



Research to Insights: Social, Economic, and Health Perspectives on Climate Change

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About *Research to Insights*

The *Research to Insights* series of presentations features a broad range of findings on selected research topics. Each presentation draws from and integrates evidence from various studies that use innovative and high-quality data and methods to better understand relevant and complex policy issues.

Based on applied research of valuable data, the series is intended to provide decision makers, and Canadians more broadly, a comprehensive and horizontal view of the current economic, social and health issues we face in a changing world.



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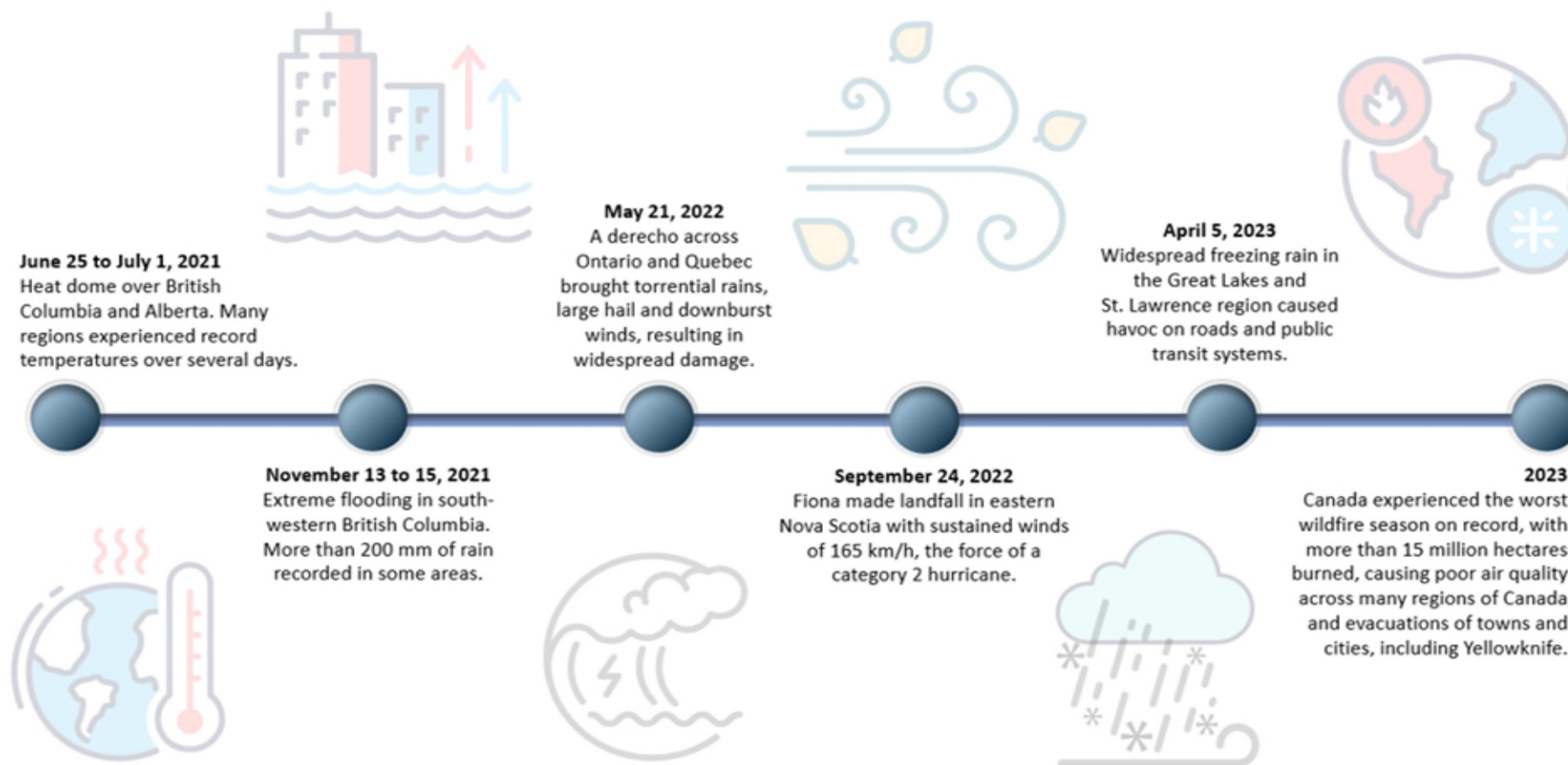
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Background

- Climate change is a long-term shift in weather conditions. It involves changes in both average weather conditions and variability, including extreme weather events. This increases the frequency and severity of precipitation events, flooding, droughts, extreme heat, wildfires and storms.
- There is scientific consensus that human activity is the main cause of climate change, primarily through the burning of fossil fuels. The burning of fossil fuels produces carbon dioxide, which stays in the earth's atmosphere and causes the earth's temperature to rise. Other greenhouse gases (GHGs) include nitrous oxide and methane.
- Many aspects of Canadian society affect and are affected by climate change, including nature and biodiversity, infrastructure, the economy, workers, and the health and well-being of Canadians.
- Tackling the causes of climate change and reducing its impact on people, society and the economy is a Canadian priority. Some examples include Canada's 2030 Emissions Reduction Plan: Canada's Next Steps for Clean Air and a Strong Economy; Canada's National Adaptation Strategy; the Federal Sustainable Development Strategy; the Clean Technology and Climate Innovation Strategy; Indigenous-led Natural Climate Solutions; and Climate Science 2050: Advancing Science and Knowledge on Climate Change.

