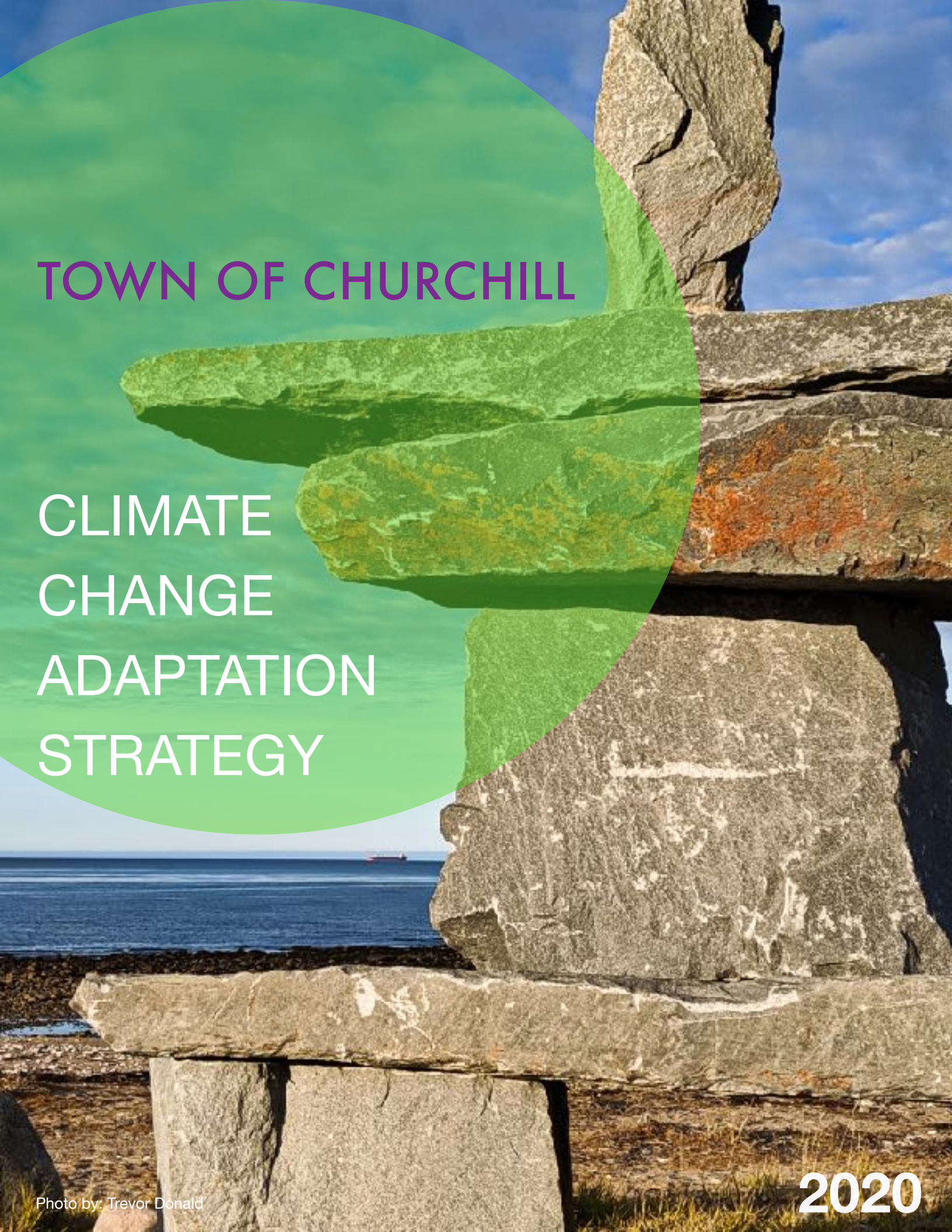
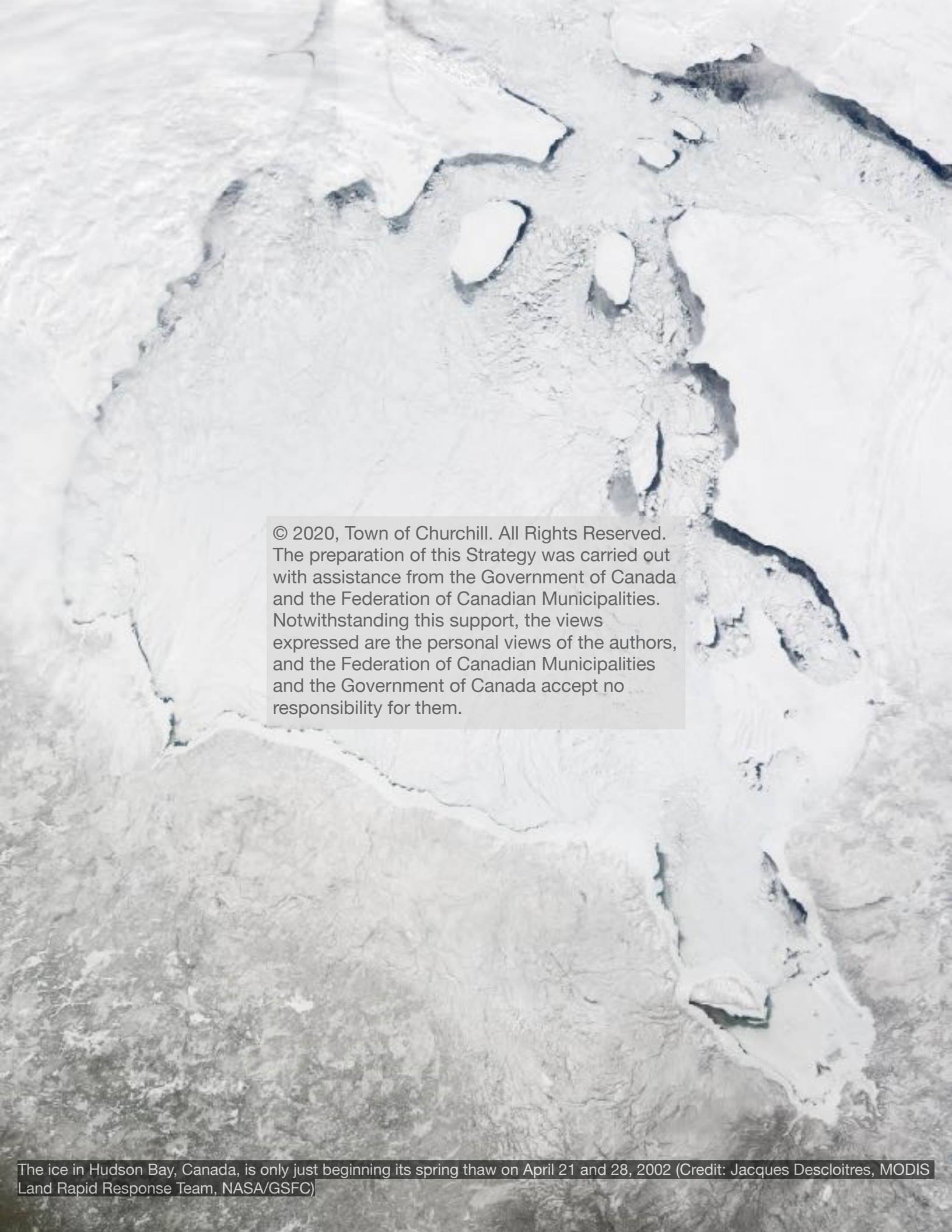


TOWN OF CHURCHILL

CLIMATE CHANGE ADAPTATION STRATEGY

Photo by: Trevor Donald

2020



The preparation of this Strategy was carried out with assistance from the Government of Canada and the Federation of Canadian Municipalities. Notwithstanding this support, the views expressed are the personal views of the authors, and the Federation of Canadian Municipalities and the Government of Canada accept no responsibility for them.

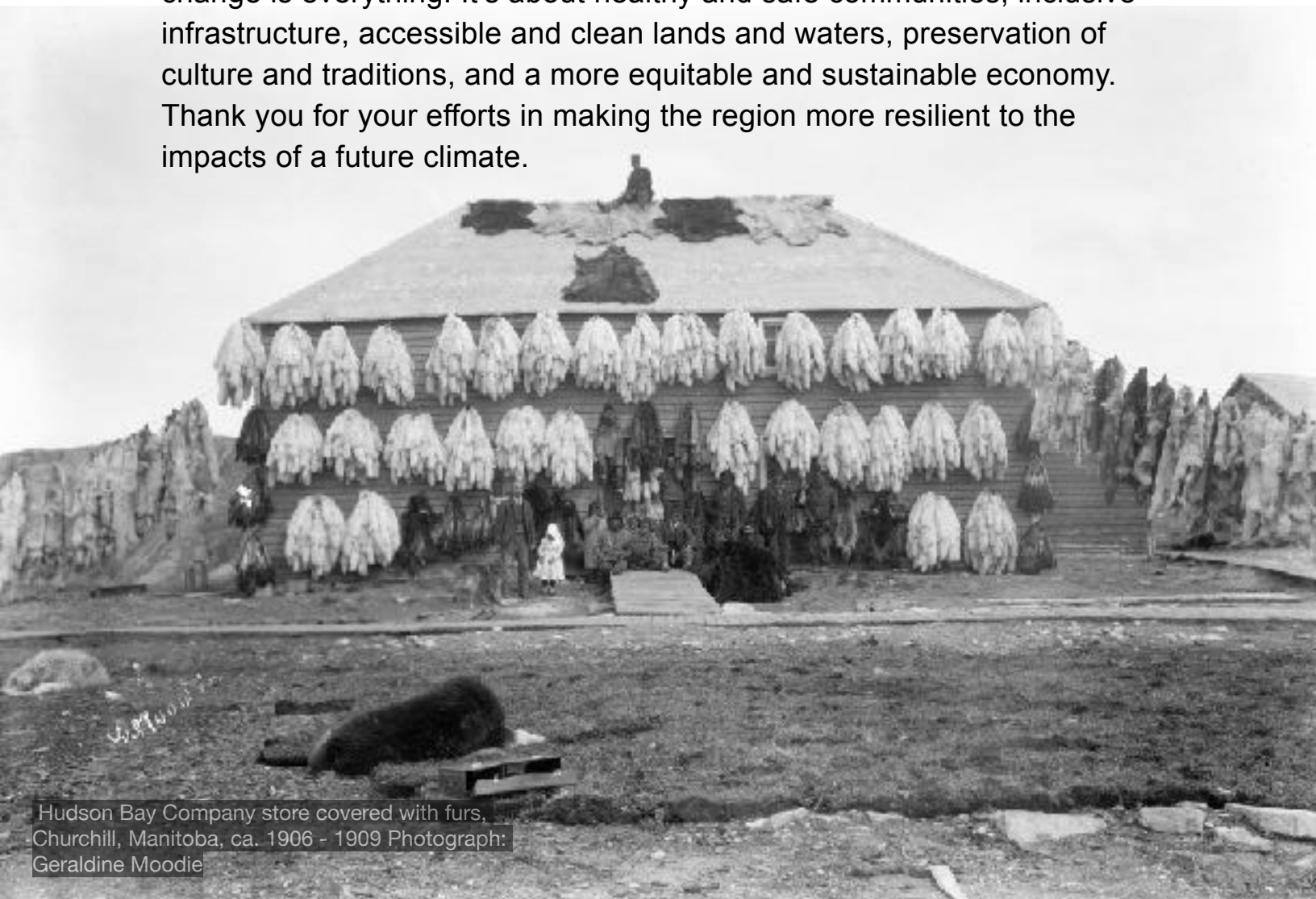
The ice in Hudson Bay, Canada, is only just beginning its spring thaw on April 21 and 28, 2002 (Credit: Jacques Descloitres, MODIS Land Rapid Response Team, NASA/GSFC)

ACKNOWLEDGEMENTS

We acknowledge that this strategy was developed on the territory of many nations including the Dene and the Cree and is home to many diverse First Nations, Inuit and Metis. We also acknowledge Churchill is covered by Treaty 5 (1875).

The Town of Churchill Climate Change Adaptation Plan is a culmination of efforts from the Mayor and Town Council, the stakeholder steering committee, municipal staff, and other local actors and key stakeholders in the community. The insights provided by these groups and individuals helped to develop goals and actions that were inclusive, comprehensive, and representative of the community of Churchill.

The Town would like to take this opportunity to thank everyone who contributed to the development of the Adaptation Strategy. Climate change is everything. It's about healthy and safe communities, inclusive infrastructure, accessible and clean lands and waters, preservation of culture and traditions, and a more equitable and sustainable economy. Thank you for your efforts in making the region more resilient to the impacts of a future climate.



Hudson Bay Company store covered with furs, Churchill, Manitoba, ca. 1906 - 1909 Photograph: Geraldine Moodie

Many of the images in this document are from SeaWalls CHURCHILL. In 2017, sixteen world-class artists from around the world put their mark on Churchill.

Arlin Graff (Brazil), Askew One (New Zealand), Case Maclaim (Germany), Charles Johnston (Canada), Cracked Ink (United Kingdom), Dulk (Antonio Segura Donat) (Spain), Fred Thomas (Canada), Georgia Hill (Australia), Jason Botkin (Canada), Kai Kaulukukui (USA), Kal Barteski (Canada), Kelsey Eliasson (Canada), Li Hill (Canada), Mandy VanLeeuwen (Canada), Pat Lazo (Canada), Pat Perry (USA), Storm Angeconeb (Canada) and Takashi Iwasaki (Japan).

10. “KNOW I’M HERE” ARTIST: GEORGIA HILL / AUSTRALIA

MESSAGE FROM THE MAYOR

“The COVID-19 pandemic and resulting economic impact will put additional stresses on communities in Canada’s north that are already seeing the impacts of climate change. Churchill, just recovering from the 2017 rail outage that saw the town cut off from the South by land for 18 months is now seeing a possible 95% reduction in local tourism, a sector that is a significant source of jobs, incomes for businesses and tax revenue for all 3-levels of government.

This climate change strategy came about from support from FCM and the federal government following a $117 million dollar strategic investment to facilitate the transfer of ownership of the port and rail line. Indigenous governments and municipalities along the railway, including Churchill, partnered with the private sector to take over ownership. Churchill saw the benefit of building back better after the rail outage by examining the challenges and opportunities of adapting to a changing climate and it sees the opportunity now to grow back better after the global pandemic to become a resilient, safe and thriving community.”

- Mayor Mike Spence

Photo by: Trevor Donald

EXECUTIVE SUMMARY

COVID-19 is rewriting the book on just about everything from public health policy to emergency management. While climate change has been the defining crisis of our lifetimes, the COVID-19 pandemic has taken precedent. Some might argue that we committed too much to fighting climate change and not enough to preparation for grey and black swan events like the pandemic. The truth is, climate change adaptation plans like this one actually consider many of the underliers that are fuelling the pandemic to be vulnerabilities for communities dealing with climate change impacts.

While pandemics and climate change impacts have similarities they are not the same. Climate change does not have a quick and immediate onset and effects are often not seen until later and individual actions are not clearly linked to immediate outcomes. Meanwhile the Coronavirus pandemic has required an immediate response and drastic changes to behaviour.

As the virus spread, it exposed how interconnected we are due to international travel and trade, overseas manufacturing, sales and supply chains and complex financial markets. Climate change in the same way is going to drastically impact countries around the world and put stress on these same systems we rely on.

The communities most vulnerable to the climate crisis are many of the communities most vulnerable to the coronavirus. Infrastructure in the North for example is lacking to handle a large crisis or emergency. The impact to the economy will be far more severe in the North as investment cannot be guaranteed due to the current economy.

EXECUTIVE SUMMARY (contd.)

Simply put, climate change is a “threat multiplier” that makes many of our problems worse and impacts the health and safety of our communities. We need to resist the urge to press ‘pause’ on climate action, because climate change isn’t stopping for anyone or anything.

