

INVESTING IN CANADA'S FUTURE: The Cost of Climate Adaptation

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Climate change is increasing the frequency and severity of extreme weather events across Canada. Earlier this year, the federal government released the report *Canada's Changing Climate*. It found that the annual average temperature in Canada has increased by 1.7°C since 1948, with higher temperature increases in Canada's North, the Prairies and northern British Columbia.

While every region in Canada experiences the impacts of the warming climate differently, evidence indicates an increase in the severity of heat waves and drought, more frequent and intense rainfall events, changes in snow and ice cover, and more frequent and intense storm surges in coastal regions.

For Canada and its economy, the consequences are severe. While a number of studies have attempted to measure the cost of climate change in terms of the damage it will cause or the impact it will have on the economy, there is more to be done to estimate the cost of adapting to climate change.

DETERMINING THE COST OF CLIMATE CHANGE

Climate change adaptation, or disaster mitigation, means taking strategic actions to reduce a community's vulnerability to the impacts of climate change. In the past decade, climate adaptation in Canada has progressed from research, to public engagement, to actions to reduce the impacts of climate change. All levels of government have developed climate change adaptation strategies and are investing in specific adaptation measures.

The Federation of Canadian Municipalities (FCM) and Insurance Bureau of Canada (IBC) commissioned Green Analytics to establish a credible estimate of the investment in municipal infrastructure and local adaptation measures needed to reduce the impacts of climate change in Canada.

Municipalities, as the owners and operators of 60% of the public infrastructure in Canada, are on the frontlines of both the impacts of climate change and the solutions to protect Canadians. However, addressing climate risks by retrofitting existing infrastructure and implementing new adaptation measures poses an additional burden on the limited financial capacity of municipalities.

Municipalities cannot shoulder the cost of adapting to climate change alone. Climate change adaptation is a shared responsibility among all orders of government, and will require a long-term commitment to action. This study is the first attempt to estimate the long-term need for investment in change adaptation measures at the local level.

RESEARCH METHODOLOGY

To estimate how much investment is required to help communities adapt to climate change and reduce disaster risk, Green Analytics collected adaptation cost estimates for a variety of communities across Canada and housed those estimates in an adaptation cost database. The estimates were based on vulnerability and risk assessments done at the local level, usually by a municipality. The adaptation cost estimates were adjusted to allow them to be compared between communities and added up at the national level.

Other information added to the database for each adaptation cost estimate includes location, such as province or territory; infrastructure type, such as buildings, green infrastructure, roads and water treatment; and climate risk, such as drought, erosion, flood, heat wave and wildfire.

The final database contained 414 adaptation cost estimates for 34 communities across the country. For each community, the gross domestic product (GDP) values were obtained or established and added to the database. Ratios of adaptation costs to local GDP were then derived for each community.



Finally, the average GDP ratios for each region of the country (West, Prairies, North, Central, East) were weighted by that region's share of the national GDP and added together to obtain a national cost estimate.

RESULTS

The analysis determined that an average annual investment in municipal infrastructure and local adaptation measures of \$5.3 billion is needed to adapt to climate change. In national terms, this represents an annual expenditure of 0.26% of GDP. This estimate represents the total cost of the actions that need to be taken by municipalities at the local level. These investments would typically be cost-shared between each order of government.

Flood, erosion and permafrost melt are associated with the highest cost to GDP ratios at 1.25, 0.12 and 0.37, respectively. These climate risks require the greatest investment in adaptation.

From an infrastructure perspective, buildings, dikes and roads require the greatest investment in adaptation; they are associated with the highest ratios at 2.01, 1.18 and 0.47, respectively. Grey infrastructure has the highest average ratio at 0.75, green infrastructure has a ratio of 0.05 and soft infrastructure (or administrative action) has a ratio of 0.03.

From a regional perspective, Canada's East, at 3.20, and North, at 0.37, have higher ratios. The four highest ratios in the database are coastal communities in Eastern Canada.

An annual average investment equivalent to 0.26% of national GDP aligns with historical investments made by leading cities outside of Canada, and with international research on future needs. In 2014-15, the cities of London, New York and Paris spent approximately 0.22% of their respective GDP on public and private expenditures on climate change adaptation. Looking forward, an international assessment concluded that countries should be spending between 0.60% and 1.25% of GDP on adaptation measures to minimize the worst impacts of climate change across sectors of the economy, including but not limited to municipally-owned infrastructure.

CONCLUSION

This research is the first attempt to quantify what Canadian governments need to be spending on local disaster mitigation and adaptation projects to reduce the impacts of climate change. In releasing this report, IBC and FCM hope to contribute to the growing body of knowledge on climate change adaptation in the Canadian context. The cost of climate change adaptation will continue to be better understood as more data on adaptation investments becomes available and additional research along these lines is undertaken.

While better data and additional research will further clarify long-term costs, what this research clearly shows is that an ambitious long-term climate adaptation investment plan—including infrastructure funding commitments and efforts to improve local capacity to better assess climate risk as called for by both IBC and FCM—is urgently needed now.

