

CANADIAN
PUBLIC HEALTH
ASSOCIATION

ASSOCIATION
CANADIENNE DE
SANTÉ PUBLIQUE

The Voice of Public Health
La voix de la santé publique

Lancet Countdown 2017 Report: Briefing for Canadian Policymakers



Within health systems, gather and analyze data on kilometers, green house gas emissions, air pollution and costs saved by telehealth in order to help drive systems change.

- Provide strong health-sector support for Health Canada's draft healthy eating guidelines, which emphasize plant-based sources of protein, with framing of these guidelines as being beneficial for both human and planetary health.
- Increase funding for research into the local health impacts of resource extraction, with a focus on impacts on Indigenous populations.
- Integrate Health Impact Assessments as a core component of the federal Environmental Assessment process.

Acknowledgements

The concept of this brief was developed by the Lancet Countdown on Health and Climate Change. The brief was written by Courtney Howard, MD, CCFP-EM; Caren Rose, PhD; and Trevor Hancock, MD, Hon FFPH. Review of the brief and edits were provided by Ian Culbert; Kim Perrotta, MHS; Joe Vipond, MD; Peter Berry PhD; Margot Parkes, MD, MBChB, MAS, PhD; Sandra Allison, MD, MPH, CCFP, FRCPC; Linda Varangu M. Eng.; Benjamin Israel, MSc; Erin Flanagan; James Glave; Jacob Larsen, MCIP RPP; and Nicola Wheeler MSc.

Strategic Partners

THE LANCET



About the Lancet Countdown

The Lancet Countdown: Tracking Progress on Health and Climate Change is a global, interdisciplinary research collaboration between 24 academic institutions and inter-governmental organisations. It monitors progress on the relationships between health and climate, and their implications for national governments, reporting annually. It was launched following the 2015 Lancet Commission on Health and Climate Change, which concluded that, left unmitigated, climate change will undermine 50 years of public health gains, whilst responding to it could represent “the greatest global health opportunity of the 21st century”.

The 2017 report presents data on the indicators selected following a consultation process in 2016. These span 5 domains, from impacts and adaptation to mitigation, and the economics and politics of climate action.

About the Canadian Public Health Association

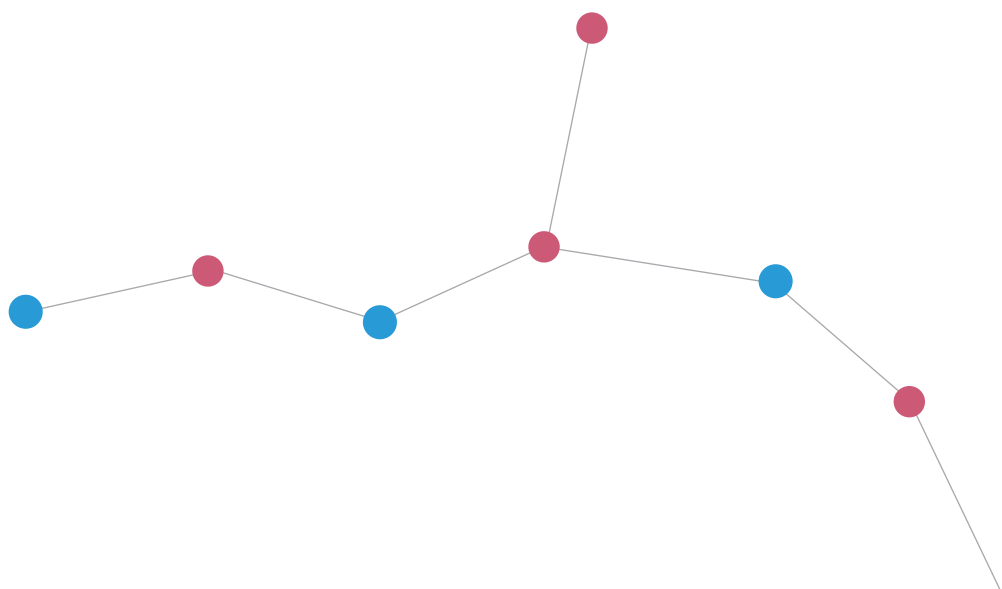
The Canadian Public Health Association (CPHA) is the independent national voice and trusted advocate for public health, speaking up for people and populations to all levels of government. The CPHA champions health equity, social justice and evidence-informed decision-making. It also works to leverage knowledge, identify and address emerging public health issues, and connect diverse communities of practice. Furthermore, the CPHA promotes the public health perspective and evidence to government leaders and policy-makers. The CPHA is a catalyst for change that improves health and well-being for all.

Key Messages from the Countdown Report:

The central finding of the 2017 Lancet Countdown report is that, “The human symptoms of climate change are unequivocal and potentially irreversible – affecting the health of populations around the world, today. Whilst these effects will disproportionately impact the most vulnerable in society, every community will be affected.”²

Heat waves are increasing; annual numbers of cases of dengue fever have doubled every decade since 1990; and 4400 people have already been identified for whom climate change, leading to changing ice conditions, permafrost melt, or coastal erosion, is the sole reason for migration. Drought-related rural-to-urban migration is already thought to have contributed to the conflict in Syria. The largest health impact of climate change in the 21st century is likely to be undernutrition.²

Global inaction to prevent or mitigate climate change has put us on a ‘high-end’ emissions trajectory, pointing towards between 2.6°C and 4.8°C of global surface temperature warming by the end of the century – a level which could be disastrous to health even with maximal adaptation efforts.² The Countdown states, “adaptation has limits, and prevention is better than cure to prevent potentially irreversible effects of climate change.”² The Countdown has found evidence that a low-carbon transition has begun, with more people employed worldwide in renewable energy generation than in fossil fuel extraction. The Countdown states, “Whilst progress has historically been slow, the last five years have seen an accelerated response, and the transition to low-carbon electricity generation now appears inevitable.”



Climate-health in Canada:

As a developed circumpolar country, Canada sits at an intersection of climate-health impact and opportunity. The Mackenzie Valley region of Canada's Northwest Territories is considered a global hotspot of warming, with observed temperatures in Inuvik having increased by 3°C in the past 50 years.⁴ Health Canada forecasts that Canada will experience, "generally warmer temperatures, shorter and milder winters, longer and hotter summers, more frequent and/or more intense severe weather events, such as hurricanes, thunderstorms, wildfires, floods and droughts."⁵

Health impacts vary by region, but include increased heat-related illness, such as heat stroke and death^{6,7} higher pollen levels (with the potential to trigger more frequent and severe asthma exacerbations),⁶ worsened air pollution from wildfire smoke,⁸ and increased ground-level ozone resulting in increased heart and respiratory disease.⁶ Canada's Arctic is seeing rapid change, bringing the potential for food insecurity due to decreased access to traditional foods,⁹ reduced safety of ice-based travel, and mental health impacts from changed landscapes.^{10,11} Impacts on agriculture and thus food security will be region-specific, varying from potentially helpful milder winters and increased precipitation to crop-damaging severe weather and drought.¹² Additionally, Canadians can expect increased stress and displacement from disasters such as floods and wildfires,¹¹ expansion in the range of certain vector-borne disease (including Lyme Disease),¹³ increased risk of water-borne disease following changed precipitation patterns, and greater exposure to higher levels of ultraviolet radiation.⁶

Indicators of Climate-health in Canada:

This brief will provide information on a subset of Lancet Countdown indicators in the Canadian context, first with an overview of a number of indicators, then by treating several indicators in more depth. It thus represents a partial summary of progress on addressing climate-health issues in Canada.

Overview of Lancet Indicators in the Canadian Context:

Several Canadian public health units have completed city-level climate change risk assessments (Indicator 2.2), notably the excellent report by Toronto Public Health, which integrates the health and economic benefits of city-wide efforts to achieve an 80% reduction in greenhouse gas (GHG) emissions by 2050.⁷ Nationally, Canada has a chapter on human health in the 2014 Natural Resources publication, “From Impacts to Adaptation: Canada in a Changing Climate,”⁶ which serves as a solid start to a national assessment of vulnerability, impacts and adaptation for health (Indicator 2.5). Health Canada has also recently launched the next vulnerability and adaptation assessment to be released in 2021.¹⁴ The Canadian Coalition for Green Healthcare is tracking the impact of climate change events on health infrastructure (Indicator 2.6).¹⁵

Canada has also made some progress on indicators in the Countdown’s Economics and Finance Section. Indicator 4.3 tracks divestment from fossil fuels – an area in which the Canadian Medical Association (CMA) has shown considerable leadership, having voted for its financial arm, MD Financial, to create a fossil-free fund for investment by CMA members,¹⁶ and into which the CMA has transferred its own organizational funds.¹⁷ Indicator 4.7 tracks coverage and strength of carbon pricing revenues: carbon pricing has been implemented in multiple Canadian provinces, and Canada’s Pan-Canadian Framework on Clean Growth and Climate Change includes a commitment to pricing carbon pollution across the country by 2018.¹⁸

Climate-health is starting to be covered in the media (Indicator 5.1), including reporting on the health impacts of disasters, such as wildfires,^{19, 20} and the publication of occasional pieces using the climate-health frame.²¹

Selected Indicators in the Canadian Context:

Climate Change Impacts, Exposures and Vulnerability

Indicator 1.4: Lethality of weather-related disasters

The Lancet Countdown states, “despite a 44% increase in annual weather-related disasters from 2000 to 2013, compared with the 1994-2000 average, there has been no accompanying increase in the number of deaths,”² a finding that they suspect may signal the beginning of an adaptive response. Weather-related disasters that were included are droughts, floods, extreme temperature events, storms and wildfires. Health impacts reported included mortality, injuries, mental health impacts, spread of disease, and food and water insecurity.

