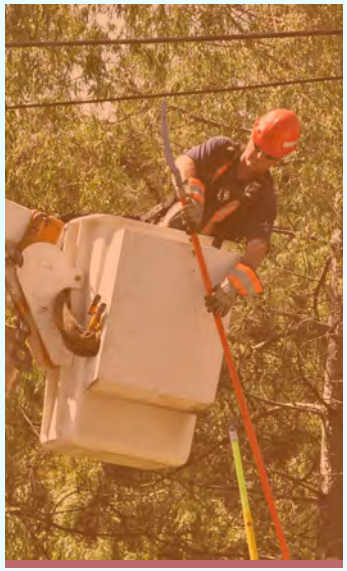
Healthy Climate, Healthy New Brunswickers

A proposal for New Brunswick that **cuts pollution and protects health**

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The Conservation Council of New Brunswick

Established in 1969, the Conservation Council of New Brunswick has remained the province's leading public advocate for environmental protection. A member of the UN's Global 500 Roll of Honour, we work to find practical solutions to help families and citizens, educators, governments and businesses protect the air we breathe, the water we drink, the precious marine ecosystem and the land, including the forest, that support us.

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Executive summary

This report summarizes existing research in a unique way to tell a story about how climate change can affect physical and mental health in New Brunswick. Making the link between climate change and health is important because most people do not realize that climate change affects the environmental and social determinants of health and can undermine provincial strategies to improve well-being. Damage from extreme weather events (e.g., flooding and ice storms) is already disrupting our lives, and harming our physical and mental health.

Slowing climate change requires drastic cuts in greenhouse gas emissions (also called carbon pollution), mostly from phasing out coal and oil to make electricity and gasoline for transportation. A clean electricity system – one that relies mostly on renewable sources such as hydro, solar, wind, and sustainable biofuels – will power zero-emitting transportation, homes, buildings, and industrial processes. At the same time, a clean energy system also cuts air quality pollution. The co-benefits of less air pollution are lower risk of cardiovascular disease, chronic and acute respiratory illnesses, lung cancer, and preterm births, according to the Canadian Association of Physicians for the Environment. A clean electricity system can improve indoor air quality, and help reduce energy poverty because energy bills can be lower in an energy-efficient home.

A more active lifestyle can reduce reliance on gasoline-powered vehicles and co-benefits can be improved mental health and well-being. We can increase food security by growing more food locally, reducing imports, all the while cutting carbon pollution from the trucks and planes used to move food products. We can change forestry and agriculture to increase conservation so plants, trees and soil absorb more carbon through photosynthesis. More green space in our communities can keep us cool on hot days, creates places for us to walk and play and improves our mental health and well-being.

New Brunswick Health Council community profiles show New Brunswick communities face physical and mental health challenges. Canadian Climate Atlas data suggest how climate change-induced changes can add to existing health challenges communities face, and can undermine health promotion strategies. It is important that climate change mitigation, adaptation and emergency preparedness planning consider social and physical and mental health if we are to take advantage of the co-benefits associated with climate protection.

New Brunswick needs to move quickly to address climate change risks and cut greenhouse gas pollution in line with science-based targets to protect our health.

We ask stakeholders interested in protecting New Brunswickers' health to encourage the provincial government to make physical and mental health protection and promotion a driving force behind climate change mitigation and adaptation planning and implementation.

Accelerating investments in clean electricity and transportation, active transportation and community greening can all reduce greenhouse gas emissions while advancing provincial objectives for well-being.

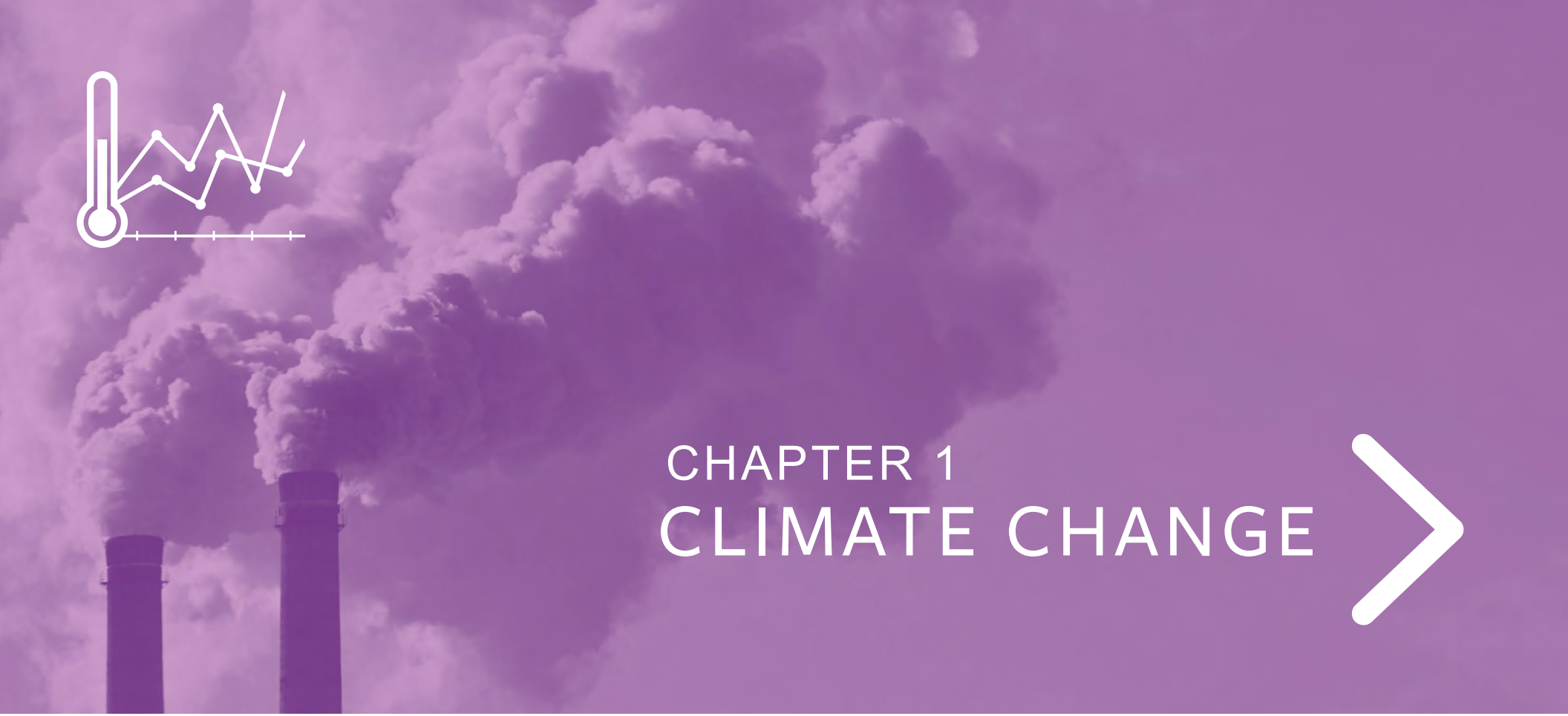
How are you feeling today? If you experienced spring flooding in 2018 and 2019, you might not feel as good as you do when spring gardening. If instead of gardening, you had to deal with mould, the loss of cherished possessions, or had to make decisions about whether to repair your home or move, you may feel anxious. Coping with extreme events like spring and winter flooding, ice and windstorms, and the power outages that go with these events, affects our physical and mental health. Acute, or extreme, events are becoming more intense because of human-caused climate change. Rising temperatures fueling these extreme events are also associated with chronic concerns like increasing exposure to ticks causing Lyme disease or ragweed worsening allergic reactions.

Making the link between climate change and physical and mental health is important because most people do not realize that climate change affects the environmental and social determinants of health and can undermine provincial strategies to improve well-being. A senior woman, for example, living alone on a low income, with one or more chronic health issues, and who has few social contacts is especially vulnerable to the mental and physical health effects of extreme events made worse by climate change. Hospital and community health-care workers, in turn, must accommodate these climate change-influenced cases, whether from flooding due to extreme rainfall and snowmelt, winter ice storms, increased cases of Lyme disease, or respiratory illnesses. Hospital administrators also must ensure their facilities operate during extreme events. Climate change has the potential to undermine provincial wellness and aging, as well as strategies aimed at protecting drinking water.

The goals of this report are first, to increase awareness in New Brunswick of the links between a changing climate and our physical and mental health and, second, to build stakeholder and government support for action to slow climate change and protect health. The Conservation Council of New Brunswick (CCNB) will pursue these goals by (1) sharing this report with our supporters, provincial stakeholders and government representatives; (2) hosting a workshop in Fredericton in June 2019; and (3) doing presentations and webinars based on its contents. CCNB will update this report and our recommendations to stakeholders and governments as we receive feedback and learn more about opportunities to protect New Brunswickers health from a changing climate.

The good news is that solving climate change in an integrated and coordinated way has many co-benefits that can make us healthier. A clean electricity and transportation system cuts greenhouse gases, as well as air quality pollution, which affects asthma and heart and lung health. Community design can increase active living, reduce reliance on personal vehicles, and add urban forest and gardening spaces. More active lifestyles and healthier diets lower carbon pollution and help improve mental health and well-being. We can respond to the climate change emergency while protecting and improving health. But getting there will take work.

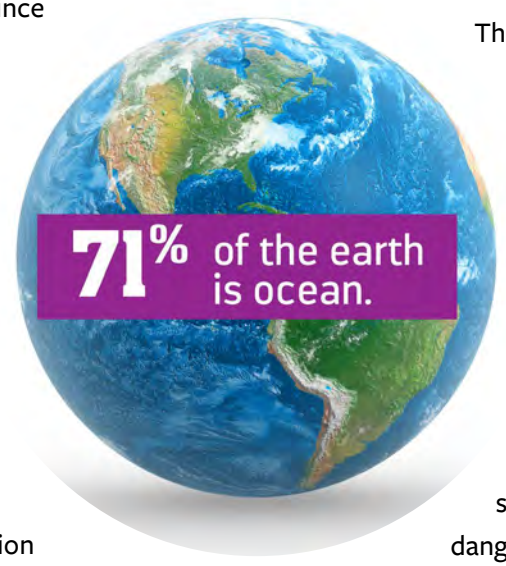
The structure of this report is as follows. We first introduce climate change and its potential health effects. We then summarize Canadian Climate Atlas temperature and precipitation projections for 16 New Brunswick communities. We then review New Brunswick community health profiles for these same communities. We close with conclusions and recommendations.



CHAPTER 1
CLIMATE CHANGE

The overwhelming consensus of the world's leading climate scientists is that human activities are raising the heat of the Earth's surface and that there is only a **one-in-a-million chance** that the signal would appear in the absence of human activity. This is because greenhouse gases that humans generate primarily from burning coal, oil, natural gas and gasoline have a special talent: they form **a blanket around the Earth** that traps heat. As the Earth gets hotter, we go from cozy to overheating. Unfortunately, when the thicker greenhouse gas blanket makes the Earth too hot, we cannot take it off.

