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The Economics of Climate Change in Canada:

Thinking about mitigation, adaptation, and clean growth

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CLIMATE CHOICES

About the Institute

Collaborative Research. Integrated Climate Policy. Better Choices.

- What are the **challenges and opportunities** along the path to 2050?
- How can we **measure success** along the way—across multiple dimensions?
- What **choices** do we have, and what are their **implications**?

Who We Are

- Independent **Board of Directors**
- 30+ **Expert Panelists** well known in their fields
- **Advisory Group** provides strategic insight
- Professional secretariat focused on **research, engagement, and communications**
- **A network of partners**

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Leveraging partnerships

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1. Canada's Net Zero Challenge

2. Climate Damages in Canada

Under Water: The Costs of Climate Change for Canada's Infrastructure

3. Opportunities in the Global Low-Carbon Transition

Sink or Swim: Transforming Canada's Economy for a Global Low Carbon Future

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Canada’s net zero challenge

Thinking About Net-Zero

Canada's new course to 2030 is en route to net zero

- New targets look net zero compliant.

It's not smooth sailing to more ambition in 2030

- GHG decline rates require 5x effort above current policy.
- Policy prices need to rise 6x much more.
- Investment needs to 2x across the entire economy.

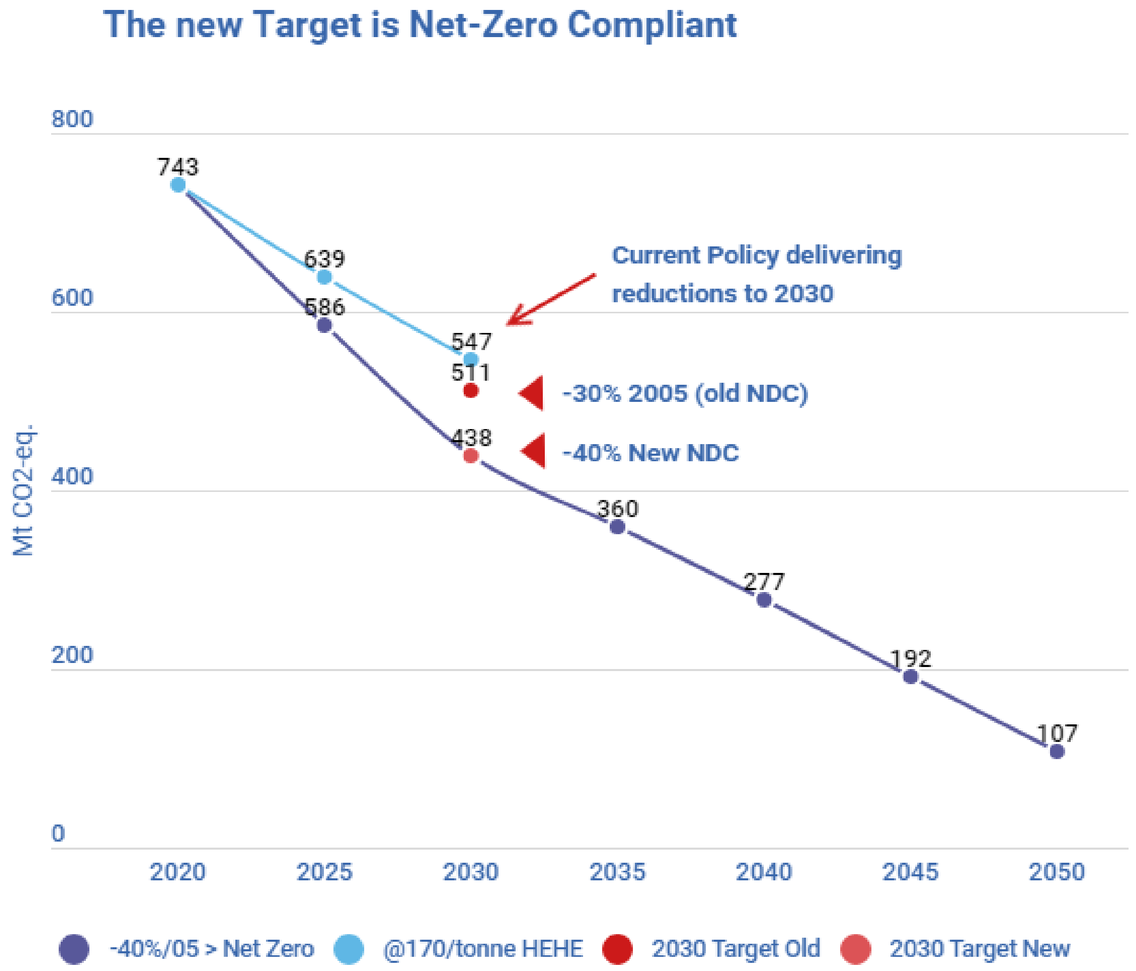
There are market and policy tailwinds helping

- We have lots of technology safe bets and more wild cards.
- Scalable policy package to more ambition.

Renewed US action is a rising tide

- A risky glide path to be the marginal barrel.
- Low carbon and clean energy exports take off.

Climate governance on the rocks



It’s Not Smooth Sailing to More Ambition to 2030, 2050

A big bend in the GHG curve

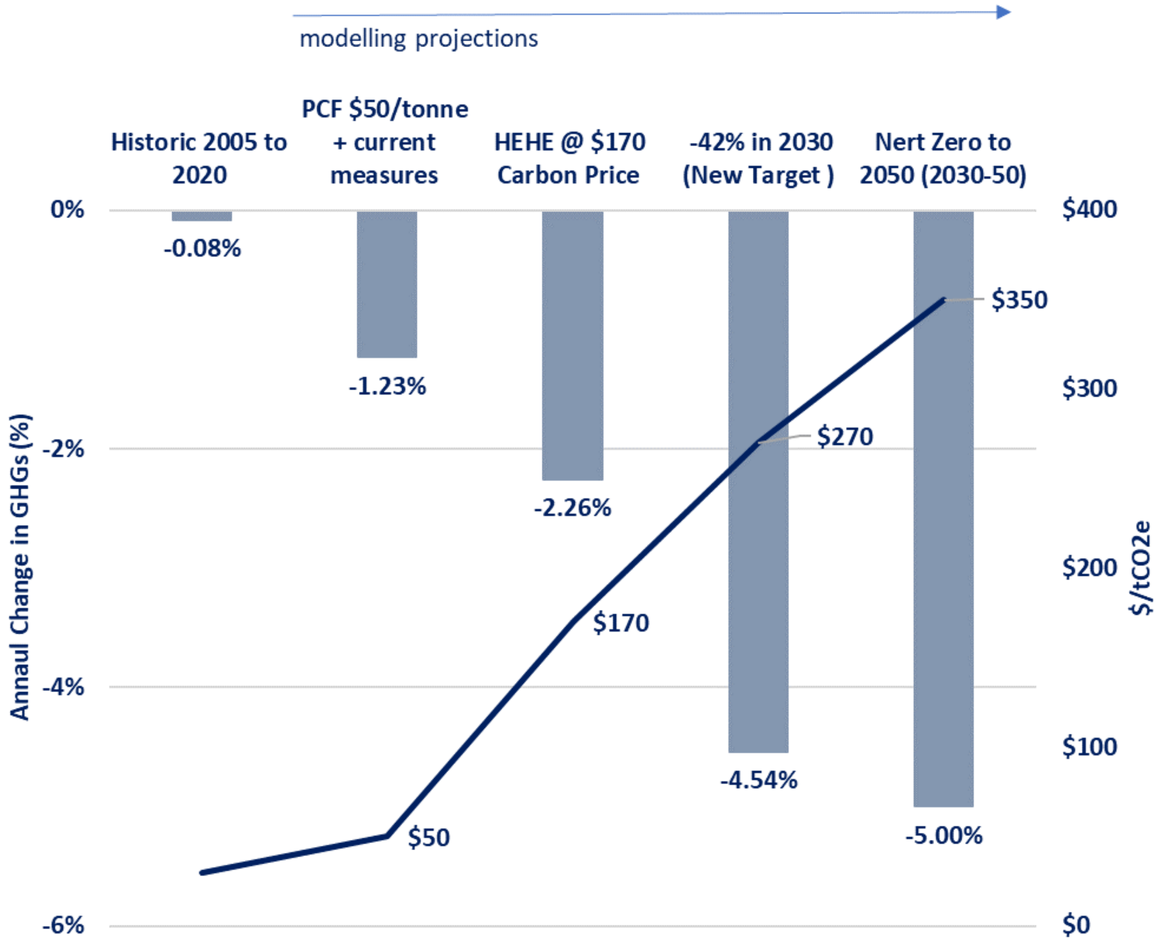
A level of GHG reduction **57x** historical rate

