

Costs of Climate Change

Climate change impacts have financial, economic and social implications for municipalities and local economies. Communities are increasingly facing direct and indirect impacts of climate change, with many implications for the built environment, human health, economies and natural systems. At the same time, affordability of housing has arisen as a key issue in Canada with Edmonton perceived to hold a competitive advantage as one of the most affordable major municipal regions in Canada¹. These two issues must be addressed together to ensure resilient and affordable housing in the face of a changing climate.

Recognizing that actions implemented as part of the Climate Resilient Planning and Development (CRPD) Action Plan will have financial implications for Edmontonians and the development industry, some costs may increase in the short term while other expenses like utility costs may be mitigated in the long term. It is important to consider the impacts of climate change on health, ecosystems, property and economies alongside the costs of adaptive actions. The cost of incorporating climate resilience into planning and development will need to be balanced against the cost of inaction and the potential for operational and life-cycle savings to ensure housing is not cost prohibitive to own and maintain.

Integrating climate resilience within the planning and development continuum has the potential to help reduce the cost of living by minimizing the life-cycle costs of a building or infrastructure. Considering climate impacts throughout the development process means that:

- New development can be sited to avoid hazard-prone areas or built to be protected from climate hazards to limit damage costs
- Buildings with access to low or zero carbon energy alternatives can reduce life cycle energy costs
- Higher efficiency homes and businesses can reduce energy bills and offer resilience to extreme heat and cold
- Community resilience can be bolstered through improved infrastructure and landscaping, reducing maintenance costs for infrastructure
- Acquiring or protecting natural assets through new neighbourhood development is more cost effective than retroactive purchasing and restoration of lands

¹ Urban Design Institute Edmonton Metro (2022). Housing Everyone: Impacts of Increasing Costs to Housing Affordability.

Prioritizing early incorporation of climate resilience into planning and development through low-cost, early stage actions can reduce the need for costly building retrofits or upgrades (e.g. incorporating Solar-Ready design at the construction stage) in the future for residents, businesses, non-profit organizations, institutions and the City. Delaying action to address climate impacts increases the likelihood of incurring these greater costs.

Economic Costs of Climate Change

As Edmonton grows and the climate continues to change, the city will experience financial, economic, and social impacts tied to climate change. A climate vulnerability and risk assessment² conducted for Edmonton in 2018 looked into the potential economic consequences of climate change. The assessment found that economic costs tied to health, environmental and financial losses associated with climate impacts could increase by \$8.0 billion by the 2050s and \$18.2 billion by the 2080s (compared to 2018). Looking solely at the gross domestic product (GDP) component, climate impacts could contribute a \$3.2 billion and \$7.4 billion reduction in Edmonton's GDP by the 2050s and 2080s respectively. Beyond economic impacts, climate change will also have an impact on human health and well-being. The climate vulnerability and risk assessment found that climate change could cause an additional 22,000 direct physical and mental health episodes in Edmonton annually by the 2050s.

Infrastructure and building losses stand as a clear example of the cost of climate change. As trends in extreme weather events have increased, so too have the trends in insured and uninsured losses³. Between 2020 to 2023, extreme weather in Alberta resulted in \$3.2 billion in insured losses⁴ and in 2023 alone, severe weather caused \$330 million in property damage in Alberta⁵. Municipalities and homeowners are increasingly exposed to these losses and the costs associated can result in direct impacts to the affordability of homeownership. Approximately 60 per cent of Canada's core public infrastructure is owned and/or maintained by municipal governments⁶. Changes made to the Alberta Disaster Recovery Program⁷ in 2021 mean that homeowners have a \$500,000 funding cap for financial assistance through the Disaster Recovery Program and municipalities and private property

² City of Edmonton (2018). Climate Resilient Edmonton: Adaptation Strategy and Action Plan.

³ IBC and FCM (2020). Investing in Canada's Future: The Cost of Climate Adaptation at the Local Level.

⁴ CatIQ, 2024

⁵ IBC (2024). Severe weather took a toll on homes, businesses and vehicles in Alberta in 2023.

⁶ Canadian Infrastructure Report Card (2016).

