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Building climate-resilient and sustainable healthcare:

A plan of action for Alberta Health

The climate crisis needs to be addressed immediately. Environmental health and human health are inextricably linked. Left unabated, worsening environmental health will increase major diseases including cardiovascular disease, asthma, cancer and mental illness, and extreme weather events. Failing to address these consequences will disproportionately impact the most vulnerable, including the Indigenous populations of Canada. There is a narrow window of opportunity to achieve net-zero carbon emissions; the climate emergency is a health emergency. We call on Alberta Health to enact policy change to transition to a low carbon healthcare system and ensure climate resilience in health services delivery.



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Background

The climate emergency is a health emergency.¹ Globally, countries are prioritizing greenhouse gas (GHG) reductions with a target of ‘net zero by 2050’.^{2,3} This target aims to limit global warming in 2050 well below 2°C, preferably 1.5°C, compared to pre-industrial levels. Every additional 0.5°C of global warming causes more intense and frequent heat waves, heavy precipitation, and agricultural and ecological droughts. Despite efforts since the 1990s the planet has still warmed by 1.2°C.⁴ The most recent Intergovernmental Panel on Climate Change (IPCC) report makes an “unequivocal” connection between human activity and climate change.⁵

Canada needs to act now. The government recently announced an interim target of 40-45% reductions in GHGs below 2005 levels by 2030 to meet the net-zero by 2050 goal.⁶ Despite this, between 1990 and 2019, Canadian emissions increased from 603 Megatonnes (MT) to 730 MT (MT CO₂ equivalents).⁷ The United Kingdom, by contrast, reduced its GHG emissions by approximately 40% during the same time, having instituted the Climate Change Act.^{8,9}

Health impacts of climate change:^{10, 11, 12, 13}

- Temperature extremes increase morbidity and mortality due to heat-related illness, predominantly impacting the elderly and vulnerable
- Worsening air quality increases chronic obstructive pulmonary disease, asthma, ischemic heart disease, stroke and lung cancer, and lower respiratory infections
- Shifting climate patterns and changing biodiversity increase infectious disease burdens like malaria and Lyme disease
- Extreme weather events lead to loss of life, infrastructure damage, with high costs to individuals, families, and society
- Warming climate and drought impact agricultural activities, resulting in inferior nutrient quality and growth yields with consequent under-nutrition
- All adversely and cumulatively impact societal mental health

Climate-related disasters impacts on Alberta

Alberta has experienced – and paid for – the consequences of extreme environmental change. Four of the costliest disasters in Canadian history occurred in Alberta: the 2020 northeast Calgary hailstorm at \$1.2 billion; the 2018 Fort McMurray wildfires at \$3.58 billion; the 2013 southern Alberta floods at \$1.7 billion; and the 2011 Slave Lake Fire at \$700 million.^{14, 15, 16}

The human suffering and financial implications of Summer 2021's 'heat dome' events, associated wildfires in Western Canada, and ongoing drought have yet to be realised. These events follow the climate trend; Canada is warming faster than the global average.¹⁷ Additional future effects of climate change specific to the Prairies—extrapolated from work completed in the United States Plains regions—include an increased demand for energy and water and change in agricultural practices.^{18, 19}

GHG emissions from the healthcare sector

Healthcare-related carbon emissions are collectively responsible for 4.6% of Canada's total GHG emissions.²⁰ These are primarily due to emissions from hospitals, pharmaceuticals, and physician services. Achievement of net-zero by 2050 requires cross-sectoral leadership, including healthcare.²¹

NET-ZERO emissions means that "anthropogenic [human-caused] emissions of greenhouse gases (GHGs) into the atmosphere are balanced by anthropogenic removals of GHG from the atmosphere over a specified period."²² (Bill C-12, 2021).