5x current policy

And big carbon prices

6x current carbon price

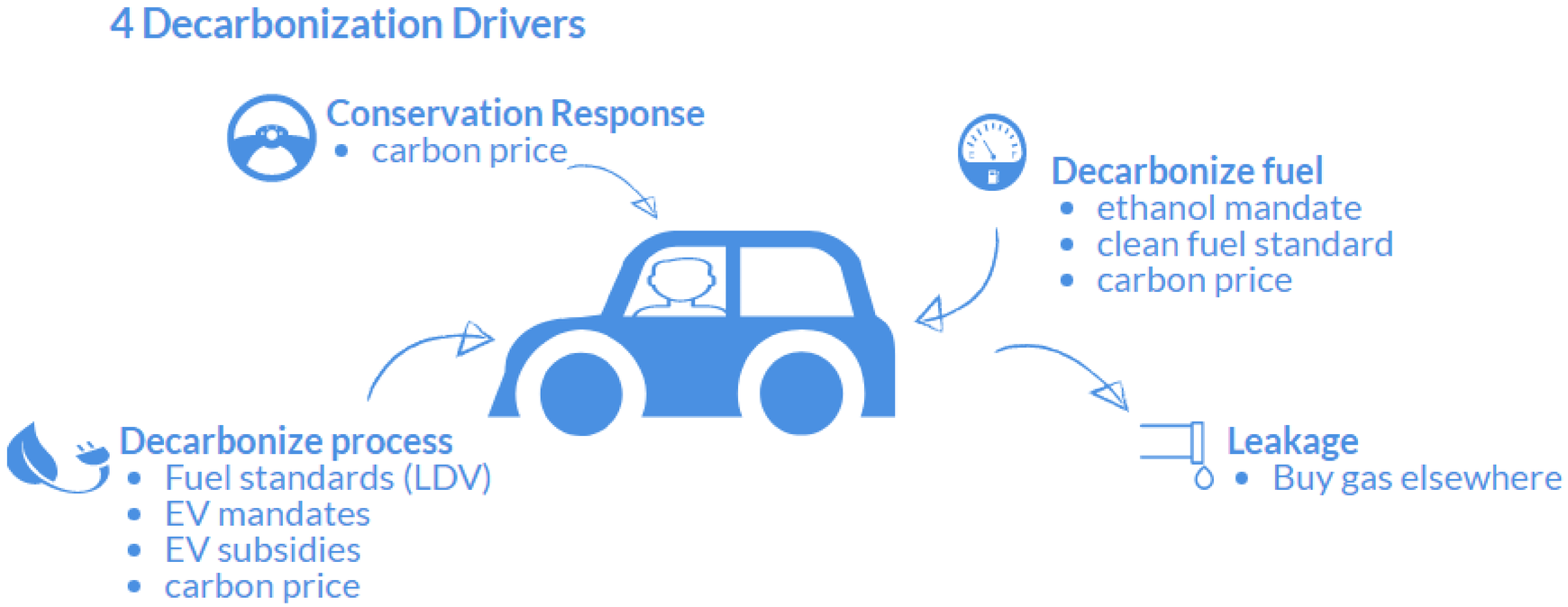
or regulatory shadow price



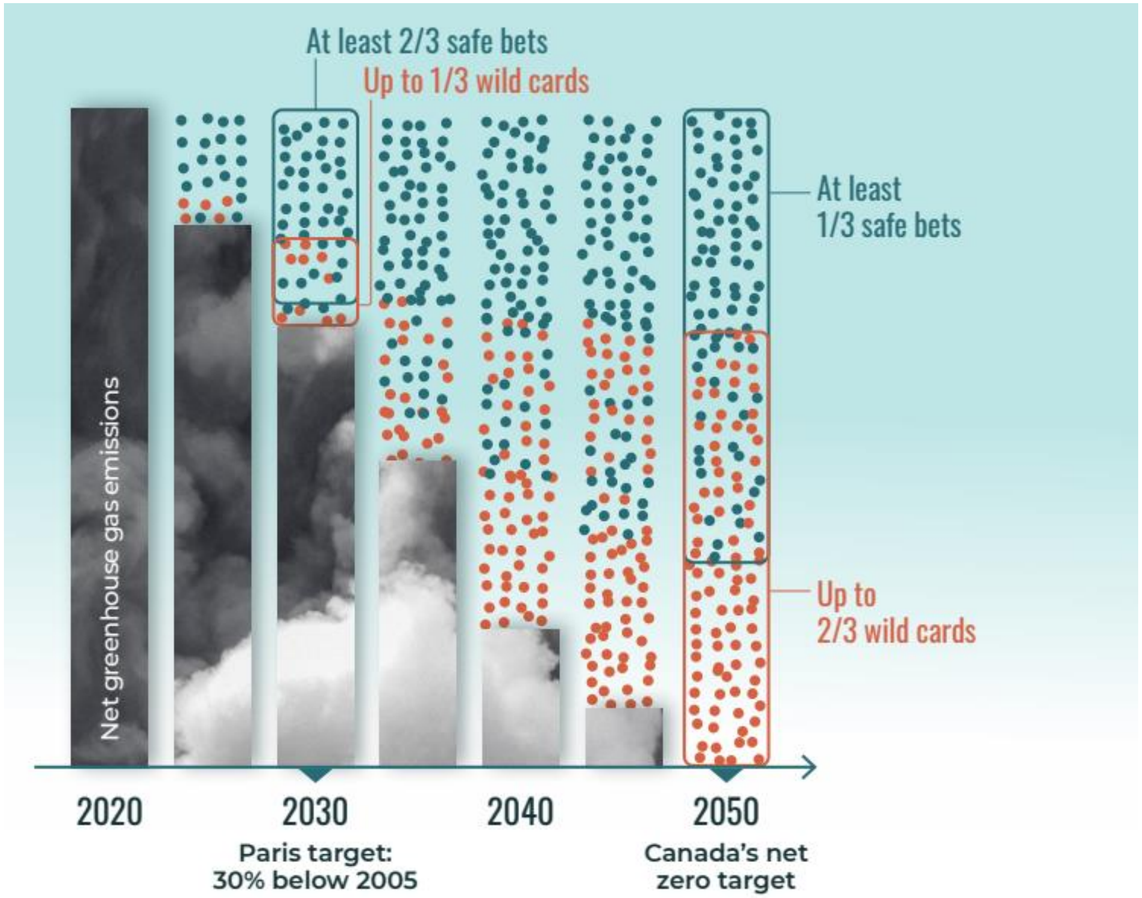
The Policy Arcehtectrure to Deliver?