Recent Canadian experience is notable for weather-related disasters. Previous publications estimate that a 2009 extreme heat event contributed to 156 excess deaths in British Columbia’s Lower Mainland,²² and that a 2010 heat event contributed to approximately 280 excess deaths in Quebec.²³ Lancet Countdown data lists the flood of 2013 in Calgary as having impacted 100,000 people, and flooding in Manitoba in 2014 as having impacted 6900.²⁴ Wildfires have also had significant impacts in recent years. In 2014, Northwest Territories (NWT) wildfires left the NWT capital of Yellowknife cloaked in smoke for much of that summer.²⁵ In 2015, 13,000 people were evacuated from La Ronge, Saskatchewan due to fires, representing the largest evacuation in Saskatchewan history.²⁶ Multiple houses burnt and one firefighter died.^{26, 27} A mandatory wildfire evacuation notice was issued in 2016 for the Alberta city of Fort McMurray, which necessitated the emergent evacuation of their hospital.^{28, 29} Lancet Countdown data lists 88,000 people from Fort McMurray as being impacted.² Two people died escaping the³⁰ fire, and approximately 2400 buildings were³¹ lost. This past summer, due to British Columbia (BC) wildfires, multiple evacuation notices were issued, including a mandatory evacuation order for Williams Lake and surrounding areas, impacting³² hospital facilities and forcing 24,000 people to leave³³ their homes. As of August 1st, 2017, an estimated 300 buildings had been lost in BC.

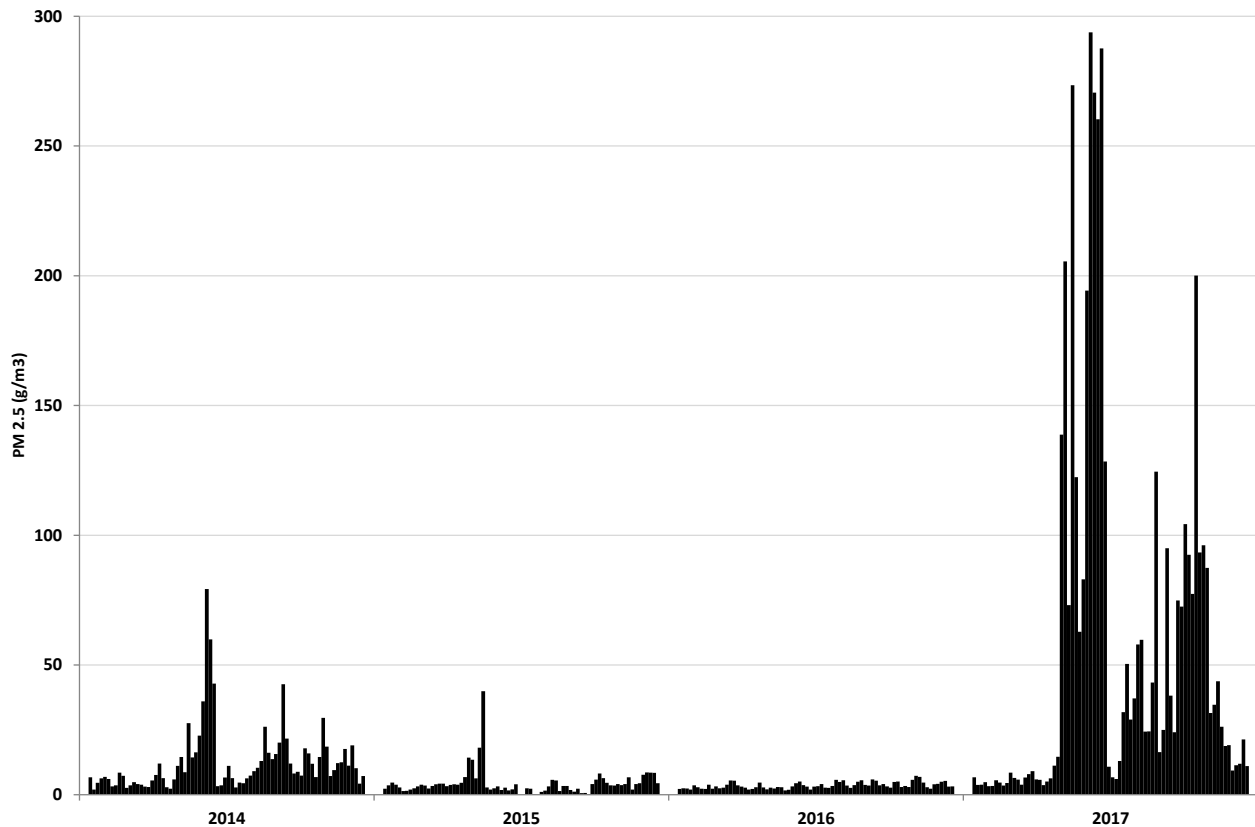


Figure 1: Level of 24 hour PM2.5 in Williams Lake, BC, from June 14 to August 30 in 4 subsequent summers, with 2017 representing a season of severe wildfires. For reference, the WHO recommended 24-hour mean for PM2.5 is 25 mcg/m3.

Though wildfires are often considered in terms of local consequences such as burns, evacuations, mortality and post-traumatic stress disorder,³⁴ they also generate smoke plumes that can travel vast distances, and which are of relevance to Indicator 3.5: Exposure to air pollution. Wildfire smoke is associated with increased use of asthma reliever medications, as well as more physician visits for asthma, obstructive pulmonary disease, bronchitis and pneumonia,^{35, 36} and is thought to contribute significantly to increased mortality worldwide.³⁶ Smoke exposure has also been associated with slightly reduced average birth weight among infants exposed in utero.³⁵ Figure 1 shows increased Particulate Matter (PM) levels in Williams Lake, British Columbia during the 2017 severe summer forest fire season. Smoke from fires in northern BC spread into southern BC – including Vancouver—prompting air quality³⁷ warnings, as well as into Alberta, contributing to air quality warnings in Calgary.³⁸

The projected increase in heat events, storms, floods and wildfires in Canada necessitated a coordinated approach to our adaptive response. This has begun: the public health community is sharing experiences³⁹ doing research into these events,²⁰ and publishing best-practice guidelines⁴⁰ to help populations cope with these exposures.

Policy Recommendation #1: Ensure funding of research and best-practice information sharing between public health communities in different regions to fine-tune adaptation strategies to cope with severe weather events.

Mitigation Actions and Health Co-benefits

Coal Phase-Out

Meeting the Paris Agreement will require global GHG emissions to peak within the next few years, transition towards near zero-carbon emissions by 2050, and move to negative emissions in the latter part of the century.² This can be thought of as needing to halve CO₂ emissions every decade.² Replacing coal-powered electricity with cleaner sources must be a cornerstone of these efforts: as the Lancet Countdown reports, “worldwide, coal supplies 30% of energy use and is the source of 44% of global CO₂ emissions.” The Lancet Countdown found indications that after a period of growth from 1990 to 2015, global coal consumption has peaked and is now in decline.