References: [Climate change statistics](#), [Causes of climate change](#) and [AR6 Synthesis Report: Climate Change 2023](#).

Figure 1
Recent weather-related events influenced by climate change that were experienced across Canada



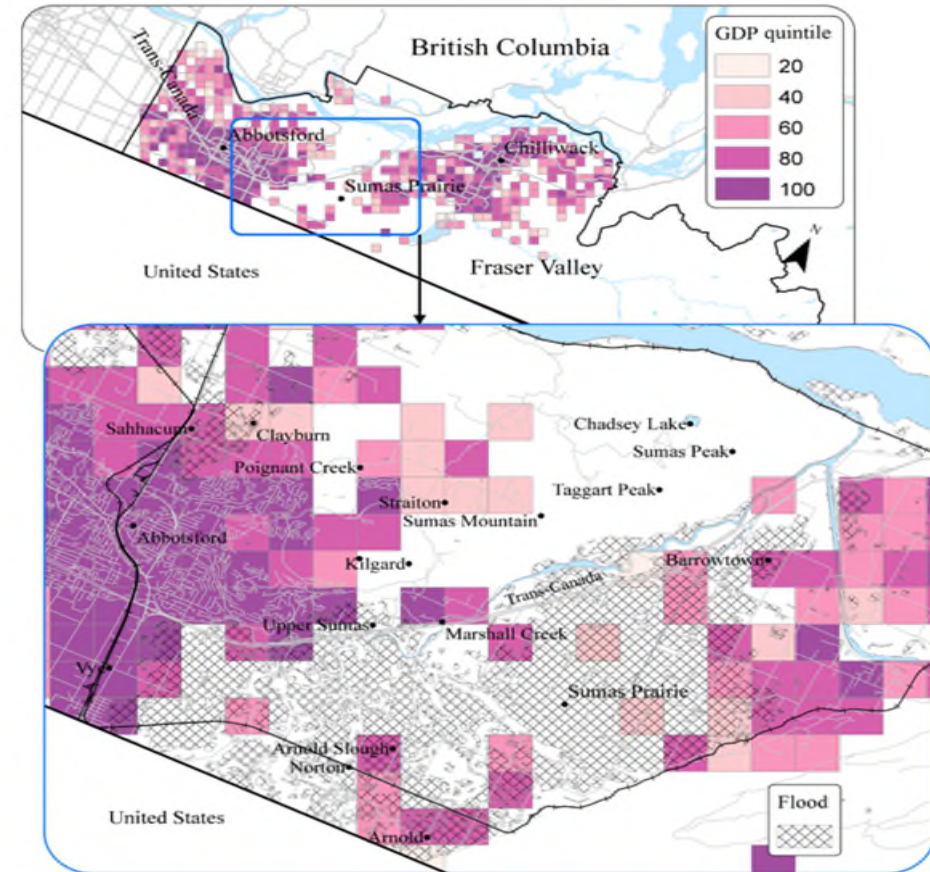
Sources: [Canada's top 10 weather stories of 2023 - Canada.ca](https://www.canada.ca/en/news/2023/04/canadas-top-10-weather-stories-of-2023.html), [Canada's top 10 weather stories of 2022 - Canada.ca](https://www.canada.ca/en/news/2022/12/canadas-top-10-weather-stories-of-2022.html), [Canada's top 10 weather stories of 2021 - Canada.ca](https://www.canada.ca/en/news/2021/08/canadas-top-10-weather-stories-of-2021.html).



Economic impacts: Up to 15% of the regional economies in British Columbia were affected by the 2021 flood events

- Fine-grain economic measures are often needed to measure the economic activity at risk from natural disasters.
- Parts of British Columbia were affected by flooding caused by heavy rains from November 13 to 15, 2021.
- While the impacted areas account for a small share of the British Columbia economy, on a regional basis they account for 15.5% of the economy of Fraser River Valley, 4.6% of the economy of Thompson–Nicola and 6.2% of the economy of Okanagan–Similkameen.

Map 1
Geographic extent of flooding relative to gross domestic product creation in the Fraser Valley around Abbotsford and Chilliwack



