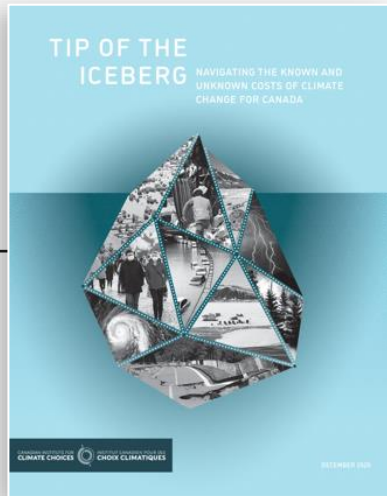


DAMAGE CONTROL

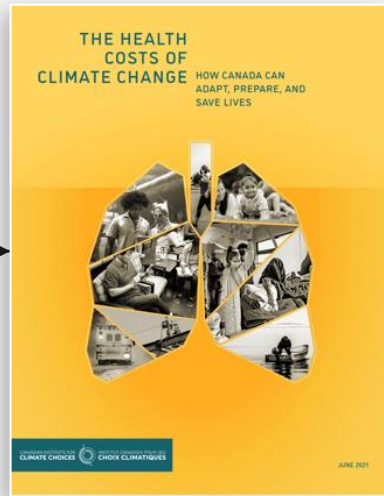
Projecting the Future
Costs of Climate
Change in Canada



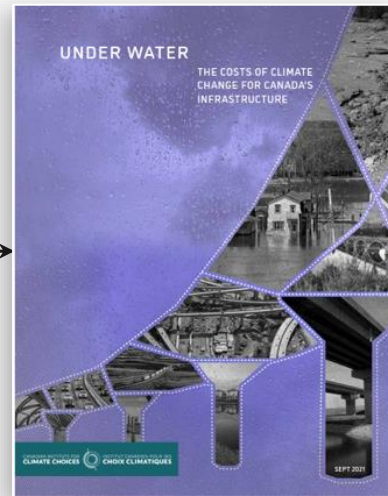
Costs of Climate Change series



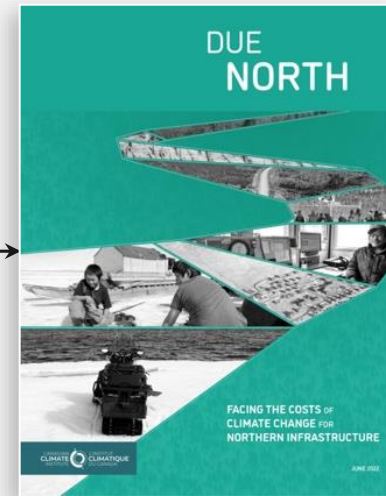
Tip of the Iceberg
December 2020



Health Costs
June 2021



Under Water
September 2021



Due North
June 2022



Damage Control
September 2022

Our Approach

1. Identification of **16 material climate impact areas**

2. Bottom-up analysis of **costs and benefits**

3. Top-down **macroeconomic and affordability impacts**

Bottom-up input

Bottom-up output

Top-down input

Top-down output

●●● Health data

▶ Health impacts

Labour productivity

●●●●● Infrastructure data

▶ Infrastructure impacts

Direct costs (or benefits)

● Disaster data

▶ Weather-related costs

●●● Sector data

▶ Forestry, Agriculture, Tourism

▶ Sector productivity

Overall national macroeconomic impacts

Regional macroeconomic impacts

Sector impacts

Economic outcomes of adaptation



Our Approach



INFRASTRUCTURE

Electricity infrastructure damage
Coastal and inland flooding
Hydropower supply
Electricity demand
Road damage
Rail damage
Road delay
Rail delay