Despite Canada having one of the world’s cleaner electricity grids, with 80% of its electricity coming from non-emitting sources, the electricity sector is still the fourth largest source of GHG’s in Canada, responsible for 8% of our emissions, 75% of which come from coal-power.⁴¹ Canadian near-term mitigation performance is discouraging: emissions are forecast to be 111 Mt above our 2020 target.⁴² Canadian scholars have suggested that in order to achieve emissions reductions of the magnitude required by 2050, Canada should target 100% reliance on low-carbon electricity by 2035, maximize energy efficiency, and electrify end-uses such as heating and transport – this would make possible an 80% decrease in greenhouse gas emissions by 2050.⁴³ The Canadian government has set a goal of having 90% of Canada’s electricity coming from non-emitting sources by 2030.⁴¹

As seen in Figure 2, there was a 41% decrease in share of electricity generation from coal from 1990-2013 in Canada, largely due to coal phase-out in Ontario. The Ontario coal phase-out was completed in 2014, and is estimated to have saved 30 Mt/yr in GHGs⁴⁴ and contributed to a decrease in air-pollution-related deaths in Toronto estimated at 400 less premature deaths and 2,450 fewer hospitalizations per year as compared to 2004.⁴⁵

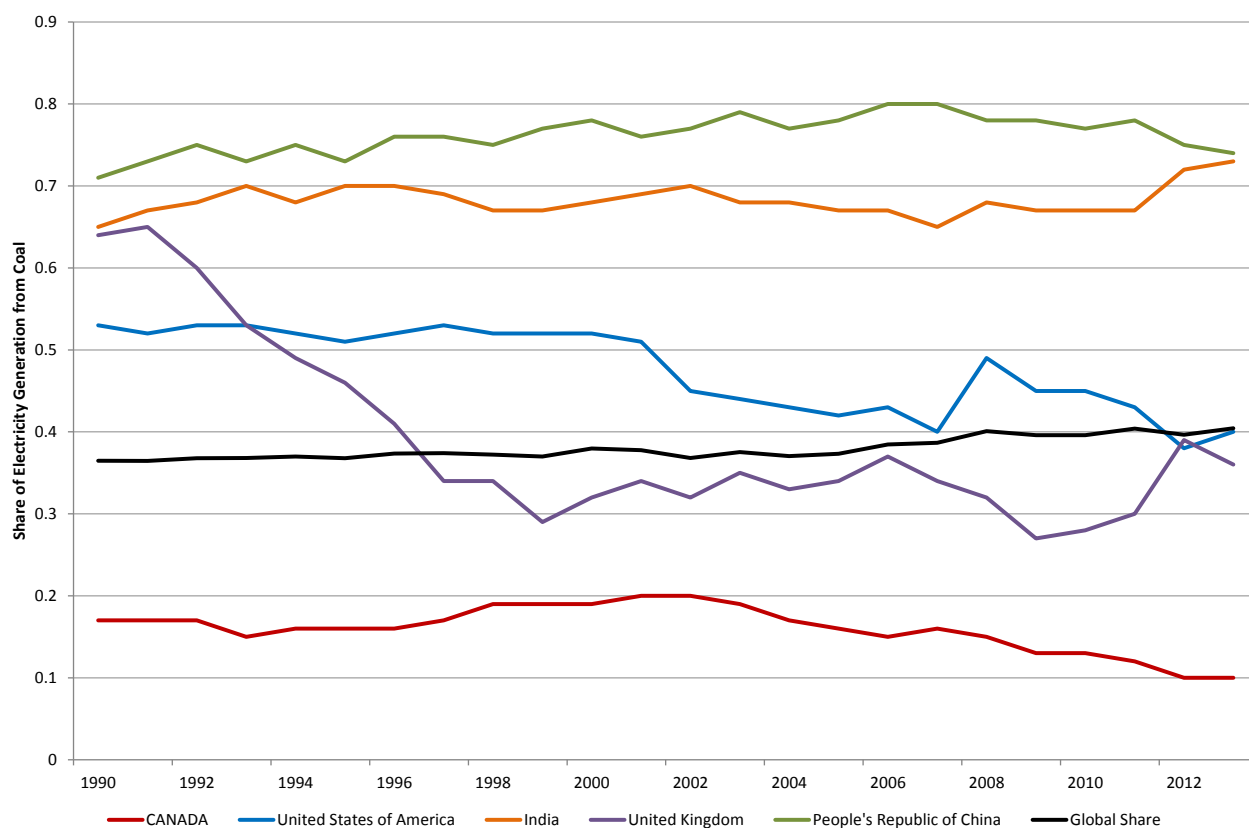


Figure 2: Share of electricity generation from coal in selected countries from 1990 to 2013. Data via the Lancet Countdown.

Canada currently has 34 coal power units operating in four provinces: Alberta, Saskatchewan, New Brunswick and Nova Scotia.⁴⁶ Coal-fired electricity has considerable local health impacts. Air pollution from fine particulate matter (PM2.5), nitrogen oxides (NOx), sulfur dioxide (SO2), and other substances contributes to cardiovascular and respiratory diseases, including lung cancer, and is an important source of increased mortality.⁴⁷ Additionally, coal power is a significant source of heavy metals, including mercury, which accumulate in the food chain and cause problems with neurological development in exposed fetuses and children.⁴⁸ Extraction and processing of coal also contaminates water sources and leads to habitat loss. Given the local health impacts of coal power and its outsized contribution to the health impacts of climate change, phasing out coal power is one of the priority recommendations of the 2015 Lancet Climate and Health Commission⁴⁹ and the 2017 Lancet Countdown.²

A report by the Pembina Institute,⁴⁶ which has been endorsed by the Canadian Public Health Association, estimates that an accelerated Canada-wide phase-out of coal-fired plants, where generators are shut down after 40 years of operation or by 2030 and which assumes the replacement of coal power by two thirds renewables and one third best-in-class gas-power, could yield an additional \$5 billion in air pollution-related health benefits (see Table 1) as compared to the plan under previous regulations. Furthermore, it could also reduce GHGs⁴⁶ by 31 Mt/year by 2030, and avoid a cumulative 418 Mt of GHG emissions between 2016 and 2035.

	Canada	Prairies	Central Canada	Atlantic Canada
Premature deaths avoided	1,008	868	86	54
ER visits and hospitalization	871	748	77	47
Asthma episodes	128,800	111,387	11,130	6,282
Days of breathing difficulty and reduced anxiety	3,031,125	2,677,573	249,001	104,551
Value of avoided health outcomes (2015 \$M)	5,040	4,342	431	266

Table 1: Health impacts forecast to be avoided with a Canada-wide coal phase-out by 2030, assuming coal-fired generators are shut down after 40 years of operation or by 2030 and that two thirds of coal generation capacity is replaced by non-emitting renewable energies, and one third by lowest-emitting natural gas technology. From: Out with the Coal, In With the New, Used with Permission from the Pembina Institute.⁴⁶

The challenge for Canada moving forwards is to ensure that all of these elements are met. The federal government has committed to a 2030 phase-out, but allowed the economic life of coal-power plants to remain at 50 years instead of reducing it to 40 years as assumed above: this approach would leave many of the potential health benefits on the table. It is important to minimize the amount of natural gas used to replace coal-power. Methane, the primary component of natural gas, has 84 times the GHG potential of CO₂ over a twenty year period,⁵⁰ leading to near-term warming risks. Also, an increased proportion of natural gas in Canada is being produced via hydraulic fracturing, for which evidence is accumulating of negative impacts: a quantitative assessment of the peer-reviewed scientific evidence from 2009-2015 indicated that 84% of studies on public health, 69% of studies on water, and 87% showed concerning findings.⁵¹ One public health hazard should not be exchanged for another.

Zero-carbon emission electricity

Zero-carbon or low-carbon energy refers to electricity generation that has no GHG emissions at the point of energy production and use. It includes renewable sources as well as nuclear power, but excludes biomass.² The Countdown found, “as a share of total generation, renewable energy has increased by over 20% from 1990 to 2013... Overall, there is now more added renewable generation capacity installed globally (almost 2000 GW) than coal, with about 80% of this newly installed capacity located in China.”² The economics of renewable energy – particularly wind and solar – continue to improve, with electricity from lower-latitude solar PV actually being cheaper than from natural gas.² When one considers, as the Countdown states, that “electric vehicles are poised to reach cost-parity with their petrol-based counterparts; and in 2016 global employment in renewable energy reached 9.8 million, over one million greater than that in fossil fuel extraction,”² one gets a sense of the remarkable potential of this transition.