Prominent medical professional associations that have issued calls to action:

- American Medical Association
- American Public Health Association
- Canadian Association of Physicians for the Environment
- Canadian Federation of Medical Students (supported by the International Federation of Medical Students).
- Canadian Medical Association
- Canadian Public Health Association
- Medical Society Consortium on Climate and Health
- National Health Service (NHS) in the United Kingdom
- Planetary Health Alliance
- WONCA (World Organization of Family Doctors)
- World Health Organization (WHO)

***In November 2021 Canada became a signatory of the WHO COP26 Health Programme. This programme "enables transformational change to protect the health of people and the planet" reflecting a strong federal commitment to change.²³*

Recommendations

The Alberta Government and Albertans must work across sectors to "re-imagine a society where health and wellbeing are prioritized, and incentives are aligned to promote fiscal and environmental stewardship."²⁴ Policy decisions need to be made through an Environment, Social and Governance lens to

align with the United Nations Sustainable Development Goals (SDGs). Mitigating the healthcare system carbon footprint requires all aspects of the economy to support vulnerable Albertans.

Creating opportunities

Meeting the outlined Canadian targets will benefit Albertans and result in cost savings. The majority of these cost savings will be due to improved human health.

- Canadians can save an estimated 112,000 lives between 2030 and 2050 due to air quality improvements alone^{25, 26}
- Every dollar spent today on adaptation will save \$6 in emergency response²⁷
- Modelling data from the International Renewable Energy Agency suggests the cost of an accelerated clean energy transition would be recovered eight-fold by the health sector²⁸
- An estimated growth in 'clean' jobs from 210,000 full-time equivalent positions in 2020 to 1.5 million by 2050²⁹
- New jobs in transition-related technologies would outweigh job losses in fossil fuel³⁰
- Net-Zero America models³¹ project big air pollution health benefits will start in the 2020s. Between now and 2050 approximately 200,000-300,000 premature deaths will be avoided, with a cost savings of \$2-3 trillion U.S. dollars in avoided damaged³²

An action plan for Alberta Health

Alberta Health, through its jurisdiction over publicly funded and publicly owned (Alberta Health Services) healthcare facilities, is ideally situated to drive change. The pressures of “fixed budget” publicly funded health systems can help provide incentive for resource stewardship in the context of population health promotion. Alberta Health can become leaders in climate change mitigation – developing insights, services and practical approaches - meeting our responsibility, while developing *business opportunities*. Key action points:

Acknowledge
urgency of
the crisis

Set goals

Invest in
people

Decarbonize
healthcare

1. Acknowledge the urgency of the climate crisis

GHG elimination should be prioritised, and COVID-based resources redirected to the climate crisis.

Actions

- Communicate the urgency of the climate crisis and GHG elimination strategies to stakeholders in Alberta
- Coordinate efforts to capitalize on breadth and depth of knowledge. Stakeholders should include other ministries such as:
 - *Alberta Environment and Parks* to ensure coordinated climate resilience planning and preparation
 - *Alberta Infrastructure* and *Alberta Transportation* to coordinate facilities and transportation as described below
 - *Alberta Education* to ensure that knowledge of impact and mitigation of climate change is taught throughout the province
 - The *Treasury Board and Finance* to ensure appropriate resources are mobilised to accomplish net-zero
 - *Engineering societies* to capitalise on knowledge translation and best environmental practices
 - The *Primary Care Networks* to raise the voice of health professionals as advocates for, and active participants in, mitigation efforts and to improve community care (a lower-carbon intensive care model than hospital-based care)
 - The *schools of public health, medicine and nursing* to promote climate adaptation research, while promoting it as educators
 - The *College of Physicians and Surgeons*, and other health professional colleges, to regulate education and mitigation efforts amongst their members
 - The *Alberta Medical Association* to support healthcare providers in making the needed mitigation efforts and ensure excellent preventative and primary care systems
 - The *Canadian Medical Association*, the *Canadian Federation of Medical Students*, the *Canadian Association of Physicians for the Environment*, and all health advisory councils to provide their knowledge and change mobilisation expertise
 - The *Ministry of Indigenous Relations*, as the Indigenous peoples of this land are often the first to experience the health effects of environmental deterioration and hold unique knowledge on land and resource management

- Develop pathways to attain emission reductions of 45% by 2030 and net-zero by 2050. Ensure pathways address the greater risks posed by those mitigation efforts to Indigenous peoples and other vulnerable populations
- Ensure pathways are updated annually to stay current, as technology and approaches are rapidly changing³³
- Ensure Alberta Health policies are viewed through an ESG (Environment, Social, and Governance) lens that will consider policy impacts to future generations

2. Set Goals: Measure, Monitor, Report, Repeat

Countries participating in the Paris Agreement³⁴ are bound to an annual greenhouse gas (GHG) emission reporting framework. Cities and many large corporations report their GHG emissions. Reliable, transparent, and comprehensive data is essential to strategic funding decisions.