The Government of New Brunswick reports that temperatures in our province have increased by 1.5°C relative to historical norms and seasonal temperatures have increased in all parts of the province. Most of this warming has occurred since the late 1970s. The level of warming in our province is similar to the average for the rest of Canada (1.7 degrees Celsius between 1948 and 2016) and it is a rate twice that of the global average.



Warmer air holds more moisture, meaning there can be more rain or snow when there is precipitation. All that heat is already increasing precipitation because **71 per cent of the Earth is ocean**. Scientists calculate that for every **one degree Celsius increase in temperature, the atmosphere can hold seven per cent more water.** That extra water increases the volume of precipitation by one to two per cent per degree of warming.

From 2000 to 2010, there were more extreme rainfall events (50 millimetres or more of rain over a 24-hour period) in Fredericton and Moncton than any other decade on record. Climate models project that New Brunswick will experience less frequent, but more intense, precipitation events, increasing the annual total precipitation throughout the province.

The increase in annual precipitation can take the form of more snow, increasing snow depth and adding to spring freshet worries and flood risk. It can take the form of more **winter rain-ice events** causing winter flooding and ice jams and ice-on-snow cover making walking dangerous, especially for seniors.

New Brunswick experienced **record-breaking floods in 2018 and 2019**, partly caused by an above average snowpack and rain partly due to a changing climate, but also by other factors such as **land-use, and housing development in flood plains**. It is getting hotter, wetter, extreme, and less safe because greenhouse gas levels are not where they need to be and **we are not changing the way we do things**.

We have about
10 years
to get climate change under control.

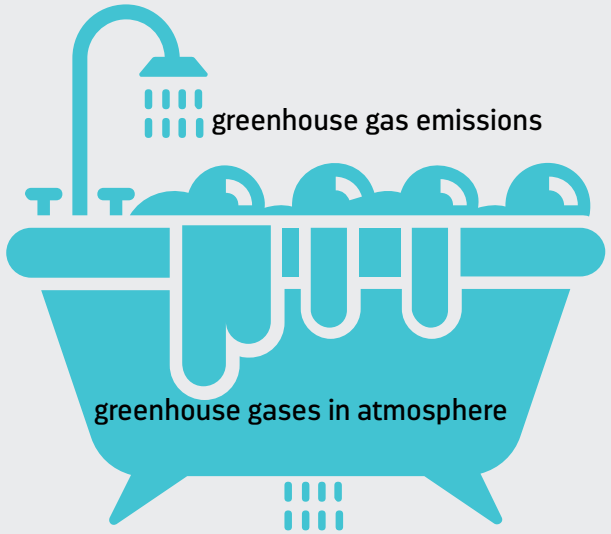
A recent special report by the Intergovernmental Panel on Climate Change (IPCC) says that if the world is to keep global average temperature increases to 1.5 degrees Celsius above pre-industrial levels that globally human-caused carbon dioxide emissions must be cut by at least **45 per cent below 2010 levels by 2030** and we need to be at **net-zero emissions by 2050**. At this level of average global warming, Canada can expect to warm by at least twice that rate on average and more in the North. To slow warming to manageable levels, the IPCC says that we have about **10 years to get climate change under control** if we are to have a chance to minimize its worst effects. **Why is this so?**

Each year, natural processes absorb about half the greenhouse gases humans emit; the other half stays in the air, adding to the total already there. Because greenhouse gases stay in the air for hundreds to thousands of years even if total emissions drop slightly, the total concentration in the air keeps growing. The only way to stop the total concentration of greenhouse gases in the air from growing is to shrink global emissions to less than half of today's levels, and then get to zero to bring the Earth's energy system back into balance.

Think of a bathtub with the taps fully turned on and water nearly overflowing. If you only turn the taps slightly to slow the water flow, the tub will still overflow. To stop the bathtub from overflowing, you have to turn the taps off, and to get the water level down, you will need to pull the plug. If you think of the atmosphere like a bathtub, we have to lower greenhouse gas pollution enough to slow or stop the flow (turning the taps off) and we have to increase the capacity of the Earth to absorb carbon, particularly through increasing green cover with forests and perennial plants (pulling the plug).

Figure 1.

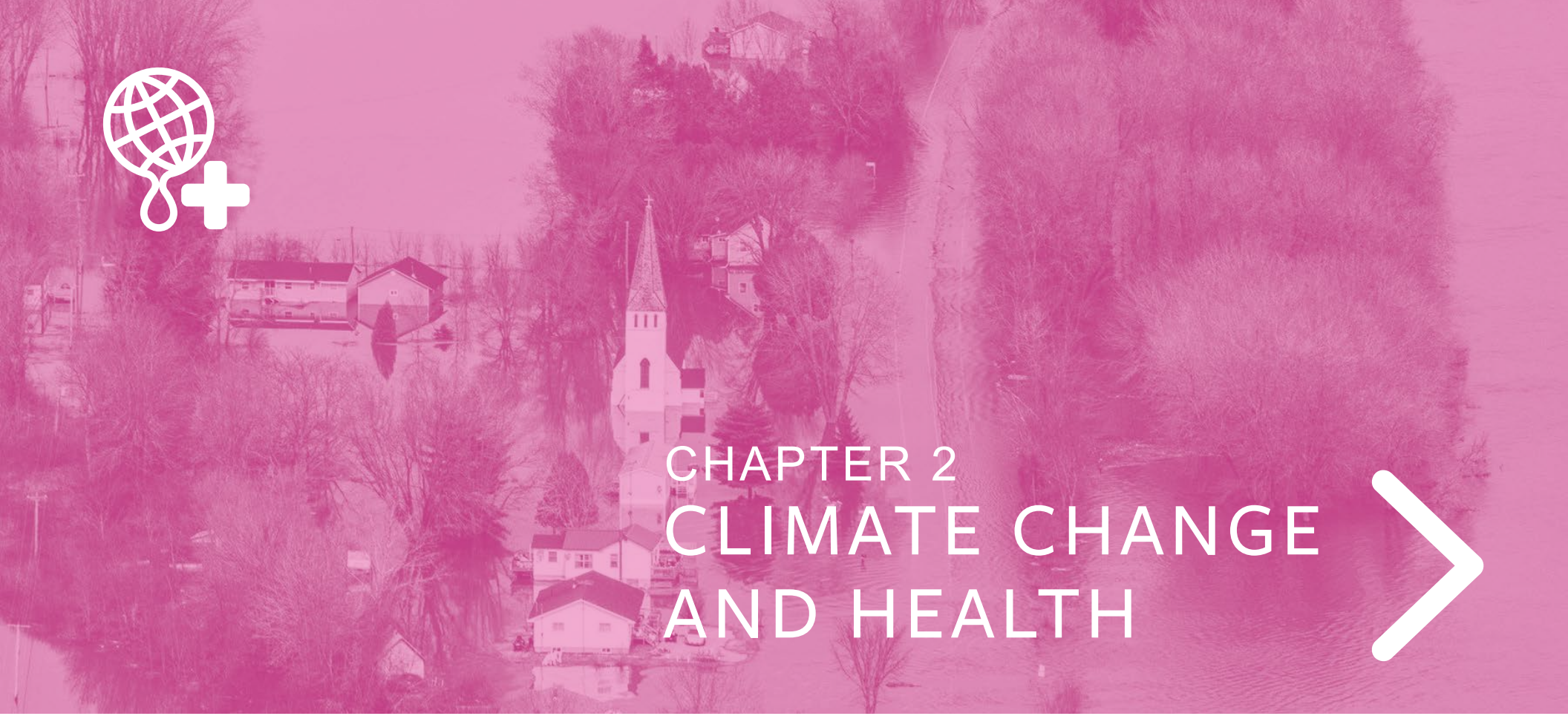
The Earth's atmosphere is like a bathtub holding too much water that can't escape



If we want to stop the bathtub from overflowing, we have to turn the taps off and pull the plug to lower the water level. We can think of the total amount of water a tub can hold before overflowing as a water budget. The same idea applies to the atmosphere. There is a total amount of greenhouse gases that the atmosphere can manage and keep temperatures safe. The global carbon budget is being used rapidly meaning we have to cut the emissions going into the air (turning off the taps) and we have to pull the plug to suck up more carbon (increase sinks).

The bathtub is like a household budget but for the atmosphere. We call it a global carbon budget. Canada's total contribution may look small, but when every tonne counts, we have an ethical duty to think about every tonne we emit, whether it is fair, and whether it is essential. The next decade will decide our fate.

New Brunswick needs a climate action plan with science-based emissions reduction targets, and actions that keep citizens safe and healthy. **Keeping New Brunswickers healthy requires that we understand how climate change affects health and how solutions protect health.**



CHAPTER 2
CLIMATE CHANGE AND HEALTH

Canadians are vulnerable to higher temperatures threatening the health of very young children and older people, as well as those with health problems. Ice and windstorms are knocking out power risking our safety in winter and our food supply in summer. Forest fires are worsening air quality and floods, sea level rise and storm surges are damaging our homes and displacing families, interrupting our lives and economy.

Climate change and health

Table 1 (page 10) summarizes some important health effects across Canada from a changing climate as reported recently by the Canadian Association of Physicians for the Environment (CAPE). Rising temperatures, extreme weather events and changes in precipitation increase the odds of experiencing smog, forest fires, droughts and dust storms, heat waves, heavy rainfall and flooding, and exposure to contaminated water, pollen and disease-carrying bugs such as ticks.

The climatic changes summarized in Table 1 affect health outcomes, including cardiovascular disease, respiratory conditions, allergic reactions (especially ragweed), heat stroke and exhaustion, cancer, traumatic injuries, vector-borne illnesses, food and water-borne illnesses, malnutrition, and mental health. Vulnerable populations – seniors, the very young, the isolated, people living on low income – are most at risk.

Table 2 reproduced from the 2019 CAPE report, shows why climate change is also a social justice issue. Inequities intersect and compound with a changing climate. We need to consider health inequity factors such as income and social status, food security, employment and working conditions, housing and homelessness, children and at-risk persons, Indigenous people, health status and access to health services, social support networks, and coping capacity and skills. Why is this the case?

If you are a senior or single mother living on low income, in an under-insulated home with no air conditioning, you are more at risk from extreme heat and extreme weather events. You might not have a vehicle to leave home, or you may have fewer social contacts to reach out to if the power goes out.

Research has shown that women are more vulnerable in extreme events, but also that women experience risk differently. Margaret Alston studied gendered responses to extreme events in Australia. She confirms what other researchers find, that women are more likely to want to leave property during a fire (or flood), while men want to stay and defend, and that violence against women increases after disasters.

Women and men also differ in post-event experiences. Alston finds that after wildfires in Australia, women kept busy serving community needs (like feeding people), while men struggled to find roles given services provided by emergency services, factors that can affect mental health and recovery. Other researchers find that in response to flooding women worry about household losses, while men worry about infrastructure losses. These gendered psychosocial differences in vulnerabilities, responses and concerns need to factor into climate-change-adaptation programs and emergency response.