AGRICULTURE

Agricultural yield



DISASTERS

Weather-related disasters



NORTHERN INFRASTRUCTURE

Permafrost thaw



HEALTH

Labour productivity
Premature death
Illness



TOURISM

Tourist arrivals



FORESTRY

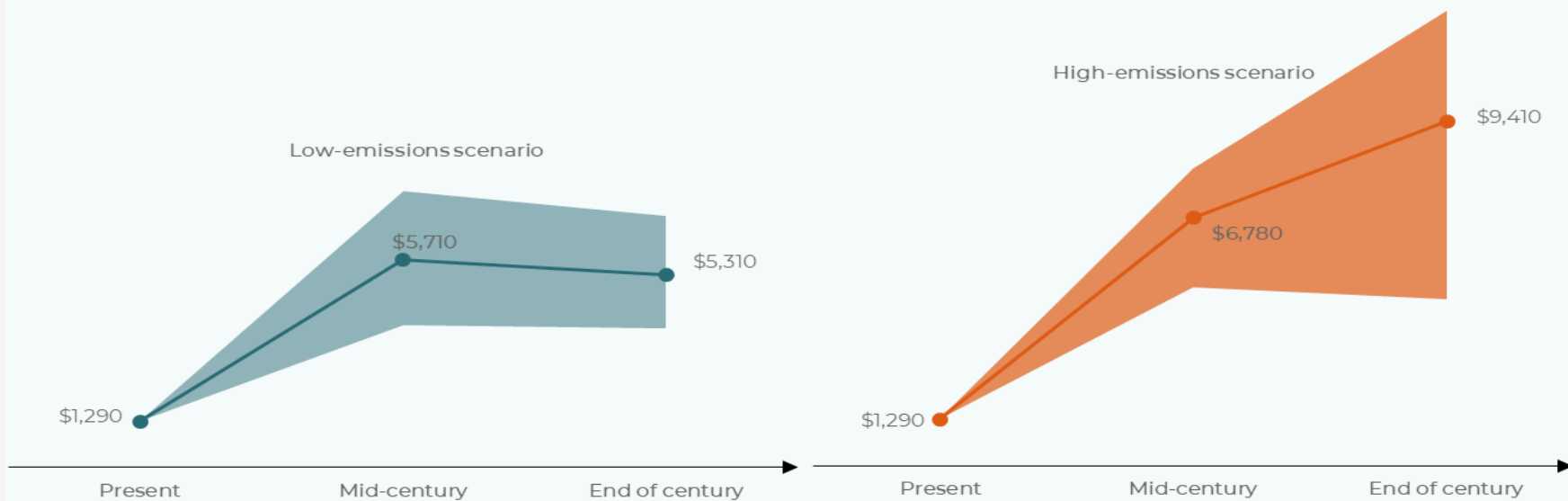
Timber harvest volumes

16

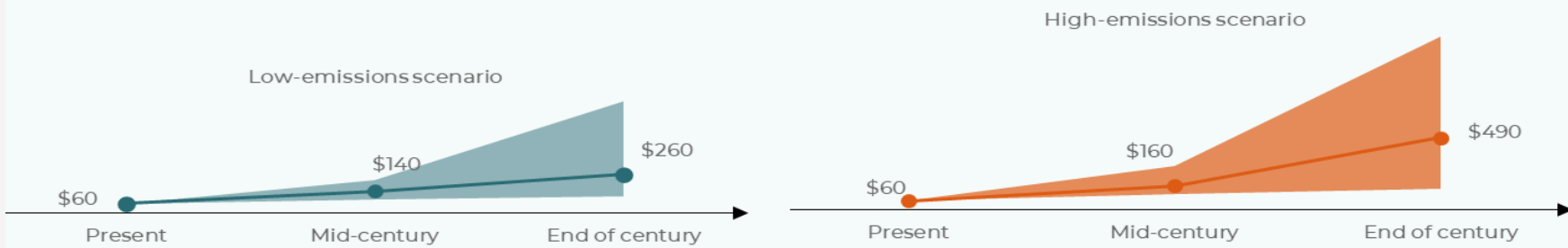
“bottom up” climate
impact areas
high-res, national-
scale analysis

Infrastructure damage may accelerate rapidly

Inland flooding: projected annual costs in millions of dollars (2019 CAD)



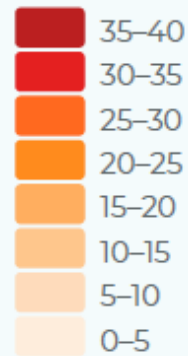
Coastal flooding: projected annual costs in millions of dollars (2019 CAD)