Actions

- Create SMART (Specific, Measurable, Achievable, Realistic and Timely) goals from the pathways developed, to ensure targets are met
- Ensure present reporting, as per the Edmonton Climate Leaders Challenge, meets the global standard, and expands throughout AH authority and spectre of influence

3. Invest in our People: Empowering Providers to Act on Planetary Health

Healthcare workers are some of the most trusted professionals in society. Their relationship with patients is a tool with which to disseminate knowledge and motivate Albertans to decarbonize. Inspiring behaviour change in the healthcare team and the patients we serve is essential.³⁵ The provincial Environmental Protection and Enhancement Act endorses development and distribution of educational materials with respect to the environment, and a commitment to “co-ordinate, develop and deliver educational programs and services to assist Albertans to better understand the environment and become responsibly involved in the protection and wise use of the environment...”³⁶ Clinicians, administrators, researchers, leaders, and patients all need to be engaged urgently.

Actions

- Enable healthcare provider proficiency in Planetary Health (Climate Change and Health) by mandating education initiatives in healthcare facilities, and by working with regulatory and licensing bodies, as well as higher education institutions, to drive the integration of Planetary Health curricula across health professions education
- Establish a joint Planetary Health Working Group, from the cross-sectoral stakeholders and Ministries listed in Action Item 1, to advance province-wide goals

4. Decarbonize Healthcare – a. Facilities

Reducing the healthcare system’s carbon footprint will benefit the local energy economy through the diversification of energy sources, the transitioning of skill sets to develop a low-carbon building workforce, and stimulate construction companies and “green” technology firms. While there is a need to consider increased investment in healthcare to mitigate the climate risk, built environment and infrastructure investments support local Alberta businesses and economies, while having a positive effect on health.

Actions

- Accelerate transition to carbon-neutral heat and electrical sources such as hydrogen, solar, wind, and support development of a smart and green electrical grid in Alberta
- Expand the present GHG audit of utilities to be more comprehensive, including approximate cost estimates of how to bring all buildings to net-zero
- Attain Leadership in Energy and Environmental Design (LEED) Gold standards in facility design, increasing from Silver
- Commit to new construction and building retrofits that are energy generating (e.g. use of solar panels or building-integrated photovoltaics)

British Columbia established provincial goals for GHG reduction in 2007, and the Greenhouse Gas Reductions Targets Act (GGRTA) mandated that the B.C. public sector achieve and maintain carbon-neutral operations by 2010. In Ontario, hospitals were required to report on their GHG emissions under the Green Energy Act (2009-2019). Federal legislation may introduce similar requirements across all of Canada in the future.

4. Decarbonize Healthcare – b. Travel and Transport

Traffic pollution is a major contributor to GHG emissions and to respiratory illnesses. Travelling increases stress levels, contributes to aggressive behaviour and traffic accidents, and are a leading cause of death and disability, particularly in younger people.

Vehicle commuting is sedentary time, and travel time to and from appointments is lost productivity elsewhere in society. Healthcare provision involves massive transport of people: employees moving from home to work or to meetings, patients moving themselves to and from appointments, and the system transferring patients between facilities by ground and air transport.³⁷

Actions

- Prioritise access to community-based healthcare for all Albertans – care that is readily accessible in reasonable proximity, centered on patients’ needs, and is seamlessly integrated with other appropriate health services and the community.³⁸
- Ensure family doctors and specialist physicians can employ telemedicine, by collaborating with telecommunication companies and care providers to strengthen the telecom network infrastructure. Robust telecommunication system infrastructure and processes offer many advantages to patients:
 - It is convenient, reducing time off work and time waiting
 - It is often more accessible for those struggling with physical transport, or those living remotely
 - There is a reduction in GHG emissions with decreased physical transport needs