Those who place climate and sustainability at the heart of the economic recovery will find themselves in a more favourable position in the long run. Shutting down the local economy resulting in the laying off of people is the very opposite of climate action.

Churchill has identified several common goals that emerged throughout the planning process. Actions to address each of these goals are designed to be cross-cutting and help to achieve each of the other goals as well as the overall mission of the plan. These goals represent early action on a longer-term agenda in areas where the municipality has the authority and ability to enact change to minimize climate change risks and build resilience.

✅**Align and integrate within the strategic plan**

✅**Maintain public health and safety**

✅**Strengthen buildings and key infrastructure**

✅**Minimize disruptions to service delivery**

✅**Protect biodiversity and natural assets**

✅**Build resilience and capacity within the region**

✅**Demonstrate reconciliation on the ground**

A SHARED, COMMUNITY VISION FOR A MORE RESILIENT CHURCHILL

A RESILIENT CHURCHILL IS...

Integrated with long-term climate and sustainability practices that are embedded in how we do things, and allow us to adapt to an uncertain and changing climate.

A place that follows the best practices to adapt proactively, focusing on municipal infrastructure, assets, operations and service levels to minimize risk for residents, businesses, community organizations and municipal staff.

A community that promotes sciences and uses the best high-quality climate data available to make informed decisions.

Connected to life on the land and promotes and incorporates northern values and traditional knowledge.

A place where the community can FEEL SAFE AND THRIVE.

INTRODUCTION

"As the ice melts, so too does the remarkable wisdom encoded in the Arctic peoples who depend on the predictability of the cold. But the Arctic is also a cooling mechanism for the planet and what happens there affects everyone"
- Siila Watt-Cloutier

Some parts of the North are now warming as much as three times faster than the rest of the world, affecting animal migration, infrastructure, and shipping. Seasons are getting longer and shorter in unpredictable ways. It is really scary for a community to think about permafrost disappearing, and how that's going to affect the land, buildings, and people's homes. We have no idea what the future will look like for the 15-year olds and 25-years olds that live in Churchill now in the next 30 years.

Northern communities face many unique challenges that are not usually considered by Canadians living in the South. Fluctuating costs of energy, remoteness, periods of inaccessibility, a cold harsh climate and ageing and inefficient infrastructure. One of the goals of the plan is to increase the resilience of Churchill as a northern community and its capacity to adapt to a changing climate.

The findings of the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) indisputably confirm that climate change is occurring and that human-produced greenhouse gas emissions are a primary cause. The subtext of the IPCC report appears to be this: Climate change is happening and will continue to happen for the foreseeable future.

INTRODUCTION (contd.)

As a result, we need to adapt to a warming planet to minimize the risks and maximize the benefits associated with increasing temperatures rather than focusing solely on curbing emissions.

With clear knowledge of long-term risks communities like Churchill can plan infrastructure and services adequately and even anticipate opportunities of climate change. The traffic in Hudson Bay has tripled since 1990 and sea ice in northern Canadian waters has been declining seven per cent a year according to Environment and Climate Change Canada. This presents new opportunities for even more shipping vessels to use the nation's largest inland sea and call Churchill their port of call. While an economic opportunity of climate change is presented with this increasing activity, there comes a greater risk of accidental spills of fuel and other transportation-related contaminants.

This climate change adaptation plan is just the first step to Churchill understanding its risks, vulnerabilities and opportunities. With the chronic and acute physical risks of climate change looming, policy based solutions alone will not be enough to tackle the impending climate crisis. This plan simply allows for guidances so that the town can make the right actions and implement a mix of policy and planning projects with infrastructure based projects to build resilience. In some cases, adaptation actions or a series of actions can reduce the damage or costs associated with climate change and take advantage of windows of opportunities. However, no risk can be completely eliminated through adaptation alone. Decision-makers need to anticipate and plan for consequences that are unavoidable in the short and medium term, while working to reduce future greenhouse gas emissions in the long-term.

Climate Action Plan

Vision: Churchill is a safe, healthy and prosperous community where its people feel a sense of belonging and connection in the face of a changing climate.

Mission: Our Mission is to have a northern approach to climate change adaptation planning that is specific to the location and is culturally relevant.

Port of Churchill

1930 View of Churchill Manitoba Andrew Taylor Fonds Collection

COMMUNITY PROFILE

Churchill, Manitoba is located within Treaty 5, also known as the Winnipeg Treaty. The lands are home to the Caribou Inuit, the Sayisi-Dene and the Maskêkô-winniwak or Swampy Cree peoples and, following the establishment of a Hudson Bay trading post, become home to a significant Métis population.

Geographically Churchill sits at 58° north at the mouth of the Churchill River estuary where it meets the Hudson Bay. It is on an ecotone between three regions: the boreal forest, the Arctic Tundra and the Hudson Bay Lowlands. No roads lead to Churchill, by train you would travel 1,710 km from start to finish.

Churchill has an ageing population and has shrunk steadily over the last 30 years. Attracting more full-time residents to Churchill is vital for the town's growth. The substantial rise in the cost of living during the 2017 rail outage encouraged out-migration to larger urban centres. Churchill also like most remote northern communities has regular commercial flights/charters coming in for supplies/workers who are on rotations and don't live in community. Because of this the community only gets some services for a few odd days a month.

The 4 pillars of Churchill economy are trade and transportation, health care, tourism and scientific research. The port used to be responsible for 30 per cent of the town's economy, but now, the tourism sector accounts for at least twice that. Tourism related to Churchill generates revenue for businesses in and out of Churchill and for all 3 levels of government. Approximately 12,000 tourists visit Churchill every year for recreation, wildlife viewing and scientific and research tourism.


260 kms to
Arviat,
Nunavut
271 kms to
Gillam,
Manitoba
1004 kms to
Winnipeg,
Manitoba
Arviat
Churchill
Gillam
WINNIPEG
MANITOBA
WAPUSK
RIDING MOUNTAIN
Lake Winnipeg

ADAPTATION 101

ad· ap· ta· tion (noun)
1. the process of changing to suit different conditions
2. the process in which a living thing changes slightly over time to be able to continue to exist in a particular environment

What is adaptation?
Climate change adaptation is adapting our lives to build the resilience we'll need for the climate of the future. Adaptation allows us to become more flexible and agile when faced with an uncertain future. Adaptation is a continuous process that takes into account fundamental behavioural changes.

Why do we adapt?
By adapting we are doing what we need to do to keep our current quality of life so that we can cope and thrive in a changing climate. We adapt to climate change for different reasons based on what is important to us. It could be preserving culture, reducing our footprint on the planet or to ensure municipal service delivery.

Who plans for adaptation?
People are drawn to adaptation because it is people-oriented. You have to have humility, a sense of vulnerability, a sense of sharing, concern and engagement with others and be committed to action on climate change.

The 2 Types of Adaptation
Proactive adaptation is the steps we take beforehand and reactive adaptation is acknowledging something isn't working and taking steps to fix it. Being proactive is the desirable approach to adaptation.

ADAPTATION = managing the unavoidable

MITIGATION = avoiding the unmanageable

RESILIENCE = confronting the unprecedented together

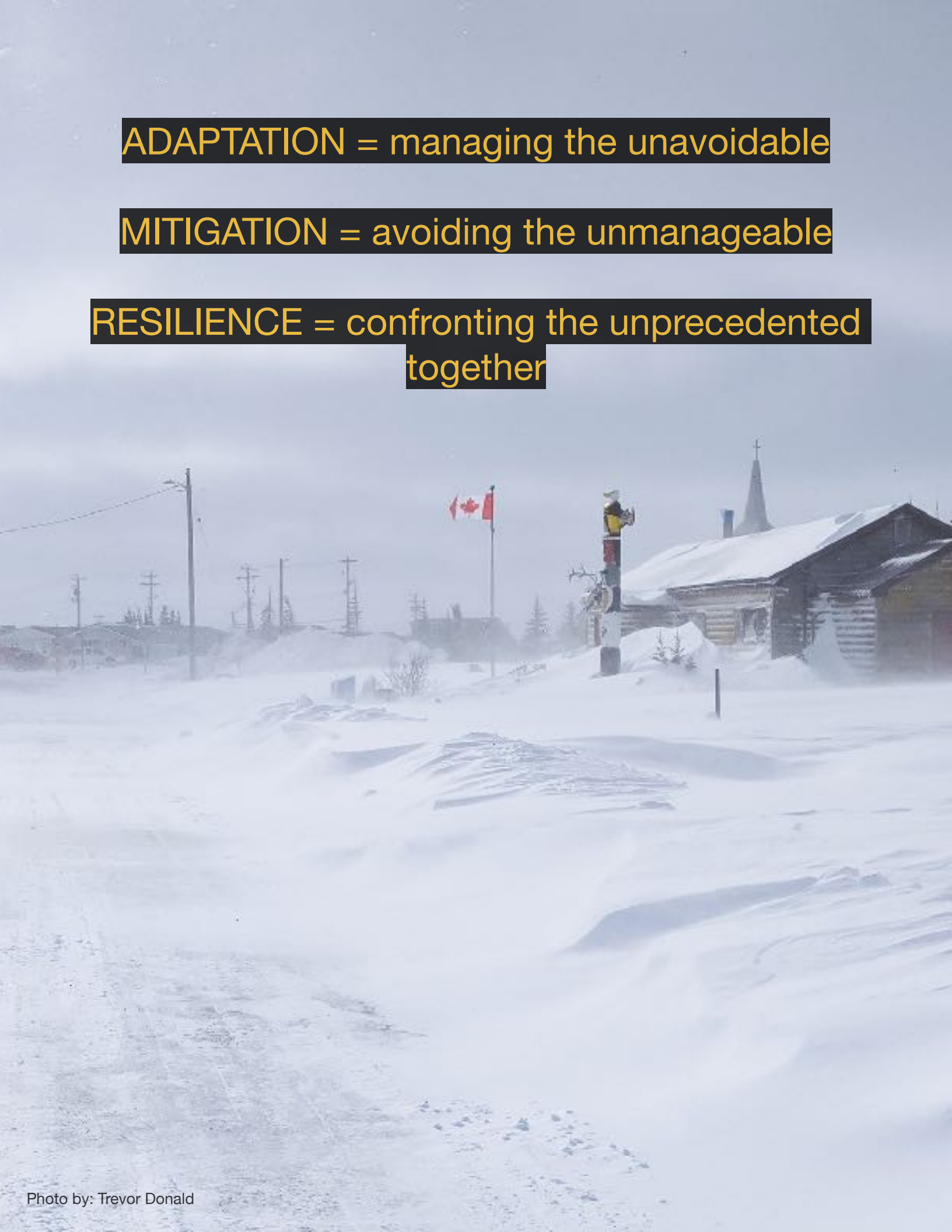


Photo by: Trevor Donald

ADAPTATION 101

Who benefits from adaptation?

There's the question of who benefits the most from adaptation. Will large urban centres in the South be able to fortify all their infrastructure while communities in the North suffer? Will it be largely educated and high-earning people that can spend money to protect their homes and fly south and live in a hotel during a natural disaster. Community outreach is necessary to address the differential needs of people in the community. For example it may be possible for a household to buy an electric car and charger but maybe a single parent with 3 kids cannot. We need to determine what are the whole needs of the community while being open and honest.

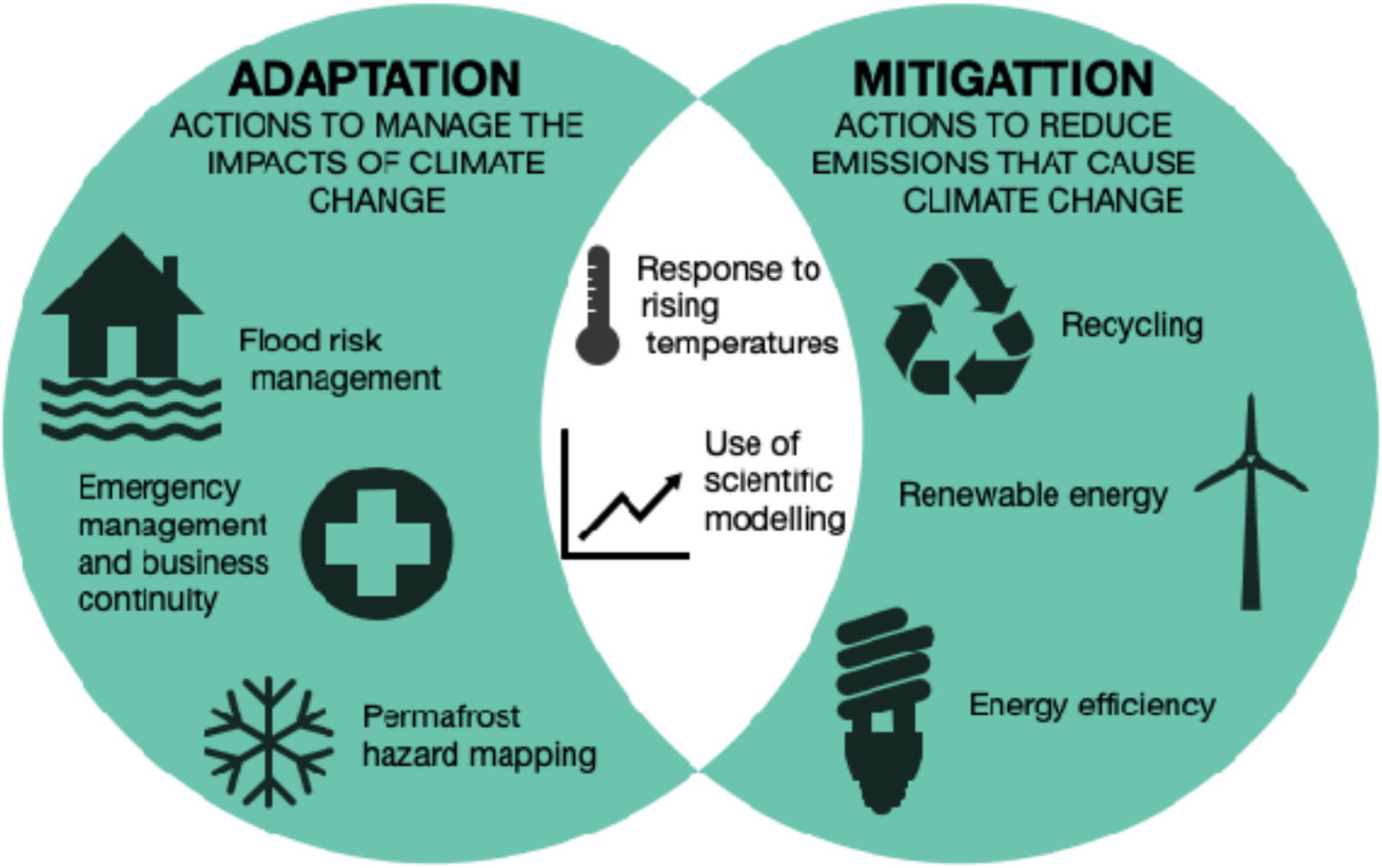
How do we adapt?

Adaptation solutions vary from place to place, are difficult to predict, and involve many trade-offs. The first step to adapting to climate change is understanding local risks and developing plans to manage them. The next step is taking action, putting systems in place to respond to impacts we are experiencing today as we prepare for an uncertain tomorrow. These actions can include ensuring infrastructure can withstand more extreme weather.

Adaptation Versus Mitigation

The lockdown due to the global pandemic only managed to cut worldwide carbon emissions by digits in the teens. While mitigation deals with the institutional root cause of the problem, adaptation is the other side of the coin — dealing with the damage already done and will continue to happen. While the mitigation side is quantifying greenhouse gas and trying to reduce our emissions; adaptation is done in stride recognizing that the climate and environment have changed.

Adaptation Versus Mitigation



ADAPTATION 101

Why we need to still do both?
Climate change is like a supertanker, even if you cut the engines, it would still take 15 kms to come to a full stop. Even if we were to stop producing greenhouse emissions today, we are still going to need to adapt. Even now, the climate change impacts we are seeing today may have started 5-10 years ago.