We have most GHGs cornered by federal, provincial, and territorial policy

- A mix of performance regulations, carbon pricing, and financial incentives squeezing carbon margins
  - In 2016, 39% Canada’s GHGs under carbon pricing; today 79%
  - Companion policies cover almost every corner of Canada's GHG Inventory



Pathway Option Value on the Road to Net Zero



Safe Bets widely available to help now

2/3 GHG reductions by 2030.

Technology already commercial and scalable by **2030**

Wild Cards needed later (think silver bullets)

2/3 GHG reductions by 2050.

Resilient across varied energy futures, with varied technology pathways.

Hydrogen, electrification, biofuels, landscape carbon.

Careful not to pick winners, dead end pathways.

Need innovation (RD&D and learning-by-doing)

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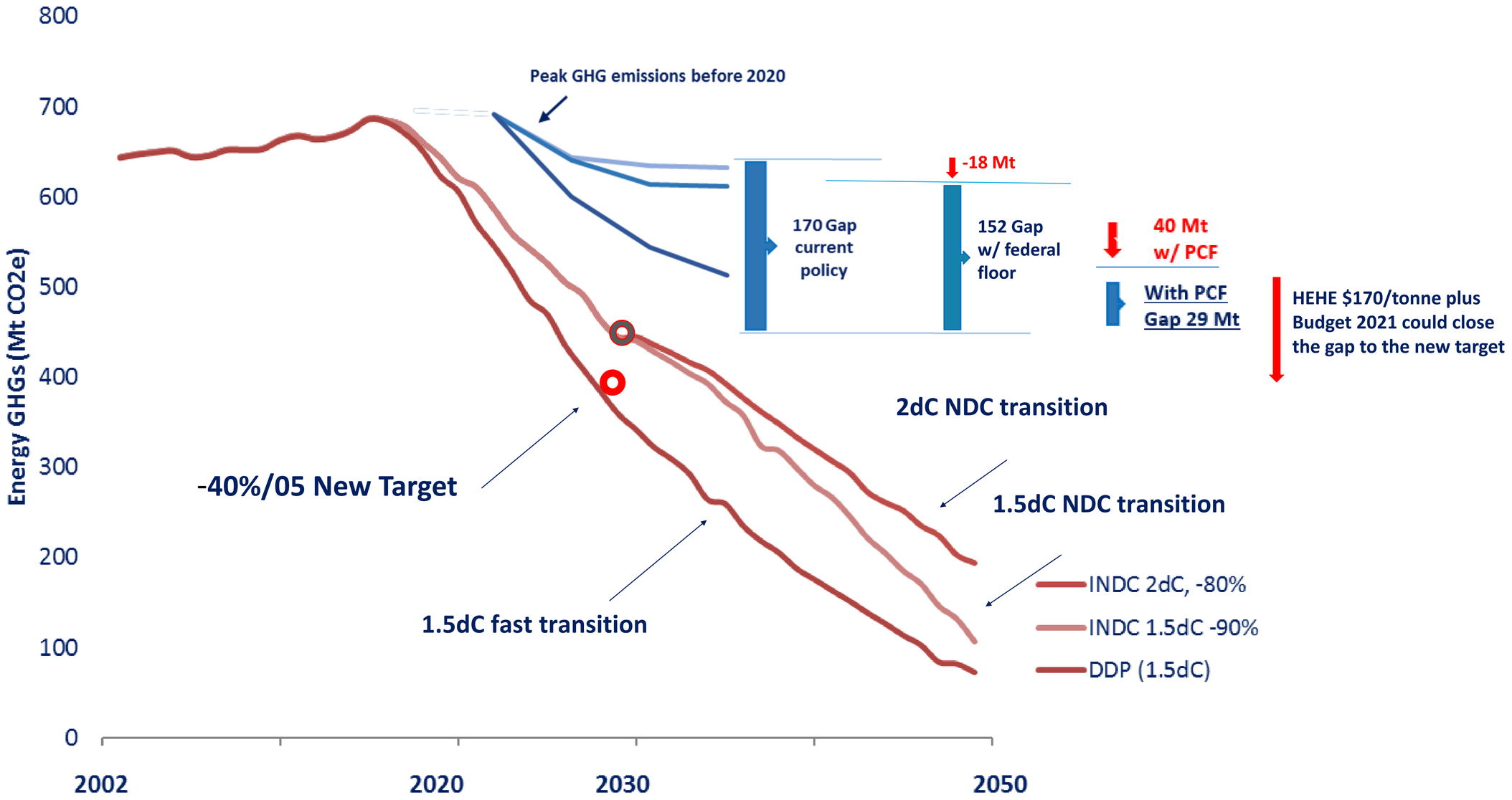
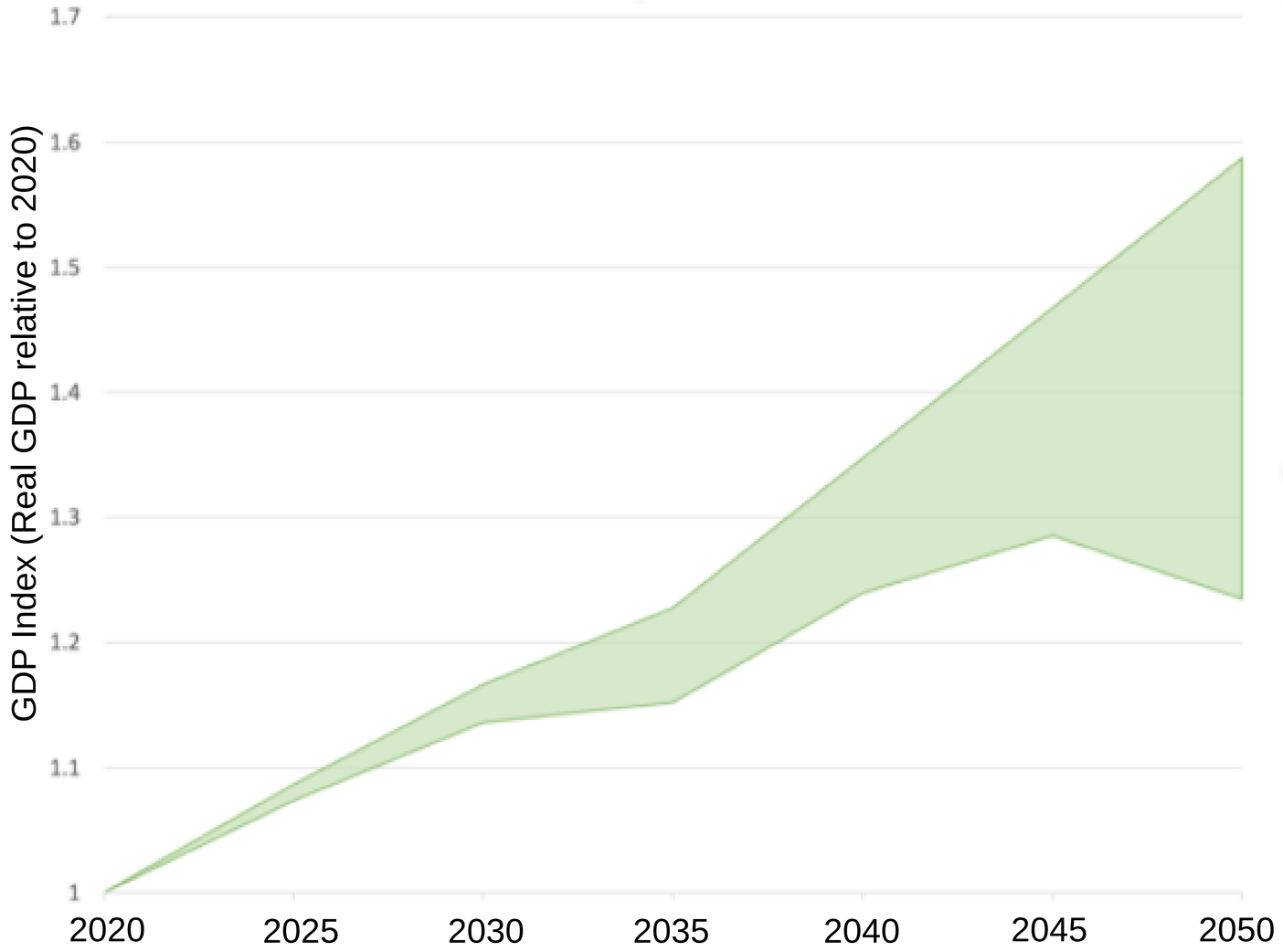
Modelling Targets: Market and Policy Drivers Look Scalable