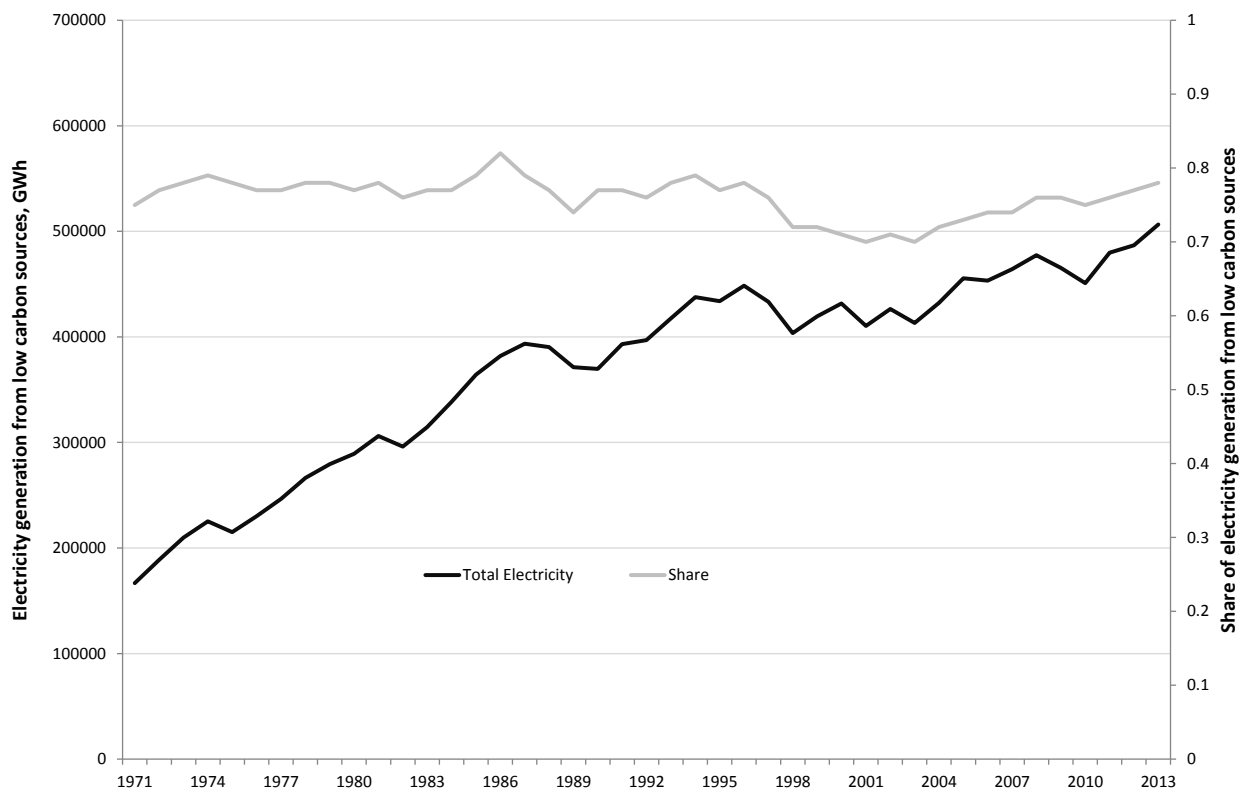


Figure 3: Electricity generation from zero-carbon (low-carbon) sources and share of electricity generation from zero-carbon sources in Canada 1971-2014 (source: International Energy Agency via Lancet Countdown)

As shown in Figure 3, Canada's production of zero-carbon electricity has essentially increased fast enough that its share of total electricity has remained relatively constant as electricity use has increased. As Canada moves to electrify end-uses, such as heating and transport, in order to decrease emissions in accordance with Paris Agreement objectives, requirements for zero-carbon sources of electricity will increase.⁵²

Policy Recommendation #2: Phase out coal-powered electricity in Canada by 2030 or sooner, with a minimum of two thirds of the power replaced by non-emitting sources, and any gap made up by lowest-emitting natural gas technology. Track and cost the health benefits of the transition in Canada and globally.

Sustainable Travel Infrastructure and Uptake

Moving from private motorized transport to public transport, walking and cycling in urban areas helps to decrease emissions from vehicles, as well as having substantial health benefits: commuting on foot or by bike has been shown to decrease cardiovascular mortality, and cycling has been shown to decrease all-cause mortality and mortality from cancer.⁵³

The PURE study, which was carried out in a range of low-, middle-, and high-income countries, also recently found that higher recreational and non-recreational physical activity (such as active transport) was associated with a lower risk of mortality and cardiovascular events.⁵⁴

Comparing modal transport rates reported in the Lancet Countdown's Figure 3.12 to those of Canadian cities, as reported in the 2011 National Household Survey (Figure 4) demonstrates that even Vancouver, which performs well on the Canadian spectrum, is still at the lower end of sustainable travel rates as compared to the international examples.

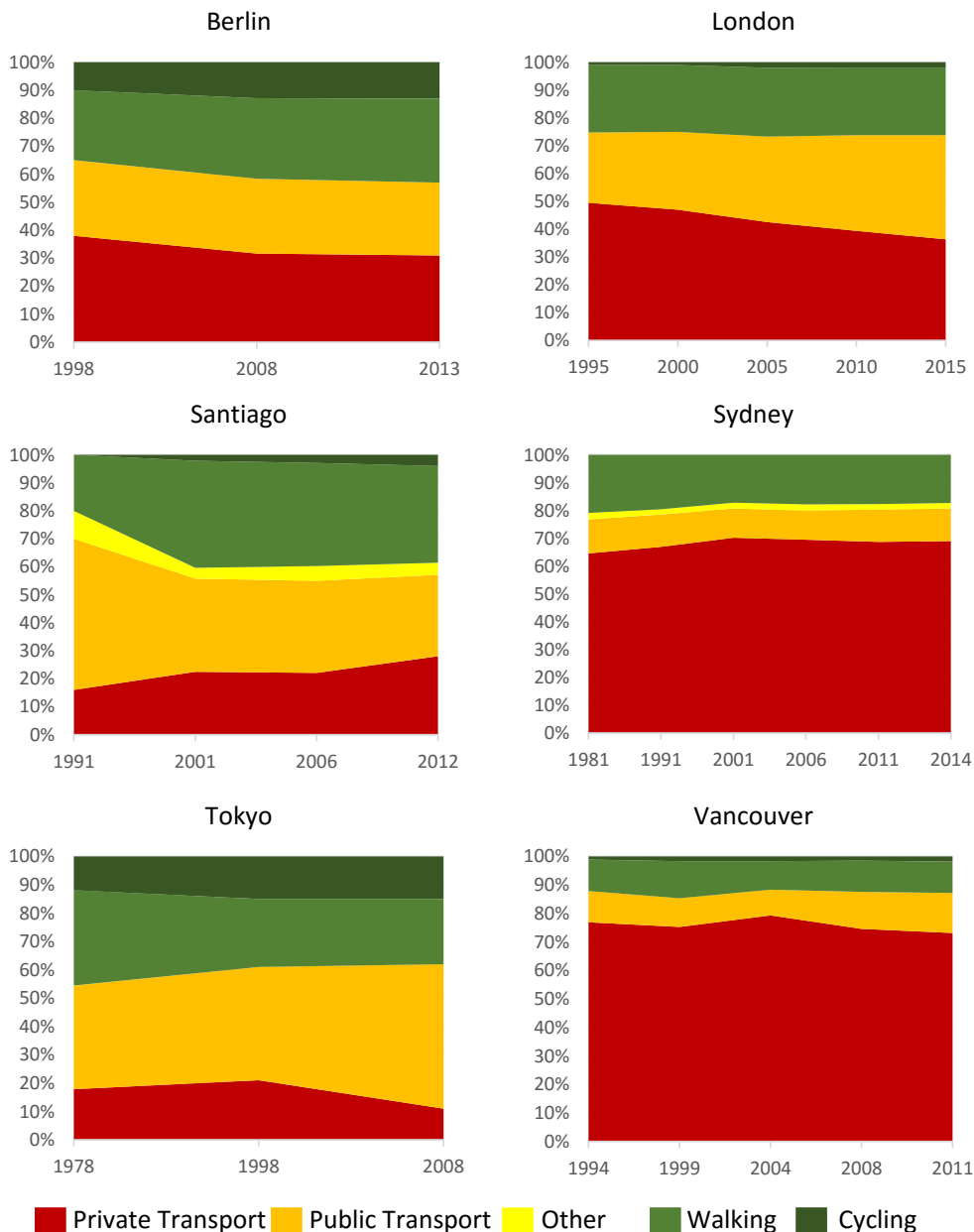


Figure 4: Trend in modal share in selected cities (from the Lancet Countdown report)