Why aren't we doing both?
Although northern communities like Churchill are the first ones to feel the severe effects of global warming, there is very little they can actually do to slow it down. We can do everything in our power to protect the town but there is one thing we can't prevent: the permafrost thaw. All we can do is to educate the public down south to care for the environment.

Adaptation Versus Resilience
Adaptation and resilience are seen as synonymous. What sets them apart though is resilience focuses on inequities and transforming the way we do things. While adaptation is bouncing back, resilience is bouncing forward. You cannot have adaptation without a sense of resilience. An example of this would be adapting your infrastructure when your community does not have adequate housing.

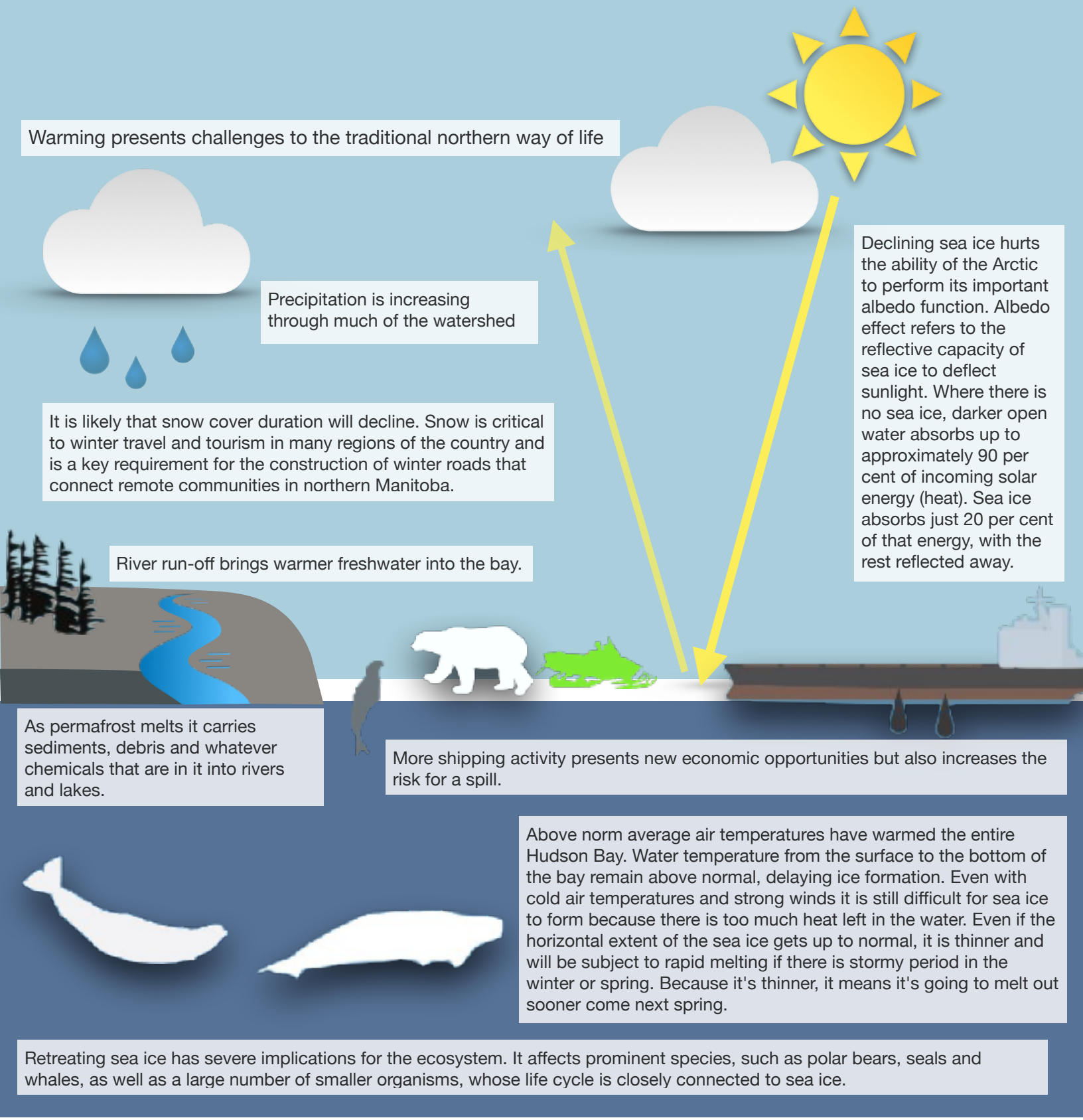
Opportunities
There are opportunities to climate change rather than seeing it as a complete train wreck. Adaptation is an opportunity to start changing paradigms, embracing innovation, breaking down silos, communicating with people we don't normally communicate with, listening to new ideas and utilizing historical and traditional knowledge.

ADAPTATION 101

How do we move forward?
By not compartmentalizing issues and hosting a broader conversation we can cultivate a more collaborative and positive attitude going forward. We don't need to be overly technical, but make complicated things simple so we can build up our community, acknowledge each other and leverage resources to peoples who's voices are not often heard.

We don't have to reinvent the wheel
By enhancing capacity that is present already and developing relationships with long-term stakeholders we can have the capacity required for people to respond to change. To get to net-zero or carbon neutral as a society by 2050, change will have to be transformational and this can be exciting yet daunting and scary. We need to move beyond the question of is this really happening and decide what we are going to do about it with a sense of urgency.

The case for Churchill to adapt
Much of the discussion surrounding climate change centres on mitigation, or curbing greenhouse gas emissions, rather than adaptation. Although this approach is easier to quantify and avoids encouraging a false sense of complacency regarding the urgency of cutting emissions, the world is no longer at a point where we can simply choose between mitigation and adaptation. Also, adaptation measures are less politicized than mitigation measures. People may not agree on the science of climate change, but uncertainty about the future is no excuse for failing to prepare for the worst. We have to get away from a culture that fears failure trying to be perfect all the time to one that isn't afraid to try a new way of doing things, otherwise we will be paralyzed.



The cryosphere (ice, snow, permafrost and glaciers) are melting. The loss of sea ice in the Arctic has been one of the most visible signs of climate change on the planet over the past four decades. According to the Intergovernmental Panel on Climate Change, the ice has been retreating by around 12% per decade between 1979 and 2018.

Atlantification of the Arctic Ocean means that due to warming there is more similarities to the Atlantic and Pacific oceans with more algae blooms and bigger waves.

Arctic amplification refers to the increase of temperatures in the Arctic to be two to three times as much as the global average due to feedbacks.

OUR CHANGING CLIMATE

"If you don't like the weather in Churchill, just wait a few minutes."

Weather refers to atmospheric conditions that occur locally over short periods of time, from minutes to hours or days. Familiar examples include rain, snow, clouds, winds, floods or thunderstorms.

Climate, on the other hand, refers to the long-term regional or even global average of temperature, humidity and rainfall patterns over seasons, years or decades.

Global warming is the long-term heating of Earth's climate system observed since the pre-industrial period (between 1850 and 1900) due to human activities, primarily fossil fuel burning, which increases heat-trapping greenhouse gas levels in Earth's atmosphere. The term is frequently used interchangeably with the term climate change

Climate change is a long-term change in the average weather patterns that have come to define Earth's local, regional and global climates. These human and naturally induced changes have a broad range of observed effects.

Warming is already happening, since records became available in 1948, temperatures in Canada have increased by 1.7 degrees and annual average temperature over northern Canada increased by 2.3 C since 1948 according to Canada's Changing Climate Report. Warming in the North is nearly 3 times the global average and shows that warming is not uniform across the globe due to arctic amplification.

OUR CHANGING CLIMATE

Greenhouse gases (GHG)

The reason we can live on this planet is because GHG keep it warmer than an atmosphere without them would provide. However, if the amount of the most effective heat-trapping GHG is increased too much, we will simply overheat, in an out-of-control manner. In 2019, GHG ratios reached new highs with carbon dioxide (CO2) at 409 parts per million (ppm). GHG concentrations will see a drop of between 4% and 7% by the end of 2020 based on 2019 levels due to COVID-19.

Warming and emissions

Just like your car doesn't reach top speed the instant you step on the gas, Earth's temperature doesn't react instantly to each year's new record-high carbon dioxide levels. Thanks to the high heat capacity of water and the huge volume of the global oceans, Earth's surface temperature resists rapid changes. Some of the excess heat that greenhouse gases force the Earth's surface to absorb in any given year is hidden for a time by the ocean. This delayed reaction means rising greenhouse gas levels don't immediately have their full impact on surface temperature.

Curbing our emissions

The Intergovernmental Panel on Climate Change (IPCC) report from 2013 shows the projected outcome depending on our actions.
If emissions were to peak now (2010-2020) and start to decline, with humans actually removing carbon from the air by 2070, the atmosphere dips back down below 400ppm somewhere between 2100 and 2200.
Canada is currently on pace to miss its emissions reduction target for 2030 outlined in its Paris Agreement commitments and the Pan-Canadian Framework for Clean Growth and Climate Change.

OUR CHANGING CLIMATE

Emissions Scenarios

A set of scenarios referred to as Representative Concentration Pathways (RCPs) are in common use to study future climate change. RCPs are designed to provide plausible future scenarios of human emissions patterns. These include consideration of future greenhouse gas emissions, deforestation, population growth and many other factors such as cloud density and sea ice extent.

Based on best practices in the global science community, the Government of Canada usually presents 3 RCPs:

***RCP8.5, a.k.a "business as usual"*:** high global emission scenario. This scenario indicates global average warming levels of 3.2 to 5.4°C by 2090.

***RCP4.5*:** medium global emission scenario, includes measures to limit (mitigate) climate change. This scenario indicates global average warming levels of 1.7 to 3.2°C by 2090.

***RCP2.6*:** low emission global scenario, requires strong mitigation actions. This scenario indicates global average warming levels of 0.9 to 2.3°C by 2090.

Churchill is using RCP8.5 until 2050, emission projections are robust up to about 2050 or 2060, based on available model results, it's only in the latter part of the century that emission projections start to strongly diverge, depending on scenario and model assumptions. The reality is we can't predict the exact amount of greenhouse gases future human activity will produce and if policies will be effective in curbing greenhouse gas emissions. For example, the impact of Covid slowdown on CO2 in the atmosphere was not even a blip.

CHURCHILL'S CLIMATE PROJECTIONS

Hotter Temperatures 🌡️

Wetter Weather 🌧️

More frost free days 🌱

More Lighting ⛈️

Higher winds 💨

-6.1ºC annual average temperature to -3.8ºC by 2050 (2ºC) According to climatedata.ca under a high emissions scenario.

51-30 ºC days now to 25.7 days by 2050 (25.2 day decease) According to the climateatlas.ca in a high carbon scenario.

463 mm annual precipitation to increase 10% by 2050 according to climatedata.ca under a high emissions scenario.

222.6 wet days to 230.7 by 2050 (an increase of 8 days) according to the climateatlas.ca in a high carbon scenario.

Increase from 96 frost-free days to 113.5 frost-free days or an increase of 17.5 days in a high carbon scenario.

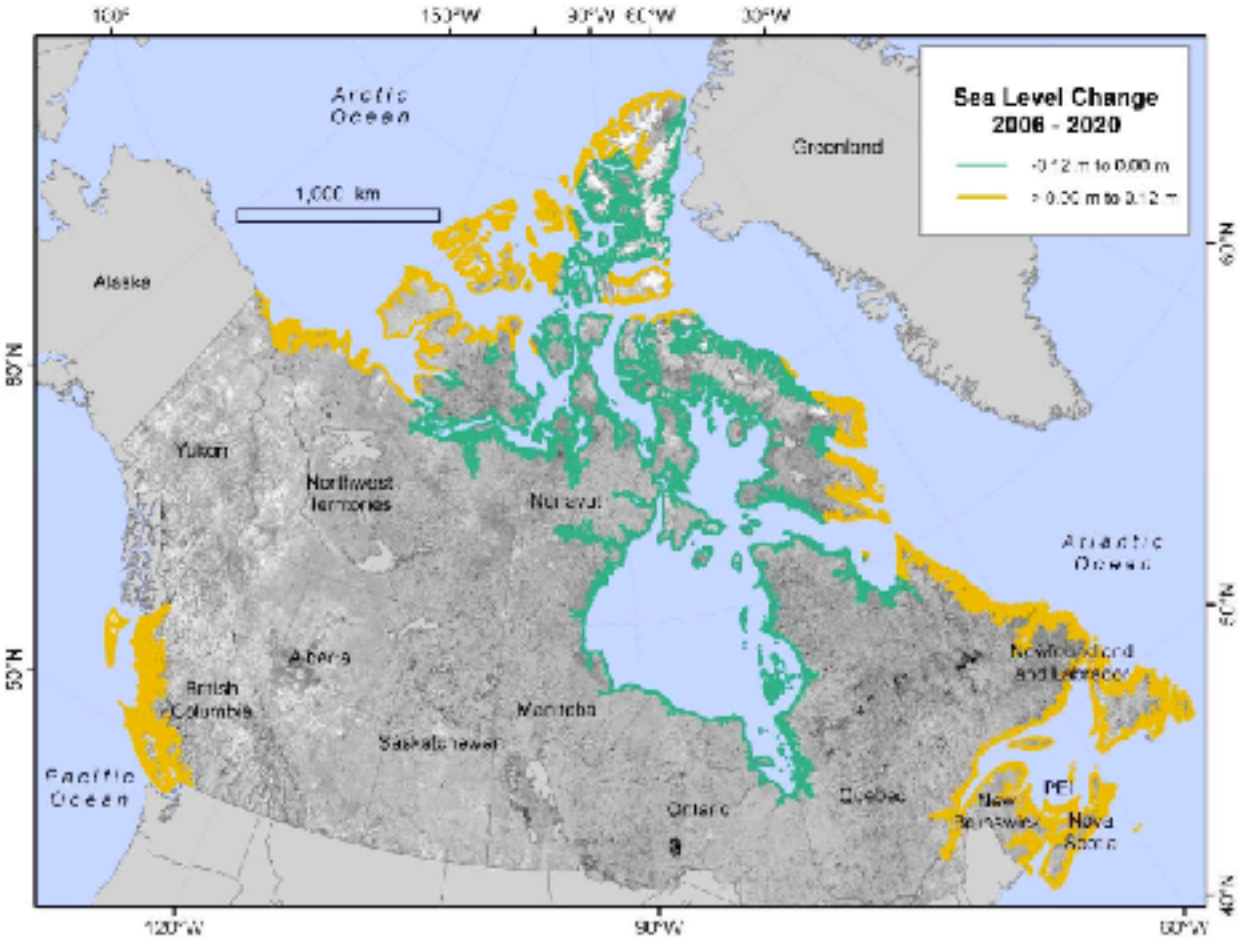
The average wind speed of 21.2 km/h is increasing over time, winds are highest in September, October. Days exceeding 30 and 50 km/h winds are also increasing.

While lightning in the North as a whole isn't unusual the frequency has definitely increased. As the North warms it is allowing for lightning-capable clouds to form.

CHURCHILL'S CHANGING COASTLINE

Sea-level rise is not uniform 🌊

Churchill is rising; parts of Hudson Bay's coastline has been rebounding up to 15 millimetres each year. As a consequence of this, sea-level in Churchill has fallen at a rate of about one metre a century. The negative allowance Churchill is projected to see is caused by the land uplift due to Glacial Isostatic Adjustment. Due to this vertical uplift sea-level has been falling in Churchill at a rate of 9.3 mm per year according to Canada's Changing Climate Report. For the period 1995-2050 and for Representative Concentration Pathway RCP8.5, the allowances are, -0.31 m for Churchill.