⁷ Alberta Disaster Recovery Program. <https://www.alberta.ca/disaster-recovery-programs>.

owners are now responsible for 10 per cent of all eligible natural disaster related costs.

Costs of Climate Inaction

Climate records show that Edmonton is already warming at a faster rate than the global average, due to its northern latitude and land-locked location. According to climate projections in the Climate Resilient Edmonton: Adaptation Strategy and Action Plan, on average, Edmonton's annual average temperature of 2.1°C would increase by 3.5°C to 5.6°C by the 2050s and by approximately 6°C to 8°C by the 2080s. The impacts and costs of climate change increase with every degree of additional warming.

Energy Costs

ClimateWest's report *Costs of Climate Change on the Prairies*⁸ evaluated projected energy demand (increase in cooling demand in summer) and consequent increases in electricity expenditures as a result of climate change. The report states that total electricity system expenditures in Alberta are projected to increase by about \$53 million and \$344 million annually by 2050 and 2100, respectively, under a business-as-usual emissions scenario.

Analysis done for the City of Edmonton projected that the increased space cooling demand in residential and commercial buildings in the hotter summers may initially be offset by the reduction in space heating demand due to the warmer winters. The imposed direct annual costs of climate change for energy consumption related to space heating and cooling by Edmonton's residential and commercial buildings caused by rising temperatures are estimated at a reduction of about \$5 million in 2055 and an increase of about \$92 million in 2085, respectively⁹.

Flooding Costs

ClimateWest's report *Costs of Climate Change on the Prairies* also assessed the economic impacts of climate change for buildings on the Prairies for overland and river/stream flooding. Relative to estimated baseline damages of \$35 million in 2020, projected annual flood damages in Edmonton are projected to increase five-fold (under a business-as-usual emissions pathway) to \$115 million in 2050 and 7-fold to \$150 million in 2080¹⁰. It is estimated that 70 per cent of total flooding

⁸ ClimateWest (2023). *Costs of Climate Change on the Prairies*.

⁹ Boyd, R. 2022. *Costs of Inaction: Economic Impacts of Climate Change on Edmonton*. Prepared by All One Sky Foundation for the City of Edmonton.

¹⁰ ClimateWest (2023). *Costs of Climate Change on the Prairies*.

losses would impact the residential sector and 30 per cent would impact the commercial sectors.

Wildfire Costs

Wildfires also pose a significant financial risk for municipalities and residents in Alberta. Canada experienced its most destructive wildfire season ever in 2023, with fires consuming 16.5 million hectares¹¹. The decade from 2011 to 2020 saw two of the most costly wildfires in Canada occur within Alberta. In 2011, the Slave Lake Wildfire resulted in \$700 million in insured losses. The 2016 Fort McMurray wildfire set a new record for insured losses with \$3.8 billion in insured losses; along with an additional \$1.2 billion in payments from federal, provincial, and municipal governments, and \$500 million in costs incurred by the private sector and households¹². In total, the Fort McMurray wildfire cost an estimated \$9 billion in direct and indirect physical, financial, health, and environmental impacts¹³.

Investments in adaptation and risk mitigation have been shown to offset the costs of climate impacts with studies showing that for every dollar invested in mitigation measures, approximately six dollars are saved in future damages¹⁴.

Costs of Climate Action

Edmonton is committed to reducing greenhouse gas (GHG) emissions by 35 per cent by 2025, 50 per cent by 2030, and net-zero by 2050. Residential buildings account for 18 per cent of Edmonton's community emissions, and commercial and institutional buildings account for 20 per cent of emissions for a combined total of 38 per cent of GHG emissions. To achieve these targets, greenhouse gas emissions associated with new and retrofitted existing buildings will need to be greatly reduced and eventually reach net-zero. Administration's analysis estimates incremental capital costs of 2 per cent to 15 per cent for increasing energy tier performance of new homes. Based on a \$400,000 house using the BILD Alberta *Tiered Energy Code Roadmap*¹⁵ and internal City of Edmonton analysis, estimated capital cost increase is in the range of \$28,000 to \$34,400 for a Tier 4 house compared to Tier 1.

¹¹Natural Resources Canada (2024). Canada's record-breaking wildfires in 2023: A fiery wake-up call.