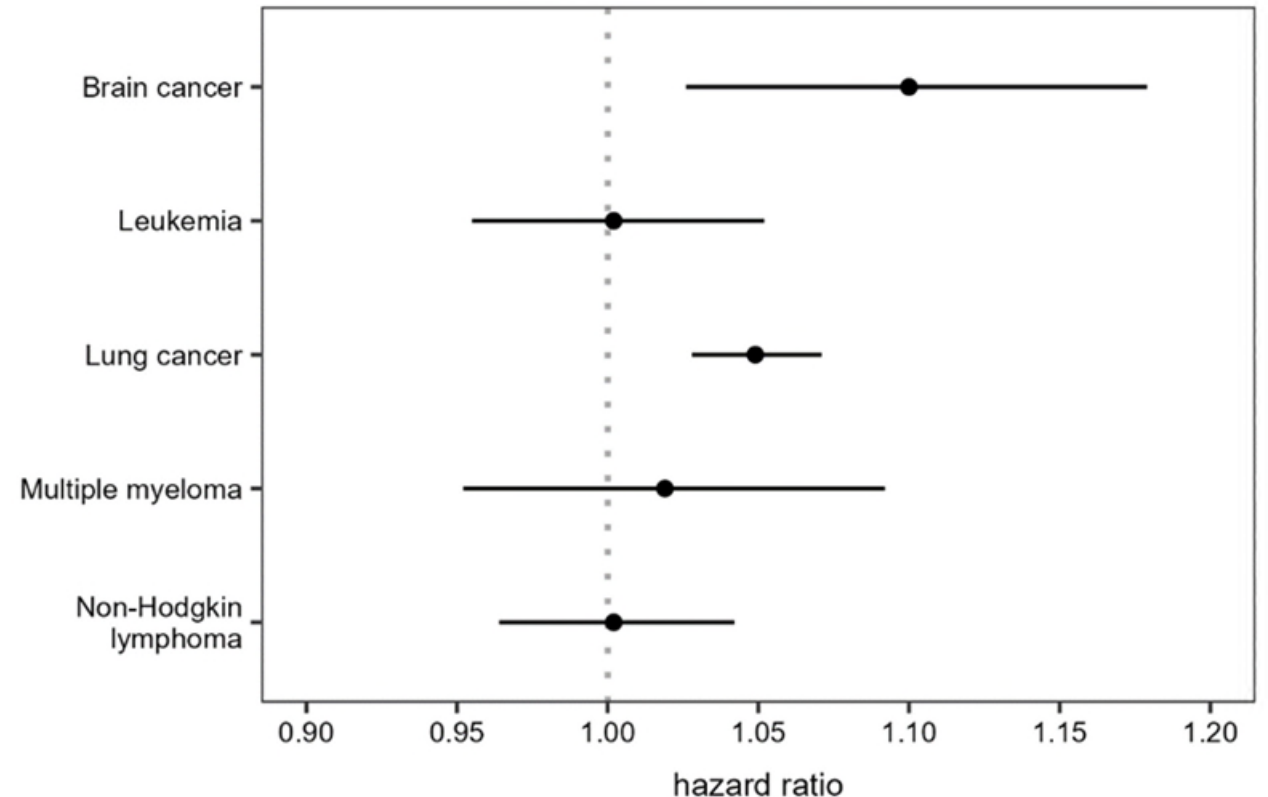
Notes: GDP: gross domestic product. The data from this map were drawn from the following sources: Statistics Canada, 2016. Road Network file. Statistics Canada, 2016. Census – Boundary files. Statistics Canada, 2011. Lakes and Rivers file. Natural Resources Canada, Floods in Canada, reference dates November 16, 2021 to November 20, 2021. Natural Resources Canada, Canadian Geographical Names. Natural Resources Canada, 2014. Transport Networks in Canada – CanVec Series – Transport Features.

Source: Statistics Canada, authors' calculations.

Health impacts: Long-term wildfire exposure is associated with increased risk of lung cancer and brain tumours

- The number of wildfires and areas burned has increased in Canada, affecting air quality.
- Wildfires emit carcinogenic pollutants that contaminate air, water, land and indoor environments.
- There was a 4.9% higher incidence of lung cancer and a 10% higher incidence of brain tumours for people living within 50 km of a wildfire in the past 10 years compared with the unexposed population (excluding the people living in large Canadian cities).
- Other cancers examined did not see a significantly increased risk.

Chart 1
Associations between 10-year wildfire exposure and cancer outcomes among Canadians