Table 1.	Climate-related health impacts and causal pathways of relevance in Canada		
Health Outcome	Hazard/Exposure	Environmental Effect	Climate Change Driver
Cardiovascular disease	Air pollutants	Formation of air pollutants Forest fires Droughts and dust storms	Rising temperatures Extreme weather events Changes in precipitation
	Extreme heat	Frequency and duration of heat waves	Rising temperatures Extreme weather events
Respiratory conditions	Air pollutants	Formation of air pollutants Forest fires Droughts and dust storms	Rising temperatures Extreme weather events Changes in precipitation
	Extreme heat	Heat waves – hot days & warm nights	Rising temperatures Extreme weather events
Allergic reactions	Pollen & spores	Longer growing season	Rising temperatures
	Mould	Heavy rainfall & flooding	Extreme weather events
Heat stroke/exhaustion	Extreme heat	Frequency and duration of heat waves	Rising temperatures Extreme weather events
Cancer	Air pollutants	Formation of air pollutants	Rising temperatures
	UV radiation	Ozone layer depletion Longer summer season	Temperature-related changes Rising temperatures
Traumatic injuries	Physical trauma, dangerous travel, drowning, violence	Floods, forest fires, tornadoes, hurricanes, storm surges, winter	Extreme weather events
Vector-borne diseases	Infected mosquitoes, ticks and rodents	Expanding habitat conducive to disease vectors Conditions for vector propagation	Rising temperatures Extreme weather events Changes in precipitation
Food-borne illness	Food-borne pathogens/toxins	Contaminated food/flood waters Conditions for bacterial growth	Extreme weather events Rising temperatures
Water-borne illness	Water-borne pathogens/toxins	Contaminated water sources Conditions for bacterial growth	Extreme weather events Changes in precipitation
Malnutrition	Food insecurity Water shortages	Drought, crop loss, biodiversity loss Floods	Rising temperatures Extreme weather events
Mental health stress & anxiety	Population displacement Multiple stressors Climate-induced stress	Floods, forest fires, hurricanes/tornadoes, droughts, heat waves Prolonged and repeated climate-related events Catastrophic events	Rising temperatures Extreme weather events Sea level rise Changes in precipitation
Socio-economic impacts	Social disruptions Loss of incomes and culture Quality of life	Floods, forest fires, hurricanes/tornadoes, droughts, heat waves Prolonged climate-related events Catastrophic events	Rising temperatures Extreme weather events

Source: Perrota, K. (2019). *Climate Change Toolkit for Health Professionals, p. 2. Retrieved from: https://cape.ca/campaigns/climate-health-policy/climate-change-toolkit-for-health-professionals/*

TABLE 2	Health equity: Populations most at risk from the health effects of a changing climate
Health inequity	Examples of climate-related inequity multipliers
Income and social status	Risk from extreme heat, air pollution, UV exposure and extreme weather events Limited financial resources/ability to take adequate protective action (e.g., seek shade, access cool spaces, afford air conditioning, make needed repairs to housing, and avoid sources of air pollution, such as high-traffic corridors
Food security	Risk of food insecurity due to extreme weather events such as droughts, heavy rainfall and flooding that damage or destroy food crops, leading to increased cost of healthy foods
Employment and working conditions	Exposure to extreme heat, air pollution, UB radiation and extreme weather events for outdoor workers (e.g., agriculture, forestry, landscaping/snow management, utility workers, construction, fire fighters and other first responders)
Housing and homelessness	Risk from extreme heat and extreme cold for people who are homeless or living in housing with inadequate heating or cooling Risk of damage from flooding and storms if living in home in need of major repair or living in flood-prone areas Risk of poor indoor and outdoor air quality if living close to sources of air pollution
Children and persons	Sensitivity to extreme heat, air pollution Risk from extreme weather events due to lower mobility and higher reliance on care-givers Risk from mental health following disasters and extreme weather events
Indigenous people	Existing inequities (e.g., access to traditional cultural practices, access to safe water, access to health care) Risk food insecurity due to general warming and lower availability/access to traditional food sources
Health status	Risk from extreme heat, air pollution, infectious diseases and extreme weather events for persons who are immunocompromised or living with chronic diseases or disabilities
Access to health services	Risk for northern, remote and low-income communities that currently experience inequities in terms of access to health care Risk from extreme weather events as health, community and social supports may be disrupted by evacuations, population displacement and damage to critical infrastructure (e.g., hospitals, water, wastewater and transportation systems)
Social support networks	Persons who are marginalized or socially isolated are more vulnerable to extreme heat and extreme weather events
Personal behaviours & coping skills	Risk from extreme weather events, extreme heat and climate variability and change While the general population is vulnerable to climate-related stress and distress, risks are amplified for persons with existing mental health conditions

Source: Perrota, K. (2019). *Climate Change Toolkit for Health Professionals,* p. 17. Retrieved from: https://cape.ca/campaigns/climate-health-policy/climate-change-toolkit-for-health-professionals/

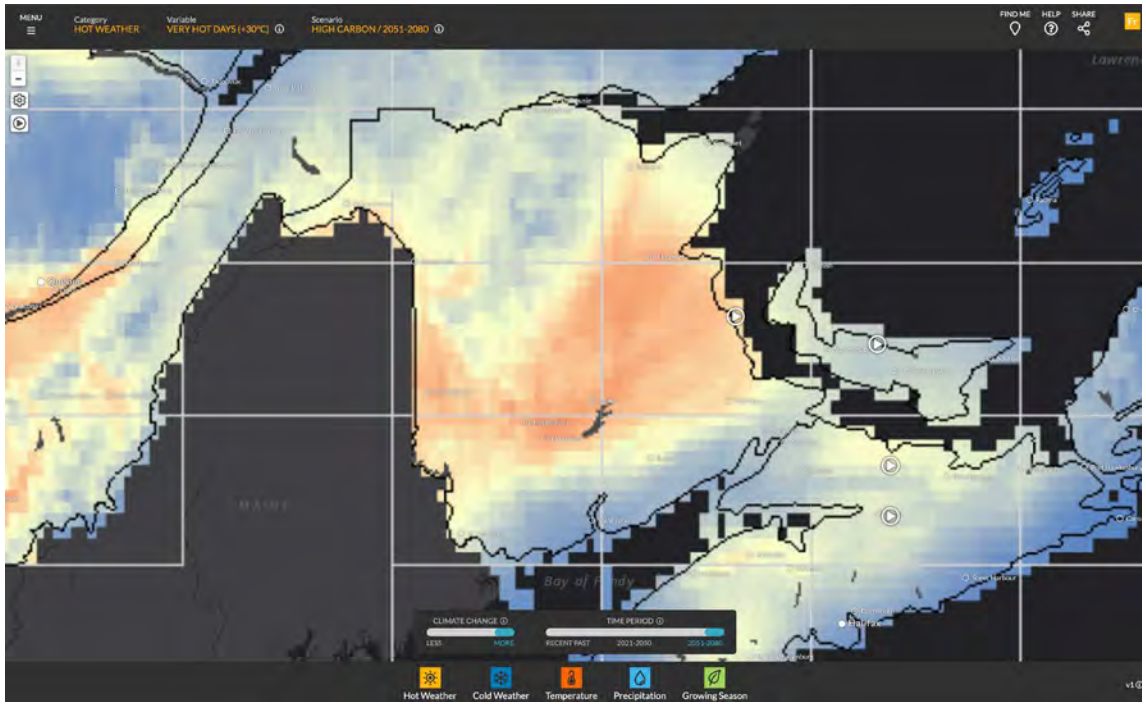
CHAPTER 3

CLIMATE CHANGE & HEALTH: THE NEW BRUNSWICK STORY

New Brunswick clearly is not immune to the health risks associated with a changing climate. Damage from extreme weather events (e.g., flooding and ice storms) is already disrupting our lives, harming our physical and mental health as demonstrated so clearly in the 2018 and 2019 St. John River floods.

Climate change and health: The New Brunswick story

To get a clearer picture of these risks, we use information from the Prairie Climate Centre where Canadian researchers use average outputs from 24 different global climate models (obtained from the Pacific Climate Impacts Consortium) to assess future climate based on expectations for global emissions and atmospheric concentrations of greenhouse gases. The Prairie Climate Centre has used these modeling outputs, and advanced statistical techniques, to create high-resolution (daily, 10 x 10-km grid point usually including the airport) versions of the data for all of Canada. This downscaled data, available through the Canadian Climate Atlas, can apply to the community area similar to the boundaries used in the New Brunswick Health Canada profiles we discuss later in this report.



Canadian Climate Atlas map of New Brunswick, 2051-2080 projections.

The Atlas shows 2021 to 2050 (immediate-to-medium term) projections for average temperature, hot days, growing season, and precipitation for Canadian communities, including 16 New Brunswick communities. The models generate projections based on assumptions for global high-and low-growth greenhouse gas emissions scenarios. A high-emission scenario is business as usual, meaning it assumes no new actions to cut global greenhouse gas pollution beyond current levels. A low-emission scenario assumes action to cut global greenhouse gas emissions are much stronger than today.

The Conservation Council averages results for the 2021 to 2050 high-and-low emissions scenarios to show projections for the Edmundston, Campbellton, Dalhousie, Bathurst, Caraquet, Miramichi, Moncton, Sackville, Sussex, Oromocto, Fredericton, Minto, Woodstock, Grand Falls, St. Stephen, and Saint John areas. **Tables 3 to 5** summarize the results for per cent increase in average annual and spring and winter temperature, number of days above 30 degrees Celsius, frost-free season, and precipitation, compared to the 1976 to 2005 mean.

Temperature

Temperature influences natural cycles, our lifestyles and our physical and mental health. Heat waves, for example, can cause death in the elderly or sick as seen in recent years in Europe, the United States and Québec. Researchers find increases in intimate partner violence and criminal activity during and right after heat waves.

Table 3 summarizes the 2021 to 2050 annual temperature projections for New Brunswick and for spring and winter. Across the province, average temperatures in the 16 communities reviewed could rise 1.9 to 2.1 degrees Celsius, with most of this warming in winter and spring. Two degrees Celsius may not seem like much warming, but it represents annual temperature increases of **68 per cent increase in Campbellton, 67 per cent in Dalhousie, 58 per cent in Grand Falls and 32 per cent in Saint John**. These projected temperature increases are in addition to warming already experienced.

Seasonally, modeling projections show spring temperatures increase 44 per cent above the 1976 to 2005 mean in Saint John for the 2021 to 2050 period, and 117 per cent in Edmundston. The trend reverses in winter with Edmundston temperatures increasing **23 per cent from 2021 to 2050**, and **40 per cent in Saint John**. The increase in summer temperature in **Saint John is 11 per cent** and **21 per cent in fall**. In Edmundston, summers could be **12 per cent warmer**, and fall could be **39 per cent warmer**, compared to the 1976 to 2005 mean.

