

CLIMATE PROSPERITY

A CANADIAN INITIATIVE



PAYING THE PRICE: THE ECONOMIC IMPACTS OF CLIMATE CHANGE FOR CANADA

// REPORT 04



Canada

**THIS IS NOT
JUST ABOUT
COPING WITH
CLIMATE CHANGE,
BUT PROSPERING
THROUGH IT.**



MESSAGE FROM THE VICE-CHAIR

Paying the Price: The Economic Impacts of Climate Change for Canada is the latest report in the *Climate Prosperity* series by the National Round Table on the Environment and the Economy. It complements *Degrees of Change: Climate Warming and the Stakes for Canada*, published in 2010, which shows a vast range of physical impacts of a warming climate on Canada. With these reports, we can better understand the growing economic impacts of climate change to Canada and assess both the costs we could face and the adaptation choices we can make.

Degrees of Change showed what the physical impacts of climate warming could be for Canada; *Paying the Price* shows what the economic impacts could be for Canada. Many of these impacts will be negative and many will carry a cost. Together, these two NRTEE reports will help Canadians know more about what some of those impacts could be and how much they could cost.

Paying the Price sets out to help all of us -- governments, business and communities -- make climate-wise investment choices now, and in the future. The economic information we provide in this report will further help us understand what is at stake if we fail to respond and global greenhouse gas emissions continue to rise.



A handwritten signature in black ink, appearing to read 'R.W. Slater'.

R.W. SLATER, CM, PH.D.
NRTEE Vice-Chair

MESSAGE FROM THE PRESIDENT AND CEO

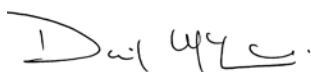
Climate change has a price tag and it could be expensive. But few Canadians know what that could be.

To date, focus has mostly been on what it would cost to reduce greenhouse gas emissions by industry and consumers. Little attention has been paid to the cost of inaction, to what economic damages could accrue to Canada and Canadians as global emissions rise and climate change plays out.

Paying the Price: The Economic Impacts of Climate Change for Canada sets out for the first time ever in Canada what those costs could be. This report makes clear that while there is an environmental cost to climate change, there is an economic cost too: of simply letting climate impacts occur. Those costs are high and could get higher.

Our report also shows that adapting to climate change makes economic sense. It can lower the costs of climate impacts by preventing damage, saving money and lives.

The Round Table's report now makes clear that getting global emissions down is both in Canada's economic and environmental interest.

A handwritten signature in dark ink, appearing to read "David McLaughlin".

DAVID McLAUGHLIN

NRTEE President and Chief Executive Officer

EXECUTIVE SUMMARY



0.0 EXECUTIVE SUMMARY

Climate change will be expensive for Canada and Canadians. Increasing greenhouse gas emissions worldwide will exert a growing economic impact on our own country, exacting a rising price from Canadians as climate change impacts occur here at home.

This report by the National Round Table on the Environment and the Economy (NRTEE) — the fourth in our *Climate Prosperity* series — sets out what those costs could be. It makes clear that while there is an environmental cost to climate change, there is an economic cost too: a cost of letting climate impacts occur and a cost to adapting to protect ourselves from these impacts.

Having highlighted some of the likely physical impacts of warming temperatures and changing precipitation patterns from climate change in Canada in our second report, *Degrees of Change*, we undertook new analysis to assess the economic costs in this companion report, *Paying the Price*.

This report represents the first time a national analysis of this kind, using various climate and growth scenarios, has been conducted to calculate how the economic costs of climate change stack up over time. This is necessary research that allows Canadians to appreciate just how pervasive and pernicious climate change can be. It shows the uncertainty of estimating economic impacts of climate change and increases our understanding of how to assess climate risk and our own willingness to accept — or not — the probability of more damages for future generations. It then identifies how adaptation measures can reduce those costs, saving money and lives.

THE NATIONAL COST OF CLIMATE CHANGE

Climate change costs for Canada could escalate from roughly \$5 billion per year in 2020 — less than 10 years away — to between \$21 billion and \$43 billion per year by the 2050s. The magnitude of costs depends upon a combination of two factors: global emissions growth and Canadian economic and population growth. Our study generated four separate scenarios combining these factors to understand the potential costs of climate change under different futures.