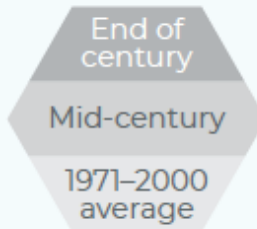
Health costs could exceed costs of physical damage

The number of days where heat can cause premature death will increase across Canada
Percentage of days in the year over heat danger thresholds

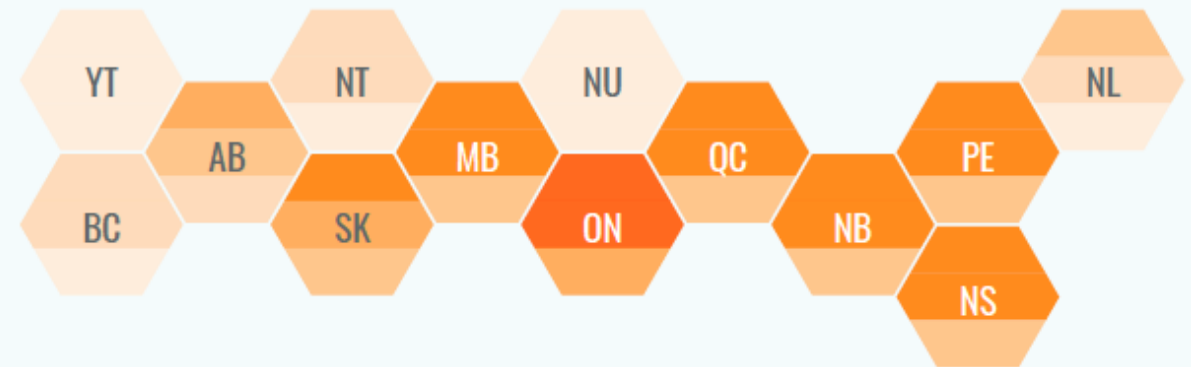
% of days



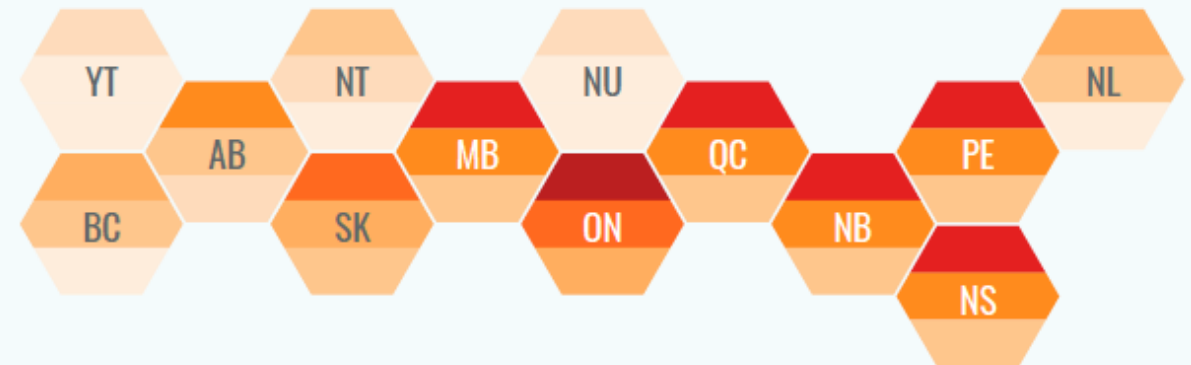
LEGEND



Low-emissions scenario

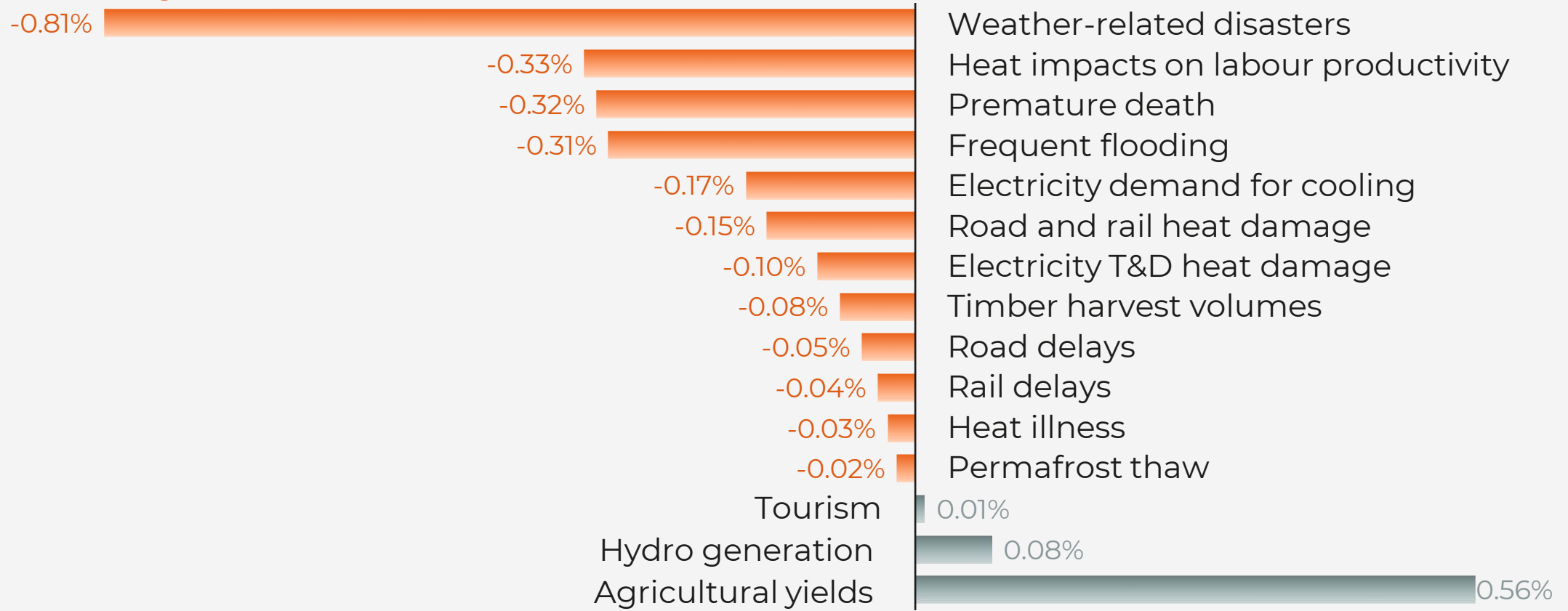


High-emissions scenario



Economic implications are widespread and compounding

Relative change in real GDP by mid-century, in a low emissions scenario

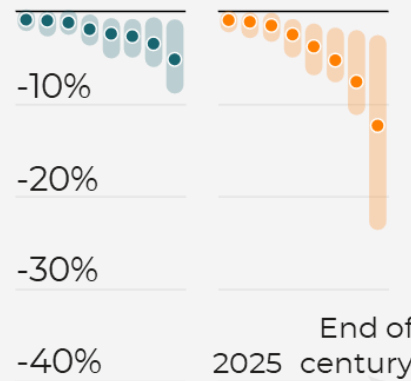


A smaller economic pie makes life less affordable

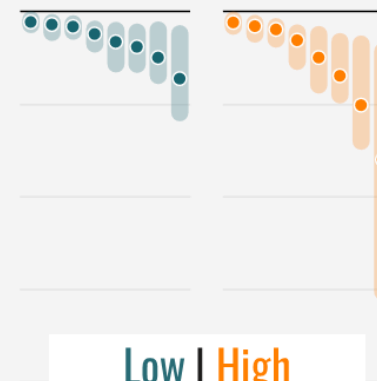
Min
Median
Max

Economic drag indicators

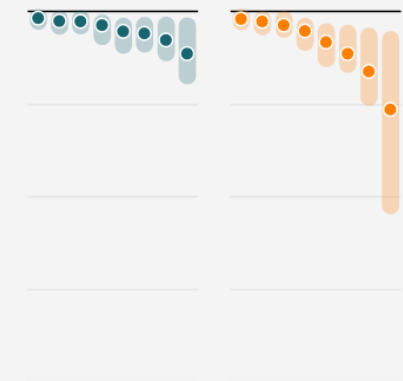
Real GDP



Exports



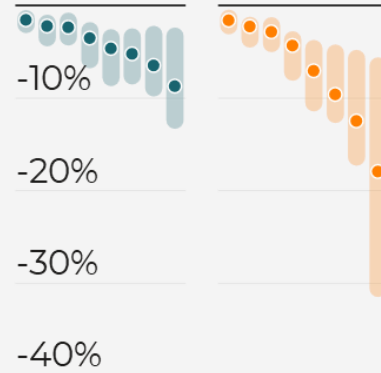
Job losses



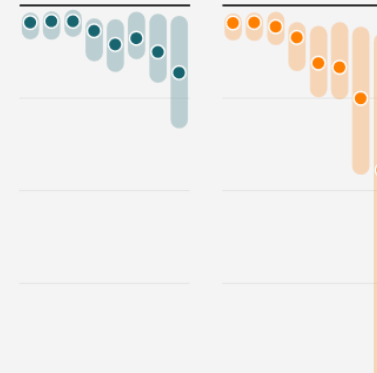