What does a Canadian Net Zero transition mean for GDP?

Figure 1: Projected changes in Canadian GDP across 60+ net zero scenarios



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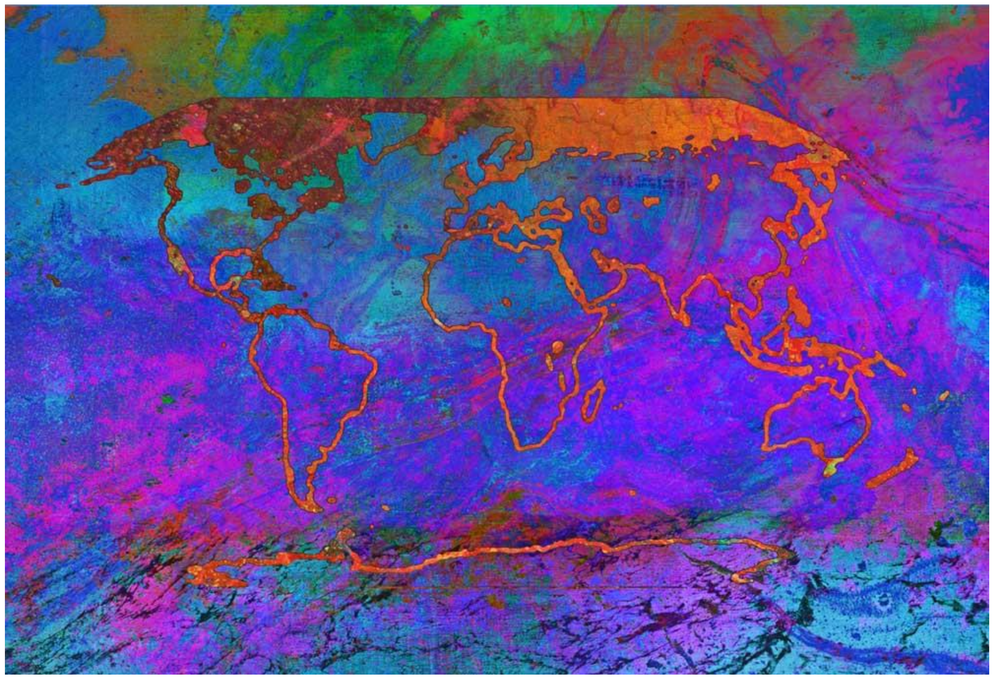
Climate damages in Canada

Most recent IPCC report signals “code red for humanity”

IPCC’s 6th assessment report – Working Group I: The Physicial Science Basis



- The report finds the world is warming faster, and with more devastating consequences, and is definitive that burning fossil fuels is clearly the main cause
- The lowest-emission scenario sees warming held to 1.4 C by the end of the century, with its best estimate in the highest-emission scenario coming in at 4.4 C warming
- The report confirms with high confidence that hitting net zero emissions globally as soon as possible can slow global warming enough to avoid catastrophic tipping points

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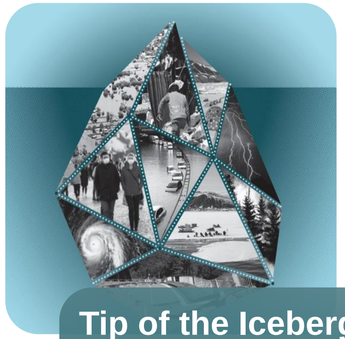
Costs of Climate Change series



Tip of the Iceberg: Navigating the Known and Unknown Costs of Climate Change for Canada

- December 2020

The Health Costs of Climate Change: How Canada Can Adapt, Prepare, And Save Lives

- Spring 2021

Under Water: The Costs of Climate Change for Canada's Infrastructure

- Fall 2021

Northern Infrastructure Impacts

- 2022

Macroeconomics

- 2022

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Current new research: the macroeconomic implications of climate damages

- Provide a view of a climate adjusted GDP growth path.
  - Integrate climate damages and net zero mitigation across scenarios.
  - Provide a macroeconomic view of various global emissions future.
    - Two RCPs (4.5 and 8.5) each with 7 GCMS downscaled regionally.
  - Assess the benefits of proactive adaptation.

- Parameterize a range of “bottom-up” physical impacts and economic outcomes into economy-wide CGE to 2100.
  - Stochastic scenario analyses to consider uncertainty and tail risks.
    - Monte Carlo analysis in the CGE.