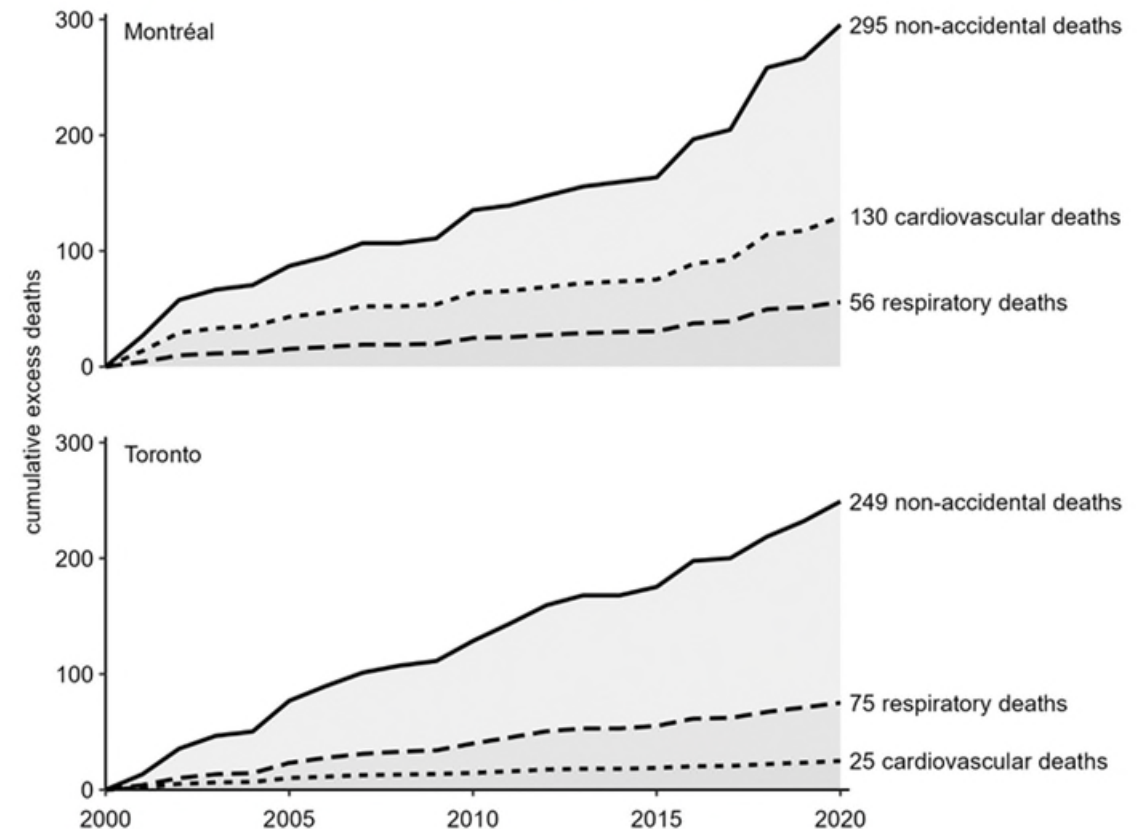


Source: Korsiak J, Pinault L, Christidis T, et al., May 2022, "Long-term exposure to wildfires and cancer incidence in Canada: A population-based observational cohort study," *The Lancet Planetary Health* 6(5).

Health impacts: More than 200 excess deaths were attributable to extreme heat events in Montréal and Toronto from 2000 to 2020

- Exposure to extreme heat is one of the most direct impacts of climate change on health. There has been, and will be, an increase in the frequency and intensity of extreme heat events.
- In 12 large Canadian cities (with population sizes of at least 500,000), daily mortality risk was 2% to 8% higher than average during extreme heat events from 2000 to 2020.
- The impacts of heat were stronger for older adults (aged 65 and older) than for younger adults.
- Approximately 295 excess deaths in Montréal and 250 excess deaths in Toronto were attributable to extreme heat events in these cities during this period.

Chart 2
Cumulative excess deaths attributable to extreme heat events



Note: Non-accidental deaths do not include deaths caused by trauma or suicide.

Source: Quick M, 2024 (forthcoming), "The impacts of extreme heat events on non-accidental, cardiovascular, and respiratory mortality: An analysis of 12 Canadian cities between 2000 and 2020," *Health Reports*, Statistics Canada Catalogue no. 36-28-0001.

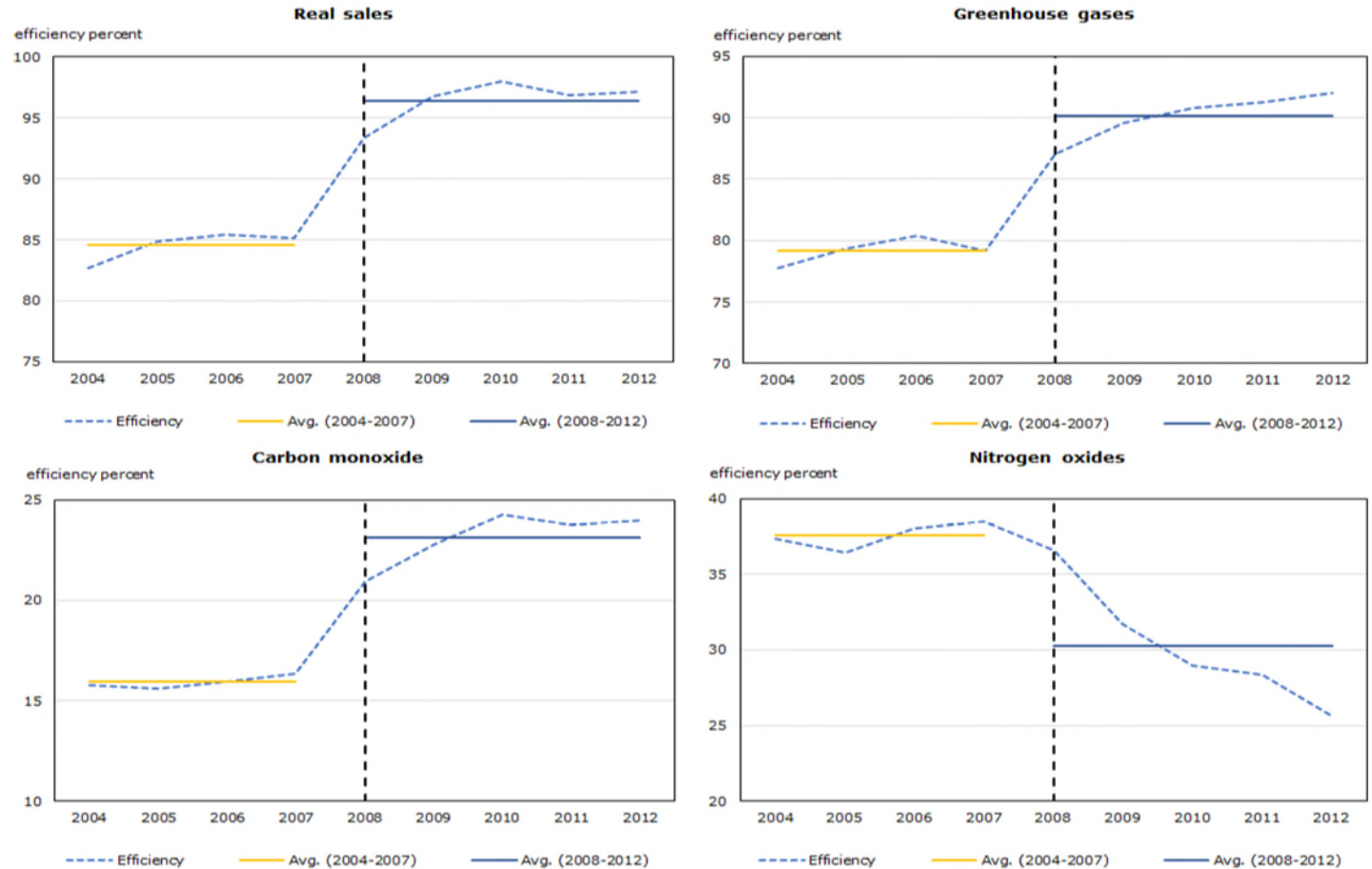
Dealing with climate change requires action, through either mitigation or adaptation measures