Low | High
Emissions scenario

Broken window indicators

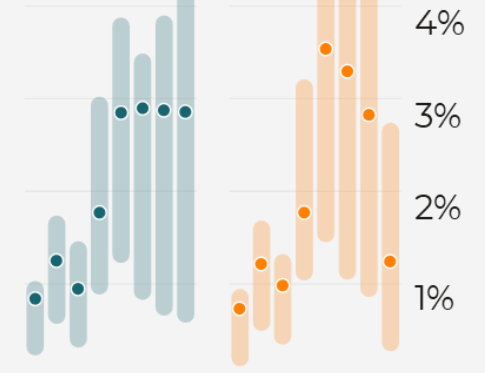
Household income



Investment



Size of government



“Tip of the Iceberg”

The climate change costs and impacts that we can estimate are likely only a fraction of the total

RISKS IN OUR PATH
for which we can
start to calculate the
scale of impact
and cost

Direct damage from increased heat, flooding, and permafrost thaw to vital infrastructure, including roads, railways, electricity systems, and buildings.

Costs of climate change-induced health hazards such as heat and declining air quality.

First-order costs of delays and outages to operators and primary users of critical infrastructure, such as transportation, energy, and communications systems.

Lower economic productivity due to more frequent weather-induced outages of critical infrastructure.

**CLIMATE IMPACTS
WE SUSPECT WILL
AFFECT CANADA**
but whose scope and scale
we don't yet have the tools
to understand

Costs of conditions exacerbated by climate change in complex ways, such as mental illness.

Unpredictable changes to precipitation, wind, and cloud cover patterns that may affect renewable electricity generation.

Cascading impacts across multiple infrastructure and social systems, such as shutdown of healthcare systems during more frequent power outages, or inability of emergency responders to reach those in need after road network damage.

**RISKS THAT MAY
HAVE MAJOR IMPACTS**
through complex interactions
and processes that are
very challenging
to predict

International conflict and migration exacerbated by climate change, leading to global geopolitical and economic instability.

Deterioration or collapse of ecosystems that provide vital ecological services and underpin Canada's economic activity.