As the speed and scale of climate change is uncertain, we need to consider the probability of both higher and lower costs. The NRTEE's research sheds new light on how to assess national economic risks. Our modelling shows not just the average results listed above, but what those economic costs could be as climate change plays out under a range of assumptions for key scientific and economic variables. It shows there is a risk those costs could be not just higher, but much higher. In the 2050s, where costs are estimated at \$21 billion in the low climate change–slow growth scenario, there is a 5% chance that the costs could be at least \$44 billion per year, and where costs are estimated at \$43 billion in the high climate change–rapid growth scenario, there is a 5% chance that the costs could be at least \$91 billion per year.

How do we get costs down? Global mitigation leading to a low climate change future reduces costs to Canada in the long term. This reinforces the argument that Canada would benefit environmentally and economically from a post-2012 international climate arrangement that systematically reduced emissions from all emitters — including Canada — over time.

CLIMATE IMPACTS ON PEOPLE, PLACES, AND PROSPERITY

Because climate change impacts will manifest themselves sectorally and regionally in different ways across our enormous country, the NRTEE conducted specific “bottom-up” studies to assess the costs of climate change on three representative aspects of Canada: its prosperity (timber supply), places (coastal areas), and people (human health).

In each of these three areas, climate change will impose costs for Canada. By the 2050s, the impacts of climate change on the timber supply through changes in pests, fires, and forest growth are expected to cost the Canadian economy between \$2 billion and \$17 billion per year. The coastal land area exposed to climate change–induced flooding from sea-level rise and increased storminess across Canada by the 2050s is roughly equivalent to the size of the Greater Toronto Area. The costs of flooding from climate change could be between \$1 billion and \$8 billion per year by the 2050s. Climate change will lead to warmer summers and poorer air quality, resulting in increased deaths and illnesses in the four cities studied — Montréal, Toronto, Calgary, and Vancouver. Illnesses associated with climate change impacts on air quality in turn will impose costs on the health care system; in Toronto these costs could be between \$3 million and \$11 million per year by the 2050s.

Our analysis shows that the costs of climate change on people, places, and prosperity will vary and be uneven across the country. Timber supply in Western Canada will be more affected than in the East. British Columbia's forest-reliant economy will suffer more than many others while Ontario's economy — due to its size — will see the largest absolute economic impact. Coastal regions across Canada are also affected differently by climate change. Relative to the total land area of each province and territory, Prince Edward Island's coastal areas are most at risk. Many dwellings in the Lower Mainland of British Columbia are likely to be impacted given

that the area is low-lying and has a high housing density, and the per capita costs of dwelling damage will be highest in British Columbia and Nunavut. Human health impacts and increased health system costs from climate change vary across the four cities we studied, with cities that experience the greatest increases in temperature — Toronto and Vancouver — experiencing the greatest impacts.

ADAPTATION SAVES MONEY

Adapting to climate change is both possible and cost-effective. Halting emissions growth tomorrow will do nothing to arrest the impacts of GHGs already in the atmosphere. So, some form of climate change impacts due to global warming can be expected, requiring adaptation measures in response. Our study examined five different adaptation strategies to assess their costs and benefits. All but one was found to be cost-effective, with the costs of the strategies being far lower than the savings they would yield through reducing the economic impacts of climate change.

Enhancing forest fire prevention, controlling pests, and planting climate-resilient tree species together reduced the impacts of climate change on timber supply across the country. Under a high climate change–rapid growth scenario, the benefit to cost ratio was 38:1 while it was 9:1 under a low climate change–slow growth scenario. In coastal areas, prohibiting new construction in areas at risk of flooding as well as undertaking “strategic retreat” by gradually abandoning dwellings once flooded reduces the costs of climate change to only 3–4% of what the costs would have been without adaptation. Adaptation strategies can reduce prospective health impacts of heat exposure and lower air quality. Replacing conventional roofs with green roofs helped reduce the urban heat-island effect across our four cities, but the costs of this strategy exceeded the benefits. In contrast, installing pollution control technologies to limit ozone formation was found to be cost-effective.

ECOSYSTEMS

Ecosystems provide us with a range of services critical to our health, economy, and overall well-being, but climate change is altering the quality and health of Canada’s ecosystems. Our report illustrates some possible economic implications of climate change on ecosystem services: climate change could increase visitor spending in and around Canada’s national parks due to warmer temperatures, and reduced availability of lake trout could lead to losses in recreational fishing expenditures. While ecosystem services, and the impact that climate change will have on them, can be very difficult to express in economic terms, a failure to do so underestimates the costs of climate inaction. At the same time, it is important to recognize that non-monetary indicators may matter more to people when it comes to preserving ecosystems—their “value” is often intrinsic and personal. Ecosystem losses can simply be irreplaceable.