3 Projected mean annual temperature (°C) annual, spring, winter

New Brunswick Community	Mean annual °C 1976 – 2005	Mean °C 2021 - 2050	Annual °C Increase	Annual % Increase	Spring change (1976 – 2005 mean)	Winter change (1976 – 2005 mean)
Edmundston area	3.1	5.2	2.1	68%	3.9 (1.8)	-8.7 (-11.3)
Campbellton area	3	5	2	67%	3.6 (1.6)	-8.6 (-11.1)
Dalhousie area	3.9	6	2.1	54%	4.2 (2.3)	-7.4 (-9.9)
Bathurst area	4.6	6.7	2	46%	4.6 (2.6)	-6.1 (-8.6)
Caraquet area	4.7	6.7	2	43%	4.2 (2.3)	-5.6 (-8.1)
Miramichi area	5	7	2	40%	5.2 (3.2)	-6 (-8.4)
Moncton	5.9	7.8	1.9	32%	5.8 (3.9)	-4.3 (-6.6)
Sackville area	6	7.9	1.9	32%	7.9 (3.8)	-3.5 (-5.8)
Sussex area	5.8	7.8	2	34%	6.1 (4.2)	-4.4 (-6.6)
Oromocto area	6	7.9	1.9	32%	6.5 (4.6)	-5 (-7.3)
Fredericton	5.6	7.6	2	36%	6.2 (5.6)	-5.5 (-7.8)
Minto area	5.6	7.5	1.9	34%	6 (4)	-5.4 (-7.7)
Woodstock area	4.3	6.3	2	37%	5 (3)	-7.1 (-9.5)
Grand Falls area	4	6.1	2.1	53%	5 (2.9)	-7.9 (-10.4)
St. Stephen area	6.1	8	2.1	31%	6.5 (4.6)	-4 (-6.1)
Saint John area	6	7.9	1.9	32%	6.2 (4.3)	-3.2 (-5.3)

Source: Averaged for high-and-low-emissions scenarios by CCNB using Canadian Climate Atlas data.

Spring warming, if combined with more intense spring rainfall and projected increases in winter precipitation in northern New Brunswick **(Table 4)** increases the risk of extreme flooding throughout the St. John watershed, especially when combined with land-use changes (e.g., agriculture, forestry, and urban development increasing open spaces and runoff, and poor planning allowing people to develop land in flood plains). We discuss flooding in the section on precipitation. For the remainder of this section, we discuss projections for hot days and frost-free season.

Table 4 shows per cent increase in the number of days per year above 30 degrees Celsius. New Brunswick can normally expect a few of these kind of hot days every year, with Miramichi averaging nine days a year to a low of one in Saint John (1976 - 2005 average). Northern communities average three to four days a year, while Oromocto, Fredericton and Minto average eight to nine days a year at 30 degrees Celsius or more. Sussex, St. Stephen and Sackville average one to four days per year. Models predict increases, ranging from 122 per cent increases in Miramichi to 300 per cent in Sackville for 2021 to 2050.

4 Projected increase in the number of 30°C+ days 2021 to 2050

New Brunswick Community	Mean # 30°C days 1976 - 2005	Mean # of 30°C+ days 2021 - 2050	% increase from 1976-2005 mean
Edmundston area	3	9	**200%**
Campbellton area	4	10	**150%**
Dalhousie area	4	11	**175%**
Bathurst area	6	14	**133%**
Caraquet area	3	9	**200%**
Miramichi area	9	20	**122%**
Moncton	6	16	**167%**
Sackville area	1	4	**300%**
Sussex area	4	12	**200%**
Oromocto area	9	21	**133%**
Fredericton	8	20	**150%**
Minto area	9	20	**122%**
Woodstock area	6	15	**150%**
Grand Falls area	5	13	**160%**
St. Stephen area	4	11	**175%**
Saint John area	1	3	**200%**

Source: Averaged for high-and-low-emissions scenarios by CCNB using Canadian Climate Atlas data.

The province's Heat Alert and Response System (HARS) has three alert levels based on three factors that characterize an extreme heat event: intensity, duration and night. **Table 5** summarizes these levels, with **Level 1** triggered when there is a humidex of 30 or greater with a nighttime low of 18 or greater for two days or more or a humidex of 36 or greater for two days. **Level 2** triggers when Level 1 conditions are met but the humidex exceeds 40 and **Level 3** triggers at a humidex of 45 or greater. As temperatures warm and we experience more hot days, we can expect to have more heat alerts affecting day-to-day life and health.

5 New Brunswick Heat Alert Response System (HARS)

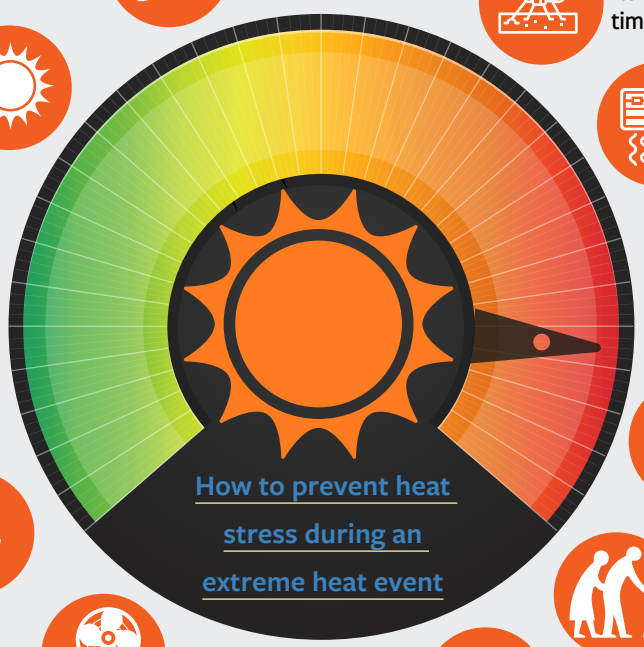
Level	Temperature Requirement	Description
	Humidex of **30 or greater** with a nighttime low of 18 or greater for two days or more **OR** a **humidex of 36 or greater for two days**.	**Certain vulnerable persons may be affected.** The main cause of illness and death during a heat wave is the aggravation of pre-existing respiratory and cardiovascular diseases.
	Level 1 criteria plus either of the two days reaches **humidex of 40-44**.	**Everyone is at increased risk of heat stress and heat stroke under the conditions.** People living alone without air conditioning are at high risk especially if the heat wave lasts many days.
	Level 1 criteria plus either of the two days reaches **humidex of 45 or greater**.	**Everyone is at high risk for heat related illnesses and heat stroke.** People living alone without air conditioning are at extreme risk.

Source: https://www2.gnb.ca/content/gnb/en/departments/ocmoh/healthy_environments/content/heat_related_illnesses/ResponseSystem.html

In just a few decades, Fredericton can expect **20 hot days a summer**, compared to the 1976 to 2005 mean of eight, a **150 per cent increase**. Bathurst will experience **14 hot days** a year by 2021 to 2050, compared to the 1976 to 2005 mean of six days. While scientists expect precipitation to increase overall, this precipitation could fall in fewer, but more intense events, with hot days indicative of drier summer conditions between events.

New Brunswickers are not used to hot days. One effect of living in a location with a cooler climate than other parts of Canada is lower use of air conditioners. About **40 per cent** of provincial households use a standalone or central air conditioner, according to Statistics Canada, compared to almost **80 per cent in Ontario** and Manitoba. Seniors, people in ill health, and especially if on lower incomes, may be less able to tolerate extreme heat, to own an air conditioner, or to live in areas surrounded by cooling green space. These kind of projected changes in the number of hot days increase the importance of New Brunswick's health alert system to manage heat risk.

HOW TO PREVENT HEAT STRESS



Wear light-coloured, loose-fitted and ventilated clothing. A ventilated, light-coloured, wide-brimmed hat is also recommended.

Spend a few hours in a cool place or in an air-conditioned location (mall, library, church, shaded park or at a pool). Make arrangements to spend time or sleep in a cooler place.

Plan outdoor activities for cooler parts of the day. Remember mosquitoes will also be active at those times. Protect yourself with insect repellent.

Avoid exposure to the sun. If sun exposure is unavoidable, protect yourself from sunburn by using a sunscreen with SPF of 15 or higher and apply it at least 30 minutes before a sun exposure.

Make arrangements to **move high-risk people** living in apartments with no air conditioning **to a cool location**.

Never leave people or pets in your care inside a parked car or in direct sunlight. Temperatures can rise to 52ºC (125ºF) within 20 minutes in an enclosed vehicle when the outside temperature is 33ºC (93ºF). Leaving the car windows slightly open will not keep the inside of the vehicle at a safe temperature.

Organizers of sporting events should modify the rules to accommodate **additional water breaks** or consider **rescheduling outdoor activities**.

Keep sun out with curtains or blinds. Keep windows closed if the temperature outside is higher than it is inside. If the temperature outside at night drops lower than it is inside, open the windows if it is safe to do so.

Drink plenty of fluids, especially water, before feeling thirsty. Beverages that contain alcohol are not recommended as they may cause the body to lose fluids and can interfere with the body's ability to cool itself.

Visit older family members, neighbours and friends, especially the chronically ill, to make sure they are cool and hydrated. Those living in an apartment with no air conditioning are at greater risk.

Avoid using the oven for cooking a meal.

Be aware that **fans alone may not provide enough cooling** when the temperature and humidity are high.

Take cool showers or baths. Splash cool water on your face and back of neck.

Source: https://www2.gnb.ca/content/gnb/en/departments/ocmoh/healthy_environments/content/heat_related_illnesses/IdentifyingPreventingHeatRelatedIllnesses.html

Frost-free days

Higher average temperatures, especially in spring and winter, increase the number of frost-free days per year as shown in **Table 6**. New Brunswickers can expect 19 to 22 more frost-free days a year from 2021 to 2050, compared to the 1976 to 2005 mean. Warmer temperatures increase the risk of exposure to ticks carrying Lyme disease and enhance climatic suitability for the expansion and establishment of other tick species and diseases.

2 Distribution of blacklegged tick risk areas in New Brunswick in 2017

Retrieved from: https://www2.gnb.ca/content/gnb/en/departments/ocmoh/cdc/content/vectorborne_andzoonotic/Tick-Borne_Diseases/brief.html

6 Projected average frost-free days 2021 – 2050

New Brunswick Community	Mean 1976-2005 days per year	Projected frost-free season (days) 2021 - 2050	# of additional frost-free days	Frost-free season % increase
Edmundston area	125	147	22	18%
Campbellton area	115	137	22	19%
Dalhousie area	135	158	23	17%
Bathurst area	146	166	20	14%
Caraquet area	156	175	19	12%
Miramichi area	140	161	21	15%
Moncton	146	167	21	14%
Sackville area	154	175	21	13%
Sussex area	142	163	21	15%
Oromocto area	145	166	21	14%
Fredericton	141	161	20	14%
Minto area	139	159	20	14%
Woodstock area	126	147	21	17%
Grand Falls area	128	150	22	17%
St. Stephen area	150	172	22	15%
Saint John area	163	182	19	12%

Source: Averaged for high-and-low-emissions scenarios by CCNB using Canadian Climate Atlas data.

Figure 2 shows the growing range for ticks in New Brunswick. Southern communities are already living with ticks and increased exposure to Lyme disease. In 2017, there were 29 confirmed cases of Lyme disease reported to New Brunswick Public Health, which is higher than the eight cases reported in 2016. Provincial public education programs are active relating to blacklegged ticks and Lyme disease (such as Be Tick Smart and Lyme NB).