7impact areas that inform the macroeconomic study (1/2)

4 to 6 health outcomes

- Heat-related mortality and hospital admissions
- Respiratory mortality due to poor air quality
- Lyme disease incidents
- Lost productivity due to hot weather

Up to 6 infrastructure outcomes

- Road damages and delay costs
- Rail damages and delay costs
- Coastal flooding
- Permafrost thaw

Electricity generation and end-uses

- Increased operations and maintenance costs
- Changes in hydroelectricity generation
- Changes in electricity consumption for space heating and cooling

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7impact areas that inform the macroeconomic study (2/2)

5 crop yield impacts

- Wheat
- Canola
- Maize
- Soybeans
- Other crops

2 main forestry components

- Wood supply
- Timber harvests

2 key tourism indicators

- Foreign tourist arrivals (net arrivals)
- Average spending

Weather-related extreme events

- Change in frequency and intensity of damage

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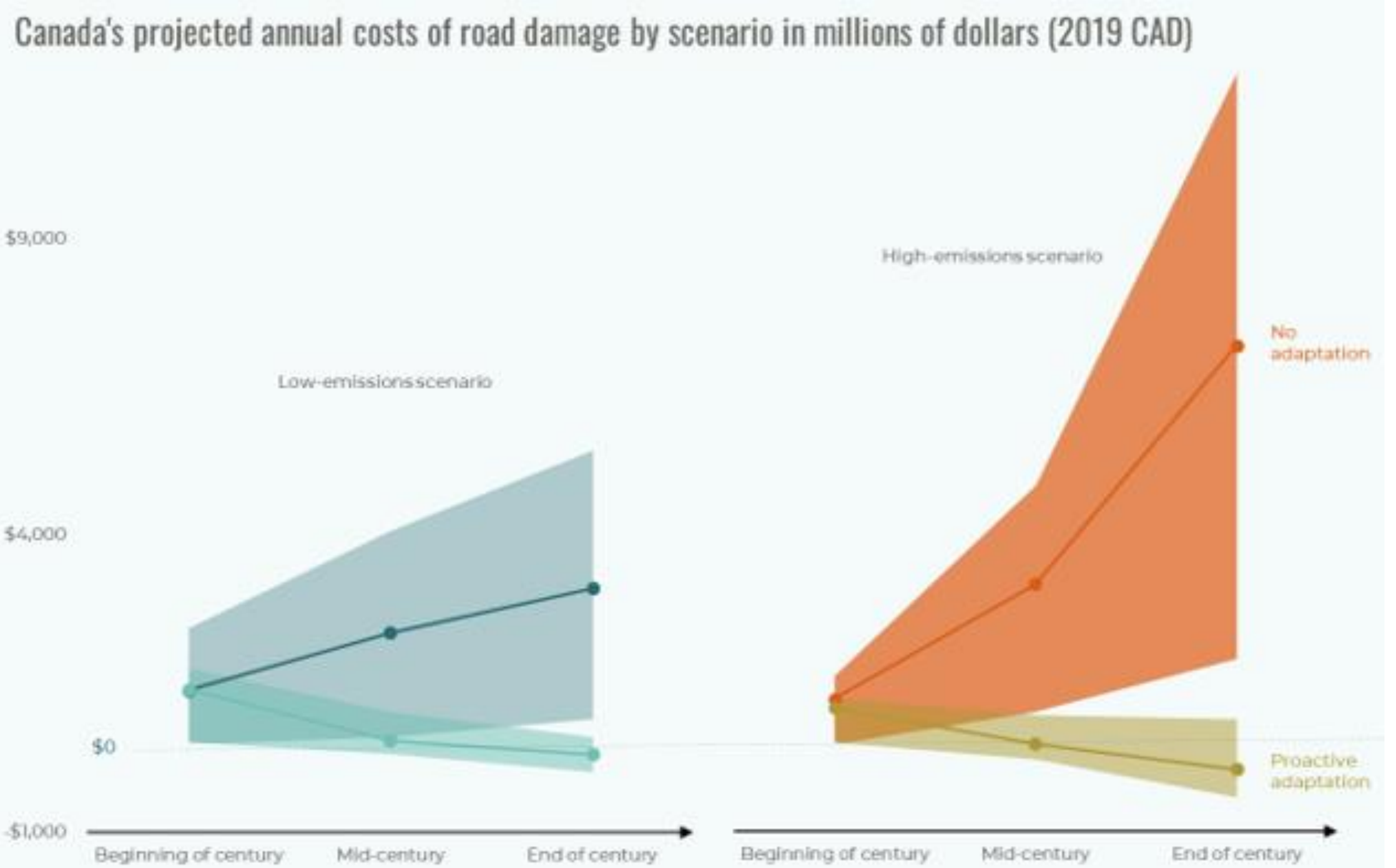
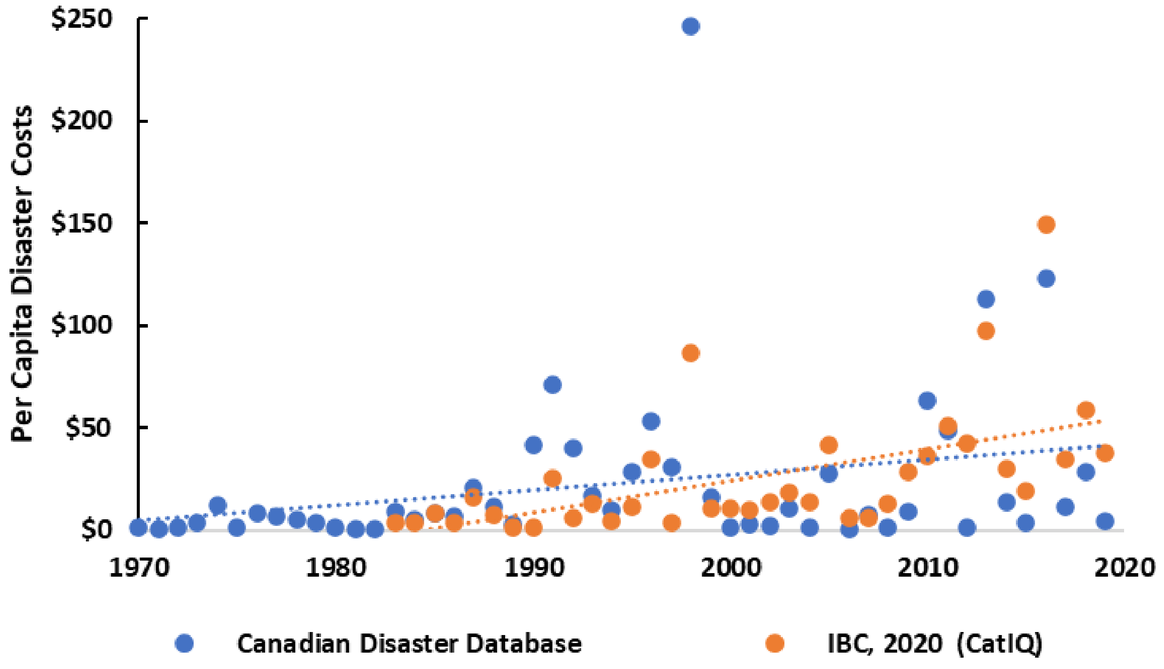
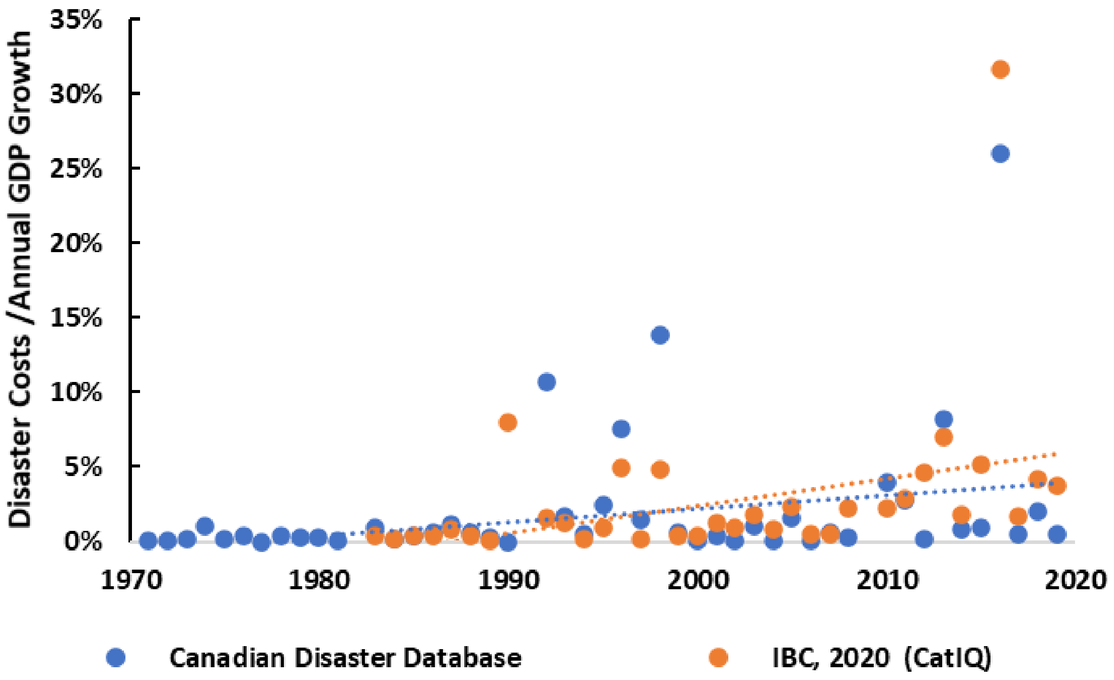