¹²IBC and FCM (2020). Investing in Canada's Future: The Cost of Climate Adaptation at the Local Level.

¹³Alam et al. (2019). Rapid Impact Assessment of Fort McMurray Wildfire.

¹⁴IBC and FCM (2020). Investing in Canada's Future: The Cost of Climate Adaptation at the Local Level.

¹⁵BILD Alberta (2022). Tiered Energy Code Roadmap.

Attachment 2

Estimates on the operational and life-cycle savings associated with resilient building practices are not available for the Edmonton context and so the City of Edmonton has two research studies underway to address this knowledge gap. The two studies are aimed at better understanding the life-cycle costs and savings of more advanced energy codes and more resilient building practices. The findings of these two studies can help to inform the full scope of each action in the Climate Resilience Planning and Development Action Plan and identify where financial incentives can support capacity building for the development industry and the public.

The first study includes a technical analysis of the lifecycle costs (capital and operational), energy savings, and greenhouse gas savings of implementing each Tier of the advanced Energy Codes in Edmonton. As well, it will include a city-wide economic and community-wide greenhouse gas impact analysis of implementing mandatory EnerGuide labeling for new homes.

The second study investigates how climate actions focused on residential buildings and specifically increased energy performance and adaptation measures, impact housing affordability, both in upfront costs (construction and market) and operational costs (utilities and maintenance). The project intends to use building data, in combination with project and cost data from the residential building industry and educational institutions, to provide an analysis of the impact that the climate actions have on capital and operational costs of homes.

Equity and Affordability

According to the ICLEI Canada 2022 report *The Cost of Doing Nothing*¹⁶, as climate hazards such as extreme heat events become more common, they will impact human health and well-being, healthcare systems, emergency services and vulnerable populations. Specific groups, such as those who work outside, low-income and racialized populations, infants and young children, older adults, those with limited mobility and chronic medical conditions, and people experiencing homelessness are disproportionately exposed to and impacted by climate change¹⁷. Indigenous Peoples are also particularly sensitive to the impacts of climate change due to a number of factors including the ongoing effects of colonization, location of communities, and deep connection with the natural world¹⁸.

¹⁶ ICLEI Canada. (2022). *The Cost of Doing Nothing: Primer Document to Build a Local Business Case for Adaptation*.

¹⁷ Berry, P., & Schnitter, R. (Eds.). (2022). *Health of Canadians in a Changing Climate: Advancing our Knowledge for Action*. Government of Canada.

¹⁸ ICLEI Canada. (2022, November 15). *The Cost of Doing Nothing: Primer Document to Build a Local Business Case for Adaptation*.

These vulnerable populations often have a reduced capacity to adapt to extreme temperatures and are more likely to experience energy poverty (10 per cent of after-tax household income is spent on dwelling energy bills¹⁹) during winter months while also lacking the financial resources to afford building retrofits to bolster resilience to climate impacts. Adaptive actions that build resilience to climate change through planning and development may impact the upfront costs of building a home, which has the potential to impact housing affordability, especially for low-income people and families. However, these actions also have the potential to reduce the life-cycle operating costs of housing and alleviate health impacts on low-income and vulnerable populations.

Balance for Housing Affordability

The affordability of buying a new home needs to be balanced with the affordability of utility costs and maintenance, as energy costs and risk of damage from climate hazards escalate in the future. Increased capital costs of energy efficiency in new construction may be offset by reduced life-cycle utility costs for homeowners. Similarly, increased capital cost of climate resilient infrastructure may be offset by reduced damage costs in the future.

Financial incentives and regulations coupled with education will help market transformation towards building new high efficiency and climate ready homes. The Climate Resilience Planning and Development Action Plan proposes both financial and non-monetary incentives and regulations to support this transition and limit impacts to affordability for new homes. Housing affordability is a key aspect of a just and equitable transition to a low-carbon future. There is a need to reduce barriers that are impeding decarbonization of affordable housing stock to ensure no one is left behind in the transition to a climate resilient Edmonton.

¹⁹ Dionne-Laforest, S., Heisel, R., & Situ, J. (2024) Estimation of Energy Poverty Rates Using the 2021 Census of Population. Statistics Canada.