Telehealth is widely used in B.C. Island Health reported patients “saved more than 3.7 million kilometers of travel to appointments.” An Interior Health study estimated just one of its Telehealth programs saved 13.5 million patient kilometres and hundreds of thousands of kilometres in consultant travel over 2 years, while reducing GHG emissions by more than 2,000 tonnes of CO₂. The program also reduces the potential for road injuries, both for patients and families, and for staff, particularly in winter.^{39, 40}

- Transition AHS fleet vehicles to electric and hydrogen as local economies in these areas accelerate, supporting the Canadian government’s mandatory target of 100% zero-emission vehicles by 2035.⁴¹

- Track incoming transport rates. As much as one third of a healthcare organization’s total logistics expenses can be tied up in inbound transportation. Tracking, co-ordinating, and developing consortium transportation offers AHS a means to both reduce costs whilst reducing GHG emissions. Creating preferred carrier programs with carriers using clean fuel vehicles is another way to support greener healthcare.
- Incentivize public and active transport to healthcare facilities for patients and employees.

The NHS developed a “Cycle to Work Scheme” to promote environmentally friendly lifestyle choices for employees and help offset the cost of a new bicycle, while making marked GHG savings through vehicle commuting avoidance.^{42, 43}

4. Decarbonize Healthcare – c. Supply Chain and Procurement

The NHS estimates that 60 to 80% of healthcare’s emissions reside in supply chain factors (medical equipment, medicines, and chemicals).⁴⁴ Building on our learnings from COVID-19 supply chain breakdowns, a key to self-reliance is development of home-grown, Alberta-based, environmentally sustainable and net-zero industries to supply materials such as PPE, medical equipment, and food. This not only reduces waste and minimizes our carbon footprint, but it simultaneously stimulates local economies and local procurement.

Actions

- Transition away from single use products. Medical devices should be designed for reuse and kept in circulation (or repurposed) for as long as possible, to achieve net zero emission footprints from these devices⁴⁵
- Develop Alberta-based industries for the production of reusable items in healthcare
- Develop local business that specialize in the reuse and repurposing of medical waste
- Invest in local, sustainable food supply for healthcare facilities:
 - Supporting the development of Alberta-based regenerative and permaculture farming practices, by working with *Alberta Agriculture* and farmer’s co-operatives to supply locally-sourced, high-nutritive food to healthcare facilities for patients and providers alike. These agricultural practices reduce transport footprints while providing a significant local biological carbon sink in Alberta agriculture.^{46, 47}

- Transitioning towards more plant-based diets that are in line with standard dietary guidelines could reduce (global) mortality by 6-10% and food-related GHG emissions by 29-70%.^{48, 49} Furthermore, plant-based meals cost on average 50% less than meat-based. New York State has passed a bill requiring plant-based meals in hospitals.⁵⁰

4. Decarbonize Healthcare – d. Medications and Pharmaceutical Industry

The gases used in various healthcare delivery situations often negatively impact the climate. Safe alternatives are available now, without compromising care.

Actions

- Transition to lower carbon-footprint personal inhalers – Move from Metered Dose Inhalers (MDIs) to Dry Powdered Inhalers (DPI), which have a much lower carbon footprint.^{51, 52} For every MDI switched to DPI the equivalent GHG of 54 km of driving could be saved.⁵³ The NHS estimates that upwards of 3% of their overall emissions comes from point-of-use inhalers.⁵⁴
- Initiate procurement contracts for low-GHG anaesthetic agents and educate caregivers on low-GHG anaesthetic techniques, and cease the use of Desflurane immediately – Certain anaesthetic gases have a fractional carbon footprint compared to other available gases. Desflurane has a high GHG contribution, upwards of 2% of healthcare emissions (NHS, 2020). Educate staff on the adaptation of low GHG anaesthetic practice.^{55, 56}
- Develop partnerships with innovative and “green” pharma – Procurement decisions between Alberta Blue Cross and pharmaceutical companies should integrate environmental policies that embed eco-friendly product options, including recycling programs for inhalers, plastic syringes (shifting cost from public purse to pharmaceutical industry), and eco-friendly packaging.
- Prioritize preventative and community health, and educate care providers in the parsimonious use of resources – Decreasing the demand for higher carbon-intensity (and more costly) health services is key to decarbonizing healthcare. Improving preventative and community health, shifting away from reactive acute or “disease care,” realizes this decrease. Preventive care also reduces medication use and hospitalizations. Furthermore, if acute treatment is needed, a sustainable healthcare system “should match the type and intensity of care provided to the problem.”⁴⁵ Meanwhile, a robust education effort should be implemented to ensure parsimonious use of diagnostic tools and medications.