TICK BITE PREVENTION

WHERE DO YOU FIND THEM?

Avoid areas where ticks live. Blacklegged ticks are usually found within and along the edges of wooded or forested areas, and in areas with woody shrubs and vegetation such as tall grasses. Walk in the middle of trails and avoid contact with tall grasses, woody shrubs, and leaf litter.

Use insect repellents containing DEET or Icaradin that are effective against ticks and approved by Health Canada. Repellents may be applied to clothing as well as exposed skin but should not be applied to skin underneath clothing. Always read and follow label directions. **Learn more about using insect repellents safely.**

Clothing treated with permethrin can repel ticks and gives protection through several washings. Do not use permethrin on skin.

Cover up to keep ticks off your body. Wear long socks, long pants, and long-sleeved shirts. Tuck pant legs into socks or boots and tuck shirts into pants to keep ticks on the outside of your clothing. Light-colored clothing will help you spot ticks more easily.

Make your yard less attractive to ticks. Remove leaves, clear brush, and tall grasses around your house and the edges of lawns. Keep the grass mowed, and place playground equipment, decks, and patios away from yard edges and trees and in a sunny location. For more information see the **Tick Management Handbook**.

CHECK FOR TICKS

Examine your clothing, outdoor gear, and pets and remove ticks before coming indoors.

Put dry outdoor clothes in a dryer on high heat for 10 minutes to kill any remaining ticks. If the clothes are damp, additional drying time is needed. If you need to wash your clothes, hot water is recommended. If the clothes cannot be washed in hot water, tumble dry on low heat for 90 minutes or high heat for 60 minutes.

Shower or bathe within two hours after being outdoors to help find ticks that are crawling on you and have not attached yet.

Check your whole body and your child's body after being outdoors and remove any ticks you find. Check the scalp and neck, in and around the ears, the back and under the arms, inside the belly button and around the waist, pelvic area and between the legs, and behind the knees. Blacklegged ticks are very small and difficult to see so look carefully. Use a mirror to view all parts of your body. A magnifying glass can help you spot ticks.

WHAT TO DO IF YOU ARE BIT

Remove any attached ticks immediately. Removing ticks within 24 hours after attachment (tick bite) usually prevents infection. Use fine-tipped tweezers or one of the many available tick removal devices. With tweezers grasp the tick's head as close to the skin surface as possible. Pull slowly upward with steady, even pressure. Do not twist or crush the tick. Wash the site of attachment with soap and water, or disinfect with alcohol or household antiseptic.

Try to save the tick that bit you in a sealed container and record the date of the bite. If you develop symptoms bring it to your medical appointment as it may help the doctor in their assessment of your illness. Avoid removals such as "painting" the tick with nail polish or petroleum jelly, or using heat to burn the tick.

Watch for early symptoms of Lyme disease or other tick-borne illnesses. Early symptoms may include fever, aches and pains (headache, fatigue, muscle pain, and/or joint pain), and rash (a characteristic skin rash called erythema migrans may occur with Lyme disease). Symptoms of Lyme disease may begin as soon as three days after a tick bite or can be as long as 30 days later.

See your family doctor if you develop a rash or have flu-like symptoms. Lyme disease is treatable with antibiotics and early treatment almost always results in full recovery.

Source: https://www2.gnb.ca/content/gnb/en/departments/ocmoh/cdc/content/vectorborne_andzoonotic/Tick-Borne_Diseases/how_to_be_protected.html

Precipitation

Average precipitation rates (1976 to 2005) for our 16 communities range from a low of **991 millimetres (mm) at Dalhousie** to a high of **1,243 mm at Saint John**. Models project a six to seven per cent increase in annual average precipitation for 2021 to 2050, compared to the 1976 to 2005 mean. **Table 7** also summarizes results for spring and winter, the two seasons where precipitation will increase most.

Projected annual spring precipitation could increase seven to nine per cent in the immediate to medium-term, with winter precipitation increasing eight to 11 per cent, and higher amounts expected in northern communities. In the longer term (to 2100), in a high-emissions scenario, annual precipitation increases throughout the province could double to 12 per cent from the six to seven per cent expected by 2050.

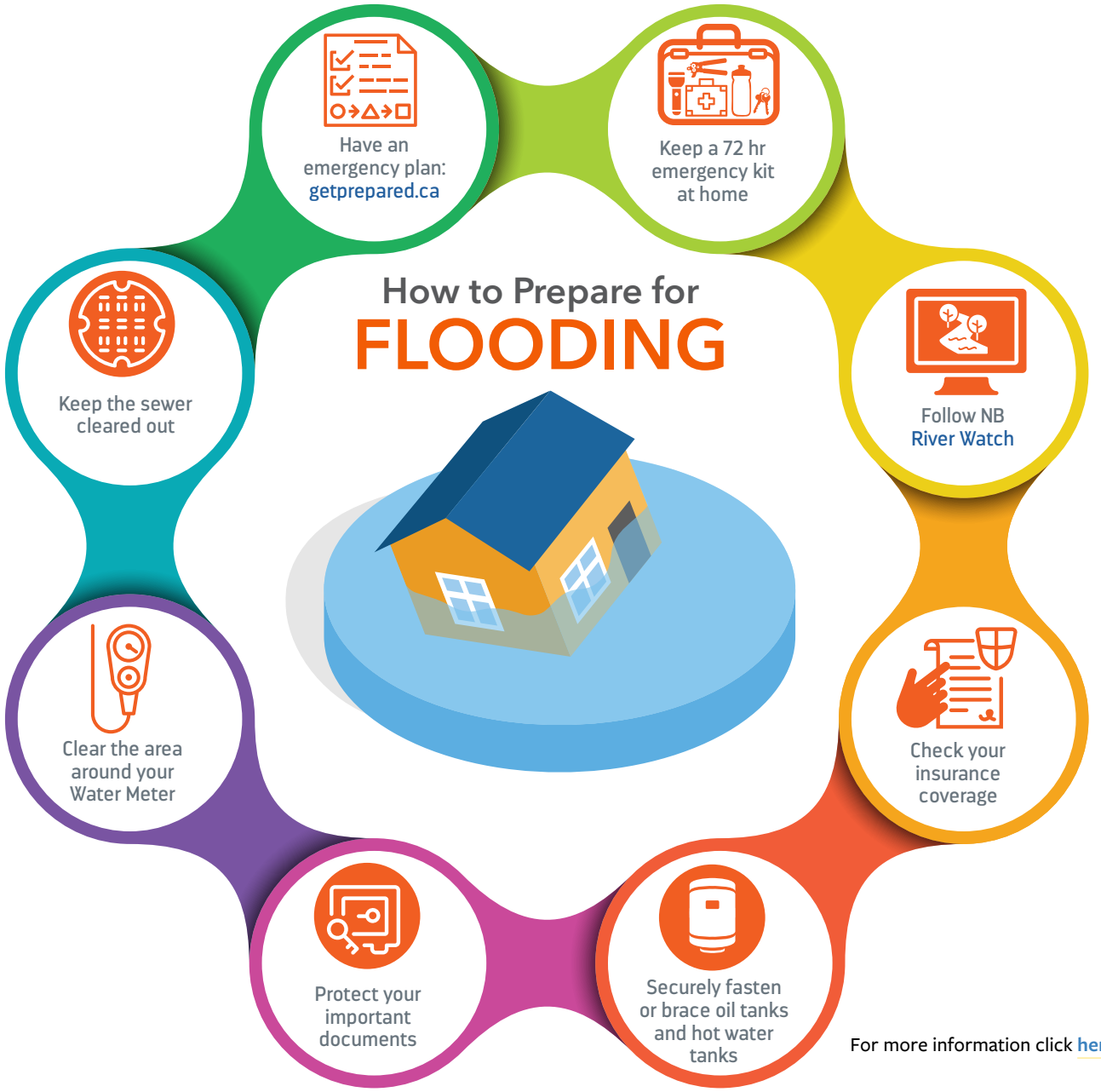
More snow and rain in winter in northern New Brunswick, combined with warmer temperatures in spring helps explain projections for greater flood risk during the spring freshet, similar to what New Brunswick has experienced in 2018 and 2019.

A recent Canadian Broadcasting Corporation (CBC) story cites University of Moncton hydrologist Nassir El-Jabi who estimates that in New Brunswick frequent but minor floods could see water levels increase **30 to 55 per cent by 2100** and extreme floods like those in 2018 and 2019 could be **21 per cent bigger by 2100.** Flooding damages our properties and homes, disrupts home and work life, which, in turn, causes stress and anxiety.

7 Projected increase in precipitation 2021 – 2050

New Brunswick Community	Mean mm 1976 - 2005	Mean mm 2021 - 2050	Annual mm Increase	Annual % Increase	Spring mm change (1976 – 2005 mean)	Winter mm change (1976 – 2005 mean)
Edmundston area	1021	1089	68	7%	247 (228)	257 (232)
Campbellton area	1070	1142	72	7%	260 (242)	277 (250)
Dalhousie area	991	1059	69	7%	238 (222)	257 (231)
Bathurst area	1026	1097	71	7%	265 (247)	285 (258)
Caraquet area	1028	1099	74	7%	259 (241)	292 (263)
Miramichi area	1052	1124	72	7%	276 (258)	293 (265)
Moncton	1117	1188	71	6%	300 (280)	327 (300)
Sackville area	1131	1198	67	6%	298 (276)	329 (303)
Sussex area	1163	1236	73	6%	301 (281)	345 (317)
Oromocto area	1103	1174	71	6%	284 (264)	314 (288)
Fredericton	1111	1182	71	6%	284 (265)	311 (285)
Minto area	1097	1168	73	6%	283 (264)	315 (288)
Woodstock area	1112	1185	73	7%	280 (261)	300 (273)
Grand Falls area	1048	1118	70	7%	250 (232)	271 (246)
St. Stephen area	1151	1218	67	6%	300 (281)	326 (302)
Saint John area	1243	1319	76	6%	322 (301)	372 (344)

Source: Averaged for high-and low-emissions scenarios by CCNB using Canadian Climate Atlas data.



For more information click here.

Source: www.fredericton.ca/en/safety-services/emergency-preparedness/flooding

Flood Protection Resources to Help Residents Reduce their Basement Flood Risk

One out of every six homes in New Brunswick is built in a flood-prone area.