Canada's projected annual costs of road damage by scenario in millions of dollars (2019 CAD)
$9,000
$4,000
$0
-$1,000
Low-emissions scenario
High-emissions scenario
No adaptation
Proactive adaptation
Beginning of century
Mid-century
End of century
Beginning of century
Mid-century
End of century

Disaster Costs on the Rise: Per Capita Costs



Disaster Costs on the Rise: Share of GDP Growth Rate



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Opportunities in the low-carbon transition

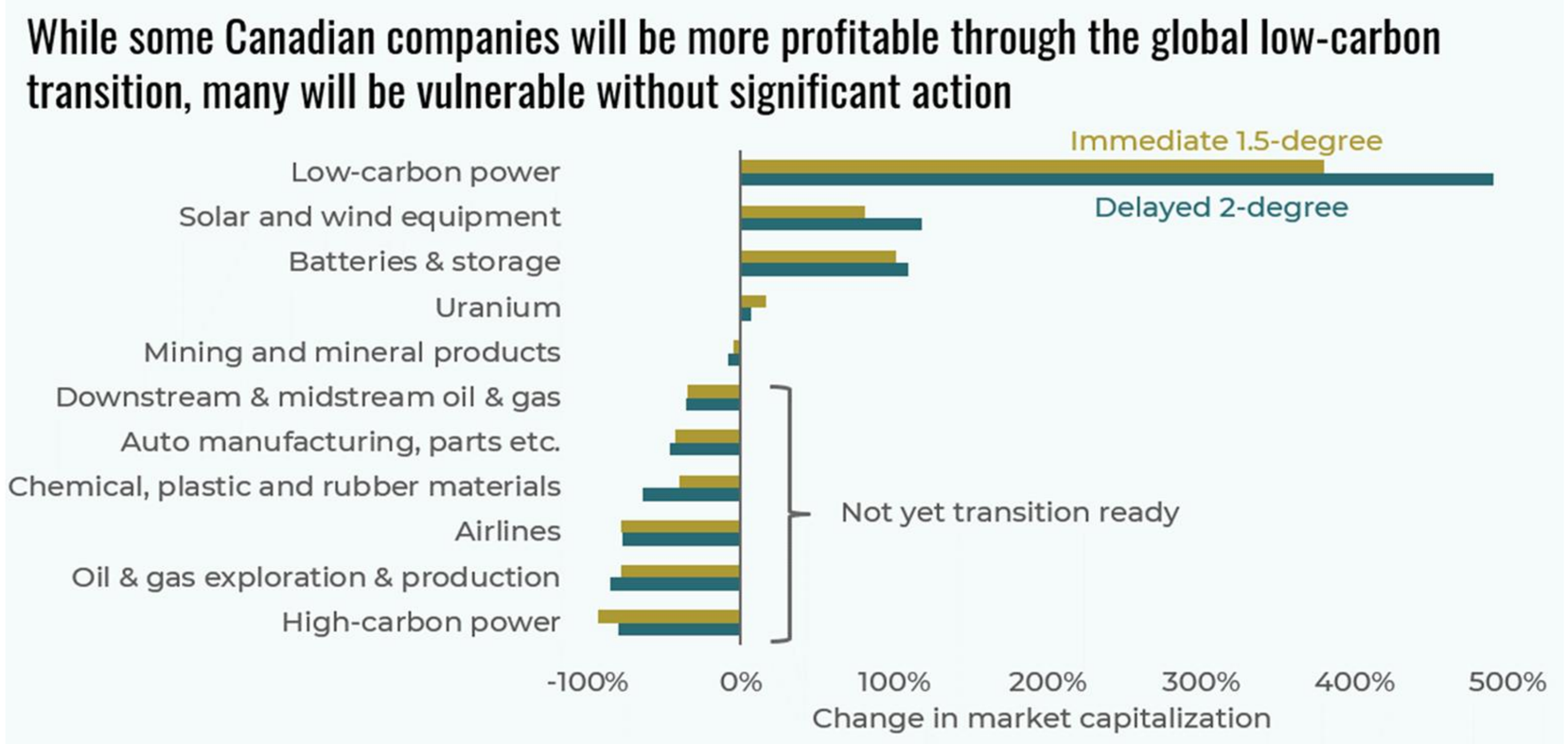
Global landscape

- Over 60 countries have committed to net zero by mid-century, with more pledges under development
  - over 70% of global GDP
  - over 70% of global oil demand
  - over 55% of global natural gas demand