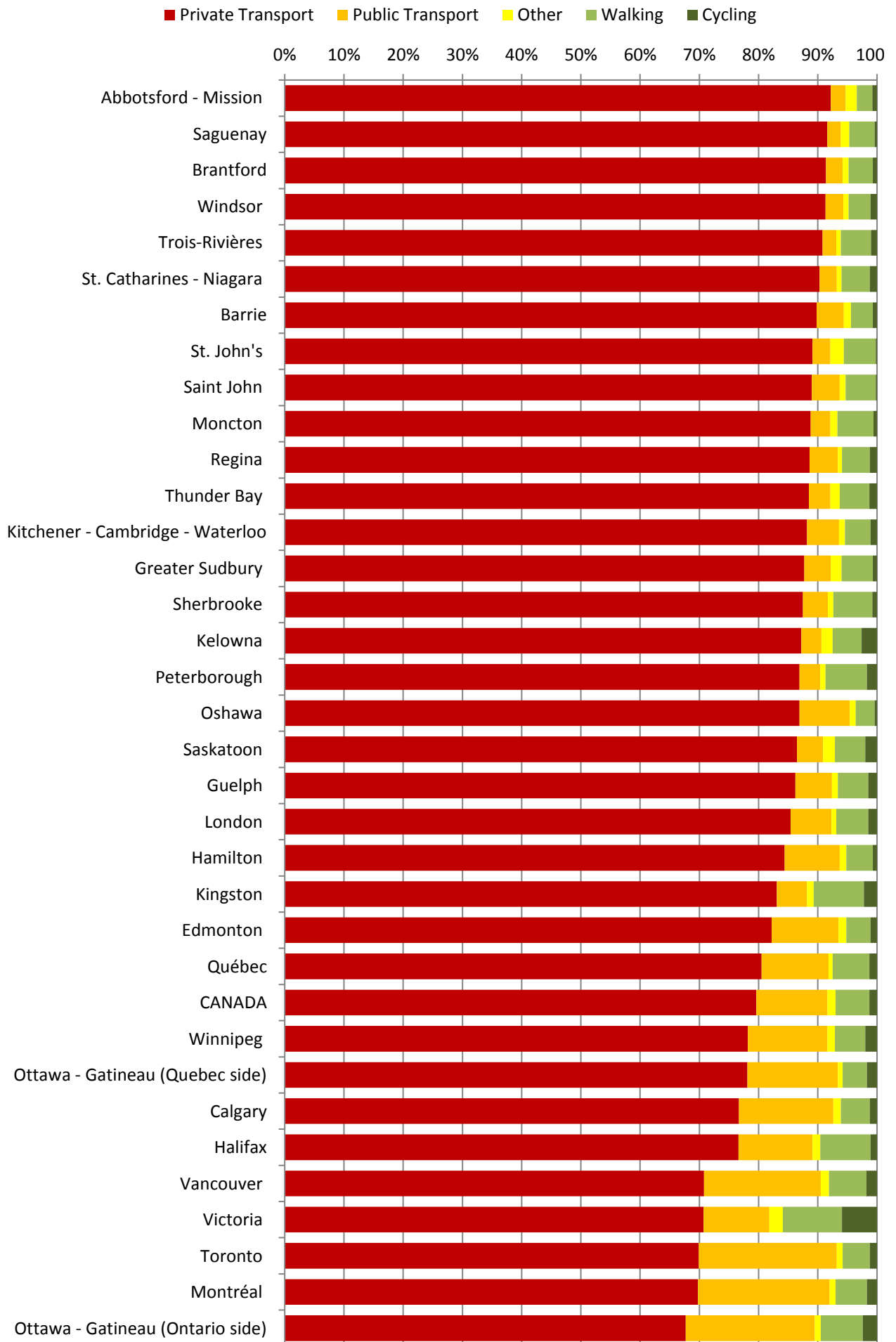


Figure 5: Modal transport during work commute (data from 2011 National Household Survey)⁵⁵

Because most transit trips begin and end with walking, transit use is considered active travel: a Montreal study found that a public transit round trip averaged 2,500 steps, accounting for 25% of the physical activity recommended each day.⁵⁶ Given that exercise reduces anxiety⁵⁷ and depression,⁵⁸ and that active travel has been shown to decrease air pollution and GHG emissions,⁵⁹ supporting sustainable travel infrastructure and uptake is a high-yield public policy opportunity. The Countdown points out that, “Recent United Nations (UN) guidance recommends devoting 20% of transport budgets to funding non-motorized transport at national and local levels in low- and middle-income countries.”² In addition to funding, opportunities to share best practices across Canada between cities of similar size, infrastructure and climate should be maximized in order to optimize active transport infrastructure, reduce urban sprawl, and create the most livable, walkable communities possible.

Telecommuting offers additional opportunities for sustainable travel. A recent Canadian study found that “working from home is associated with decreases in overall travel time by 14 minutes and increases in odds of non-motorised travel by 77%,”⁶⁰ while a US study found that there may be health benefits for people who telecommute.⁶¹

An aspect of telecommuting of relevance to Lancet Countdown indicator 3.9 (healthcare sector emissions) is telemedicine. A study in Portugal found that teleconsultations resulted in reductions in distances and GHGs of 95%,⁶² while a Canadian study, which calculated the savings involved in 840 telemedicine consultations in Ontario, estimated savings of 185 tonnes of CO₂ equivalents (CO₂eq) in vehicle emissions, and 360 444 g of other air pollutants.⁶³ Given that 282 teleconsultations involved northern Ontario residents who could claim compensation for distance traveled and accommodation, \$192,665.88 CAD was saved in costs to the Northern Health Travel Grant program.⁶³ Similarly, British Columbia’s Island Health estimates that it has saved 10.6 million km of patient travel and 2,900 tonnes of CO₂eq between 2007 and end-July 2016.⁶⁴ Telemedicine components including expanded electronic medical records and videoconferencing are being introduced in remote Canadian jurisdictions, such as the NWT and Labrador, but support for data collection is needed. Canadian estimates of health-system wide GHG emissions and targets for reduction are also required: the UK, for example, has monitored system-wide emissions from a 1992 baseline and “set an ambitious target of 34% health-system wide GHG emission reduction by 2020.”² Data and targets drive change – and change is needed.

Policy Recommendation #3: Development of a National Active Transport Strategy for Canada to coordinate improvements to walking, cycling and transit environments. This should receive priority funding, with healthcare cost savings calculated in order to demonstrate the cost offset of the investments.

Policy Recommendation #4: Enhance support for telecommuting and telehealth options. Within health systems, gather and analyze data on kilometers, greenhouse gas emissions, air pollution and costs saved by telehealth in order to help drive systems change.

Ruminant Meat for Human Consumption

The Lancet Countdown tracks ruminant meat availability, assuming a correlation between availability and consumption. Ruminant meat accounts for high levels of GHG emissions, estimated at 5.6-7.5 GtCO₂e per year, much of it from cattle.² Low-meat, plant-rich diets have been shown to decrease colorectal cancer and cardiovascular disease risk,⁶⁵ modestly reduce all-cause mortality,⁶⁵ and improve glycemic control among those with Type II Diabetes,⁶⁶ as well as reduce water use, land use and GHGs to a median of 20-30% across studies in a recent review.⁶⁵

Using data constructed from UN Food and Agricultural Organization balance sheets, the Lancet Countdown found that the amount of ruminant meat available for human consumption globally has declined slightly from 1990-2013.² Canada's statistics follow this trend, with a gradual decrease since the mid-to-late 1970's.

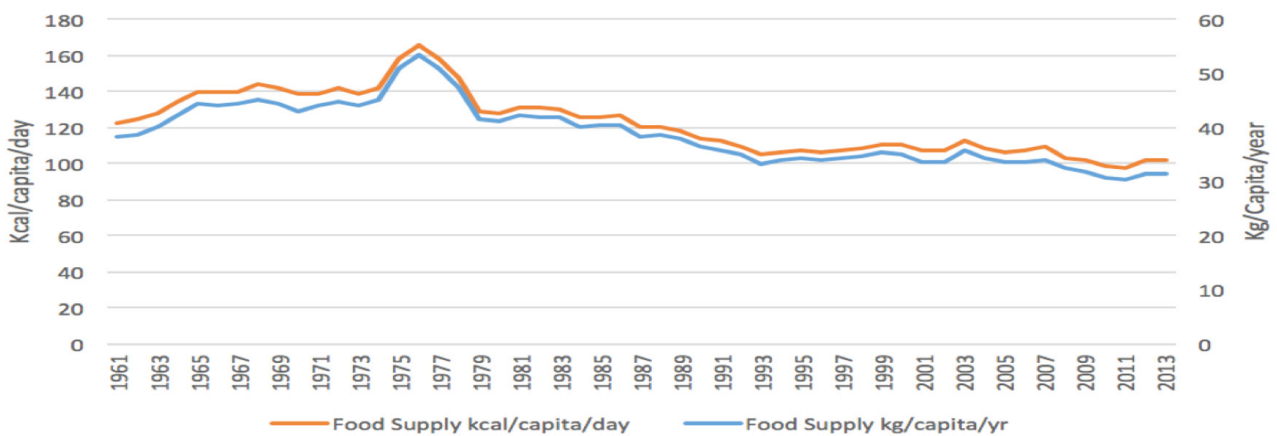


Figure 6: Ruminant meat for human consumption in Canada from 1961-2013. Data from FAO via Lancet Countdown.

In a timely development for planetary health, the Government of Canada's recent draft guiding principles for healthy eating recommend, "regular intake of vegetables, fruit, whole grains and protein-rich foods, especially plant-based sources of protein."⁶⁷

Policy recommendation #5: Provide strong health-sector support for Health Canada's draft healthy eating guidelines which emphasize plant-based sources of protein, with framing of these guidelines as being beneficial for both human and planetary health.

Land Use Case Study:

Local Health Impacts of Resource Extraction on Indigenous Communities

Rapid development of the Canadian oil sands and hydraulic fracturing over the past several decades, particularly in Alberta and British Columbia, has changed Canadian landscapes considerably, and generated a research lag regarding potential direct health impacts on local populations.