Flood Protection Tips

Flood Protection Best Practices

- Three Steps to Basement Flood Protection Infographic
- Top Actions to Reduce Your Risk of Basement Flooding
- Estimated Cost Ranges for Completing Residential Flood Protection Projects
- Water-resistant Building Materials

Do-it-yourself Checklists

- Basement Flood Protection Checklist
- Seasonal Flood Protection Maintenance Checklist

Resource Links

- Self-Help Flood Protection Resources Inside and Outside the Home

Instructional Videos

- Three Practical Actions to Reduce Your Risk of Basement Flooding
- Introduction to Reducing Flood Risk
- How to Extend Downspouts
- How to Maintain a Sump Pump
- How to Maintain Backwater Valve
- Best Practices for Maintaining Your Backwater Valve
- How Flood Alarms Work

Reducing Mould Risk

Mould Risk Reduction Best Practices

- Guide for Understanding and Fixing Interior Moisture Problems in Housing
- Mold in Housing: Information for First Nation Occupants

Understanding Water Damage Insurance Coverages

Resource Links

- Questions to Ask your Insurance Provider
- Understanding Different Types of Water Damage Risks at Your Home – Infographic
- Self-Help Resources for Understanding Water Damage Insurance Coverages

Emergency Preparedness

Resource Links

- Emergency Flood Preparedness Resources
- Flood Barriers for Homeowners
- Get a Kit

Source: https://www.intactcentreclimateadaptation.ca/programs/home_flood_protect/resources/

Mental health effects

Mental health professionals are increasingly worried about the psychological effects of climate change. Climate change effects such as flooding and extended power outages can undermine well-being and cause ecoanxiety, a "chronic fear of environmental doom." The American Psychological Association (APA) assessment of the mental health effects of climate change (p. 69) summarizes research showing that following disasters, damage to social or community infrastructural components, such as food systems and medical services, results in many acute consequences for psychological well-being. In contrast, gradual impacts of climate change, such as changes in weather patterns and rising sea levels, will cause some of the most resounding chronic psychological consequences. Acute and chronic mental health effects include the following:

- Trauma and shock
- Post-traumatic stress disorder
- Compounded stress
- Strains on social relationships
- Depression
- Anxiety
- Suicide
- Substance abuse

Students in Fredericton, New Brunswick, participate in May 2019 School Strike for Climate.

- Aggression and violence
- Loss of personally-important places
- Loss of autonomy and control
- Loss of personal and occupational control
- Identity
- Feelings of helplessness, fear, fatalism, solastalgia (the lived experience of negatively perceived change to a home/community environment), and ecoanxiety

We know young children and adults are increasingly anxious about climate change as demonstrated by the global School Strike for Climate movement started by 16-year-old Greta Thunberg from Sweden. Studies show that women, in particular, experience ongoing anxiety and other mental health symptoms years after an event. At the same time, women are more willing to talk about their mental health, compared to men. Men also need support.

First responders are vulnerable to "post-traumatic stress syndrome, major depressive disorder, anxiety, depression, complicated grief, survivor guilt, vicarious trauma, recovery fatigue, substance abuse, and suicidal ideation." These events can also trigger "post-traumatic growth (altruism, compassion, optimism, sense of meaning and personal growth) in response to increasingly extreme weather events and effects," according to a recent research paper by Katie Hayes (p. 2, 3).

Hayes, a leading researcher focused on the mental health effects of climate change points out in her recent paper, that the mental health effects of climate change are accelerating, "resulting in a number of direct, indirect and overarching effects that disproportionately affect those who are most marginalized" (p.2).

The American Psychological Association researchers point out that a changing climate can also negatively affect community well-being through "loss of identity and cohesion, hostility, violence and interpersonal and intergroup aggression" (p.7). To strengthen psychosocial well-being, the APA researchers recommend helping individuals:

- Build belief in one's own resilience
- Foster optimism
- Cultivate active coping and self-regulation skills
- Maintain practices that help to provide a sense of meaning
- Promote connectedness to family, place, culture, and community (p.7)

Multiple challenges, multiple opportunities

Climate change does not travel alone. The physical and mental health effects due to climate change have greater risks for people dealing with existing social and health inequities. A person with asthma is more at risk from hotter days and more smog (ground-level ozone). Smog forms when air pollutants like sulphur dioxide and nitrogen oxide and fine particles from industry and cars combine in the presence of the sun and heat to form lung and heart-damaging smog.

New Brunswick generally has low levels of smog-related pollution. Communities like Saint John, Belledune and Edmundston, however, that house industrial operations (pulp and paper, coal-fired power, lead smelting, and oil refining), experience **close to maximum levels for fine particulate matter and higher levels of smog** (although at levels below the objective of not exceeding 63 parts per billion over an eight-hour period).

A person with asthma, or who is older, may be less able to manage health risks during a heat wave or smog event and may be less mobile during an extreme event such as flooding. The next section summarizes some of the existing social and health conditions in the 16 New Brunswick community areas we discuss through a climate change lens.

Saint John oil refinery

CHAPTER 4
COMMUNITY HEALTH PROFILES

The New Brunswick Health Council (NBHC) 2017 community profiles (based on administrative, census and volunteer survey information) provide an invaluable resource for understanding how climate change might interact with social and health challenges communities already face. In this section, we report on the incidence of low-income households, seniors, food insecurity, living alone, and quality of life and explore how climate change might exacerbate these issues.

The community areas covered by the New Brunswick Health Council profiles are:

- Edmundston, Riviére-Verte, Lac-Baker Area;
- Campbellton, Athoville, Tide Head Area;
- Dalhousie, Balmoral, Bellledune Area;
- Bathurst, Beresford, Petit-Rocher Area
- Caraquet, Pacquetville, Bertrand Area;
- Miramichi, Rogersvile, Blackville Area;
- Moncton;
- Sackville, Dorchester, Port Elgin Area;
- Sussex, Norton, Sussex Corner Area;
- Fredericton;
- Oromocto, Gagetown, Fredericton Junction Area;
- Minto, Chipman, Campbridge-Narrows, Fredericton Junction Area;
- Florenceville-Bristol, Woodstock, Wakefield Area;
- Grand Falls, Saint-Léonard, Drummond Area;
- Saint Andrews, Campobello Island Area; and
- Saint John, Simonds and Musquash.

For ease of reporting, we describe Edmundston, Riviére-Verte, Lac-Baker as the Edmundston area. As noted, the geographic boundaries for these community areas roughly align with the areas covered by climate change modeling grids (i.e., the 10 x 10-km grids are reasonable proxies for the community area).

8 Living in low-income households (%)

	All age groups	Child under 6 years old	Youth under 18 years old	Adults 18-64	Seniors (65+)
New Brunswick	17	23	21	15	20
Edmundston area	19	20	21	17	27
Campbellton area	24	46	37	20	27
Dalhousie area	26	48	33	23	30
Bathurst area	20	27	24	17	24
Caraquet area	23	41	30	18	33
Miramichi area	16	21	20	14	21
Moncton	17	22	21	16	14
Sackville area	18	27	18	18	18
Sussex area	15	26	20	12	19
Oromocto area	11	14	13	10	12
Fredericton	17	24	23	18	9
Minto area	21	38	26	19	24
Woodstock area	22	24	27	20	24
Grand Falls area	22	24	27	20	24
St. Stephen area	23	28	30	22	19
Saint John area	21	35	30	20	19

Source: Table compiled by CCNB using New Brunswick Health Council 2017 Community at a Glance data.

Based on the 2017 community health profiles by the NBHC, we see that the Campbellton, Dalhousie, Caraquet, Minto, Grand Falls, St. Stephen, and Saint John areas are well above the provincial average for young children and youth under 18 years-of-age and seniors living in low-income households **(Table 8)**. The Oromocto area is below average across all age segments.

Low-income households can also be at risk for moderate to severe food insecurity, especially if they lack the capacity to grow some of their own food, as can be the case in urban environments. St. Stephen (16%), Moncton (14%), Campbellton (13%), Woodstock (13%), Sackville (13%), and Saint John (11%) area communities are above the provincial average of nine per cent of households experiencing food insecurity. Fredericton and Oromocto areas have the lowest levels of household food insecurity at six per cent each (not shown in a separate table).

Local food self-sufficiency has potential benefits for food security, particularly if climate change disrupts global food production, and food imports to locations such as New Brunswick become more expensive. Higher costs for food, especially fruits and vegetables, is a concern given that the NBHC reports only about half of New Brunswickers eat five or more servings a day of fruit and vegetables.

Almost 20 per cent of the New Brunswick population is over 65 years old, three per cent higher than the national average in 2011. Northern communities exceed the provincial average at 22 to 24 per cent in Edmundston, Campbellton, Dalhousie, Bathurst, Caraquet and Miramichi areas. More seniors in the Edmundston and Saint John areas live alone than the provincial average of 24 per cent, while the Sussex, St. Stephen and Saint John areas have more senior women living alone than the provincial average of 31 per cent **(Table 9)**.

9 Seniors living alone

	Seniors, 65 years and over, as a proportion of the population (2011) %	Seniors living alone (2011) (%)	Female seniors living alone (2011) (%)
New Brunswick	19	24	31
Edmundston area	22	31	33
Campbellton area	24	26	34
Dalhousie area	24	25	32
Bathurst area	23	23	29
Caraquet area	23	24	28
Miramichi area	22	26	35
Moncton	18	26	34
Sackville area	18	22	28
Sussex area	18	27	37
Oromocto area	17	24	29
Fredericton	17	26	35
Minto area	17	27	35
Woodstock area	17	26	34
Grand Falls	22	25	32
St. Stephen area	18	28	36
Saint John area	18	29	37

Source: Table compiled by CCNB using New Brunswick Health Council 2017 Community at a Glance data.

Post-tropical storm Arthur in July 2014, followed by the January 2017 ice storm in the Acadian Peninsula, taught us some important lessons about the effects of extreme events on the isolated and the sick.

In Laméque, New Brunswick, door-to-door check-ins during the ice storm revealed disturbing levels of isolation for low-income people. Church leaders at the Notre-Dame-des-Flots responded by building a community kitchen and shower and laundry facilities, and creating free meals and counselling programs. These kinds of services are essential to creating connection and building community physical and mental health resiliency.

When asked in NBHC surveys about the state of their mental and physical health, two-thirds in the 16 community areas have a positive view of their mental health **(Table 10)**. Fredericton has the most positive view at 76 per cent. Older people, however, have less positive views of their physical health, with seniors in the Campbellton, Dalhousie, and Grand Falls areas well below the provincial average of 36 per cent for health, and Sussex and Fredericton above average.

The American Psychological Association mental health assessment describes some of the effects of extreme events, including post-traumatic stress syndrome, anxiety, and anger. Seana Creaser from the Fredericton Mental Health and Addiction Centre noted in a recent CBC interview that these kind of symptoms compound in people with pre-existing mental health issues.

10 Quality of life

	See their mental health as being very good or excellent (%): 18 to 64 years old	See their mental health as being very good or excellent (%): 65 years and over	See their health as being very good or excellent (%): 18 to 64 years old	See their health as being very good or excellent (%): 65 years and over
New Brunswick	67	60	54	36
Edmundston area	71	63	52	40
Campbellton area	70	60	53	28
Dalhousie area	61	55	38	28
Bathurst area	64	65	50	38
Caraquet area	63	62	53	38
Miramichi area	63	64	50	34
Moncton	64	63	58	35
Sackville area	68	64	54	40
Sussex area	69	61	57	44
Oromocto area	63	51	57	35
Fredericton	76	62	65	42
Minto area	55	54	40	33
Woodstock area	67	55	54	36
Grand Falls	61	63	45	27
St. Stephen area	63	64	53	36
Saint John area	68	57	52	34

Source: Table compiled by CCNB using New Brunswick Health Council 2017 Community at a Glance data.