- Over 120 international investors, with US$43 trillion in assets under management, have committed to supporting the global net zero goal through the Net Zero Asset Manager’s Initiative

- Technological change is accelerating, and costs are declining, making climate goals easier to achieve

Many of Canada's exporters and multinationals are not yet transition ready



- Around 70% of Canada's goods exports, and around 60% of our foreign direct investment come from transition-vulnerable sectors
- Improving transition readiness requires large-scale, transformative investments

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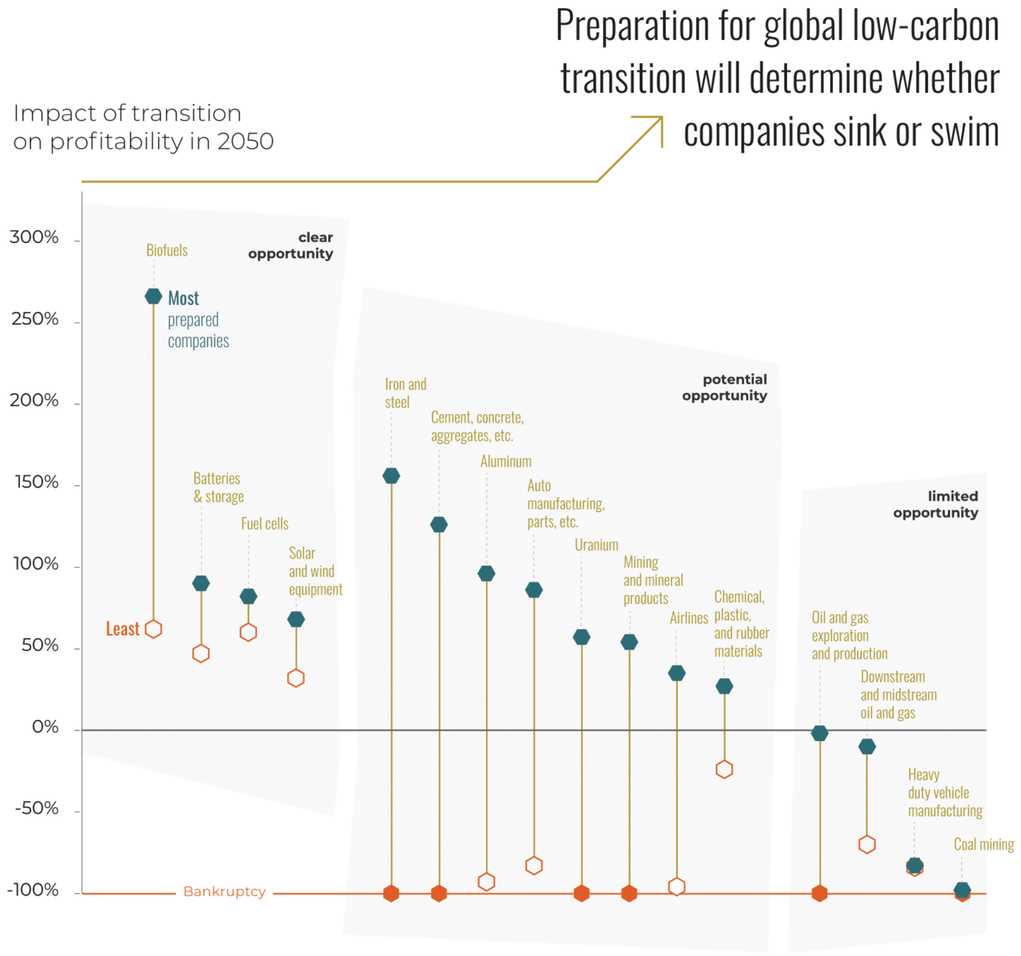
There are opportunities for companies that improve transition-readiness



- Sector averages do not tell the full story – within sectors, low-carbon leaders could benefit from transition.

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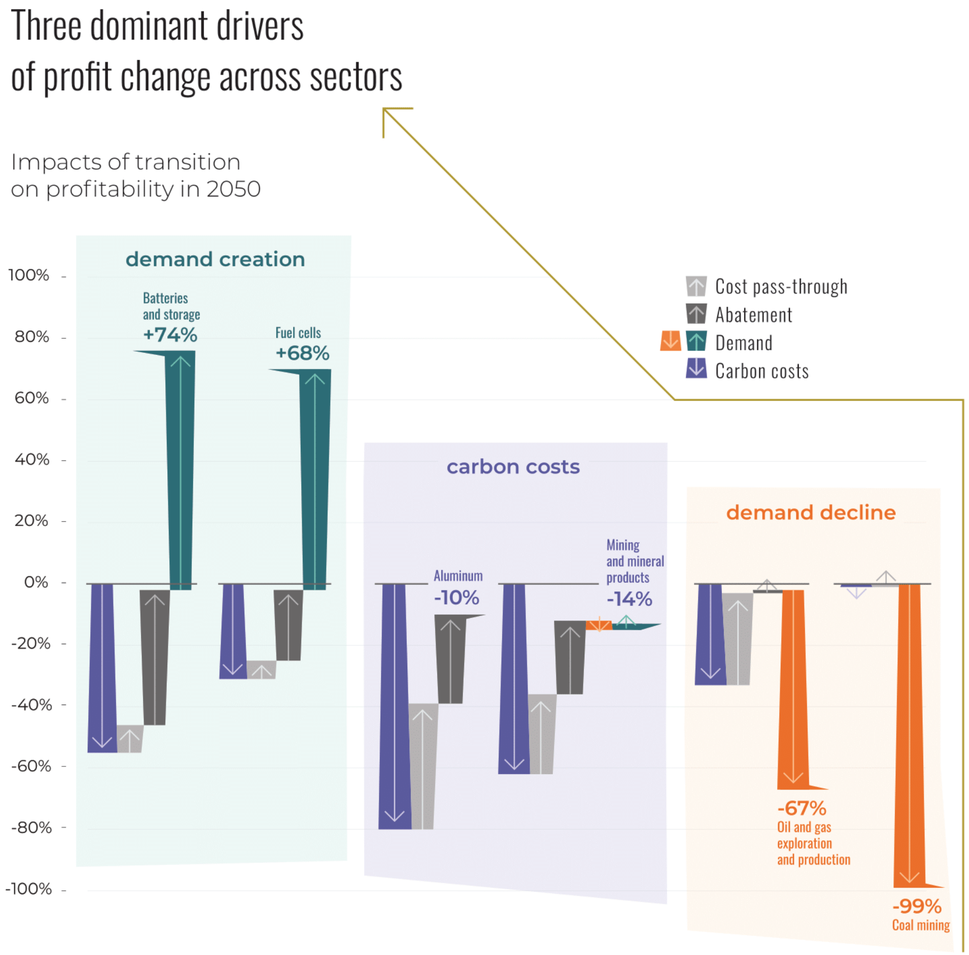
The best strategy for companies depends on the main driver of change they face



- Reducing emissions alone will not be enough to improve Canada's transition readiness.
- Canada needs to generate and grow more companies in areas of demand creation.
- Companies active in demand decline sectors need to transform, shifting into new business lines.