Coastal sensitivity to climate change using CanCoast data, Natural Resources Canada, 2019

THE CHANGING CRYOSPHERE

Later freeze up and earlier break up of sea ice

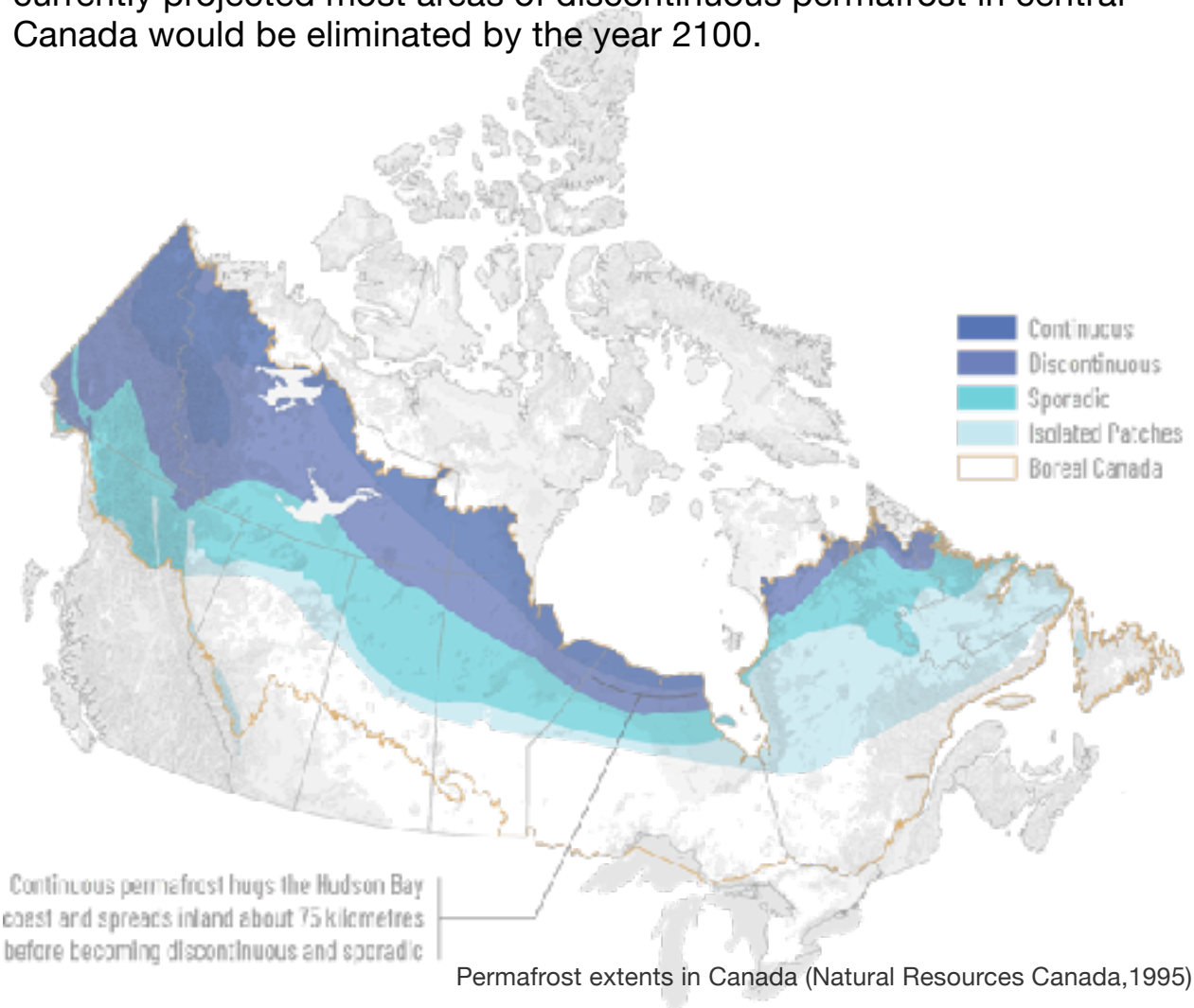
The sea ice is freezing two weeks late, and breaking up two weeks earlier translating into an extra month of open water.

Portion of the year with snow cover is decreasing

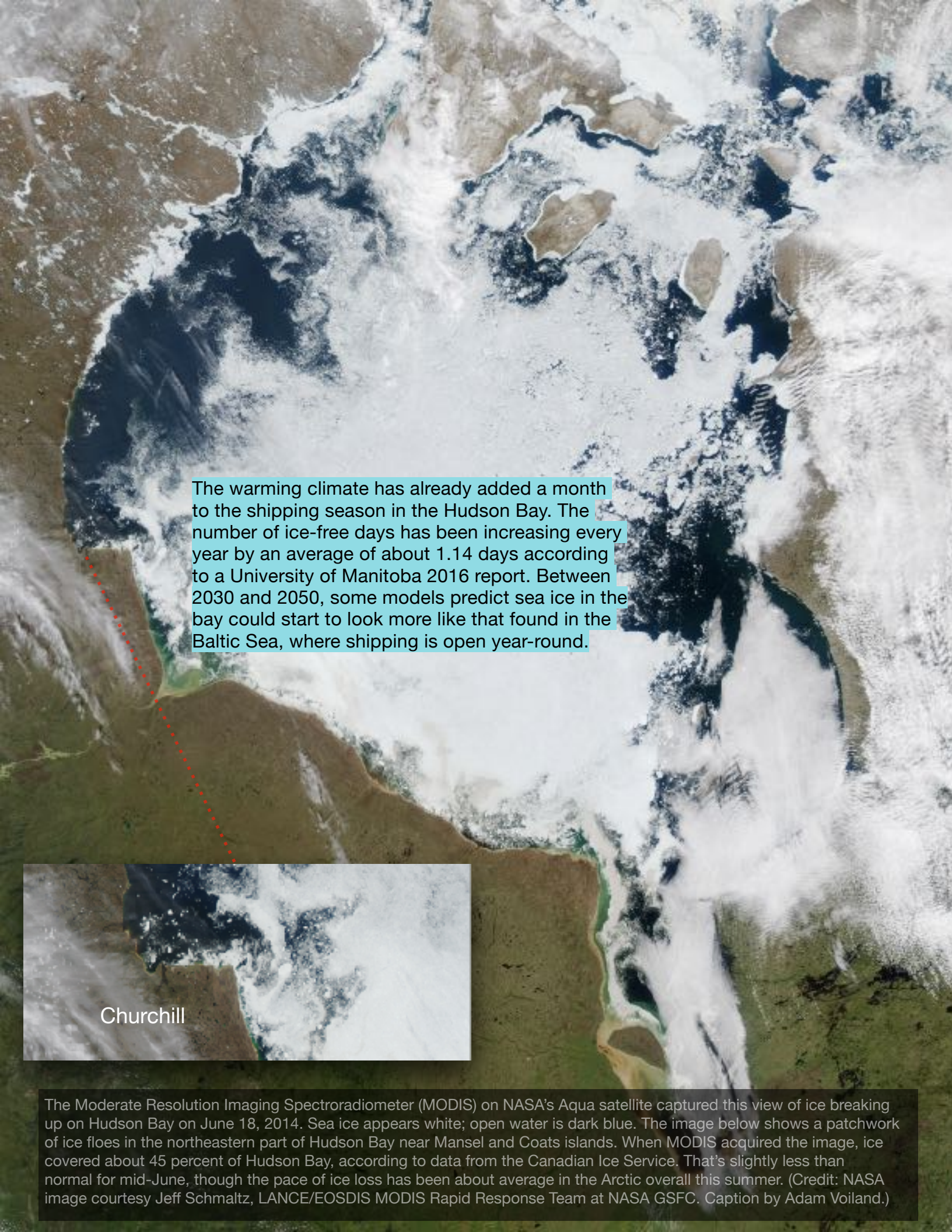
Snow cover in Canada has decreased between 5% and 10% per decade since 1981 due to later snow onset and earlier spring melt.

Irreversible permafrost loss

The entire region has continuous permafrost (ground that is frozen for 2 or more years). Active layer depths are typically less than 1 m. It is currently projected most areas of discontinuous permafrost in central Canada would be eliminated by the year 2100.



Permafrost extents in Canada (Natural Resources Canada,1995)



The warming climate has already added a month to the shipping season in the Hudson Bay. The number of ice-free days has been increasing every year by an average of about 1.14 days according to a University of Manitoba 2016 report. Between 2030 and 2050, some models predict sea ice in the bay could start to look more like that found in the Baltic Sea, where shipping is open year-round.

The Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Aqua satellite captured this view of ice breaking up on Hudson Bay on June 18, 2014. Sea ice appears white; open water is dark blue. The image below shows a patchwork of ice floes in the northeastern part of Hudson Bay near Mansel and Coats islands. When MODIS acquired the image, ice covered about 45 percent of Hudson Bay, according to data from the Canadian Ice Service. That's slightly less than normal for mid-June, though the pace of ice loss has been about average in the Arctic overall this summer. (Credit: NASA image courtesy Jeff Schmaltz, LANCE/EOSDIS MODIS Rapid Response Team at NASA GSFC. Caption by Adam Voiland.)

TIMELINE OF CLIMATE EVENTS

2014

Transport Canada data shows the derailment rate in 2014 on the Hudson Bay Railway was three times higher than it had been a decade earlier. Figures from the Transportation Safety Board of Canada show there have been 63 accidents on the Hudson Bay rail line between 2003 and 2012. All but 10 were derailments. In June, 13 grain cars from a 50-car load derailed on the Hudson Bay Railway line, about 32 kilometres south of Churchill "severe permafrost issues and its effect on railway surface conditions" was cited as the cause.

March, 2017

In March, 2017 The Town of Churchill declared a local state of emergency Friday night when an "unprecedented" storm lasted three days, bringing 60-80 centimetres of snow and winds gusting between 100 and 120 kilometres per hour. Snow drifts as high as 25 feet in some places made roads impassable. Businesses and essential services were shut down.

May, 2017

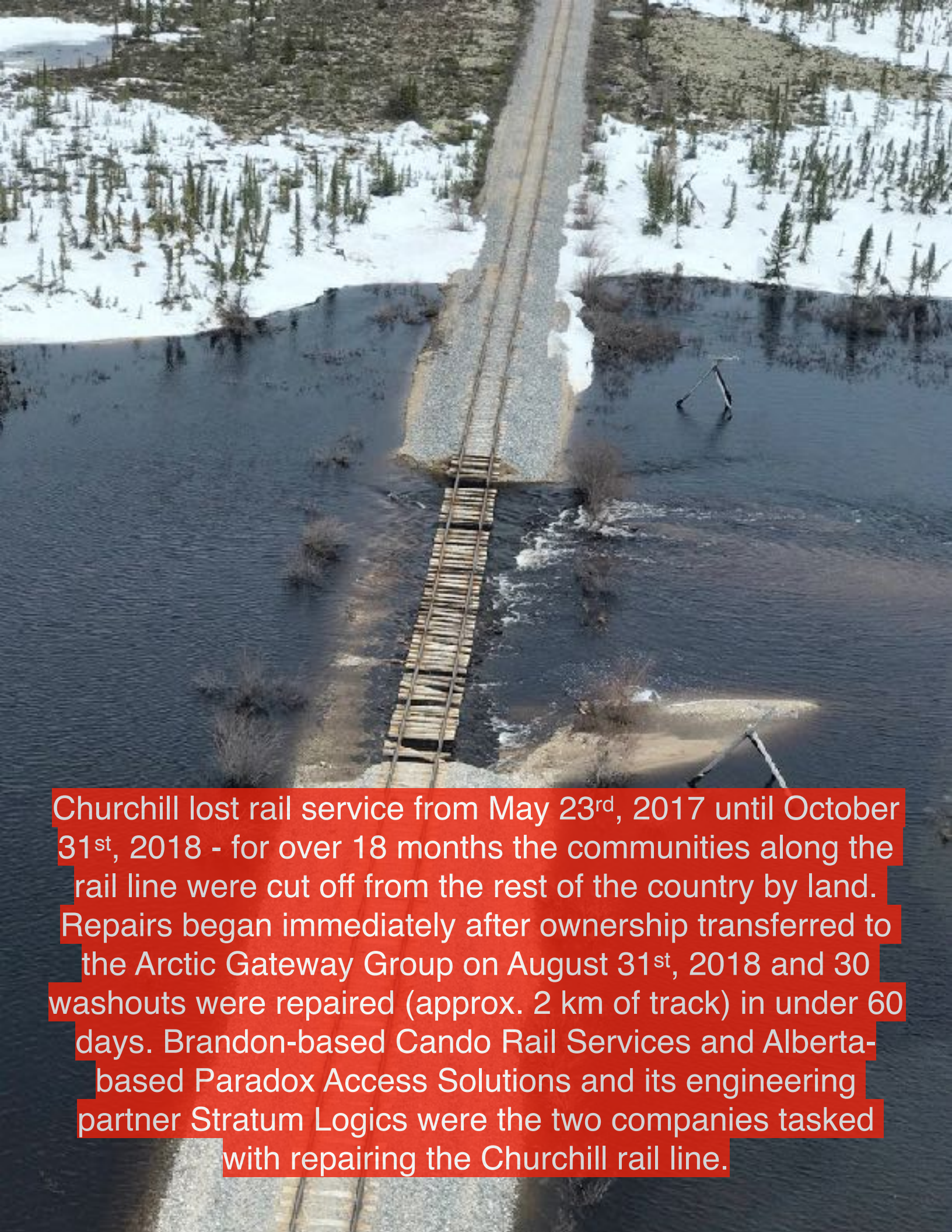
An unprecedented snowfall and subsequential spring floods in May, 2017 washed out several places along a 271 km portion of the 1000 km long Hudson Bay Rail line. The portion of the rail line between Gillam and Churchill was was essentially closed, cutting off rail service to Churchill and the Port of Churchill.

June, 2018

On June 10th and 11th, 2018, Churchill had back-to-back highs of 32.2 and 29.7 C breaking local records from 1941 and 1950, a 68-year-old warm-weather record. 24.4 C was the record set in 1950 and 25.6 C set in 1941. The average highs for June 10 and June 11 in Churchill are 10 C and 10.3 C. Often when things heat up in the town, a cool sea breeze sweeps off Hudson Bay and cools things down. But, a continuous, southerly wind blew up from the Prairies, and the warmth was trapped over Churchill due to the fact that half of Hudson Bay was still frozen over.

September, 2018

A summer of heavy precipitation and high water levels south of Ponton led to a washout that led to a fatal train derailment in September, 2018. Precipitation in the summer of 2018 was about 60 per cent higher than the historical average and led to Beaver dams along the rail line breaching and inundating the track with water, washing out a 50-foot section of the rail bed.



Churchill lost rail service from May 23rd, 2017 until October 31st, 2018 - for over 18 months the communities along the rail line were cut off from the rest of the country by land. Repairs began immediately after ownership transferred to the Arctic Gateway Group on August 31st, 2018 and 30 washouts were repaired (approx. 2 km of track) in under 60 days. Brandon-based Cando Rail Services and Alberta-based Paradox Access Solutions and its engineering partner Stratum Logics were the two companies tasked with repairing the Churchill rail line.

IMPACTS OF CLIMATE CHANGE

➡️ Summers are much more warmer than normal and increased demand for cooling;

➡️ People are seeing more thunder and lightning, which wasn't never really that common;

➡️ Variability in precipitation and increased evapotranspiration, could lead to long-term shifts in the water resources available for hydropower generation;

➡️ The run-off used to come after the ice break-up. Now you're seeing them coincide; the spring melt is happening at the same time as the ice break-up;

➡️ A later river freeze-up and earlier break-up means it's not safe to go on the ice in some places;

➡️ Infrastructure is exposed to changes in river discharge due to events such as floods from intense precipitation or rapid spring snowmelt;

➡️ Low water levels associated with prolonged drought upstream could affect availability of drinking water;

➡️ The ice on the bay is melting earlier, and freezing later, meaning increased "fetch" or the area of open water where prevailing winds can create higher, more destructive waves;

➡️ Permafrost is thawing, roads and buildings were constructed with the assumption that the ground beneath them would remain frozen;

➡️ River bank erosion from the sudden surges of spring melt sent down river coupled with the melting permafrost may make the river wider;

➡️ Increased risk of power outages, including widespread interruptions to internet and cellular network due to extreme weather events;

➡️ More difficult to determine "natural disaster" or mismanagement;

➡️ Increased risk of pollution and other threats that accompany increased marine traffic;

➡️Disproportionate impacts on vulnerable populations and regions.