A 2016 study of the health effects of floods in Canada makes the same point and notes:

> The health impacts from flooding range from mortality, drowning and other injuries to hypothermia, mental health impacts, deterioration of elderly/patients who required emergency transportation, homelessness and transmission of contagious diseases and others. The Canadian population includes a range of socio-economic levels, demographics and pre-existing illness. Additionally, many Canadians live and work in flood plains or on shorelines where floods are a hazard. There is, therefore, variable susceptibility to flood events in the population. Susceptibility to these health impacts can be buffered by the population's adaptive capacity and external support (*Burton, H., Rabito, F., Danielson, L., & Takaro, T. K. (2016)*.

New Brunswick Health Council profiles show communities throughout New Brunswick face health challenges, sometimes well above provincial averages, such as Campbellton and Dalhousie or Saint John. The province is working to address these health challenges through wellness and aging strategies, but climate change-induced changes can add to existing health challenges communities face, and can undermine health promotion strategies. Climate change mitigation, adaptation and emergency preparedness planning must consider social and health factors to be effective.

CHAPTER 6

HEALTH CO-BENEFITS OF CLIMATE ACTION

Slowing climate change requires drastic cuts in greenhouse gas emissions, mostly from phasing out coal and oil to make electricity and gasoline for transportation. A **clean electricity system** – one that relies mostly on renewable sources such as hydro, solar, wind, and sustainable biofuels – will power zero-emitting transportation, homes, buildings, and industrial processes.

Table 11 describes potential health co-benefits of climate action as summarized in the 2019 report by the Canadian Association of Physicians for the Environment (CAPE). According to the CAPE report, a clean energy system cuts air pollution, reducing the risk of cardiovascular disease, chronic and acute respiratory illnesses, lung cancer, and preterm births. It can improve indoor air quality, and help reduce energy poverty because we spend less money on energy. These are co-benefits of climate action.

Ontario already benefits from some of these co-benefits. Ontario is the first province to phase out coal from electricity generation. As a result, according to a 2017 **Pembina Institute report**, smog days declined from **53 in 2005 to zero in 2014**, while cutting greenhouse gas emissions by seven per cent.

A more active lifestyle can reduce reliance on gasoline-powered vehicles and increase physical activity, which in turn can help **reduce chronic diseases and mental health** issues associated with inactivity. More green space in our communities can keep us cool on hot days, create places for us to walk and play, and also improve our **mental health and well-being**.

The change required to solve climate change and reap the co-benefits will take work. We can take steps now to build momentum and to accelerate the shift to a clean energy system, more sustainable forest and agriculture management, and community development that reduces automobile dependency. We can address climate change while meeting objectives the province has set for improving wellness and aging.

TABLE 11 Health co-benefits of climate action: Highlights

Action	Benefits for climate	Benefits for health
Energy use and production ▪ Replacing fossil fuels with renewable energies ▪ Reduce the demand for energy through energy efficiency and other measures ▪ Improve energy efficiency in buildings	▪ Reduce emissions of carbon dioxide, black carbon, methane and other climate pollutants	▪ Improve air quality by reducing exposure to outdoor air pollution with a corresponding reduction in risk of cardiovascular disease, chronic and acute respiratory illnesses, lung cancer, and preterm birth ▪ Improve indoor environments to reduce energy poverty and respiratory and cardiovascular illnesses
Transportation ▪ Increase fuel efficiency ▪ Use alternative fuels ▪ Decrease the demand for motorized transportation ▪ Give higher priority to active transportation and walking environment	▪ Reduce emissions of climate pollutants by reducing vehicle travel and lowering emissions from vehicles	▪ Improve air quality with a corresponding reduction in health impacts (see above) ▪ Increase physical activity which reduces the risk of all-cause mortality, cardiovascular disease, obesity, type 11 diabetes, and certain types of cancer ▪ Fewer vehicle-related deaths and injuries from improved cycling and walking infrastructure
Buildings and communities ▪ Increase urban density and diversity of land uses ▪ Increase urban green spaces and forests	▪ Reduce emissions of climate pollutants by reducing vehicle travel and emissions from vehicles ▪ Reduce atmospheric carbon dioxide by sequestering carbon in plants and soil and reducing cooling needs	▪ Improve air quality by reducing vehicle travel ▪ Increase physical activity by fostering active travel ▪ Reduce ambient temperatures and heat island effect with green space ▪ Reduce noise pollution with increased green space ▪ Improve mental health with increased access to green space ▪ Improve water quality with increased green space
Food consumption ▪ Shift diets to emphasize foods of plant origin ▪ Reducing the amount of food that is wasted	▪ Lower carbon dioxide and methane emissions from energy-intensive livestock systems and less food waste	▪ Improve diets (less meat, more fruits and vegetables) which decreases risk of heart disease, stroke, colorectal cancer, diabetes and other diseases ▪ Improve food security ▪ Improve air quality by reducing methane emissions that contribute to ground-level ozone

Source: Perrota, K. (2019). *Climate Change Toolkit for Health Professionals, p. 2. Retrieved from: https://cape.ca/campaigns/climate-health-policy/climate-change-toolkit-for-health-professionals/*

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Our lives depend on energy. Industry needs electricity, oil and natural gas to make and ship products that consumers buy. We use electricity to heat and cool our homes, generate light so we can read bedtime stories to our children, and cook a special meal for our friends. Enjoying a hot shower or a cold drink at the end of the day depends on electricity or natural gas. Presently, we rely on gasoline and other liquid fuels to move cars, trucks, planes, trains and buses so we can ship products, get to work or school, or go on holidays. It is not an overstatement to say that our way of life depends on energy.

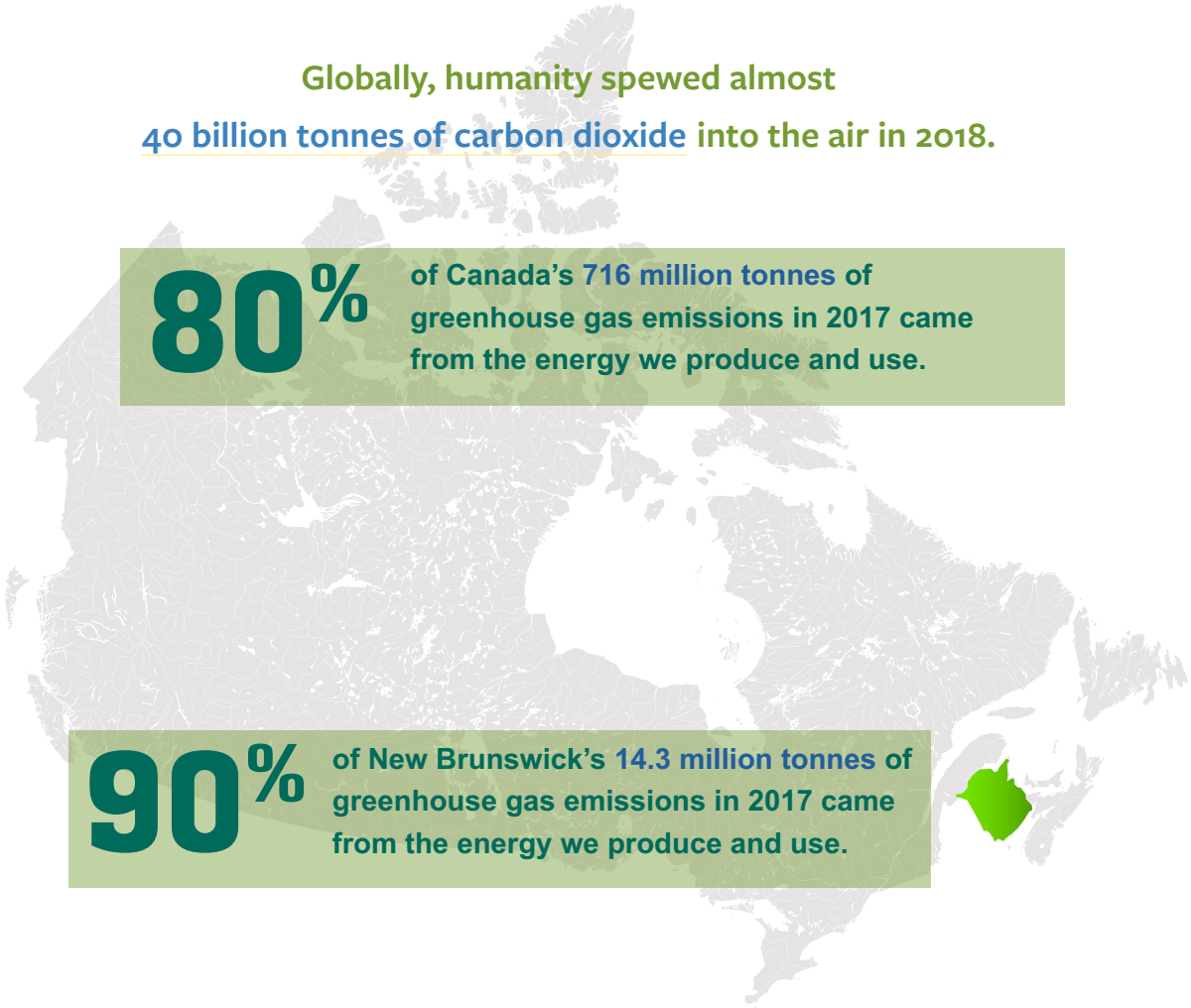
Unfortunately, there are unintended consequences from depending on these energy sources, as well as from how we manage forests, grow food, and build our communities. When we burn fossil fuels to generate energy, we also produce greenhouse gases that change the climate. When we cut forests for timber, pulp, fuel and other products and clear land for farms and communities, we also add greenhouse gases to the air. This is because through photosynthesis, trees and plants absorb carbon dioxide when they grow and release it when they die or are disturbed. Rotting food in landfills and using too much fertilizer also add to the problem by releasing greenhouse gases called methane and nitrous oxide. **Our way of life is heating up the planet and the changing climate is making weather extreme.**

Burning fossil fuels can also generate other pollution that worsens air (and water) quality. Small particles and volatile organic compounds that react in sunlight creates smog and can make rain more acidic. Special pollution control equipment placed on smoke stacks, and in cars, can reduce this kind of air pollution, and once this pollution is reduced air quality can quickly improve. End-of-pipe technologies on cars, however, cannot trap greenhouse gases like carbon dioxide. These gases stay in the air for hundreds of years.

Globally, humanity spewed almost 40 billion tonnes of carbon dioxide into the air in 2018.

80% of Canada's 716 million tonnes of greenhouse gas emissions in 2017 came from the energy we produce and use.

90% of New Brunswick's 14.3 million tonnes of greenhouse gas emissions in 2017 came from the energy we produce and use.



More than **80 per cent of Canada's 716 million tonnes of greenhouse gas emissions in 2017** came from the energy we produce and use, about the same percentage as globally. In New Brunswick in 2017, the proportion of our 14.3 million tonnes **of emissions from energy use was about 90 per cent.** The rest comes from changing the land, either by cutting trees to make products or to grow food. Some people say that Canada's, and New Brunswick's, contribution to climate change pollution is too small to matter in the total scheme of things.