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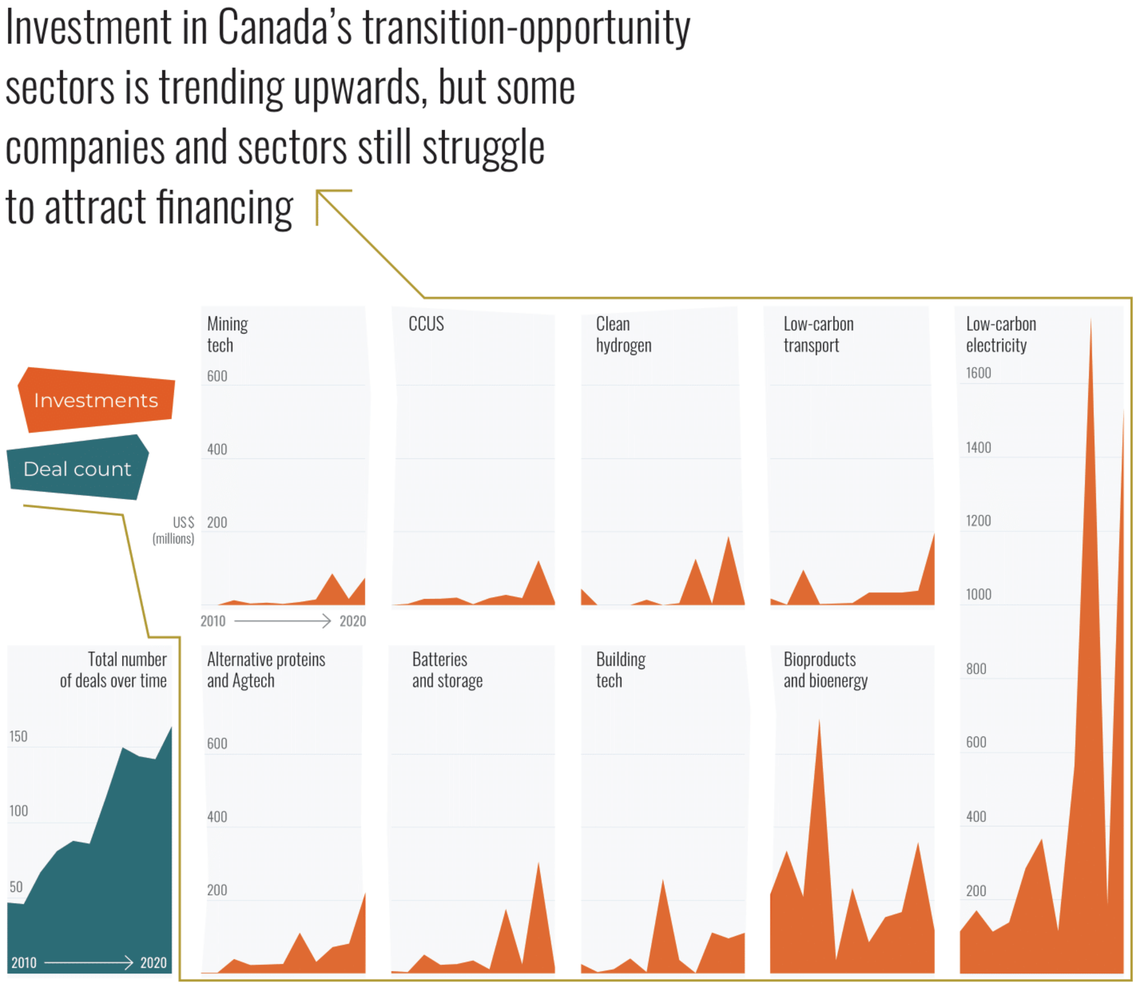
Analyzing growth opportunities



- Canada has hundreds of companies active in markets that will see global and domestic demand growth.
- Investment is rising, but many companies still struggle to obtain the financing they need to grow.
- Promising companies that have received public support are still being lost to foreign buyers and markets.

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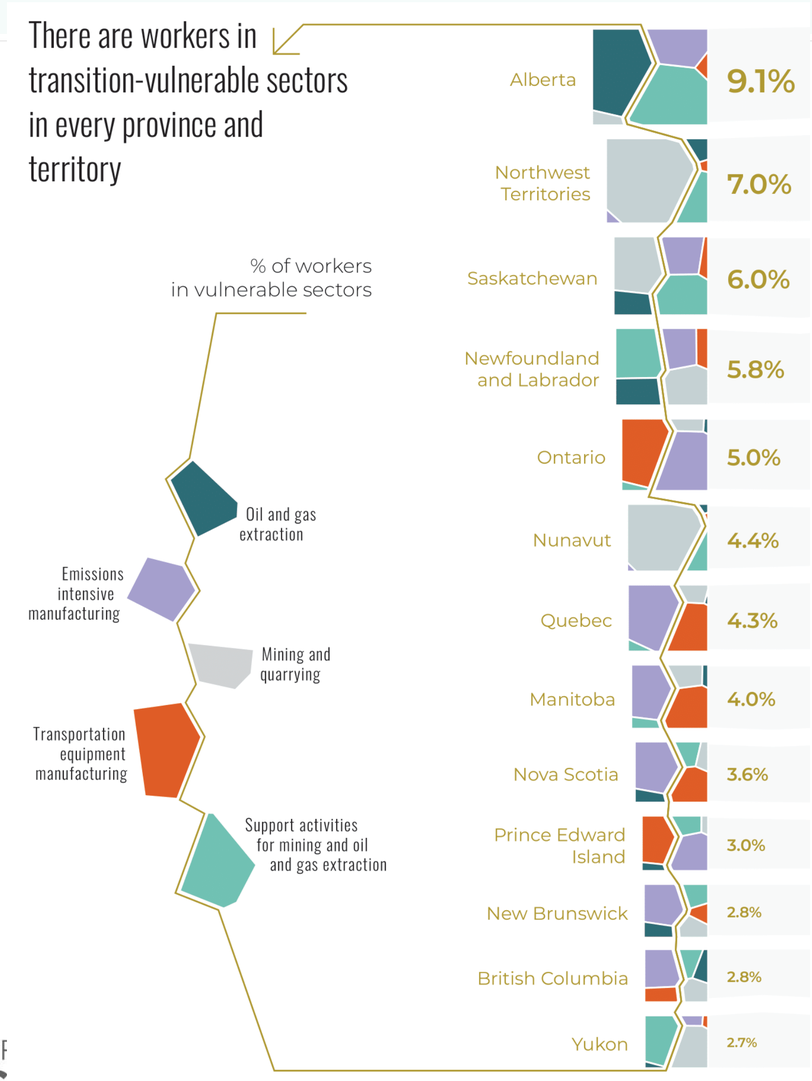
Implications for people and communities



- Market disruptions caused by global transition will affect some people and communities more than others.
- Workers with lower education or skills, and those who face discrimination, will find it harder to find a new job.
- Communities dependent on transition-vulnerable sectors face cascading risks.

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