- Mitigation involves finding ways to reduce the human causes of climate change, such as reducing the emission of GHGs or removing them from the atmosphere.
- Adaptation involves finding ways to adapt to a changing climate by building resilience and reducing the adverse impacts of climate change today and in the future.

Mitigation: Carbon taxes increased manufacturers' economic and climate change performances but had mixed results for air pollutants in British Columbia

- The carbon tax improved manufacturers' efficiency, with real sales efficiency increasing by 11.9 percentage points.
- It also led to an 11.0 percentage point increase in efficiency for GHG emissions.
- The tax's impact on air pollutants was mixed, enhancing carbon monoxide efficiency by 7.2 percentage points but reducing nitrogen oxide efficiency by 7.3 percentage points.
- Differences in average efficiency levels among outputs suggest producers prioritize economic over environmental efficiency to remain competitive.

Chart 3
Marginal effects of the carbon tax on output efficiency



Notes: Vertical lines indicate the year 2008. Full efficiency = 100%. Increases in desirable output (real sales) efficiency means producing more output, while increases in undesirable output (pollution) efficiency means producing less output, holding inputs and technology constant.

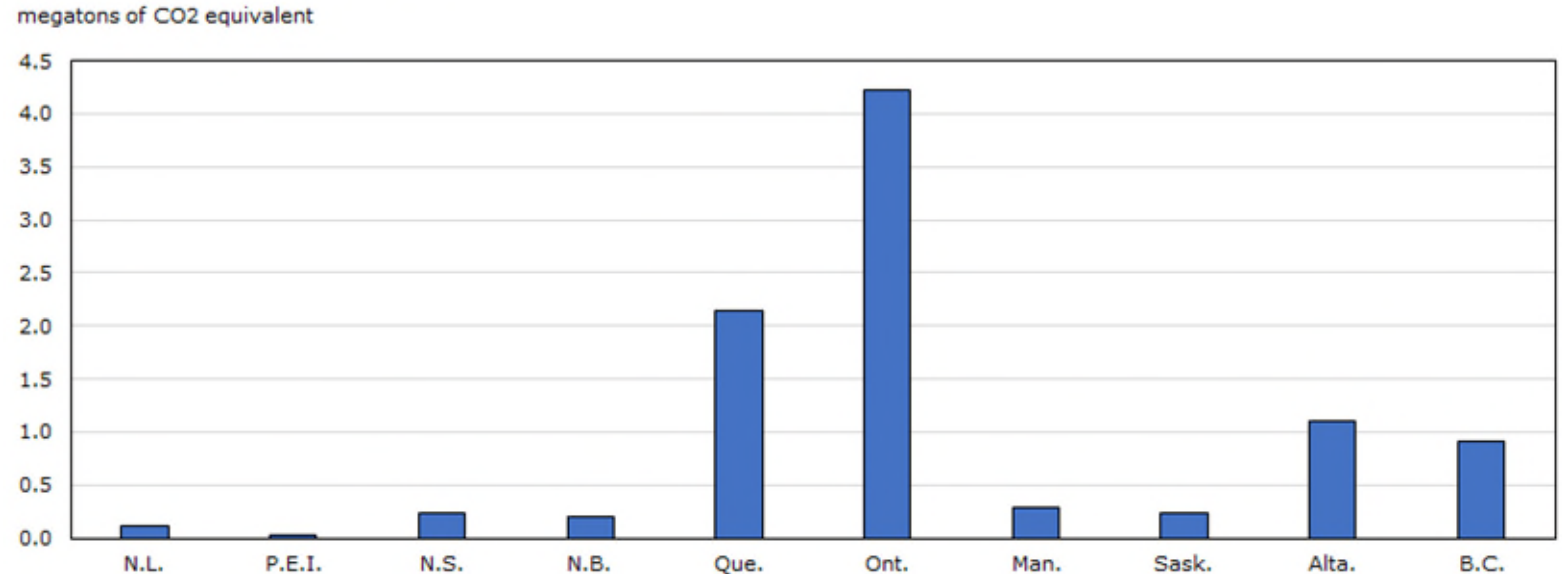
Source: Kumbhakar S, Badunenko O, Willox M, November 2022, "Do carbon taxes affect economic and environmental efficiency? The case of British Columbia's manufacturing plants," *Energy Economics* 115."