Conclusion

Alberta Health has the responsibility to adopt policies that will enforce the transition to net zero for our healthcare system by 2050, with an early target of a 45% reduction by 2030. This is a short timeline but necessary to avoid further catastrophic climate events in our province, our country, and throughout the world. If any one sector SHOULD and CAN meet this challenge it is the healthcare sector. With strong policy changes now, Alberta Health could be leaders towards a future that is bright for Albertans and for the planet.

References

- ¹ National Health Service. (2020). *Delivering a “Net Zero” National Health Service. 2020.* <https://www.england.nhs.uk/greenernhs/wp-content/uploads/sites/51/2020/10/delivering-a-net-zero-national-health-service.pdf>.
- ² United Nations Framework Convention on Climate Change (UNFCCC). (2015). *The Paris Agreement.* United Nations Climate Change. <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>.
- ³ IPCC 2021: Summary for Policymakers. In: *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [Masson-Delmotte, V., Zhai, P., Pirani, A., Connors, S.L., Péan, C., Berger, S., Caud, N., Chen, Y., Goldfarb, L., Gomis, M.I., Huang, M., Leitzell, K., Lonnoy, E., Matthews, J.B.R., Maycock, T.K., Waterfield, T., Yelekçi, O., Yu, R., & Zhou, B. (eds.)]. Cambridge University Press. In Press. <https://www.ipcc.ch/report/ar6/wg1/>.
- ⁴ Environment and Climate Change Canada. (2021). *Canada’s Enhanced Nationally Determined Contribution.* Government of Canada. <https://www.canada.ca/en/environment-climate-change/news/2021/04/canadas-enhanced-nationally-determined-contribution.html>.
- ⁵ IPCC 2021: Summary for Policymakers. [Masson-Delmotte, et al.].
- ⁶ Environment and Climate Change Canada. (2021). *Canada’s Enhanced Nationally Determined Contribution.* Government of Canada. <https://www.canada.ca/en/environment-climate-change/news/2021/04/canadas-enhanced-nationally-determined-contribution.html>.
- ⁷ Environment and Climate Change Canada. (2021). *Canadian Environmental Sustainability Indicators: Greenhouse gas emissions.* Government of Canada. <https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/greenhouse-gas-emissions.html>.
- ⁸ Frankhauser, S., Averchenkova, A., & Finnegan, J. (2018). *Policy brief: 10 years of the UK Climate Change Act.* Grantham Research Institute on Climate Change and the Environment. <https://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2018/04/10-years-of-UK-Climate-Change-Act-Summary-Policy-Brief.pdf>
- ⁹ Department for Business, Energy & Industrial Strategy (BEIS). (2020). *2020 UK greenhouse gas emissions, provisional figures.* Government of the United Kingdom. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/972583/2020_Provisional_emissions_statistics_report.pdf.