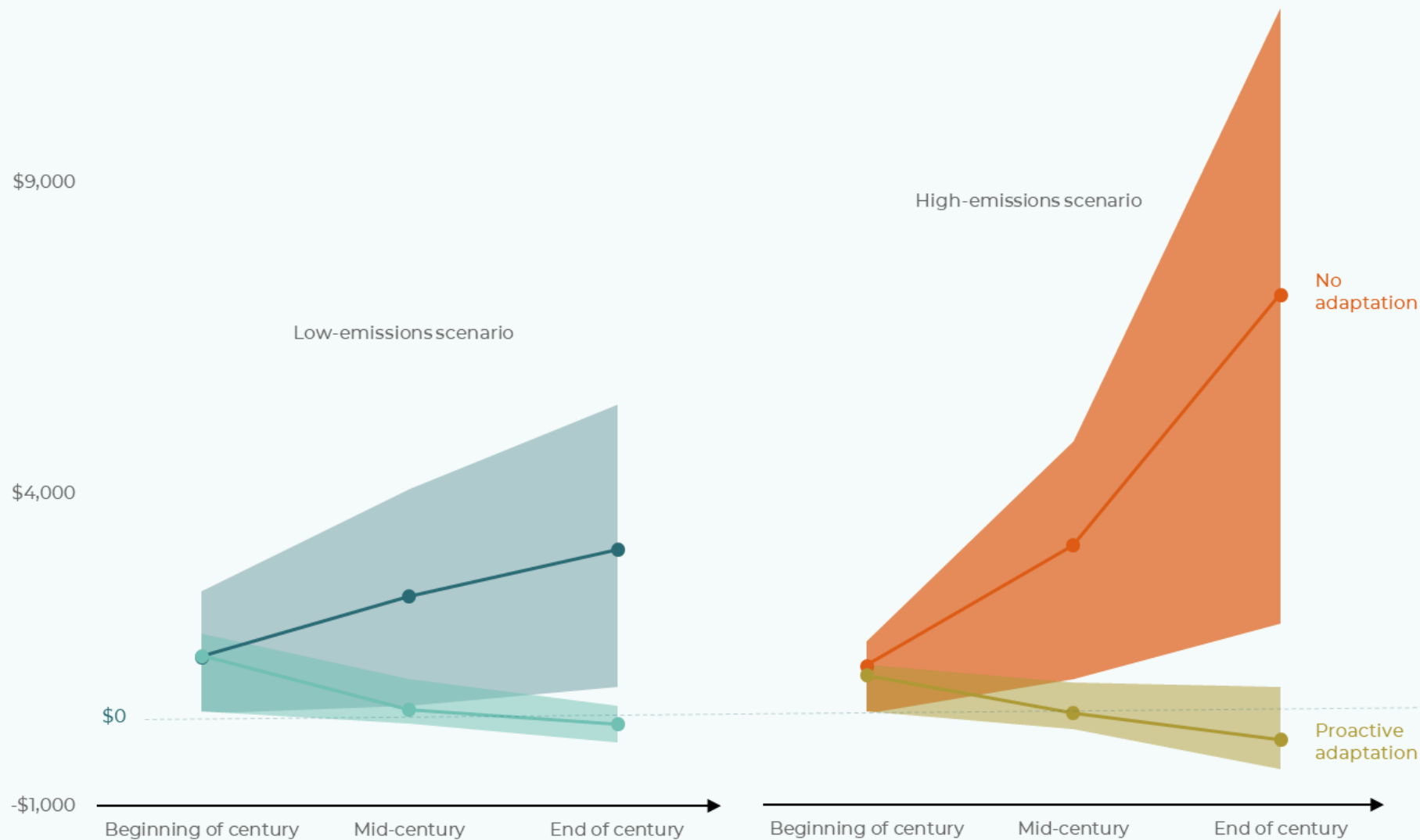
International supply chain interruption impacts on food and water security and on business continuity for Canadian industry.

Tipping cascades of domino effect-changes that could fundamentally and irreversibly destabilize global ecosystems and institutions.