For more information: [Do carbon taxes affect economic and environmental efficiency? The case of British Columbia's manufacturing plants.](#)

Mitigation: Telework has the potential to reduce transportation emissions by up to 9.5 megatons

- The increase in telework triggered by the COVID-19 pandemic will likely reduce GHG emissions by reducing commuting.
- If all Canadians who could work from home in 2015 did so exclusively, GHG annual emissions attributable to transportation could have fallen by 9.5 megatons of carbon dioxide equivalent emissions (i.e., 12.1% of households' direct emissions attributable to transportation in 2015).
- If personal homes are less energy efficient than large office buildings, part of the reduction in GHG emissions triggered by reduced commuting could be offset by emissions associated with households' increased energy use required for heating or providing air conditioning. The magnitude of this offsetting effect is currently unknown.

Chart 4
Hypothetical reduction in annual greenhouse gas emissions resulting from a complete transition to telework, by province, 2015



Source: Morissette R, Deng Z, Messacar D, 2021, "Working from home: Potential implications for public transit and greenhouse gas emissions," *Economic and Social Reports*, Statistics Canada Catalogue no. 36-28-0001.

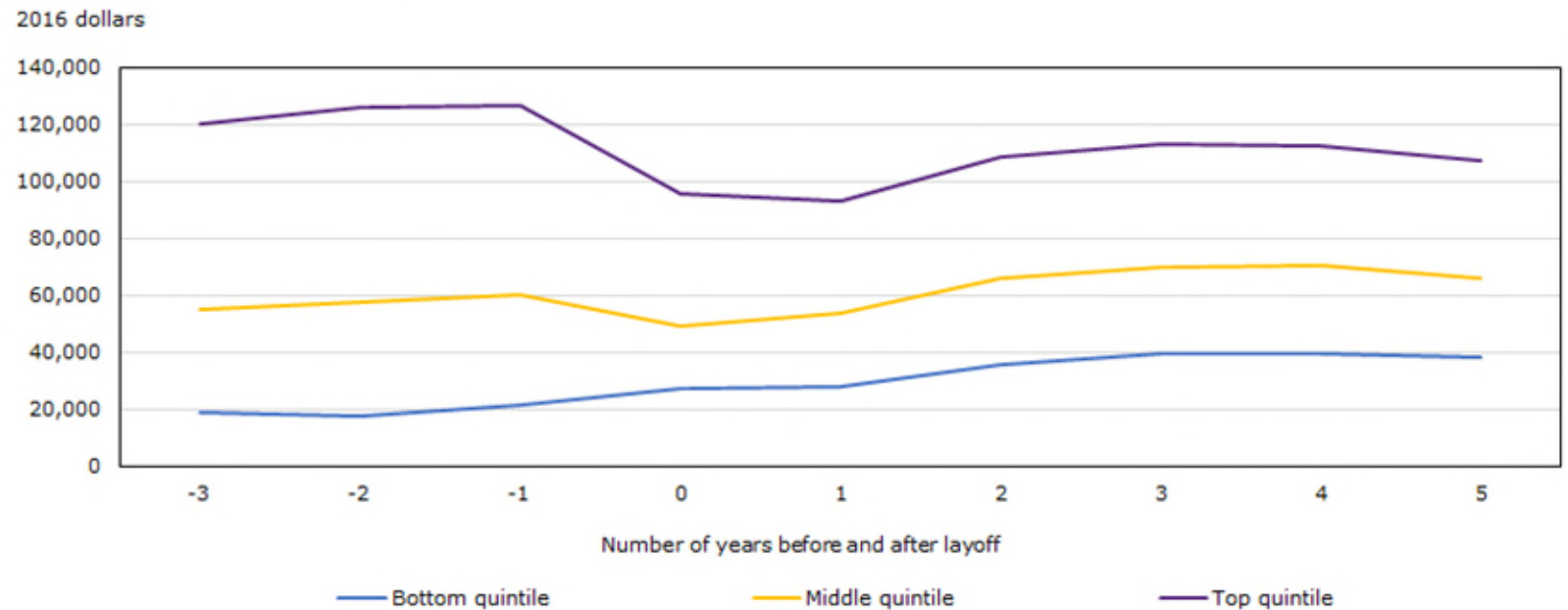


Adaptation: Not all workers displaced from fossil fuel industries experience similar earnings trajectories after job loss

- Transitioning to a low-carbon economy will require phasing out coal and other fossil fuels, as well as related jobs in these industries.
- Five years after job loss, one in four workers displaced from coal mining from 2004 to 2011 saw their annual wages fall by at least \$19,000.
- However, one in four workers saw their annual wages increase by at least \$31,000 during the same period.
- Therefore, not all workers displaced from fossil fuel industries experience similar earnings trajectories after job loss.