- ¹⁰ IPCC 2021: Summary for Policymakers. [Masson-Delmotte et al.]
- ¹¹ Watts, N., Amann, M., Arnel, N., Ayeb-Karlsson, S., Belesova, K., Boykoff, M., Byass, P., Cai, W., Campbell-Lendrum, D., Capstick, S., Chambers, J., Dalin, C., Daly, M., Dasandi, N., Davies, M., Drummond, P., Dubrow, R., Ebi, K.L., Eckelman, M., Ekins, P. et al. (2019). The 2019 report of The Lancet Countdown on health and climate change: ensuring that the health of a child born today is not defined by a changing climate. *The Lancet*, 394(10211), 1836–78. [https://doi.org/10.1016/S0140-6736\(19\)32596-6](https://doi.org/10.1016/S0140-6736(19)32596-6).
- ¹² World Health Organization. (2018). *Climate change and health*. <https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health>.
- ¹³ World Health Organization. (2016). *WHO Director-General addresses Human Rights Council on climate change*. <https://www.who.int/director-general/speeches/detail/who-director-general-addresses-human-rights-council-on-climate-change>.
- ¹⁴ Reiger, S. (2020, July 8). *Calgary hailstorm that caused \$1.2B in damage ranks as Canada's 4th costliest natural disaster*. CBC News. <https://www.cbc.ca/news/canada/calgary/calgary-hailstorm-costly-damage-1.5642317>.
- ¹⁵ Insurance Bureau of Canada. (2020). *Severe Weather Caused \$1.3 Billion in Insured Damage in 2019* [Media release]. <http://www.ibc.ca/ab/resources/media-centre/media-releases/severe-weather-caused-1-3-billion-in-insured-damage-in-2019>.
- ¹⁶ Insurance Bureau of Canada. (2014). *Canada inundated by severe weather in 2013: Insurance companies pay out record-breaking \$3.2 billion to policyholders* [Media release]. [http://www.ibc.ca/yt/resources/media-centre/media-releases/canada-inundated-by-severe-weather-in-2013-insurance-companies-pay-out-record-breaking-\\$3-2-billion-to-policyholders](http://www.ibc.ca/yt/resources/media-centre/media-releases/canada-inundated-by-severe-weather-in-2013-insurance-companies-pay-out-record-breaking-$3-2-billion-to-policyholders).
- ¹⁷ Bush, E., & Lemmen, D.S. [Eds.]. (2019). *Canada's Changing Climate Report*. Government of Canada. https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/energy/Climate-change/pdf/CCCR_FULLREPORT-EN-FINAL.pdf.
- ¹⁸ Larson, E., Greig, C., Jenkins, J., Mayfield, E., Pascale, A., Zhang, C., Drossman, J., Williams, R., Pacala, S., & Socolow, R. (2020). *Net-Zero America: Potential Pathways, Infrastructure, and Impacts*, interim report, Princeton University, Princeton, NJ. https://netzeroamerica.princeton.edu/img/Princeton_NZA_Interim_Report_15_Dec_2020_FINAL.pdf.
- ¹⁹ Sauchyn, D., Davidson, D., & Johnston, M. (2020). *Prairie Provinces; Chapter 4 in Canada in a Changing Climate: Regional Perspectives Report*, (ed.) Warren, F.J., Lulham, N., & Lemmen, D.S.; Government of Canada, Ottawa, Ontario.
- ²⁰ Eckelman, M.J., Sherman, J.D., & MacNeill, A.J. (2018). Life cycle environmental emissions and health damages from the Canadian healthcare system: An economic-environmental-epidemiological analysis. *PLoS Medicine*, 15(7): e1002623. <https://doi.org/10.1371/journal.pmed.1002623>.
- ²¹ Shumake-Guillemot, J., Villalobos-Prats, E., & Campbell-Lendrum, D. (2015). *Operational framework for building climate resilient health systems*. World Health Organization. https://apps.who.int/iris/bitstream/handle/10665/189951/9789241565073_eng.pdf.
- ²² Bill C-12, *An Act respecting transparency and accountability in Canada's efforts to achieve net-zero greenhouse gas emissions by the year 2050*. (2021). 43rd Parliament, 2nd Session. <https://parl.ca/LEGISInfo/BillDetails.aspx?Language=E&billId=10959361>
- ²³ World Health Organization. (n.d.). *COP26 Health Programme*. Retrieved December 10, 2021 from <https://www.who.int/initiatives/cop26-health-programme>.
- ²⁴ MacNeill, A.M., McGain, F., & Sherman, D.J. (2021). Planetary health care: a framework for sustainable health systems. *The Lancet Planetary Health*, 5(2), e66-e68. [https://doi.org/10.1016/S2542-5196\(21\)00005-X](https://doi.org/10.1016/S2542-5196(21)00005-X).
- ²⁵ Zhao, Q., Gua, Y., Ye, T., Gasparrini, A., Tong, S., Overcenco, A., Urban, A., Schneider, A., Entezari, A., Vicedo-Cabrera, A.M., Zanobetti, A., Analitis, A., Zeka, A., Tobias, A. Nunes, B., Alahmad, B., Armstrong, B., Forsberg, B., Pan, S-C., Íñiguez, C. et al. (2021). Global, regional, and national burden of mortality associated with non-optimal ambient temperatures from 2000 to 2019: a three-stage modelling study. *The Lancet Planetary Health*, 5(7), E415-E425. [https://doi.org/10.1016/S2542-5196\(21\)00081-4](https://doi.org/10.1016/S2542-5196(21)00081-4).