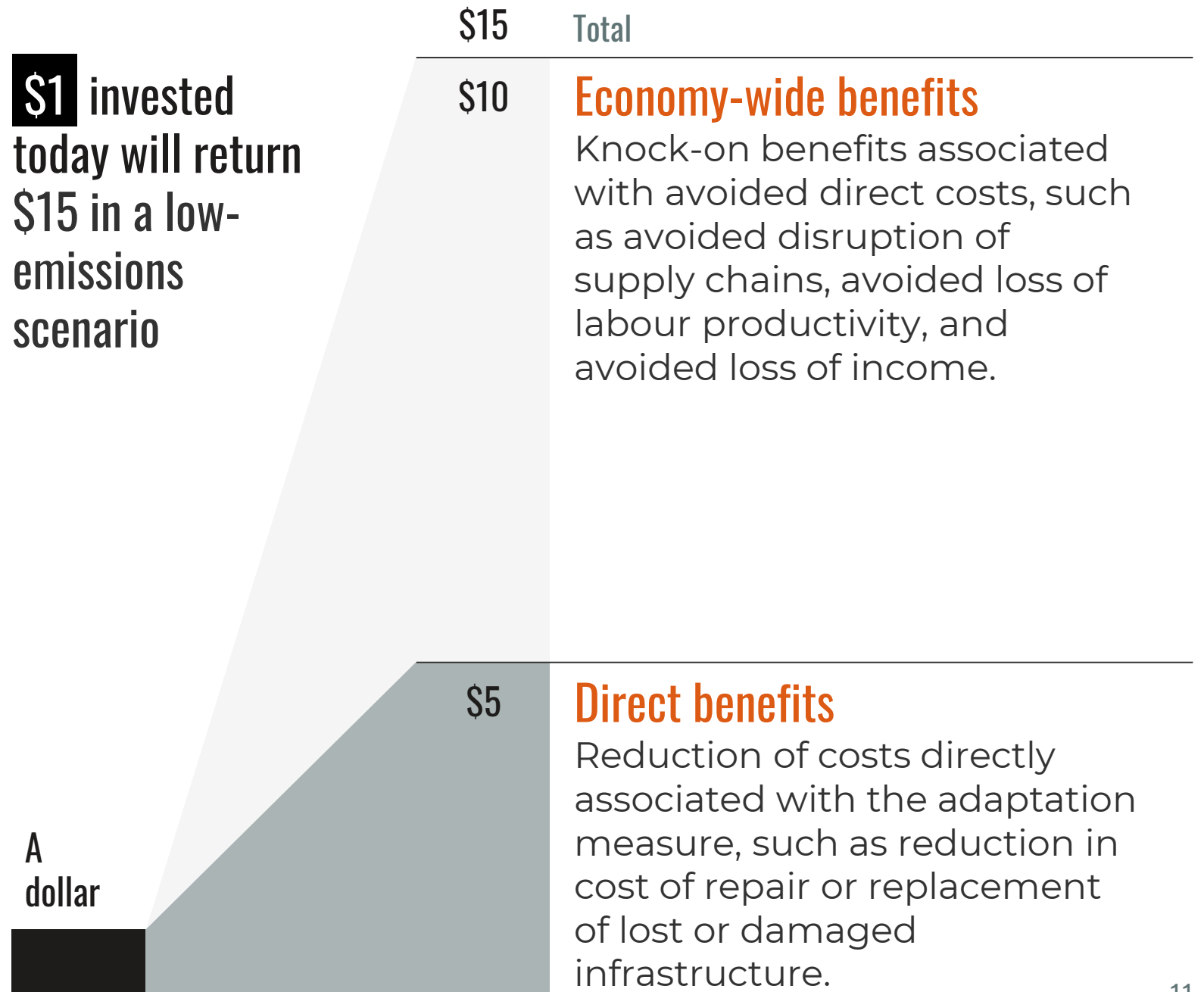
Proactive adaptation can save billions

Canada's projected annual costs of road damage by scenario in millions of dollars (2019 CAD)



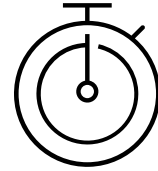
Adaptation investments pay big social dividends

\$1 invested today will return **\$15** in a low-emissions scenario

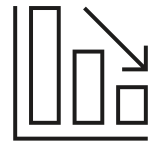


Key Takeaways

Damages are happening today



Income and prosperity will decline



No good scenarios



Proactive adaptation + global mitigation



Actions for Governments

1

Build climate impacts and adaptation policies into economic decision making.

2

Encourage—and where appropriate, mandate—accounting for climate change risks in **private-sector decision making.**

3

Scale-up adaptation measures to match the magnitude of the risk Canada faces.

4

Double down on aggressive reductions in emissions both at home and abroad.

5

Invest in understanding and preparing for the economic risks of climate change that have not yet been modelled.