OPPORTUNITIES OF CLIMATE CHANGE

Opportunities can be defined according to **seven** criteria, including: [1]Magnitude of the climate impacts; [2]Timing of the climate impacts, [3]Persistence and reversibility of the change in climate; [4]Likelihood and confidence in the aspects of climate impacts; [5]The ability to adapt to or mitigate climate impacts and change current practices; [6]Distribution of the climate impacts over an area or region; [7]Importance placed on vulnerable infrastructure, *Others include state of infrastructure, market impacts, climate variability, and extreme events including storms.

➡️ Steps taken to prepare for climate variability and change can improve health and provide other societal benefits, such as sustainable development, disaster risk reduction, and improvements in quality of life;

➡️ There is considerable potential for development of natural resources (minerals and oil & gas) in northern Canada;

➡️ Easier access to Canada's North will also likely reduce the overall cost of exploration, extraction, and shipment of natural resources, making such projects more economically viable;

➡️ With more access to natural resources more people will be able to work. This may result in the population increasing further as less people leave for economic opportunities elsewhere;

➡️ A warmer temperature in the winter when usually temperatures are at least -30 C or -40 C, might mean being able to go dog-sledding in February where it might be warm enough to just mush in a sweater;

➡️ There may also be economic opportunity as people start to migrate or vacation north to escape extreme temperatures in the South;

➡️ Modern land claims will become more important and provide a strong basis for Indigenous-led initiatives;

➡️ Energy consumption in northern remote communities is much higher than the Canadian average due to poor building design and energy efficiency a warming climate will require less energy use in winter.

A NORTHERN ADAPTATION APPROACH

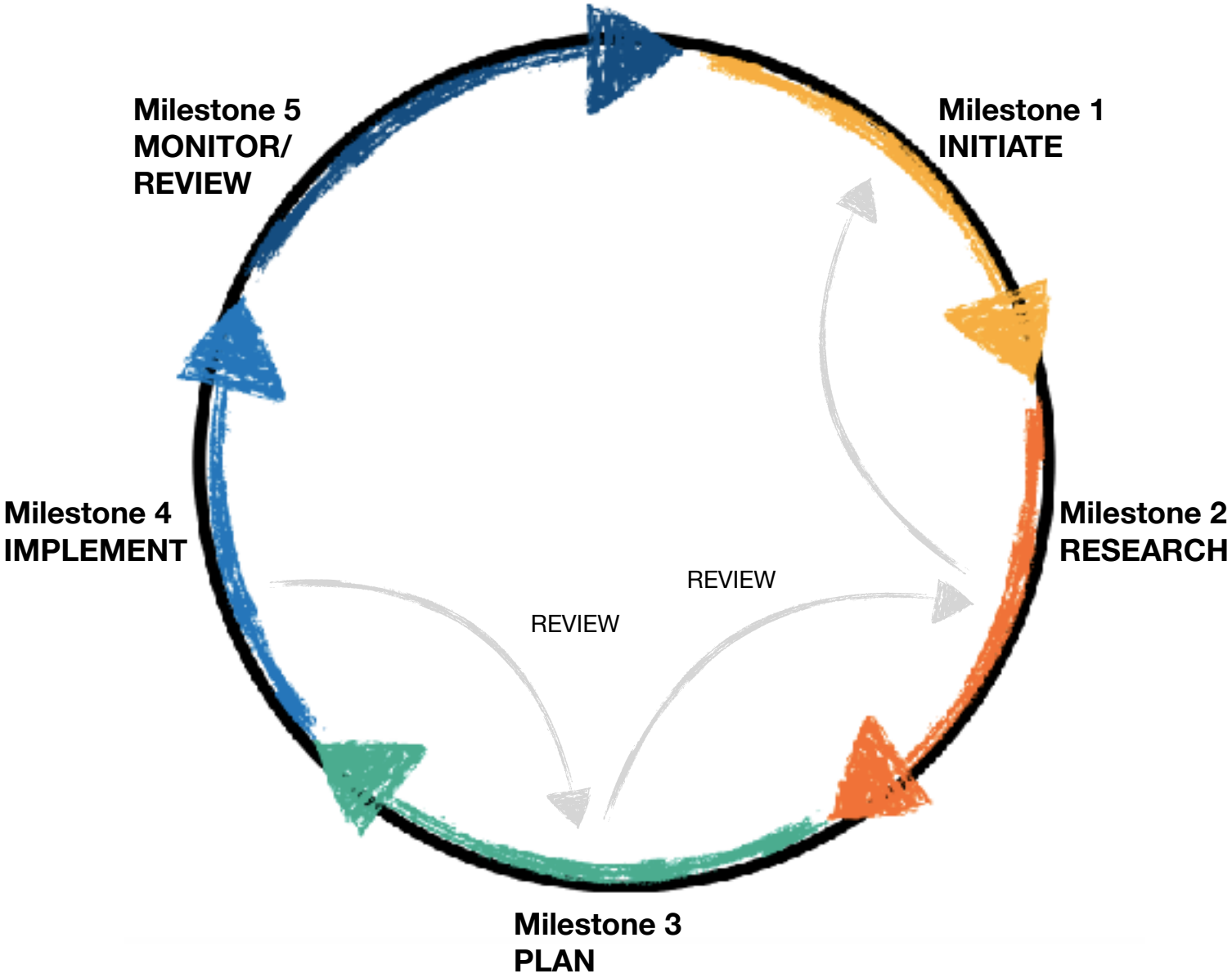
Understandably there is no one size fits all solution when it comes to building resiliency and communities in the North face a wide range of challenged and barriers to be able to act. Municipalities like Churchill have a lot of agency especially in adaptation actions, they can map what the physical hazards are, and then because they are closest to their citizens and population, they can understand what the impacts can be. There is no single approach or simple formula to adapt to climate change. Anticipatory or planned adaptation actions will be needed to lessen climate risks and to protect the municipality.

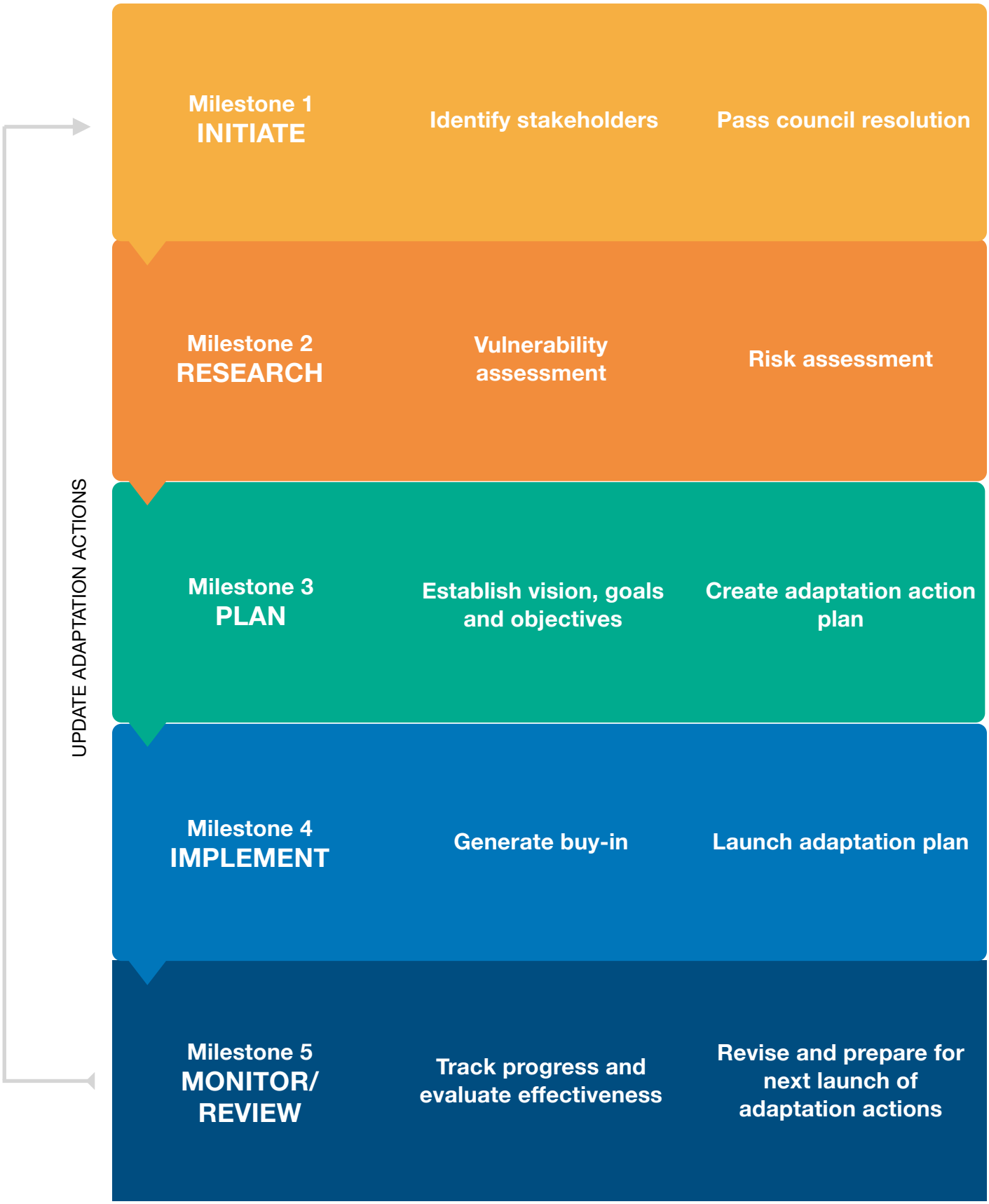
By incorporating the perspectives and narratives of the community as it understands climate change and communicating effectively and transparently about how plans are being created to address the specific, long-standing needs of the community our approach puts the community first.

Climate policies that promote co-benefits (that tackle climate change whilst also delivering on other priorities like addressing COVID-19 and restarting the economy) can bolster support from local stakeholders, increasing the likelihood that they will be approved by decision makers.There is an opportunity to provide multiple benefits and value to the community while aligning goals to reduce costs and mitigate risks.

A Risk-based Adaptation Approach typically focuses on identifying hazards, assessing the severity of the hazards and the probability of their occurrence. The goal of the adaptation strategy in this case would be to find a way to mitigate the most severe risks in the most cost-effective and efficient way and/or to invest in initiatives which enhance capacity to deal with the risks.

Climate Change Adaptation Cycle based on The Building Adaptive and Resilient Communities (BARC) framework developed by ICLEI Canada.




Milestone 1
INITIATE
Identify stakeholders
Pass council resolution
Milestone 2
RESEARCH
Vulnerability assessment
Risk assessment
Milestone 3
PLAN
Establish vision, goals and objectives
Create adaptation action plan
Milestone 4
IMPLEMENT
Generate buy-in
Launch adaptation plan
Milestone 5
MONITOR/ REVIEW
Track progress and evaluate effectiveness
Revise and prepare for next launch of adaptation actions
UPDATE ADAPTATION ACTIONS

Churchill's Relative Risk Index

Churchill is seeing risks, vulnerabilities and opportunities resulting from climate change that are both event driven (acute) like flooding and longer-term shifts (chronic) like variability in precipitation patterns.

Occurrence of climate change impact

VERY HIGH

HIGH

MEDIUM

LOW

Temperature extremes
- Rapid spring snow melt
- Changes to river ice formation, breakup and jamming

Extreme variability in weather
- Increased intensity
- Higher frequency
- High wind damage
- Emergency management

Sea-ice decline
- More ice free days
- Lesser extent
- Higher waves and storm surges

Biodiversity loss
- Habitat shifting and alteration
- Disturbances to ecosystems
- Invasive species & diseases
- Protected areas

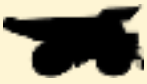
Permafrost thaw
- Settlement
- Frost heaves
- Need for hazard mapping

Change in precipitation patterns
- Drought
- Fog
- Standing water issues
- Snow clearing and removal

Buildings and infrastructure
- Water, sewer and drainage
- Roads and bridges
- Electricity and information and communication technology
- Solid waste management
- Building codes
- Energy planning
- Housing
- Renewable energy
- Land-use planning
- Asset management

Supply chain and transportation
- Shipping lanes
- Rail lines
- Ports and marine structures
- Airports
- Warehouses and distribution centres

Watershed management
- Source water protection
- Hydroelectric generation
- Riverine flooding
- Flood-risk mapping



Natural resources exploration and extraction
- Mining and quarrying
- Oil & gas activity
- Pipelines

Health and wellness
- Heat-related illness
- Mental health
- Addictions
- Food security
- Extreme poverty
- Vulnerable populations
- Pandemics

Tourism and recreation
- Ecotourism
- Business continuity
- Museums and galleries
- Parks and historic sites

Social protections
- Education and skills training
- Green jobs
- Cultural and natural heritage
- Accessible, inclusive and equitable community
- Safe neighbourhoods
- Northern values
- Opportunities for new Canadians
- Resilient economic recovery

On the land activities
- Hunting, fishing and trapping
- Berry picking
- Gathering medicinal plants
- Logging and wood harvesting
- Access to cabins and traditional lands

Agriculture and Aquaculture
- Livestock farming
- Marine and freshwater commercial fisheries
- Hydroponics
- Greenhouses
- Community gardens

Low | Medium | High

Role of municipality in adaptation

Our Climate Change Priority Areas

Churchill is determined to actively shape climate policies and actions so that they are inclusive and effective for us, and improve our standard of living. By working together, we can make significant progress within our seven interconnected climate priorities:

These priority areas align with federal policy coordination of Ecosystems/ Biodiversity, Health and Well-Being, Particularly Vulnerable Communities and Regions, Communities, Infrastructure and Economy to lay down foundational knowledge and information and build resiliency to the impacts of climate change.

1 Align and Integrate Within The Strategic Plan

For many northern communities, long-term access to funding to back projects is a perpetual challenge. Government funding typically supports efforts for a few months to a few years at the most. Furthermore, access to funds sometimes comes with strings attached. For example, funds from a government program may require that a certain proportion be spent on “quick wins” in the short-term rather than long-term objectives outlined within the municipalities strategic plan, if one exists.

By creating opportunities for alignment it will be that much easier to integrate the adaptation plan within the municipalities current internal organizational structure. At the end of the day, not all issues outlined in the plan will warrant equal concern; adaptation actions should be ranked in the order of “what matters most” to the community.

Projects like this one need to be flexible to be able to anticipate funding as it emerges, effectively utilize the limited resources available and resolve issues as they crop up. In terms of capacity, Churchill is better able to manage the challenges related to funding constraints much better than other remote northern communities.

Action 1.1 Incorporate climate change considerations into municipal decision-making

- ☑ Inject climate change language into the strategic plan;
- ☑ Integrate climate change considerations into new and existing plans and policies when appropriate;
- ☑ Use cross-cutting actions to make use of limited technical staffing and technology resources;
- ☑ Prioritize amongst adaptation objectives and activities.

Action 1.2 Increase level of knowledge of climate change

- ☑ Promote climate change education awareness initiatives for residents, municipal staff and councillors;
- ☑ Collaborate with stakeholders to enhance climate change engagement strategies;
- ☑ Share localized climate change data as open-source when able to do so;
- ☑ Ensure that community interest in the project is maintained over a long period, and that human resources are not over-taxed.