This is particularly relevant with regards to Indigenous communities, some of whom now express concerns that landscapes are fragmented to the extent that their traditional way of life is no longer possible, with adverse impacts on their culture and wellbeing.^{68,70}

One such group, the Blueberry River First Nations, sued the government of British Columbia in 2015, alleging it had breached Treaty 8, which promises that in exchange for opening their lands to settlement, they could continue their traditional way of life.⁷⁰ A subsequent report by non-governmental organizations Ecotrust and the David Suzuki Foundation found that, "Based on government data, 73% of the area inside Blueberry River First Nations traditional territory is within 250 metres of an industrial disturbance, and 84% is within 500 metres of an industrial disturbance."⁷¹

In 2015, Canada's Truth and Reconciliation Commission called on Canadians to identify and close the gaps in health disparities between Indigenous and non-Indigenous communities.⁷² An emerging commitment to do so is evident in the Canadian community, as seen in recent discussions about Indigenous health at the Canadian Medical Association, and the ⁷³appointment of a Federal Minister of Indigenous Services, tasked with Indigenous health provision. An important part of this wave is research-related: committing to investigate the resource-related concerns of our Indigenous communities in a manner consistent with Canada's considerable epidemiologic, toxicological and medical research expertise.

Another important element of reconciliation and planetary health moving forwards is to ensure that health impact assessments (HIAs) are integrated as a core component of the federal Environmental Assessment process. These HIAs must take a determinants of health approach; position sustainability and equity as key pillars; require the establishment of baseline health and community well-being prior to development; and involve Indigenous communities, and the federal government (Health Canada, Public Health Agency of Canada, Employment and Social Development Canada as well as Environment and Climate Change Canada) as key decision-makers. Where there are considerable and reasonable scientific uncertainties with potential for serious present or future harm, the UNESCO 2005 definition of the precautionary principle should be used to inform the discussion, as outlined in a submission by health organizations including the Canadian Public Health Association and the Canadian Association of Physicians for the Environment.⁷⁵

An encouraging case study into new practices is, the ECHO-Environment, Community, Health, Observation network. It is a 5-year research program, funded by a Canadian Institute of Health Research Team Grant, focused on "working together across sectors to take notice of--and respond to--the influences of resource development on health and well-being, with specific emphasis on rural, remote and Indigenous communities,"⁷⁶ including in the area of the Blueberry River First Nations.

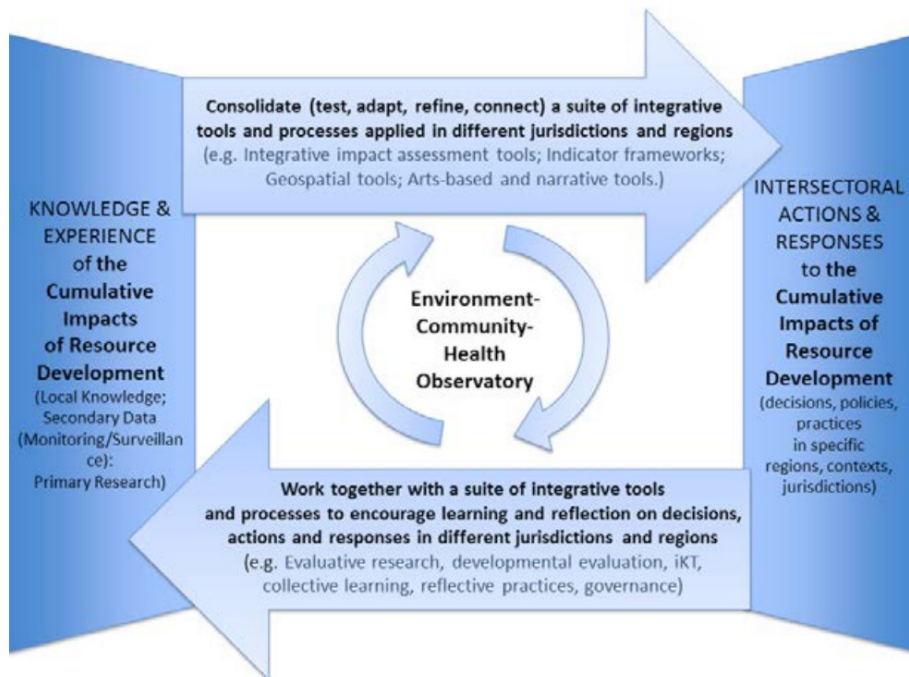


Figure 7: The ECHO Framework.⁷⁶ Used with permission from the research team.

A multidisciplinary project that seeks to honour different types of knowledge, and work towards an understanding of the cumulative impacts of resource development, the ECHO project is the type of inquiry needed to help us understand the health complexities of our current energy system, so we may best design the one to come.

Policy Recommendation #6: Increase funding for research into the local health impacts of resource extraction, with a focus on impacts on Indigenous populations.

Policy Recommendation #7: Integrate Health Impact Assessments as a core component of the federal Environmental Assessment process.

Additional Information

Lancet Countdown Website: <http://www.lancetcountdown.org/>

WHO UNFCCC Climate and Health Country Profiles

The WHO UNFCCC Climate and Health Country Profiles form the foundation of WHO's national level provision of information, and monitoring of progress in climate change and health. The climate and health country profiles, first published in 2015, are developed in collaboration with ministries of health and health determining sectors with the aim of empowering Ministers of Health to engage, advocate and act to protect health from climate change. The most recent and relevant scientific evidence from the health, environment and meteorological communities is presented to highlight country-specific climate hazards and the potential health impacts facing populations. National action on health adaptation and mitigation is reported in the profiles and opportunities to promote actions that improve health while reducing carbon emissions are presented. For more information on the WHO UNFCCC Climate and Health Country Profiles please visit the [website](#) and watch the [introductory video](#).

References

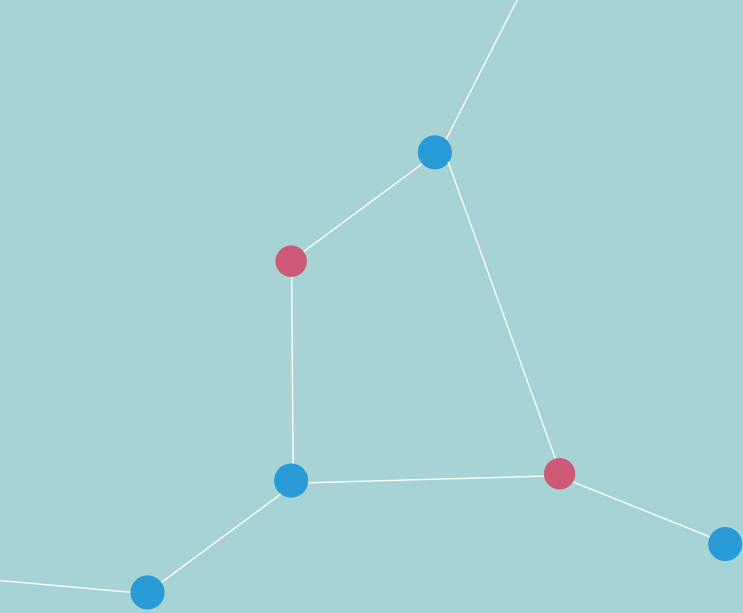
1. Costello A, Grant M, Horton R. The Lancet-UCL Commission: health effects of climate change. *Lancet*. 2008;371(9619):1145-7. <https://www.ncbi.nlm.nih.gov/pubmed/18395563>
2. Watts N, et al. The 2017 Report of the Lancet Countdown on Health and Climate Change: From 25 years of inaction to a global transformation for public health. *The Lancet*. 2017
3. Watts N, Adger WN, Agnoleschi P, Blackstock J, Byass P, Cai W, et al. Health and climate change: policy responses to protect public health. *Lancet*. 2015;386(10006):1861-914. <https://www.ncbi.nlm.nih.gov/pubmed/26111439>
4. Government of the Northwest Territories. CLIMATE OBSERVATIONS IN THE NORTHWEST TERRITORIES (1957-2012) Inuvik * Norman Wells * Yellowknife * Fort Smith. <http://studyres.com/doc/1539834/climate-change-in-the-northwest-territories>
5. Government of Canada HC. Climate Change and Public Health Factsheets [Sept 30, 2017]. Available from: <https://www.canada.ca/en/public-health/services/health-promotion/environmental-public-health-climate-change/climate-change-public-health-factsheets.html>.
6. Berry P, Clarke K, Fleury MD, Parker SHH, in Canada in a Changing Climate: Sector Perspectives on Impacts and Adaptation eFJWaDSLGoC, Ottawa, ON, p. 191-232. Human Health; in from Impacts to Adaptation: Canada in a Changing Climate. Natural Resources Canada, 2014. <http://www.nrcan.gc.ca/environment/resources/publications/impacts-adaptation/reports/assessments/2014/16309>
7. Toronto Public Health. A Climate of Concern: Climate Change and Health Strategy for Toronto 2015. 2015. <http://www.toronto.ca/legdocs/mmis/2015/hl/bgrd/backgroundfile-81509.pdf>
8. Henderson SB, Johnston FH. Measures of forest fire smoke exposure and their associations with respiratory health outcomes. *Current opinion in allergy and clinical immunology*. 2012;12(3):221-7
9. Rosol R, Powell-Hellyer S, Chan HM. Impacts of decline harvest of country food on nutrient intake among Inuit in Arctic Canada: impact of climate change and possible adaptation plan. *International journal of circumpolar health*. 2016;75(1):311-27. <https://www.ncbi.nlm.nih.gov/pubmed/28156428>
10. Cunsolo Willox A, Harper SL, Ford JD, Landman K, Houle K, Edge VL, et al. "From this place and of this place:" climate change, sense of place, and health in Nunatsiavut, Canada. *Social science & medicine*. 2012;75(3):538-47. <http://www.ncbi.nlm.nih.gov/pubmed/22595069>
<http://www.sciencedirect.com/science/article/pii/S0277953612003255>
11. Alberta Health. Impact of Wildfires on the Mental Health of Fort McMurray Residents: Neurotic Disorders, Daily Physician Visits within an Emergency Department 2015 vs. 2016. Alberta Health, Health Standards, Quality and Performance Division, Analytics and Performance Reporting Branch, 2016
12. Government of Canada, Agriculture and Agri-Foods. Impact of climate change on Canadian agriculture 2015-07-30 [Oct 22, 2017]. Available from: <http://www.agr.gc.ca/eng/science-and-innovation/agricultural-practices/agriculture-and-climate/future-outlook/impact-of-climate-change-on-canadian-agriculture/?id=1329321987305>
13. Ogden NH, St-Onge L, Barker IK, Brazeau S, Bigras-Poulin M, Charron DF, et al. Risk maps for range expansion of the Lyme disease vector, *Ixodes scapularis*, in Canada now and with climate change. *International journal of health geographics*. 2008;7:24. <http://www.ncbi.nlm.nih.gov/pubmed/18498647>
14. Berry P. 2017.
15. Canadian Coalition for Green Healthcare. Canadian Health Care Facility Impacts due to Climate Events 2017 [cited 2017 October 18, 2017].
16. MD-Financial. Invest With Impact: MD Fossil Fuel Free Funds™ [September 30 2017]. Available from: <https://mdm.ca/our-services/investments/md-fossil-fuel-free-funds>.
17. Howard C. Canadian Medical Association Completes Divestment from Fossil Fuels. *National Observer*. 2016. <http://www.nationalobserver.com/2016/08/29/news/canadian-medical-association-completes-divestment-fossil-fuels>
18. Government of Canada, Environment and Climate Change. Technical paper: federal carbon pricing backstop. 2017. <https://www.canada.ca/en/services/environment/weather/climatechange/technical-paper-federal-carbon-pricing-backstop.html>
19. Bell D. Children feeling stress of Fort McMurray wildfires. 2016. <http://www.cbc.ca/news/canada/calgary/children-impact-fort-mcmurray-fire-1.3572275>
20. V. M, Nolan M, Doig C. What are the health impacts of forest fires? 2017 September 14, 2017. <http://healthydebate.ca/2017/09/topic/forest-fires-health>