Chart 5

Average real annual wages and salaries of workers aged 25 to 49 permanently laid off from the oil and gas industry from 2009 to 2011, by earnings quintile

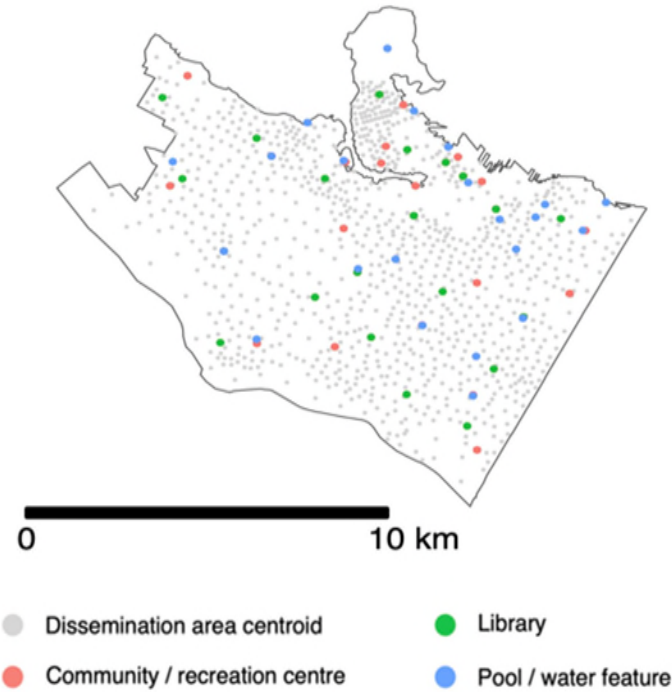


Source: Statistics Canada, Longitudinal Worker File.

Adaptation: More than 50% of the population in Montréal, Toronto and Vancouver had a cooling centre within a 15-minute walk

- Cooling centres such as libraries and community or recreation centres provide safety and social support during extreme heat events.
- More than 50% of Montréal, Toronto and Vancouver residents had access to at least one cooling centre within a 15-minute walking trip of their homes.
- Residents living in neighbourhoods characterized by high deprivation were more likely to have at least one cooling centre within a 15-minute walk than areas with low deprivation.

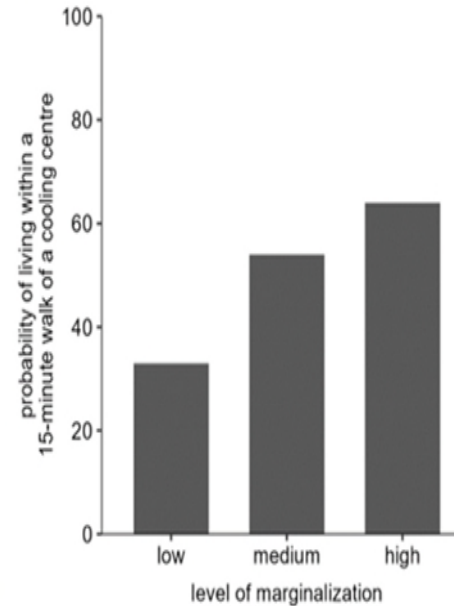
Map 2
Cooling centre locations in Vancouver, British Columbia



Source: Statistics Canada, City of Vancouver Open Data.

Chart 6

Access to cooling centres stratified by marginalization in Vancouver, British Columbia

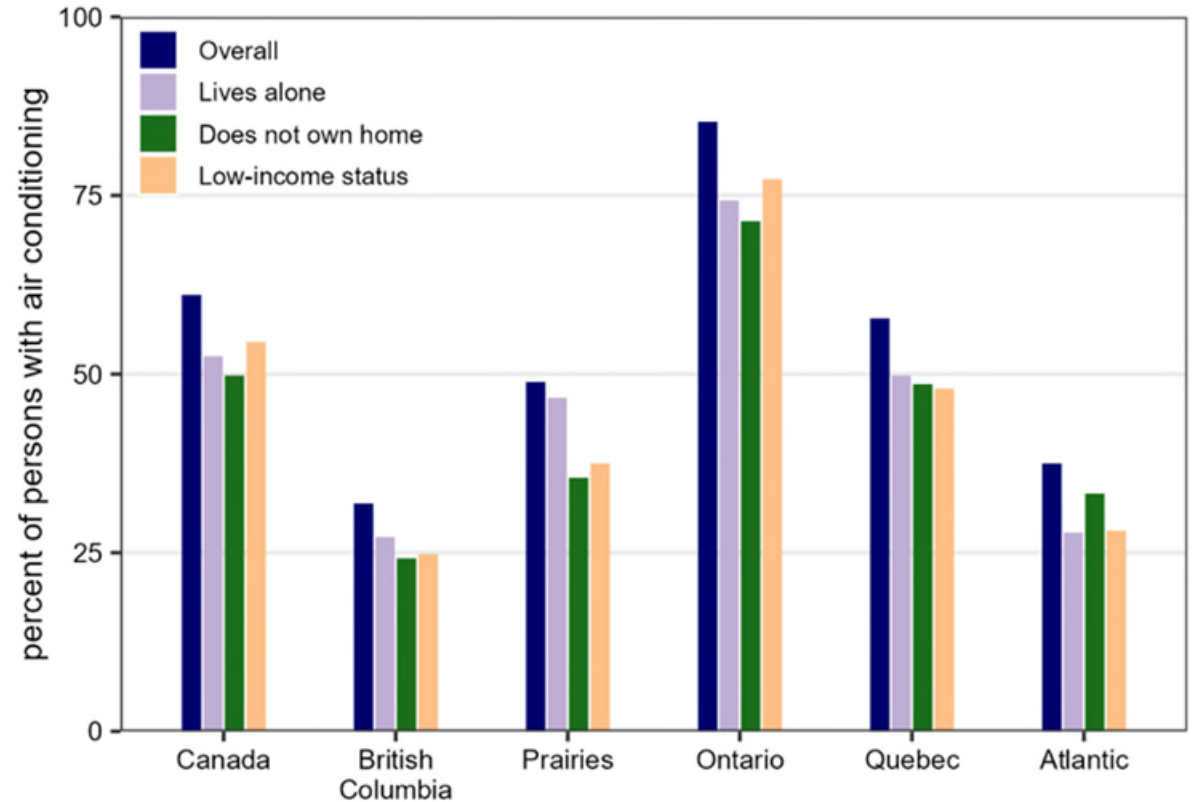


Source: Quick et al., September 2022, "Exploring the associations between cooling centre accessibility and marginalization in Montreal, Toronto, and Vancouver, Canada," *Canadian Geographies* 67(3).