Action 1.3 Advocate for financial support for unforeseen impacts of climate change

- ☑ Explore patching together or stacking funds from multiple sources to sustain long-term programs;
- ☑ Plan for periods of no funding so that the project is not put on hold or phased out altogether. The lack of continuity in funding is a serious barrier to addressing and trying to understand long-term climate related changes.

Action 1.4 Embed climate change actions within the “safe restart” of the local main street economy

- ☑ Leverage the gas tax fund to bolster municipal operations;
- ☑ Lobby the province to start making use of the Investing in Canada Infrastructure Program for projects in the North.

2 Maintain Public Health and Safety

6. “WE SWIM IN THE SAME WATERS” ARTIST: CHARLES JOHNSTON / CANADA (WINNIPEG)

Disasters don’t just cause physical damage; they can leave communities struggling mentally and emotionally, as well. Working to shore up physical structures only tackles part of the problem. Impacts on physical and mental health can be both short-term and long-term.

The costs for food even with the rail in Churchill is high, food insecurity has been highlighted as a top priority. Anyone standing at the baggage carousel at the Churchill airport will see an endless train of Rubbermaid totes and Coleman coolers full of food being brought from the South. Losing a freezer full of meat due to a power outage could set a family back several hundred dollars, when food already costs a premium due to shipping costs.

The community supports organizations like the Hungry Bears Food Bank and Danica's Village which spearheads initiatives like stocking the local food bank shelves, hamper drives and providing bikes and winter clothing to youth. These initiatives have been vital for alleviating persisting food security issues during the current pandemic.

Action 2.1 Review and update emergency response procedures

- ☑ Update emergency management plans to account for more frequent and intense weather events that last several hours;
- ☑ Have a notification system in place that informs the public on what to do and where to go in an emergency.

Action 2.2 Enhance public education to increase personal preparedness and readiness

- ☑ Produce targeted messaging for at risk populations including elders and persons with disabilities.

Action 2.3 Enhance protection during extreme heat conditions

- ☑ Provide sun protection options such as sunscreen or hats to municipal staff and promote the importance of hydration;
- ☑ Educate about the risks of heat stroke and heat exhaustion;
- ☑ Ensure there is public access to air-conditioned spaces;
- ☑ Consider new design and replacement standards for building Heating, Ventilation and Air Conditioning (HVAC) units.

Action 2.4 Address food insecurity within the community

- ☑ There needs to be an examination of the food supply chain in its entirety from the wholesaler, retailer distribution, and figure out where the breakdown is;
- ☑ Facilitate the expansion of food sovereignty initiatives (Growcer).

Action 2.5 Maintain access to the land and traditional foods

- ☑ Work with Manitoba Hydro to minimize the loss of traditional country foods kept in freezers during planned outages;
- ☑ Increase access to on-the-land experiences, improving mental health outcomes and building community resilience;
- ☑ Promote policies that devolve resource and wildlife utilization rights to the community to support sustainable management.

Infrastructure in the community was built to support a region, an example of this is the 26,000 square metre Town Centre Complex - a multipurpose community facility. However, due to a declining population and downgrading or cancelling of services there isn't enough users to support the costly upkeep of overbuilt infrastructure in the community. For instance, raw water is pumped over 20 kms from the Churchill River to the townsite and heated 3 times along the way. The sewer and water systems were originally designed to accommodate 3,500 residents, with additional capacity to service up to 5,000. Current users are less than a quarter of that now.

Ideally, Churchill could implement a mix of policy and planning projects with infrastructure based projects. Without funding, solutions will more likely be mostly policy-based instead of investing in big infrastructure retrofits and upgrades. However, with the physical risks of climate change looming, policy alone will not be enough to tackle the impending climate crisis, consistent funding is required to take steps to ensure that infrastructure is prepped for a future shocks and stresses.

Action 3.1 Integrate climate change adaptation and asset management

- ☑ Collect data to accurately identify climate change-related infrastructure vulnerabilities;
- ☑ Develop a complete list of assets and equipment, an asset assessment and costs for their upkeep, as well as a complete layout of service standards and current levels of service (cost, condition, risk);
- ☑ Institutional knowledge needed for maintenance needs to be documented and there needs to be a move away from focusing on short-term goals;
- ☑ Project proposals regarding infrastructure need to take into account future climate projections.

Action 3.2 Adopt technologies for data driven decision-making

- ☑ There is a need for up-to-date mapping and GIS;
- ☑ Testing new technologies is risky business in northern communities. Getting a replacement part can take months to ship, and good luck getting a technician to come by to fix it. Self-reliance is key in the North. So before renewable or even efficient technologies can be introduced, residents must become the experts. Churchill needs to encourage champions to participate in hands-on programs that lead to green jobs that support the adoption of clean energy and community resilience projects;
- ☑ Slow internet speeds cause internet-connected devices like thermostats controlled by phone to not work as they should, the new fibre-optic network will open up the North but it needs to be accessible and affordable.

Action 3.3 Incorporate green infrastructure when possible

- ☑ Use green infrastructure instead of traditional grey infrastructure to temporarily store or slow down rainwater runoff to ease the burden on ageing infrastructure.

4 Minimize Disruptions to Service Delivery

Photo by: Trevor Donald

The Town of Churchill is one of the largest employers in the community, providing jobs to nearly 10% of the population. The municipality provides essential services, like waste management, water treatment, emergency services, and maintains critical infrastructure like roads and buildings. COVID-19 related budget shortfalls and community economic challenges will make it difficult to align expectations of service delivery with capacity of the local government. A changing climate will further stress the municipalities fiscal and operational capacity.

While climate change will lengthen the summer construction season it will also mean increased intensity of rainfall, runoff, and erosion leading to wash-outs on roads; more frequent freeze-thaw cycles, soil instability, and permafrost subsidence and ground movement causing damage to foundations and underground infrastructure; and more extreme weather events leading to direct physical damage to infrastructure. Building-back-better policies will need to be devised.

Action 4.1 Implement a stormwater master plan

- [x] Connect downspouts and encourage the use of French drains, dry wells, bioretention stormwater ponds or rain gardens to enhance drainage and attenuate water from catchments;
- [x] Continue to implement sewer infrastructure replacement and improvements and complete integrated modelling of water in the town (pipe system and surface water).

Action 4.2 Create a drainage strategy to contend with permafrost degradation

- [x] Drainage issues that regularly afflict residents that have not been dealt with in the past need to be addressed;
- [x] Have a permafrost study of the landfill conducted and a permafrost hazard map of the townsite constructed.

Action 4.3 Construct a municipal flood-risk map of the townsite and surrounding features

- [x] Work with Manitoba Hydro through the Environmental Issues Committee (EIC) to acquire localized LiDAR data and Digital Elevation Model;
- [x] Identify roads and areas prone to overland flooding and extreme rain event flooding and have appropriate plans in place to address them.

Action 4.5 Develop communications campaign with messaging to residents on lot-level resiliency actions

- [x] Promote the use of rain gardens, rain barrels, native plants;
- [x] Work with homeowners to install eavestroughs and downspouts to channel water away from foundations;
- [x] Develop outreach programs to teach residents what they can do to reduce snowmelt flooding on their property (e.g. removing snow from around their foundations, clearing debris from catch basins, etc.);
- [x] Update building codes to take into account “best practices”.

5 Protect Biodiversity and Natural Assets

18. “IMPACT” PART 2
ARTISTS: KAI KAULUKUKUI HAWAII + CRACKED INK / UK

Tourism in Churchill revolves around its richness in biodiversity. The main tourism seasons are:

Beluga Season - June to September, every summer, approximately 4000 beluga whales travel from the Arctic to the warmer waters of the Churchill River Estuary to feed and give birth and nurse their calves.
Bear Season - From October to November, the roughly 900 polar bears in the entire Western Hudson Bay region congregate on the shore of the Hudson Bay to anticipate the annual freeze-up
Lights Season - In February and March, Churchill is an excellent location for seeing the northern lights.
Shoulder Season - In the spring, more than 250 species of birds pass through Churchill on their annual migration attracting a small number of avid birders.

If the COVID-19 pandemic has shown us one thing, resilient communities are tied to thriving ecosystems and biodiversity. Climate change as well as other factors and human stressors put these valuable resources in jeopardy. We need the services natural areas provide to both mitigate and adapt to climate change and other shocks.

Action 5.1 Promote the protection of species at risk

- ☑ Monitor, protect and advocate for species at risk (i.e. Polar Bear Working Group);
- ☑ Enhance communication and coordination with other agencies (e.g. Parks Canada, Manitoba Conservation and Climate, Agriculture and Resource Development, Environment and Climate Change Canada);
- ☑ Reduce human wildlife conflict through education and awareness.

Action 5.2 Assess new opportunities for different forms of business and tourism as a result of a changing climate

- ☑ Promote “shoulder seasons” as a great time for tourism;
- ☑ Work with businesses to encourage climate resilience within tourism related services;
- ☑ Educate and encourage local businesses and the tourism industry to implement adaptation actions to prepare for our future climate;
- ☑ Provide guidance to local business on how to maintain business continuity (e.g. supply chain) during extreme weather events.

Action 5.3 Implement an Invasive Species Program

- ☑ Create awareness that Zebra mussels are progressing northward through Manitoba’s waterways, they have the potential to clog drinking water infrastructure and other supports. These mussels could also hurt local tourism;
- ☑ Any watercraft transported should be cleaned, drained and dried;
- ☑ Utilize Citizen Science Programs to help monitor and collect information on species at risk and invasive species;
- ☑ Ensure tree and plant species established are native where possible, diverse, disease resistant and have high climate adaptability.

Action 5.4 Develop a collaborative, watershed-based source protection plan that is locally driven and based on science

- ☑ Prevent, minimize, and control potential sources of contaminants in or near the community's raw water sources.

6 Build Resilience and Capacity Within the Region

Churchill faces non-climate drivers felt by remote northern communities around it such as environmental degradation from hydro generation which is further exacerbated by climate change, high unemployment and low incomes coupled with higher costs of living and food insecurity.

Just above Churchill lies Nunavut, a vast Arctic region — the size of Mexico - with a population of 36,000 mostly Inuit. Though rich with mineral deposits, it suffers from a dire lack of infrastructure and all electricity is produced by diesel generators. Electricity production for the territory costs over 10 per cent more per kWh/h than in Churchill (Qulliq Energy Corporation). A proposed C$1.6 billion project would provide hydro power and fibre optics to the country's remote north and spur new business. Canada's Infrastructure Bank signed a memorandum of understanding to assess the project, which needs federal investment to get built and would run to Nunavut from Manitoba. Churchill's resilience would greatly be enhanced if the decision for the location of a route for the line cut through the town.

Action 6.1 Identify new economic opportunities associated with climate change in the region

- [x] A 270-kilometre 138 kilovolt line electric power transmission line currently runs from the Radisson Converter Station near the Nelson River to Churchill. It should be made more robust for the Manitoba to Nunavut transmission line project;
- [x] Nunavut's population could reach 54,000 by 2043 according to StatsCan. This takes into account more people migrating out of Nunavut than migrate in. In the years to come, there are going to be more houses and more development. Churchill needs to lobby all levels of government and industry to be realized once again as the main hub for facilitating goods movement to northern communities, in particular the Kivalliq region of Nunavut, and some of the central areas of Kitikmeot and Qikiqtaaluk regions.

Action 6.2 Have communities and stakeholders in the region disclose risks and vulnerabilities associated with climate change

- [x] Develop a mechanism for effective in-house sharing of emerging climate change initiatives and corresponding data within the region.

Action 6.3 Provide data, resources and support for regional climate change planning as needed

- [x] We can't perfectly model the Earth's climate system, there is no single best climate model. The data required to accurately predict risks and vulnerabilities needs to be highly localized to the region and to get this data either requires extrapolation from data collected already within the region or by using downscaled climate models. Downscaling comes with tradeoffs so collecting, analyzing and sharing site specific data is key. A working group within the Hudson Bay Consortium could support this knowledge sharing.

Action 6.4 Encourage and support the completion of floodplain mapping for the regions watersheds

- [x] Work with regional stakeholders to develop a watershed plan.

7 Demonstrate Reconciliation on the Ground

According to social entrepreneur Shaun Loney, reconciliation is not simply one sided. The Truth and Reconciliation Commission Report reminds us that a key part of the reconciliation process involves those of us who are not indigenous becoming aware of our own personal stories and how they connect to the past and current lives of Indigenous people. Reconciliation is a path we must walk together as Canadians to tackle the issue of climate change.

Indigenous people in Canada are just starting to regain traditional practices and cultural aspects that were meant to be eliminated. While Indigenous peoples are often considered more vulnerable, they do not seek to be seen as vulnerable but rather seek reconciliation and a restoration of the health, wellness, self-determination and sovereignty, which were eroded through historical and ongoing colonization.

Action 7.1 Be a good ally and strengthen indigenous self-determination in climate change decisions, policy-making and assessment processes

- ☑ Give Indigenous peoples meaningful roles at climate change decision-making tables and amplify their leadership capacity;
- ☑ Recognize that Indigenous perspectives on life, land and growth as an interconnected system presents a path forward. Sustainable and resilient economies of the future are embedded in a pathway that align with indigenous culture;
- ☑ Collaborate with indigenous stakeholders but understand it will come with some difficult conversations and some hard truths. Indigenous peoples in the North have been forced to take action and/or express frustration because of a track record of ignoring their concerns. Resistance, has been due in part to distrust of how governments have operated and made decisions in the past;
- ☑ Ensure Indigenous stakeholders have access to space to ensure they can engage in meaningful consultation and uplift their voices so they can have their concerns heard from centre stage.

Action 7.2 Facilitate and support regional indigenous climate change and stewardship strategies

- ☑ Support Indigenous educational initiatives linked to on-the-land traditional knowledge transfer in a culturally appropriate way.

Action 7.3 Promote indigenous-driven climate change research and monitoring while also attributing credit

- ☑ Indigenous-led and co-produced climate change research and monitoring should carry equal weight in decision-making.

Action 7.4 Ensure climate information is available to all indigenous stakeholders to inform evidence-based decision-making

- ☑ Establish two-way climate change information sharing best practices.

Direct experience has shown that there may not be the capacity to plan and undertake complex projects like renewable energy and deep energy retrofits independently in the North, even when funding exists. Any of these projects from start to finish involves financial, technical, and operational complexity, and has a high degree of perceived risk. In addition, workforce capacity, contractor reliability, experience, and access to innovative technology is limited in the North.

Public and private resources are required to address both funding and service gaps. The municipality needs support throughout the stages of planning, financing, procurement, construction, quality assurance and evaluation. By coordinating access to grants, incentives and financing, bringing expertise and buying power, and aggregating investible projects there is a greater chance for success. As a result of COVID-19 and the economic crisis, stimulus solutions for green recovery projects need to be fast and predictable to support municipalities and northern communities.

Special Consideration Action 1 Try to create our own power in the community to exercise energy sovereignty.

- ☑ Look at the possibly of a micro-grid where the community could produce its own power and be able to easily make repairs to get the power online in just a few hours;
- ☑ Propane is used to heat the over 200 Manitoba Housing units. Efforts should be made to move away from fossil fuels wherever feasible to do so;
- ☑ Create redundancies in case the power is interrupted and have back-up power options especially for buildings that are used primarily for sheltering in place in an emergency.

Special Consideration Action 2 Retrofits of existing buildings can provide opportunities for co-beneficial climate adaptation upgrades.

- ☑ Heat pumps present an opportunity for all new buildings to provide active heating and cooling at little or no incremental cost while also providing energy efficiency benefits;
- ☑ Reduce cooling and heating demand in new construction.

Special Consideration Action 3 Understand the effect of permafrost thaw as a result of warming and the river diversion on water quality.

- ☑ As permafrost melts from increasingly warmer summers, it carries the surrounding dirt with it. Fresh water moves the sediments downwards towards rivers and lakes, bringing with it whatever chemicals are within it. It is important to understand what this will do to water quality and what effect if any does the river diversion have.