- ²⁶ Navius Research Inc. (2020). *Health-related impacts of decarbonization in Canada*. <https://www.naviusresearch.com/wp-content/uploads/2020/07/Navius-CAPE-Health-impacts-of-climate-change-report-May-2020.pdf>.
- ²⁷ United Nations. (2019 October 10). *For Every Dollar Invested in Climate-Resilient Infrastructure Six Dollars are Saved, Secretary-General Says in Message for Disaster Risk Reduction Day* [Press release]. <https://www.un.org/press/en/2019/sgsm19807.doc.htm>
- ²⁸ IRENA. (2020). *The Post-COVID Recovery: An agenda for resilience, development and equality*. International Renewable Energy Agency, Abu Dhabi. https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Jun/IRENA_Post-COVID_Recovery_2020.pdf.
- ²⁹ Clean Energy Canada. (2021). *The New Reality*. https://cleanenergycanada.org/wp-content/uploads/2021/06/Report_CEC_CleanJobs2021.pdf.
- ³⁰ IRENA. (2020). *The Post-COVID Recovery*.
- ³¹ Larson, E., et al. (2020). *Net-Zero America*.
- ³² Ibid.
- ³³ Net-Zero Advisory Body. *Net-Zero Pathways: Initial Observations June 2021*. (2021). Environment and Climate Change Canada. <https://nzab2050.ca/publications>.
- ³⁴ UNFCCC. (2015). *The Paris Agreement*.
- ³⁵ Larson, E., et al. (2020). *Net-Zero America*.
- ³⁶ Province of Alberta. (2021). *Environmental Protection and Enhancement Act*. Revised Statutes of Alberta 2000 Chapter E-12. <https://www.qp.alberta.ca/documents/acts/e12.pdf>.
- ³⁷ Dora, C., & Phillips, M. (Eds.). (2000). *Transport, environment and health*. World Health Organization Regional Office for Europe and Copenhagen. WHO Regional Publications, European Series, No. 89. <https://apps.who.int/iris/bitstream/handle/10665/326582/9289013567-eng.pdf>.
- ³⁸ College of Family Physicians of Canada. (2019). *A New Vision for Canada: Family Practice – the Patient’s Medical Home 2019*. Mississauga, ON: College of Family Physicians of Canada. https://patientsmedicalhome.ca/files/uploads/PMH_VISION2019_ENG_WEB_2.pdf.
- ³⁹ Canadian Public Health Association. (2015). *Global Change and Public Health: Addressing the Ecological Determinants of Health*. [Discussion Paper]. https://www.cpha.ca/sites/default/files/assets/policy/edh-discussion_e.pdf.
- ⁴⁰ Hancock T, Spady D, & Soskolne C. (Eds.). (2015). *Global change and Public Health: Addressing the Ecological Determinants of Health. The Report in Brief*. Working Group on the Ecological Determinants of Health. <https://www.cpha.ca/sites/default/files/assets/policy/edh-brief.pdf>.
- ⁴¹ Transport Canada. (2021). *Building a green economy: Government of Canada to require 100% of car and passenger truck sales by zero-emission by 2035 in Canada*. Government of Canada. [News release]. <https://www.canada.ca/en/transport-canada/news/2021/06/building-a-green-economy-government-of-canada-to-require-100-of-car-and-passenger-truck-sales-be-zero-emission-by-2035-in-canada.html>.
- ⁴² BDI Resourcing (2019). *NHS Cycle to Work Scheme*. [Blog post]. <https://bdiresourcing.com/news/nhs-cycle-to-work-scheme/359>.
- ⁴³ Jack, C.M., Edwards, M., & Rajaratnam, S. (2009). Cycle to work scheme in the NHS. *British Medical Journal*, 338. <https://doi.org/10.1136/bmj.b1896>.
- ⁴⁴ National Health Service. (2020). *Delivering a “Net Zero” National Health Service. 2020*.