21. Picard A. Heat and health: Doctors taking the pulse of the planet on climate change. *Globe and Mail*. 2017 March 21, 2017. <https://beta.theglobeandmail.com/opinion/heat-and-health-doctors-taking-the-pulse-of-the-planet/article34352790/?ref=http://www.theglobeandmail.com&>
22. Kosatsky T, Henderson S, Pollock S. Shifts in Mortality During a Hot Weather Event in Vancouver, British Columbia: Rapid Assessment With Case-Only Analysis. *American journal of public health*. 2012 102(12):2367–71. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3519317/>
23. Bustinza R, Lebel G, Gosselin P, Belanger D, Chebana F. Health impacts of the July 2010 heat wave in Quebec, Canada. *BMC public health*. 2013;13:56. <https://www.ncbi.nlm.nih.gov/pubmed/23336593>
24. data LC. 2017.
25. Government of the Northwest Territories. 2014 NWT Fire Season Report. In: Resources EaN, editor. 2014.
26. 'Unprecedented' wildfires force out 13,000 Sask. evacuees: Biggest ever exodus of its kind in Saskatchewan, Red Cross says. *CBC News*. 2015 Jul 06, 2015. <http://www.cbc.ca/news/canada/saskatchewan/unprecedented-wildfires-force-out-13-000-sask-evacuees-1.3139554>
27. Hopper T. Scores of wildfires in Western Canada creating a disaster of historic proportions. 2015. <http://nationalpost.com/news/canada/scores-of-wildfires-in-western-canada-creating-a-disaster-of-historic-proportions>
28. Todd Z. Fort McMurray wildfire - by the numbers. 2016. <http://www.cbc.ca/news/canada/edmonton/fort-mcmurray-wildfire-by-the-numbers-1.3572193>
29. Hampshire G. Hospital heroes get patients to safety during Fort McMurray fire: 17 buses took 105 patients to safety in dramatic evacuation. *CBC News*. 2016. <http://www.cbc.ca/news/canada/edmonton/hospital-heroes-get-patients-to-safety-during-fort-mcmurray-fire-1.3574416>
30. Friscolanti M. 'People say there were no casualties. There are two now'. 2016. <http://www.macleans.ca/news/canada/people-say-there-were-no-casualties-there-are-two-now/>
31. McConnell R. Fort McMurray is 'still alive,' fire chief says — but safety concerns linger . 2016 May 9, 2016. <http://www.cbc.ca/news/canada/edmonton/fort-mcmurray-tour-notley-media-1.3572982>
32. Wildfires prompt closure of Williams Lake hospital, evacuation of patients from Clearwater hospital. *Kamloops This Week* 2017 July 15, 2017 <https://www.kamloopsthisweek.com/wildfires-prompt-closure-williams-lake-hospital-evacuation-patients-clearwater-hospital/>
33. Pawson C. <http://www.cbc.ca/news/canada/british-columbia/williams-lake-evacuation-order-1.4207323>. 2017. <http://www.cbc.ca/news/canada/british-columbia/williams-lake-evacuation-order-1.4207323>
34. Finlay SE, Moffat A, Gazzard R, Baker D, Murray V. Health impacts of wildfires. *PLoS Curr*. 2012;4:e4f959951c-ce2c. <https://www.ncbi.nlm.nih.gov/pubmed/23145351>
35. Liu JC, Pereira G, Uhl SA, Bravo MA, Bell ML. A systematic review of the physical health impacts from non-occupational exposure to wildfire smoke. *Environmental research*. 2015;136:120-32. <https://www.ncbi.nlm.nih.gov/pubmed/25460628>
36. Johnston FH, Henderson SB, Chen Y, Randerson JT, Marlier M, Defries RS, et al. Estimated global mortality attributable to smoke from landscape fires. *Environmental health perspectives*. 2012;120(5):695-701. <https://www.ncbi.nlm.nih.gov/pubmed/22456494>
37. Judd A. Air quality advisory issued again for Metro Vancouver, Fraser Valley due to smoke from wildfires. 2017 September 4, 2017 <https://globalnews.ca/news/3717031/air-quality-advisory-issued-again-for-metro-vancouver-fraser-valley-due-to-smoke-from-wildfires/>
38. CBC. 'High risk' air quality warning issued for Calgary as B.C. wildfire smoke returns: Environment Canada advises people with breathing difficulties to stay indoors. 2017. <http://www.cbc.ca/news/canada/calgary/calgary-air-quality-index-health-aqhi-bc-forest-fires-alberta-smoky-skies-august-31-1.4269864>
39. Iwasawa S. [WEBALOGUE]: Wildfires and Ecosocial Determinants of Health: Reflections on Experience in the NWT and BC 2017. <https://copehcanblog.wordpress.com/2017/09/15/webalogue-wildfires-and-ecosocial-determinants-of-health-reflections-on-experience-in-the-nwt-and-bc-2/>
40. Elliott CT. Guidance for BC Public Health Decisionmakers During Wildfire Smoke Events. *Environmental Health Services British Columbia Centre for Disease Control*, 2014 September 2014. Report No.:
41. Government of Canada Environment and Climate Change Canada. Powering our future with clean energy 2016 [updated 2016-12-09; cited 2017 October 5]. Available from: <https://www.canada.ca/en/services/environment/weather/climatechange/pan-canadian-framework/clean-energy.html>.
42. Government of Canada, Office of the Auditor General. 2017 Fall Reports of the Commissioner of the Environment and Sustainable Development to the Parliament of Canada. Report 1—Progress on Reducing Greenhouse Gases—Environment and Climate Change Canada. 2017. http://www.oag-bvg.gc.ca/internet/English/parl_cesd_201710_01_e_42489.html - hd4c
43. Potvin C. Acting on climate change: Solutions from Canadian scholars. 2015 March 2015. Report No. <http://>

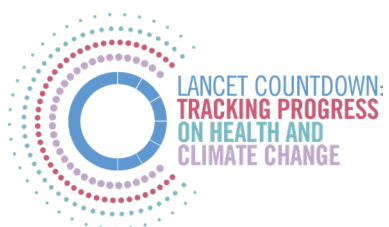
www.sustainablecanadialogues.ca/files/PDF_DOCS/SCD_short_30marchlr.pdf