Special Consideration Action 4 Scale infrastructure to support the current size and capacity of the community.

- ☑ Continue water conservation and efficiency actions and work to go from an overbuilt system to a fit-for-purpose approach for water use to reduce pressure on the regional supply and heating and delivery of treated drinking water.

4. “POWER OF NATURE” ARTIST: ARLIN GRAFF / BRAZIL

NORTHERN CHALLENGES TO ACT

While climate change is an important factor to consider in the decision-making process around adaptation, it is not the only factor. Funding, political will, needs of the community are other major elements of making a decision, each with associated uncertainties that need to be considered.

Barriers for Churchill to act:

- 🛑 Budgetary capacity
- 🛑 Municipal infrastructure at the end of lifecycle
- 🛑 Short summer construction season
- 🛑 Housing not culturally appropriate or suitable for the climate
- 🛑 Cost of living and access to basic services due to remoteness
- 🛑 Post-secondary education options
- 🛑 Political engagement regionally and provincially
- 🛑 Governance centralized in the south

Enablers for Churchill to act:

- ✅ Access to quality localized climate data and research
- ✅ Community engagement
- ✅ Access to healthcare
- ✅ Land use planning
- ✅ Local government capacity
- ✅ Safety and security
- ✅ Infrastructure built for the region
- ✅ Federal cooperation
- ✅ Connected to an integrated electricity grid and not reliant on diesel

FACTORS FOR SUCCESS

Despite challenges implementing actions embedded within this plan there are factors that can be followed to overcome these challenges. There is a strong desire to raise living conditions in Churchill and at the same time build community resilience. While conversations have generally been positive, there are still technological, infrastructure and capacity challenges that limit the acceptance and implementation of adaptation actions in the North.

💲 **Financial support:** Adaptation actions require higher capital than small communities have available. Government funding programs for financial support are therefore critical. Even with 50 per cent of the capital required it is still difficult.

👷 **Trained and skilled operators:** A critically important and often overlooked aspect of successful projects in northern communities is ensuring that there is always people trained to be on hand to address issues and carry out maintenance. Having municipal staff help out (as part of their regular duties) seems to work alright but with high staff turnover and no plan for on-going training it is really a challenge. Having dedicated project staff is crucial. Projects should fit well with local residents' skill sets and the current training programs available.

🏗️ **Community-owned infrastructure:** While a project may be organized by the community it should be financially independent in order to have money available when needed.

💪 **Community support and local champion:** A project "champion" can help get the community on board and push the project through hurdles. In some cases, the champion can be someone from outside of the community with the right expertise, who sees an opportunity for the community by getting locals on board.

LESSONS LEARNED

Awareness of climate change and its impacts may be growing, yet the use of the information is failing to gain the policy traction necessary to adequately prepare for and adapt to future changes The reasons for this are complex but there are steps that can be taken to bridge this gap:

🚨 **Be patient:** Despite stakeholders' level of understanding of climate-related risks, it will take time to define and specify their needs, and decide what is important to them. Frequent dialog is required to promote knowledge exchange and build trust.

🚨 **Weigh options carefully:** Take the time while developing and assessing implementation actions to consider issues well beyond the topic of climate change adaptation.

🚨 **Establish a timeline early:** Decide what is the realistic amount of time it will take to build trust, conduct research and develop a plan for implementation. This creates some flexibility, reduces tension during the decision-making process and manages expectations of deliverables.

🚨 **Decide who is your target audience:** What is the intended use of the information, who is it intended for and how much detail is needed.

🚨 **Be as clear and transparent as possible:** Consider what is already used and what peoples personal preferences are and try to combine formats like storytelling and visualizations when presenting technical information.

🚨 **Be inclusive:** A lack of value attributed to indigenous ideas and solutions and the imposition of policies in which only scientific and economic approaches are consulted can be interpreted as a new era of "climate change-driven colonialism."

CLOSING KNOWLEDGE GAPS

Knowledge gaps constitute significant barriers to successful climate change adaption actions, whether it is the absence of knowledge, lack of access to existing knowledge or the disconnect between knowledge holders and users.

❓ **COVID-19:** What can we learn from the pandemic and how we can apply it to adaptation efforts?

❓ **Nature-based solutions:** How will community-led NbS help the local community to adapt to a changing climate?

❓ **Youth:** How will young people in the community be part of solutions, and how will their input shape the future of adaptation?

❓ **Clean tech:** How can new technologies help with adaptation efforts?

❓ **Newcomers:** How will immigration rejuvenate the existing community?

❓ **Cascading events:** Disasters and disruptions are rarely standalone events. Are we able to respond to multiple events simultaneously?

❓ **Cumulative effects:** What will the combined impact of past, present and future human activities and natural processes be in the long-term?

❓ **Shifting goal posts:** Because climate change has a slow onset; how will people's attitudes change over time along with their expectations?

❓ **Future shocks:** What would happen if there was a second wave of COVID-19 or the current economic downturn gets worse?

❓ **Reconciliation:** How will inevitable indigenous self-determination and equity increase efforts to build relationships and collaborations to adapt?

LOCAL ACTOR AND STAKEHOLDER CONSULTATIONS

Before policy can be drafted though, input is required from stakeholders in the community. In August, 2019 the Churchill Climate Change Adaptation Steering Committee was formed. This approach takes into account the narrative or account of the community's origins and an explantation of how it developed into its current state in terms of culture, economy, politics, and the natural and built environment and how these factors need to be considered when creating plans and policies around climate change adaptation

Including diverse stakeholders in planning can help make policy more responsive to community needs. By getting first-hand information by inviting everyone to engage in adaptation initiatives encourages a deeper understanding of others' perspectives, interests, & lived experiences. It also makes you aware of competing and sometimes conflicting needs and agendas.

It is also important to engage with Indigenous stakeholders as they rely heavily on the natural environment for their material and cultural existence. They have also contributed the least to the climate crisis, and they are the ones most affected by it and now finding themselves on the front lines

By using collective power to create and deliver climate change adaptation policy that effectively increases internal, external, and overall political efficacy there is promise for increasing future political engagement around climate change adaptation.

CHURCHILL'S VULNERABLE POPULATIONS

Less vulnerable

Persons with low income
Persons with substance abuse issues
Persons with mood disorders
Lesbian, gay, bisexual, trans, queer & Two-Spirit (LGBTQ2S) communities
Indigenous peoples
Women
Youth
Infants
Seniors and elders
Groups at greatest risk for heat-related illness
Refugees and asylum seekers
Undocumented individuals
Immigrant communities

Adaptation planning processes need to take into account complex issues like race, gender and social inclusion, ensuring that different social groups are reflected in adaption actions and benefits are shared equitably. By identifying particularly vulnerable populations or those that are disproportionately affected by shocks and stresses, hardest to reach, and are too often voiceless and forgotten, adaptation actions can point to existing or new mechanisms for delivering support.

Victims of Intergenerational trauma (residential school survivors, sixties scoop survivors)
Victims of abuse and violence
Individuals with a permanent disability
Racialized groups
Persons with Fetal Alcohol Spectrum Disorders (FASD)
Individuals at high-risk for suicide
Individuals with diabetes and obesity and other health issues related to food insecurity
Persons who are homeless (not necessarily living on the street i.e. couch-surfing) or under-housed

More vulnerable

ADOPTION, IMPLEMENTATION, MONITORING AND REVIEWING

Next Steps

The Town of Churchill in collaboration with other stakeholders, needs to develop a means to adopt, fund and implement the adaptation plan. Concrete actions have been identified but they need to be prioritized in an internal planning process along with, timelines, and costs; clearly identified roles and responsibilities, including who is responsible for overseeing the implementation of the plan and accountabilities for implementing actions; and requires monitoring and reporting on the plan's progress. Projects planned to date should be informed by the assessment of climate change risks contained within the plan.

Strategy to Overcome Challenges

Monitoring of policy strategies is limited. Although there is contained commitments to monitor and review the effectiveness of the adaptation actions, there is nothing to ensure this will happen. A climate change working group should be established to coordinate implementation and review adaptation strategies.

Maladaptation

Because of the scale and complexity of adaptation decisions maladaptation likely will occur, despite efforts to avoid it. It is important then for every adaptive action to be monitored and evaluated. The only way for policy-makers to enable better and more effective adaptation decision-making is by learning and sharing the knowledge of what does not work.

19. “GOOSE CABIN” ARTIST: PAT PERRY / USA

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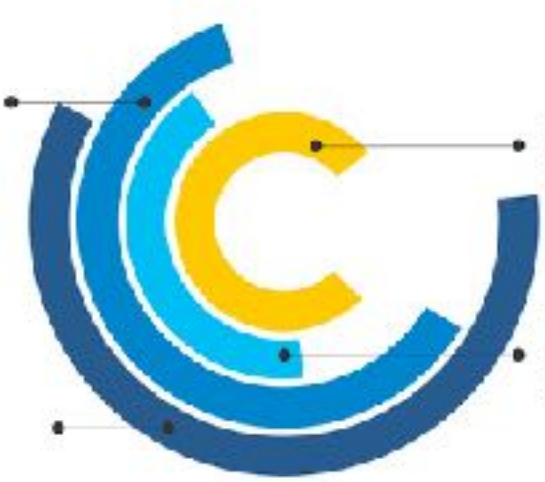
APPENDIX A: MUNICIPAL INFLUENCE

Municipalities Degree of Influence to adapt to climate change:

Indirect Influence
- Food security
- Home energy



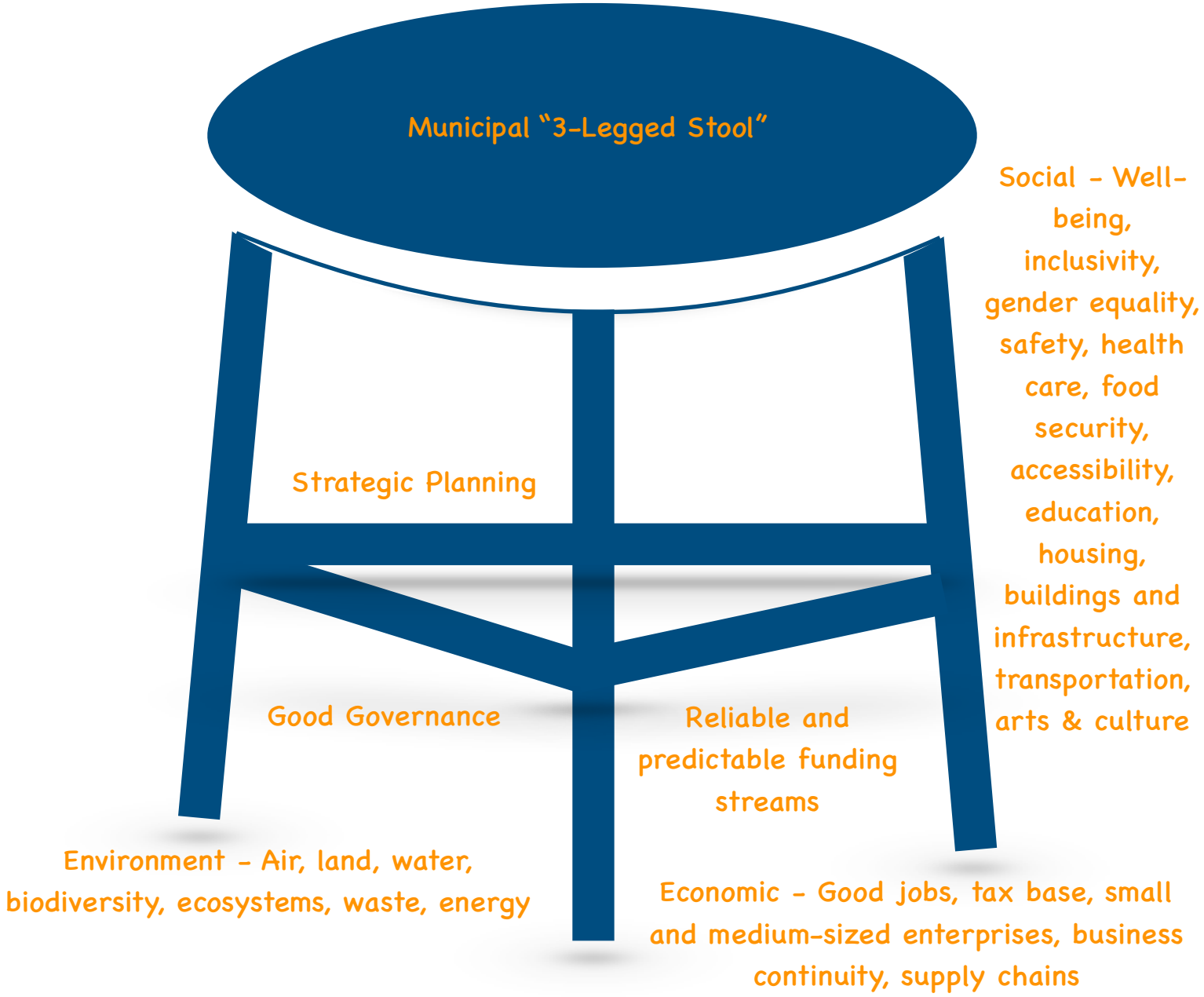
Direct Control
- Municipal infrastructure
- Day-to-day Operations

Direct Influence
- Land use planning
- Solid Waste Management

Little Influence
- Energy utilities
- Air travel

Municipal	Province & Territories	Federal
• By-laws • Land use planning • Size & type of buildings • Building energy consumption • Solid Waste Management • Water and sewer • Economic Development	• Municipal Act • Building codes • Health care • Education • Regulates utilities • Natural Resources • Can control efficiency of vehicles and equipment but often leaves to Federal government	• Constitutional responsibilities • Regulates some transportation - air & marine • Regulates pollutants including greenhouse gas emissions • Influence over building codes

APPENDIX B: SUSTAINABILITY



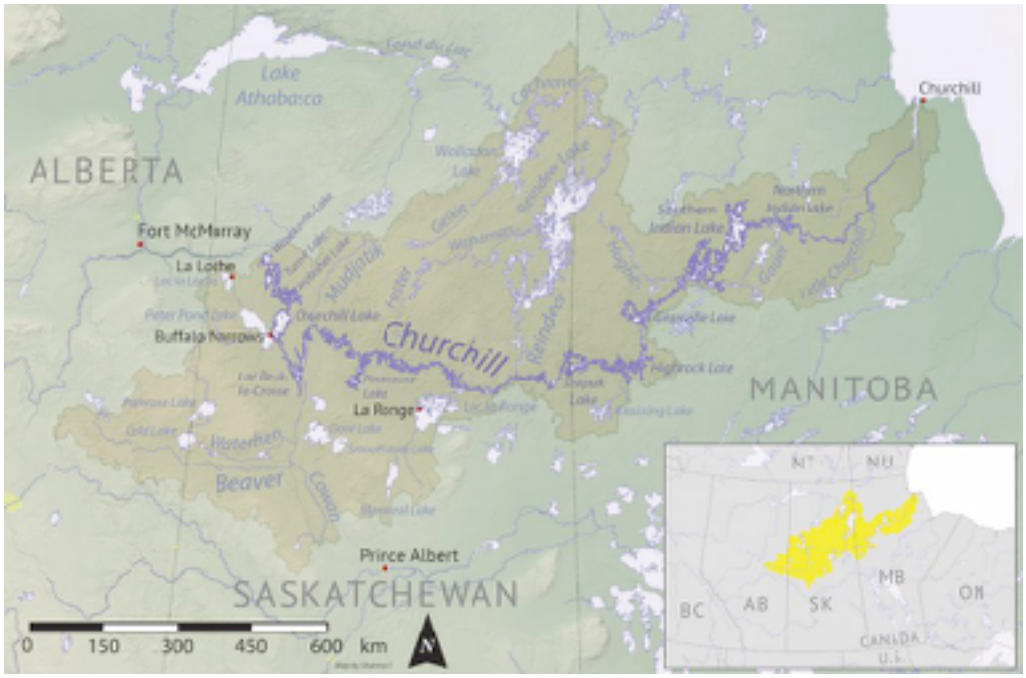
The 1987 Report of the Brundtland Commission, Our Common Future, defined sustainable development as, "meeting the needs of the present generation without compromising the ability of future generations to meet their own needs." The 3-legged stool model is typically used to illustrate the common three dimensions of sustainability: economic, environmental, and social. The 3-legged stool metaphor reinforces that society is unstable if one of the legs is weak. The downside of this metaphor is that the legs look separate and equal when in reality we know this isn't necessarily accurate.