After all, Canada's total emissions are less than two per cent of the global total. It is also true, however, that in 2017 Canada remains a top ten global emitter. We are one of the world's highest per capita emitters at 19.5 tonnes per person. New Brunswick is the fourth highest per capita emitter in Canada. We are a wealthy nation, marked by our membership in the Group of Seven, the club for the world's most advanced economies, representing almost 60 per cent of global net wealth. We also punch above our weight as polluters. Scientists tell us we need to do more to get our pollution under control.

Climate change is a health issue in New Brunswick as elsewhere. Chronic climate change-induced changes in temperature, hot days, and precipitation cause both day-to-day changes (ticks carrying Lyme disease, pollen like ragweed making allergies worse, increased eco-anxiety) and acute changes from extreme events (intense precipitation, floods, ice storms, droughts) that will exacerbate existing physical and mental health conditions in these communities.

Climate change effects can make existing social, and physical and mental health vulnerabilities worse; solutions can improve social, and physical and mental health conditions. Maximizing this opportunity, however, means considering social, and physical and mental health dimensions of climate change in climate change mitigation and adaptation planning.

Campbellton, the area with the lowest median household income and Oromocto, the area with the highest, provide instructive examples. Campbellton can expect greater annual and spring warming and precipitation increases than Oromocto. More of the Campbellton-area population is comprised of seniors, especially women living alone, people living on low income, and people experiencing food insecurity. The Oromocto area, however, has higher rates of chronic conditions and perceives its mental and physical health as lower than people living in the Campbellton area. How will these differences in population and climate change dynamics affect people living in these communities?

In the Oromocto area, factors associated with military life may be important, while in the Campbellton area, factors associated with income may be more of a factor. Community-appropriate strategies need to account for climate change and health condition differences to protect the most marginalized and vulnerable, and to maximize opportunities to advance protection from extreme events, while advancing provincial goals for aging and wellness.

New Brunswick needs to move quickly to address climate change risks and cut greenhouse gas pollution in line with science-based targets in order to protect our health. We ask stakeholders interested in protecting New Brunswickers' health to encourage the provincial government to:

1 **To maximize the potential for securing health and climate change co-benefits, make physical and mental health protection and promotion a driving force behind climate change mitigation and adaptation plans and implementation strategies.** There is an opportunity to ensure the province meets its wellness objective of increasing the number of New Brunswickers with capacity to support healthy development and wellness and increasing the number of settings that have conditions to support wellness, while pursuing greenhouse gas reductions and protection from the acute and chronic effects of climate change.

a. Integrate and coordinate climate action strategies with provincial strategies aimed at improving wellness and aging.

b. Commit to tracking and reporting on climate change-related health and well-being indicators to monitor progress over time (Appendix 1).

2 **To secure the air quality and greenhouse gas (carbon pollution) reductions, develop an electricity implementation plan for New Brunswick that phases out coal and oil over the next 10 years.** Strategies would:

a. Accelerate the shift to a clean electricity system with a commitment to **50 per cent renewable energy supply by 2025**, 60 per cent by 2030, 70 per cent by 2035, 80 per cent by 2040, and by 95 per cent by 2050. Accelerate solar rooftop targets. A stretch target for New Brunswick could be 200,000 kilowatts (kW) of cumulative installed commercial and residential solar power by 2025 (100,000 kW each for residential and commercial, grid connected and off-grid).

b. **Legislate a ban on the sale of internal combustion engine vehicles in the province by 2025.** Create incentives to ensure New Brunswick reaches its goal of having **2,500 electric and plug-in hybrid vehicles** on the road in New Brunswick by 2020 and 20,000 by 2030. Pursue community planning that emphasizes active transportation, community green space and gardening.

c. Regulate energy-efficiency-performance targets of at least **two per cent a year** to lower electricity demand and improve the quality of our homes and buildings, require net-zero home building standards by 2025.

d. Put a price on carbon in 2020 that meets federal requirements of at least **$50 per tonne of greenhouse gas by 2022** for industry and consumers. Direct carbon pricing revenue to the provincial Climate Change Fund to invest in programs and to provide incentives.

3 **To protect communities and households from the acute and chronic physical and mental health effects of climate change,** accelerate regulations and investments in programs and physical and institutional infrastructure to minimize flood risk, protect seniors from extreme heat, and the population from Lyme (and other vector-borne) disease.

a. Commit to **17 per cent of New Brunswick in protected areas by 2020** on land and 10 per cent in the ocean to increase carbon uptake and to create natural spaces for well-being. Designate all drinking water watersheds as protected areas. Enhance forest restoration and diversification and expand green spaces in urban environments to moderate heat.

A comprehensive climate change plan for New Brunswick is essential to our physical and mental well-being. The time to act is now; any delay harms our health.

APPENDIX

Appendix: Indicators of climate change for health and well-being

Indicators of climate change for health and well-being

The federal Expert Panel on Climate Change Adaptation and Resiliency Results recommended governments track a number of indicators relating to health and well-being and climate change. There are three objectives and a number of indicators that New Brunswick can track that will tell us whether we are making progress toward protecting New Brunswickers as we deal with climate change. The province recently received funding to complete a climate change health vulnerability assessment; these indicators are an invaluable resource to completing that work.

OBJECTIVE 1:

Reduce vulnerability by decreasing sensitivity to climate impacts through alleviating the conditions that make high-risk populations more vulnerable to health-related climate impacts.

- Proportion of climate change vulnerability assessments that consider high-risk populations (i.e., high-risk populations as identified by the Canadian Red Cross).
  - **Baseline:** Current number of completed climate change and health vulnerability and adaptation assessments.
  - **Status:** A climate change and health vulnerability and adaptation assessment proposal from New Brunswick recently received $300,000 in funding from Health Canada. The assessment is due by 2021.
- Percentage of Canadians living on low incomes in climate hazard areas
  - **Baseline:** Median household income, climate hazard risk maps (e.g., flooding, wildfire, storm surge, etc.), and number of low-income households.
  - **Status:** Available for New Brunswick from Statistics Canada 2016 Census profile, Canadian Climate Atlas, New Brunswick's Future Climate Projections maps, and New Brunswick Health Council community profiles.
- Percentage of high-risk Canadians living in hazard areas with social support and response systems in place.
  - **Baseline:** Climate risk mapping, identification of high-risk Canadians, demonstration of social support levels.
  - **Status:** This report combines New Brunswick Health Council community profile data for health and well-being indicators with Canadian Climate Atlas data. Together, these data sets can be compared, as we do in this report, to understand climate change-induced health risks to New Brunswick's vulnerable populations (i.e., the very young and old, those with pre-existing health conditions (i.e., obesity, diabetes, cardiovascular and aging related illnesses). It can be a template for the provincial climate change and health vulnerability and adaptation assessment. Community profile metrics can expand to include tracking the physical and mental health effects of extreme weather and other climate change and health effects.

OBJECTIVE 2:

Increase at-risk Canadians' ability to monitor and intervene to reduce their vulnerability to the health impacts of a climate-related hazard.

- Number of culturally-appropriate public awareness and education campaigns to promote personal protection from climate change health effects.
  - **Baseline:** To use this indicator, organizations must investigate the number of programs that promote personal protection and determine whether in the given context of use they are culturally appropriate.
  - **Status:** Provincial public education programs are active relating to ticks and Lyme disease (such as Be Tick Smart and Lyme NB) and heat alerts. During the 2019 flood, the provincial government issued a press release focused on stress and anxiety relating to flooding and encouraged people to reach out to Tele-Care 811. The provincial Environmental Trust Fund can support climate change and health education and engagement projects, although no such projects received funding in 2019. These and other communication and project funding channels can be important vehicles for increasing education and awareness about climate change-induced health effects.
- Area covered by surveillance programs for water-, food- and vector-borne diseases.
  - **Baseline:** Establishing the baseline for this indicator will require an analysis of all federal, provincial/territorial, and local/regional surveillance systems to identify what proportion of Canada's area is currently served by water-, food- and vector-borne diseases surveillance programs that can be associated with climate change.
  - **Status:** New Brunswick has systems in place through its Heat Alert and Response System, Boil Water and Beach advisories, Tick Talk NB program, Lyme disease monitoring and communication program, and River Watch program. It is not clear whether these programs are coordinated from a climate change perspective, but assessing these, and other programs using a climate change and health lens could identify opportunities. These and other relevant programs (i.e. relating to the mental health effects of climate change-induced extreme events) could link through a climate change and health web portal. The provincial climate change and health vulnerability assessment could review existing provincial strategies affecting health to suggest integration and updating opportunities. Strategies for review include the 2017 Lyme Disease Strategy, 2018 to 2028 Water Strategy, the 2014 provincial Flood Risk Reduction Strategy, the 2016 to 2018 Local Food and Beverages Strategy, the 2017 Aging Strategy, the 2014 to 2021 Wellness Strategy, and respond to the NB Medical Society call for a provincial obesity strategy.
- Number of culturally-appropriate programs that identify mental health effects resulting from climate hazards.
  - **Baseline:** Develop definition of 'mental health programs,' 'culturally-appropriate,' and 'climate change risks to mental health;' current number of mental health programs in Canada; current number of mental health programs in Canada that are culturally-appropriate; and current number of mental health programs in Canada that identify climate change risks to mental health.

- **Status:** Mental health services are available throughout New Brunswick and people with mental health effects from flooding are registering with public health agencies such as Fredericton Mental Health and Addictions Services. The New Brunswick Health Council is a valuable source of community profiles identifying gaps in health-related services and the health status of New Brunswickers. Community profile metrics can expand to track the physical and mental health effects of extreme weather and other climate change and health effects. Engaging mental health professionals to make the link with extreme weather and climate change and mental health will need to be an important part of the provincial climate change and health vulnerability and adaptation process.

- Proportion of health care facilities that have emergency and management plans that include climate hazards (i.e., inclusion of on-site back-up energy sources, back-up water access, alternate access routes, emergency shelters, etc.)

  - **Baseline:** The total number of health care facilities. Health care facilities include hospitals, clinics (physician, social services, nursing), outpatient care centers, and specialized care centers, such as birthing centers and psychiatric care centers.

  - **Status:** Should be included in New Brunswick's climate change and health vulnerability and adaptation assessment due in 2021.

OBJECTIVE 3:

Ensure adequate responses to health-related climate impacts for those for whom the climate hazard could not be eliminated.

- Number of health care practitioners trained to identify and respond to climate-related health effects (including doctors, nurses, social workers, first responders, pharmacists, etc.)

  - **Baseline:** The current baseline status of the number of health care practitioners trained to identify climate change health effects can be established through a survey administered in partnership with the relevant professional colleges, associations and providers of post-secondary education.

  - **Status:** Populating this metric could easily be accomplished if a survey is part of the climate change and health vulnerability and adaptation assessment.

- Number of first responder support programs capable of addressing the physical and mental stresses associated with climate-related hazards.

  - **Baseline:** Define 'capable;' current number of first responder-identified support programs addressing physical stress in Canada; current number of first responder-identified support programs addressing mental stress in Canada as having come from climate change impacts; and current number of first responder-identified support programs that identify climate change impacts in the above.

  - **Status:** Unknown, but appropriate to completing the provincial climate change and health vulnerability and adaptation assessment.

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