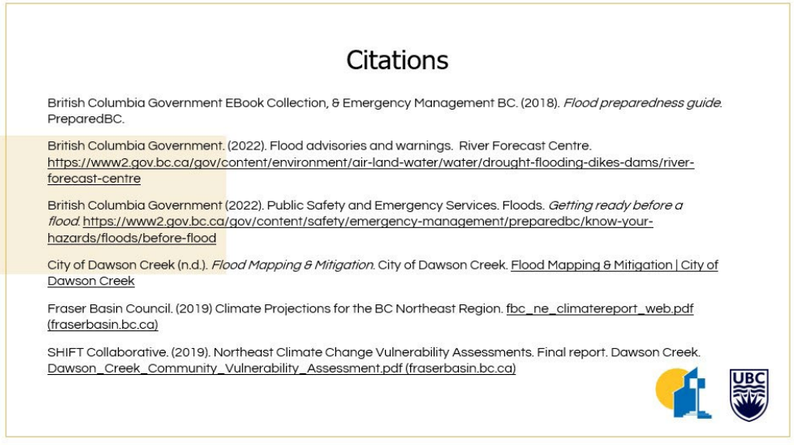
TRANSCRIPT

Thank you all for participating tonight and for giving your precious contribution. This workshop wouldn't have been possible without all of you. If you have any further questions or you would like more clarifications on the topic addressed, please do not hesitate to contact the City of Dawson Creek or us scholars.

EXPLANATION

We hoped for this workshop to be just the beginning of the conversation on flood preparedness and climate adaptation. Hence, we provided participants with the opportunity to reach out for more information and clarifications.

SLIDE 51



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