APPENDIX C: CHURCHILL WATERSHED

The 1609 km Churchill River flows from the glacial fed Churchill Lake and discharges into the Hudson Bay. The name comes from John Churchill, first Duke of Marlborough and governor of the Hudson's Bay Company from 1685 to 1691. It was applied to the river as early as 1686; the Cree called it Missinipi, meaning "big river."

Glaciers on top of mountains seem worlds away from the flat tundra. Lake Churchill where the Churchill River originates in fed by water frozen in glaciers at the tops of mountains. These “water towers” have a huge effect on communities downstream from them. Like permafrost, glaciers are part of the cryosphere (frozen water on Earth).

We currently do not know how freshwater entering the Hudson Bay from increased river runoff will affect the bay aside from acidification effects. As the bay changes it is also unknown how it will affect weather and climate within bayline communities and lower latitudes.



A map of the Churchill River (Hudson Bay) drainage basin. Data derived from NASA SRTM, Natural Resources Canada, US Geological Survey, Natural Earth. Public domain

APPENDIX D: CRD

The Churchill River Diversion (CRD) was completed in 1976 to increase water flow to generating stations on the Nelson River, and the Augmented Flow Program, which allowed Hydro to increase flows even further during certain times of year. According to Manitoba's Clean Environment Commission the CRD diverts over 80 per cent of water flowing in the Churchill River through the Rat and Burnwood rivers to the Nelson River, increasing that river's flow by 25 per cent. The original rate following the completion of the project was increased further in 1986 with the Augmented Flow Program. As a result of the diversion the municipalities water supply pump house needed to be relocated from CR20 to the present CR30 location farther upstream. This was done because the reduced flow due to the diversion meant salt water from high tides could inundate further upstream.

One result of the much-reduced flow of the Churchill has been the large-scale environmental impact. Ramping refers to the increasing or decreasing water flows, ramping rates have an impact on fish locally. In the late 1990s, a 3,700-metre rockfill weir and associated fish passage and marina facilities was constructed across the river channel between Mosquito Point and Drachm Point some 13 km from the river's mouth. This was done to raise the water level of a section of the river below Southern Indian Lake to increase water levels for the benefit of recreational boating and fishing.

APPENDIX E: CMO

Led by the University of Manitoba, the Churchill Marine Observatory (CMO) is a unique, highly innovative and multidisciplinary research facility located in Churchill, adjacent to Canada's only arctic deep-water port. The CMO is dedicated to studies on the detection, impact and mitigation of spills of oil and related contaminants in sea ice-covered waters, as well as extreme weather, climate change, and fresh-water marine coupling studies. The development of the CMO is funded by the Canada Foundation for Innovation (CFI) and the Provinces of Manitoba and Alberta, and several federal and private partners.

The CMO has 3 science priorities:

- Oil and other transportation related contaminant spills in sea ice
- Climate change, extreme weather and teleconnections
- Freshwater-marine coupling

The core CMO infrastructure is comprised of:

1. The Ocean-Sea Ice Mesocosm (OSIM),
2. The Environmental Observing (EO) system and the Research Vessel William Kennedy is a 65-foot former fishing vessel that has been retrofitted for Arctic science expeditions.

THE CHURCHILL MARINE OBSERVATORY (CMO), CENTRE FOR EARTH OBSERVATION SCIENCE (CEOS)

APPENDIX F: CNSC

Founded in 1976, the Churchill Northern Studies Centre (CNSC) is an independent, non-profit field station focused on research and education in the subarctic and is located 23 km east of the town of Churchill, Manitoba. Their LEED Silver facility hosts scientific and social researchers working on a diverse range of topics of interest in the North. The CNSC is located on the site of the former Churchill Rocket Research Range.

The CNSC is able to grow fresh produce year round. CNSC has branded their “Rocket Greens” as Churchill's first locally grown produce. The produce grows in a hydroponic farm inside a repurposed shipping crate designed by Growcer Modular Food Solutions, an Iqaluit/ Ottawa company focused on northern food security.

Rocket Greens distributed 13,850 pieces of produce in the community (stores, subscription, hotels, lodges, food banks and donations) in 2018 and 15,996 pieces of produce in 2019. About 60% of what Rocket Greens distributes goes directly into households in the Launch Box subscription service and currently 44 households are subscribed.

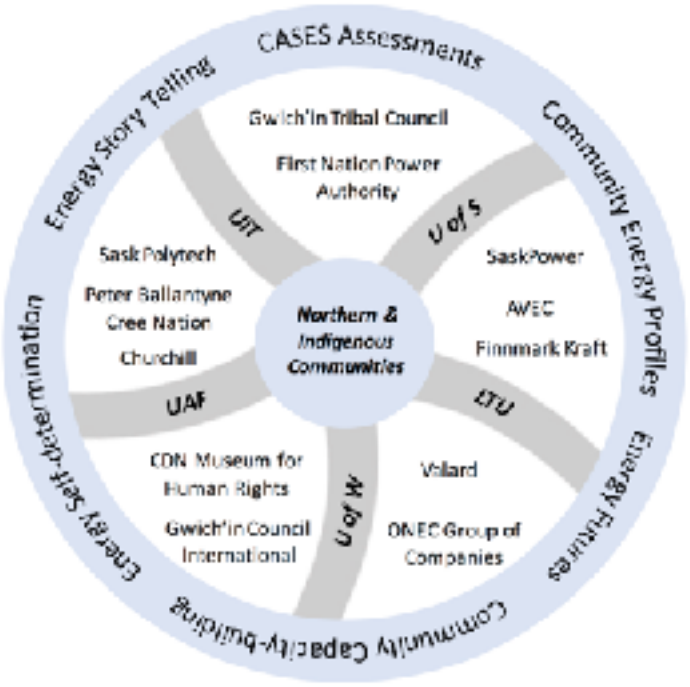
Hydroponic “Growcer” at Churchill Northern Studies Centre.

APPENDIX G: CASES

The Town of Churchill is part of the Community Appropriate Sustainable Energy Security (CASES) partnership, an international research initiative involving 15 northern and Indigenous communities and public and private sector project partners from Canada, Alaska, Sweden, and Norway.

CASES Objectives

i. Co-develop and apply tools for assessing, understanding, and enhancing the social and economic value of renewable energy in northern and Indigenous communities.
ii. Determine the necessary and sufficient conditions, including common challenges and solutions, for successfully introducing renewables into the energy mix of northern and Indigenous communities.
iii. Facilitate co-learning between partners and 'sister communities' to share knowledge and innovations that contribute to long-term sustainable energy security, through a network of model energy communities across the Circumpolar North.
iv. Create a northern Circumpolar knowledge sharing platform, comprised of model community energy plans, energy transition tool-kits, and stories from international experience for communities, utilities and researchers to network, exchange knowledge, and facilitate long-term capacity building.
v. Train a new generation of interdisciplinary researchers, policy makers, and practitioners to transform energy systems and promote sustainable energy patterns in northern and Indigenous communities.



APPENDIX H: PERMAFROSTNET

PermafrostNet is an NSERC funded research project to focus in permafrost thaw. PermafrostNet has $5.5 million in federal funding over 5 years. They are studying the railway to monitor and predict changes and identify hazards related to permafrost thaw. They have also agreed to study the Churchill landfill. PermafrostNet includes 40 partner organizations from across the Canadian north and consists of experts from 12 universities and collaborators from the private, public and non-profit sectors.

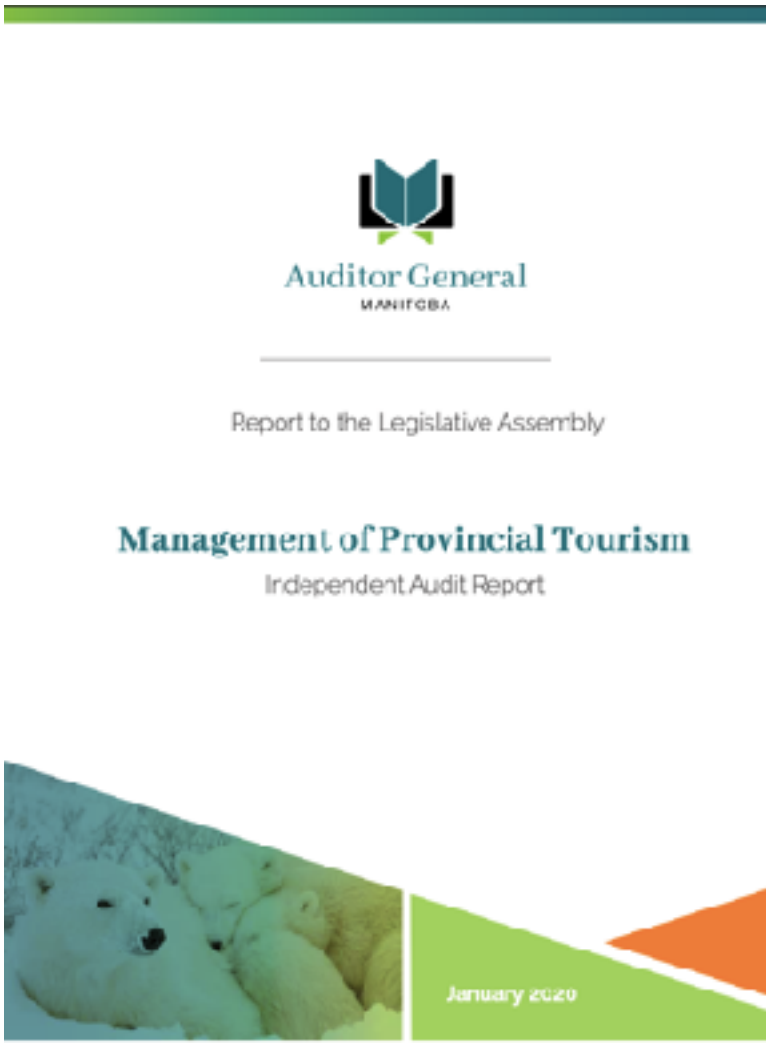
Poor surface drainage exists throughout much of the community, as much of Churchill is built on a thin layer of fill covering a wetland area. It may not provide adequate insulation to keep the underlying organic soils frozen. If underlying soils become unstable, subsidence may occur as the active layer of permafrost underlying the community thickens due to warmer temperatures and/or human disturbance.

Climate change makes the more stable esker sands and gravels and former beach gravels, the best building sites. A combination of permafrost hazard mapping and improvements to the overall drainage in the community would help prevent permafrost degradation.

APPENDIX I: TOURISM

A recent report by the Auditor General of Manitoba, Norm Ricard titled "Management of Provincial Tourism" found that risks that could affect tourism were not fully considered. The report showed that while tourism business plans identified risks and ranked them as either high, medium, or low risks were only spanned over a 3-year period. There were no discussions of how these risks would be mitigated. The Auditor General Report has recommended that Travel Manitoba conduct a risk assessment for all tourism strategies, including short, medium, and long-term risks, and identify measures to mitigate significant risks.

An example of a risk that is not fully considered is that of the external environment. Churchill is one of the main drivers of tourism to Manitoba and a centerpiece of Travel Manitoba's marketing. The loss of the polar bear's environment due to climate change would have a significant impact on tourism. Yet, the plan identifies climate change as a low risk to tourism.



APPENDIX J: FOOD SECURITY

The clinical phrase for hunger is “food security.” People experiencing food insecurity can also face malnutrition if they are unable to afford nutritious foods and exposes them to a self-reinforcing cycle of health consequences such as diabetes and obesity.

The North West Company along with Arctic Buying Company were some of the voices that called on the federal government to consider Churchill an isolated community and eligible for the Nutrition North food subsidy due to the loss of the rail in 2017. The North West Company, which operates a Northern Store in Churchill, had to increase plane shipments of food to the small northern town from once to twice a week, the cost being about three times more to ship food by air than by train. Nutrition North is a Government of Canada subsidy program to provide Northerners in isolated communities with improved access to perishable nutritious food.

After the rail line was repaired and the train started resuming service to the community, Churchill was no longer eligible for Nutrition North Canada. Churchill currently falls under Manitoba's food subsidy program called AFFIRM (which stands for Affordable Food in Remote Manitoba) that provides a subsidy to some food in communities not eligible for Nutrition North.

Churchill, Manitoba to benefit from new funding to help make food affordable and grow the economy

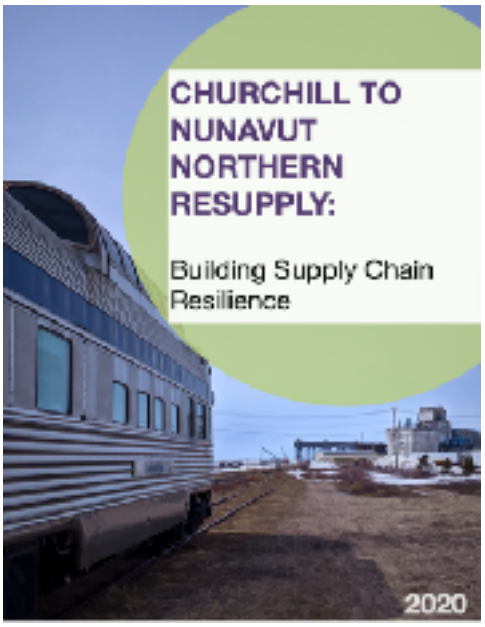
News Release

APPENDIX K: ARCTIC GATEWAY

The Arctic Gateway Group (AGG), a public-private consortium acquired the Hudson Bay Railroad (HBR) and Port of Churchill on August 31st, 2018 and currently employs 183 people including 66 in Churchill.

AGG is a Limited Partnership made up of Toronto-based Fairfax Financial, Saskatchewan-based AGT Foods and a consortium of 30 First Nations and 11 non-First Nations communities in northern Manitoba including Churchill, and seven Kivalliq communities in western Nunavut. The Hudson Bay Rail connects nearly 30,000 people from First Nations and other communities along the line, as well as the Kivalliq region of Nunavut through the use of arctic resupply.

The rail and port are typically framed as a nation-building project, but for the people that live in the region, these pieces of infrastructure allow them to connect with themselves. It is anticipated that the when this pandemic ends there will be a long and slow recovery. Before the pandemic, the north's economic future looked stable. Investment by AGG in transportation was creating jobs and contributing to Manitoba's economic growth. While it remains to be seen exactly what the post-COVID economy looks like, northern resupply will need to continue to aid in the north's economic recovery. By communities working to engage industry and their supply chain and vice versa, it is easier to pinpoint risks and vulnerabilities, identify opportunities, set and meet targets, reduce energy use and waste and be more resilient overall.



A resilient community is always working to address inequities and transforming the way things are done including integrating climate change adaptation and mitigation into day to day operations and strategic planning. A resilient community does not mean people's well-being in that community has to suffer or they have endure more disruptions to their livelihoods.

When municipalities have the tools to assess risk, prepare for risk, and respond to risk, they can build resilience at all levels of the community. At the macro-level, municipalities being better prepared for shocks; at the meso-level, businesses, critical supply chains, and critical infrastructure getting back into action more quickly; and at the micro-level, households, assets, and livelihoods being protected.

"Churchill will always survive due to the resilience of the population and the willingness to work together to make sure everyone is safe."

- Town of Churchill Councillor

Photo by: Trevor Donald