TWO FUTURES

Examining long-term economic costs of climate change to Canada raises the spectre of two futures: one where the world acts — and keeps global warming to 2°C by 2050 as world leaders have pledged — and one where it doesn't and climate change impacts grow and accelerate beyond targets. At slightly under 2°C of global warming, the economic costs of climate change to Canada in 2050 would be between \$21 billion and \$43 billion with no adaptive action taken; costs could be at the lower end of range if economic growth slowed as part of domestic mitigation or for other reasons. If the world acts to limit warming to 2°C, future costs could stabilize around this 2050 level since emissions growth would have been dampened and plateaued to reach this new global reality.

WHAT DO WE RECOMMEND?

Canadians can and should use economic information to decide how to best prepare for, and respond to, the impacts of climate change. Our recommendations are as follows:

- 1 // The Government of Canada invest in growing our country's expertise in the economics of climate change impacts and adaptation so we have our own Canadian-focused, relevant data and analysis for public and private-sector decision makers.
- 2 // The Government of Canada cost out and model climate impacts to inform internal decisions about adapting policies and operations to climate change and allocating scarce resources to programs that help Canadians adapt.
- 3 // Governments at all levels continue investing in generating and disseminating research to inform adaptation decision making at the sectoral, regional, and community level. This research should, as a matter of routine, incorporate economic analysis of the costs and benefits of options to adapt to climate impacts because the current data is insufficient for decision makers and is not readily or consistently available.
- 4 // The Government of Canada forge a new data- and analysis-sharing partnership with universities, the private sector, governments, and other expert bodies to leverage unique and available non-governmental resources for climate change adaptation.

WHAT'S NEXT?

Knowing the economic risks of climate change is one thing; acting to reduce them through adaptation is another. The NRTEE's fifth report in its *Climate Prosperity* series will examine the state of readiness of Canada's private sector to manage the impacts of climate change and what the private sector can and should do to reduce its own risk and exposure to climate change. We will analyze various risk management practices to build business resilience to climate change and barriers to putting them in place. And we will consider how government can cost-effectively promote private-sector adaptation, what businesses need from government to plan and adapt, and how government can most usefully contribute to this growing, long-term, shared challenge facing our country.

CLIMATE PROSPERITY

THE TIMELINE

2010

2012



REPORT 01 //
MEASURING UP:
BENCHMARKING CANADA'S
COMPETITIVENESS IN A
LOW-CARBON WORLD

This report will assess Canada's capacity to be competitive in a new global low-carbon economy, by comparing us to other G8 nations in areas such as emissions and energy, skills, investment, innovation and governance.



REPORT 02 //
DEGREES OF CHANGE:
CLIMATE WARMING AND
THE STAKES FOR CANADA

This report will communicate the risks and benefits that a warming climate poses to Canada over the next one-hundred years in areas such as ecosystems, water resources, health, infrastructure and natural resource sectors and how adaptation can help.



REPORT 03 //
PARALLEL PATHS:
CANADA-U.S. CLIMATE
POLICY CHOICES

This report will examine Canadian climate policy choices based on potential U.S. courses of action and what this means for achieving Canadian environmental goals at the least economic cost.



REPORT 04 //
PAYING THE PRICE:
THE ECONOMIC IMPACTS
OF CLIMATE CHANGE
FOR CANADA

This report will provide, for the first time, national economic costings of the impact of climate change on Canada, together with a detailed look at three key sectors.



REPORT 05 //
POLICY PATHWAY
REPORT FOR CLIMATE
IMPACTS AND
ADAPTATION

Building on previous reports in the series, this advisory report will provide a range of policy pathways and actions to help Canada take advantage of its potential to adapt to a changing climate.



REPORT 06 //
POLICY PATHWAY
REPORT FOR GLOBAL
LOW-CARBON
TRANSITION

Building on previous reports in the series, this advisory report will provide policy pathways and actions necessary for Canada to thrive in a global low-carbon economy in areas such as energy, innovation, skills, investment and governance.



A CANADIAN INITIATIVE

NRT



NATIONAL
ROUND TABLE ON
THE ENVIRONMENT
AND THE ECONOMY

WWW.NRTEE-TRNEE.CA