- ⁴⁵ MacNeill, AJ, Hopf, H, & Khanuja, A, Alizamir, S., Bilec, M., Eckelman, M.J., Hernandez, L., McGain, F., Simonsen, K., Thiel, C., Young, S., Lagasse, R., & Sherman, J.D. (2020). Transforming the medical device industry: road map to a circular economy. *Health Affairs*, 39(12): 2088-97. <https://www.healthaffairs.org/doi/10.1377/hlthaff.2020.01118>.
- ⁴⁶ Teague, W.R. (2018). FORAGES AND PASTURES SYMPOSIUM: COVER CROPS IN LIVESTOCK PRODUCTION: WHOLE SYSTEM APPROACH: Managing grazing to restore soil health and farm livelihoods. *Journal of Animal Science*, 96(4), 1519-1530. <https://doi.org/10.1093/jas/skx060>.
- ⁴⁷ Gosnell, H., Grimm, K., & Goldstein, B.E. (2020). A half century of Holistic Management: what does the evidence reveal? *Agriculture and Human Values*, 37, 849-867. <https://doi.org/10.1007/s10460-020-10016-w>
- ⁴⁸ Springmann, M., Godfray, H.C.J., Rayner, M., & Scarborough, P. (2016). Analysis and valuation of the health and climate change co-benefits of dietary change. *Proceedings of the National Academy of Sciences Apr 2016*, 113(15), 4146-4151. <https://doi.org/10.1073/pnas.1523119113>.
- ⁴⁹ Grant, J.D. (2017). Time for change: Benefits of a plant-based diet. *Canadian Family Physician*, 63(10), 744-746. <https://pubmed.ncbi.nlm.nih.gov/29025793/>.
- ⁵⁰ Physicians Committee for Responsible Medicine. (2019 Dec 19). *New York Makes Plant-Based Hospital Meals the Law* [News release]. <https://www.pcrm.org/news/news-releases/new-york-makes-plant-based-hospital-meals-law>.
- ⁵¹ Wicklum, S., Kelly, M., Svrcek, C. (2020). Dry powder inhalers are environmentally preferable to metered-dose inhalers. *Canadian Medical Association Journal*. <https://www.cmaj.ca/content/re-dry-powder-inhalers-are-environmentally-preferable-metered-dose-inhalers>.
- ⁵² National Health Service. (2020). *Delivering a “Net Zero” National Health Service*.
- ⁵³ Wicklum, S., et al. (2020). Dry powder inhalers are environmentally preferable to metered-dose inhalers.
- ⁵⁴ National Health Service. (2020). *Delivering a “Net Zero” National Health Service*.
- ⁵⁵ Charlesworth, M., & Swinton, F. (2017). Anaesthetic gases, climate change, and sustainable practice. *The Lancet Planetary Health*, 1(6), e216–7. [https://doi.org/10.1016/S2542-5196\(17\)30040-2](https://doi.org/10.1016/S2542-5196(17)30040-2).
- ⁵⁶ Kagoma, Y., Stall, N., Rubinstein, E., & Naudie, D. (2012). People, planet and profits: the case for greening operating rooms. *Canadian Medical Association Journal*, 184(17), 1905–11. <https://doi.org/10.1503/cmaj.112139>.

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