Adaptation: About two in three Canadians had household air conditioning

- Air conditioning is one of the most effective ways to reduce health impacts during extreme heat events.
- Access to air conditioning varied by region, ranging from 32% in British Columbia to 85% in Ontario.
- Individuals who lived alone, did not own their home and had low-income status were less likely to have air conditioning in their homes.

Chart 7
Prevalence of household air conditioning in Canada



Source: Quick M, Tjepkema M, 2023, "The prevalence of household air conditioning in Canada," *Health Reports*, Statistics Canada Catalogue no. 36-28-0001.



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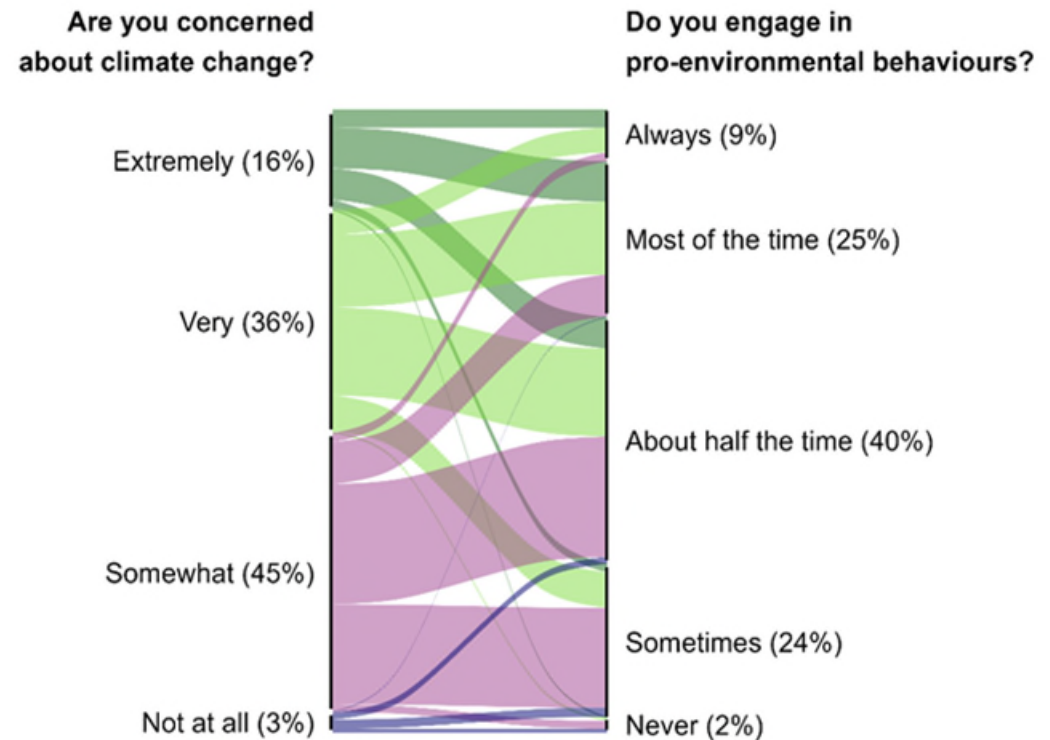
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Adaptation: Positive emotions and concern are determinants of climate action for youth

- Young people's emotions in response to climate change may be important in determining their behaviour, separating activists from non-activists.
- More than 9 in 10 youth reported feeling somewhat, very or extremely concerned about climate change.
- During the last six months, about 7 in 10 youth described themselves as engaging in pro-environmental behaviours at least half of the time.
- Both concern and pleasant emotions about climate change (hope, optimism and solidarity) were found to significantly increase the frequency of climate actions.

Chart 8
Frequency of climate-related concern



Source: Maggi S, Benomar C, Quick M, Corvello M, Kingsbury M, Kohen D, 2023, "Climate emotions, pro-environmental behaviours, and activism among Canadian youth," *Journal of Mental Health and Climate Change*, 23.10.01–23.10.21, <https://doi.org/10.5281/zenodo.10443325>.



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Summary of key findings

- Climate change has had important economic, health and well-being impacts. For example, flooding had impacts on the economy in British Columbia, extreme heat was associated with increased risk of death, especially for the senior population, and exposure to wildfires increased the risks of cancer.
- The carbon tax in British Columbia improved manufacturers' efficiency and environmental efficiency for GHG and carbon monoxide emissions.
- Work from home can potentially reduce GHG emissions caused by transportation by a non-negligible amount.
- Not all workers displaced from coal mining and oil and gas industries experienced wage drops in the long term.
- Access to cooling centres and household air conditioning differed by region and population group.



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