44. Government of Canada Environment and Climate Change Canada. Pan-Canadian Framework on Clean Growth and Climate Change. 2017 January 25, 2017. Report No.<https://www.canada.ca/en/services/environment/weather/climatechange/pan-canadian-framework.html>
45. Gower S, Macfarlane R, Belmont M, Bassil K, Campbell M. Path to Healthier Air: Toronto Air Pollution Burden of Illness Update. Technical Report. April 2014. Toronto Public Health, 2014.<http://www1.toronto.ca/CityOfToronto/TorontoPublicHealth/HealthyPublicPolicy/ReportLibrary/PDFReportsRepository/2014AirPollutionBurdenofIllnessTechRPTfinal.pdf>
46. Israël B, E. F. Out With the Coal, in With the New: National benefits of an accelerated phase-out of coal-fired power. Pembina Institute, 2016.<http://www.pembina.org/reports/out-with-the-coal-in-with-the-new.pdf>
47. World Health Organization. Factsheet Ambient (outdoor) air quality and health: WHO; 2016 [Sept 13 2017]. Available from: <http://www.who.int/mediacentre/factsheets/fs313/en/>.
48. World Health Organization. Mercury and health Factsheet. 2017.<http://www.who.int/mediacentre/factsheets/fs361/en/>
49. Watts N, et al. The Lancet Countdown: tracking progress on health and climate change. *The Lancet*. 2016;389(10074):1151–64
50. Pachauri RK, Climate CWTPOC. IPCC 2014; Climate Change 2014 Synthesis Report; Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Geneva, Switzerland.: Intergovernmental Panel on Climate Change, 2014.https://www.ipcc.ch/pdf/assessment-report/ar5/syr/SYR_AR5_FINAL_full.pdf
51. Hays J, Shonkoff SB. Toward an Understanding of the Environmental and Public Health Impacts of Unconventional Natural Gas Development: A Categorical Assessment of the Peer-Reviewed Scientific Literature, 2009–2015. *PloS one*. 2016;11(4):e0154164.<http://www.ncbi.nlm.nih.gov/pubmed/27096432>
52. Government of Canada, Environment and Climate Change Canada. Canada's Mid-Century Long-Term Low-Greenhouse Gas Development Strategy. 2017.http://unfccc.int/files/focus/long-term_strategies/application/pdf/can_low-ghg_strategy_red.pdf
53. Celis-Morales CA1 LD, Welsh PI, Anderson J2, Steell LI, Guo Y1, Maldonado RI, Mackay DF2, Pell JP2, Sattar NI, Gill JMR3. Association between active commuting and incident cardiovascular disease, cancer, and mortality: prospective cohort study. *British Medical Journal*. 2017;357(j):1456.).<https://www.ncbi.nlm.nih.gov/pubmed/28424154>
54. Lear SA, Hu W, Rangarajan S, Gasevic D, Leong D, Iqbal R, et al. The effect of physical activity on mortality and cardiovascular disease in 130 000 people from 17 high-income, middle-income, and low-income countries: the PURE study. *Lancet*. 2017.<https://www.ncbi.nlm.nih.gov/pubmed/28943267>
55. Government of Canada, StatsCan. Commuting to work: National Household Survey 2011–2016 [updated 2016-09-15; cited 2017 September 20, 2017]. Available from: http://www12.statcan.gc.ca/nhs-enm/2011/as-sa/99-012-x/99-012-x2011003_1-eng.cfm.
56. Morency C, Trépanier M, Demers M. Walking to transit: an unexpected source of physical activity. *Transport Policy*. 2011;18.6:800–6
57. de Souza Moura AM, Lamego MK, Paes F, Ferreira Rocha NB, Simoes-Silva V, Rocha SA, et al. Effects of Aerobic Exercise on Anxiety Disorders: A Systematic Review. *CNS Neurol Disord Drug Targets*. 2015;14(9):1184–93.<https://www.ncbi.nlm.nih.gov/pubmed/26556089>
<http://www.eurekaselect.com/136835/article>
58. Wegner M, Helmich I, Machado S, Nardi AE, Arias-Carrion O, Budde H. Effects of exercise on anxiety and depression disorders: review of meta-analyses and neurobiological mechanisms. *CNS Neurol Disord Drug Targets*. 2014;13(6):1002–14.<https://www.ncbi.nlm.nih.gov/pubmed/24923346>
<http://www.eurekaselect.com/122692/article>
59. Maizlish N, Woodcock J, Co S, Ostro B, Fanai A, Fairley D. Health cobenefits and transportation-related reductions in greenhouse gas emissions in the San Francisco Bay area. *American journal of public health*. 2013;103(4):703–9.<https://www.ncbi.nlm.nih.gov/pubmed/23409903>
60. Lachapelle U, Tanguay GA, Neumark-Gaudet L. Telecommuting and sustainable travel: Reduction of overall travel time, increases in non-motorised travel and congestion relief? *Urban Studies*. 2017
61. Henke RM, Benevent R, Schulte P, Rinehart C, Crighton KA, Corcoran M. The Effects of Telecommuting Intensity on Employee Health. *American journal of health promotion : AJHP*. 2016;30(8):604–12.<https://www.ncbi.nlm.nih.gov/pubmed/26389981>
62. Oliveira TC, Barlow J, Goncalves L, Bayer S. Teleconsultations reduce greenhouse gas emissions. *Journal of health services research & policy*. 2013;18(4):209–14.<https://www.ncbi.nlm.nih.gov/pubmed/23945677>

63. Masino C, Rubinstein E, Lem L, Purdy B, Rossos PG. The impact of telemedicine on greenhouse gas emissions at an academic health science center in Canada. *Telemed J E Health*. 2010;16(9):973-6. <https://www.ncbi.nlm.nih.gov/pubmed/20958198>
64. Henderson JTS, Centre for Telehealth, Island Health). . In: Hancock T, editor: 2016.
65. Aleksandrowicz L, Green R, Joy EJ, Smith P, Haines A. The Impacts of Dietary Change on Greenhouse Gas Emissions, Land Use, Water Use, and Health: A Systematic Review. *PloS one*. 2016;11(11):e0165797. <https://www.ncbi.nlm.nih.gov/pubmed/27812156>
66. Yokoyama Y, Barnard ND, Levin SM, Watanabe M. Vegetarian diets and glycemic control in diabetes: a systematic review and meta-analysis. *Cardiovasc Diagn Ther*. 2014;4(5):373-82. <https://www.ncbi.nlm.nih.gov/pubmed/25414824>
67. Health Canada. Summary of Guiding Principles and Recommendations for Healthy Eating. 2017. <https://www.foodguideconsultation.ca/guiding-principles-summary>
68. Treaty 8 Releases their statement and position on Alberta's Final draft Aboriginal Consultation Policy [press release]. Sept 10, 2013 2013.
69. Kuhn J. Tar Sands Trial: BLCN vs. Alberta and Canada 2017 [cited 2017 October 5]. Available from: <https://raventrust.com/tar-sands-trial/>.
70. Hume M. First Nations seek injunction barring development in Fort St. John region. 2015 MARCH 4, 2015. <https://beta.theglobeandmail.com/news/british-columbia/sweeping-aboriginal-lawsuit-threatens-to-strangle-resource-development-in-northeastern-bc/article23282084/?ref=http://www.theglobeandmail.com&>
71. Macdonald E. Atlas of Cumulative Landscape Disturbance in the Traditional Territory of Blueberry River First Nations. 2016. [http://www.davidsuzuki.org/publications/Blueberry Atlas report_final.pdf](http://www.davidsuzuki.org/publications/Blueberry%20Atlas%20report_final.pdf)
72. Truth and Reconciliation Commission. Truth and Reconciliation Commission Calls to Action. 2015. http://www.trc.ca/websites/trcinstitution/File/2015/Findings/Calls_to_Action_English2.pdf
73. Canadian Medical Association News. Physicians gather to address First Nations health. CMA News. 2016. <https://www.cma.ca/En/Pages/physicians-gather-to-address-first-nations-health.aspx>
74. Trudeau J. Minister of Indigenous Services Mandate Letter 2017 [cited 2017 October 5]. Available from: <http://pm.gc.ca/eng/minister-indigenous-services-mandate-letter>.
75. The Need for Health Impact Assessments to be Integrated into all Federal Environmental Assessment Processes 2016 [updated 23 DECEMBER 2016]. Available from: https://cape.ca/wp-content/uploads/2017/01/HIA-EA_final.pdf.
76. Parkes M, Allison S. Ecohealth Knowledge to Action Research Group 2017 [cited 2017 October 5]. Available from: <https://ecohealthkta.net/health-resource-development/echo/>.



Created by



CANADIAN PUBLIC HEALTH ASSOCIATION ASSOCIATION CANADIENNE DE SANTÉ PUBLIQUE

The Voice of Public Health
La voix de la santé publique