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The Impact of Climate Change on Global Economies Worldwide Report

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**Introduction to The Impact of Climate Change on Global Economies Worldwide Report**

Climate change impacts humanity every years. It can cause a lot of disasters that can affect anyone. The effects of climate change in the past decades has affected life differently. Temperatures have risen highly over the years. Therefore, the impact of climate change is really concerning because it affects everyone not just global economies.

Temperatures in Edmonton used to be -30°C in the winter. Now the temperature in the winter is not colder then -10°C in the same city. Summers in the city were not warmer then 25°C. Now summers in Edmonton can be as warm as 30°C. Spring in Romania, used to be no warmer then 20°C. Now Spring in the same country is 30°C.

The 2015 Paris Agreement, signed by 195 countries, established a goal of holding the increase in global temperature within a range of 1.5 to 2.0 degrees Celsius above pre-industrial levels as well as a commitment to engage in adaptation planning and implementation. Achieving this goal implies a timely transition to a low-carbon economy. Such a transition involves implementing a range of climate policies, making significant technological progress, investing in green technologies and inducing major socio-economic changes.2 While this transition creates opportunities for innovation, investment and potential green growth, it also poses economic transition risks.

Changes in climate policies, technology or market sentiment could lead to economic dislocation and a reassessment of the value of a variety of financial assets. In particular, climate change–driven alteration of projected earnings and expenses could affect the debt repayment capacity and collateral of borrowers and increase credit risk borne by banks and other financial institutions. The speed at which such asset repricing would occur is uncertain, but its impacts could be important for the safety and soundness of financial institutions and financial stability.

Below, we describe the main issues, outstanding research questions and some promising directions of research along two main themes:

* macroeconomic forecasting and monetary policy, and
* financial system risk assessment and stability.

**Macroeconomic forecasting and monetary policy**

The physical risks of climate change will likely imply increases in the frequency and severity of negative supply shocks (e.g., destruction of capital stocks, disruptions to labour supply, disruptions to supply chains) and demand shocks (e.g., damage to household and corporate balance sheets that result in reduced consumption and investment). While demand shocks are typically manageable from a monetary policy perspective, supply shocks are generally more challenging because they generate a trade-off for central banks between stabilizing inflation and stabilizing output variations. A rise in the regularity and harshness of negative supply shock wave makes it more difficult for central banks to accurately forecast output gaps and, by extension, inflation. In particular, changes in weather patterns could lead to increased volatility of headline inflation (e.g., food prices) and, in some circumstances, could affect inflation hopes. [**4**](https://www.bankofcanada.ca/2019/11/researching-economic-impacts-climate-change/#footnote-4) The associated increase in the volatility of inflation and output could also have important implications for the choice of monetary policy regime (e.g., inflation targeting, price-level targeting or nominal income/GDP targeting) because they differ in their balance of output and inflation goals and their ability to tie down inflationary expectations.

There is a high degree of uncertainty regarding the future path of climate change, climate policies, technological innovation and socio-economic changes. Climate-economy models must therefore be used to develop a range of plausible macro financial scenarios to assess possible outcomes. The Bank of Canada, as a member of the Central Banks and Supervisors Network for Greening the Financial System (NGFS), has been working with regulators and other central banks to develop common macro financial scenarios as a reference point.

**Assessing climate-related risks to the financial system**

More frequent or severe extreme weather events and/or a late and abrupt transition to a low-carbon economy could have significant impacts on the Canadian financial system, with potential systemic consequences.

Extreme weather events could cause damage to physical assets, including real estate, capital and infrastructure, and loss of life with consequent property and casualty (P&C) insurance losses, damage to balance sheets of both households and firms, increases in defaults, and potential financial sector distress.

A late and abrupt transition to a low-carbon economy could lead to a sudden repricing of climate-related risks and stranded assets, which could negatively affect the balance sheets of financial market participants, with potential consequences to financial stability. Given the Canadian economy’s reliance on carbon-intensive activities, its financial system could be particularly vulnerable to transition risks under some adverse scenarios.

Clear climate policy, a smooth and steady transition and financial disclosure of climate-related risks could contribute to the correct pricing of risks and assets and a more efficient allocation of capital, mitigating the risks to the macroeconomy and the financial system.

**The extent to which markets and investors internalize carbon risks**

Some recent literature has assessed the extent to which investors and markets are internalizing risks related to climate change. Using standard event methodology, it is possible to examine the market reaction to specific events, which could be associated with a change in market opportunities about the profitability in investing in carbon-intensive activities. To date, the literature has found evidence that there is a limited but growing sensitivity to carbon risks. The Bank is partnering with academic researchers to further explore this question.

**The climate-related risk exposures of financial market participants and the resilience of the financial system to hypothetical climate and transition scenarios**

Understanding the climate-related risk exposures (business, credit, underwriting, market and legal risk) of P&C insurers and re-insurers, banks, pension funds, investment funds and real estate investment trusts is a priority for central banks and financial regulators. Several central banks and supervisors have, for example, compared geographic distribution of insurance coverage and retail lending activity with that of extreme weather events (e.g., hurricanes and floods). Others have looked to quantify the exposure of financial portfolios to transition risk by identifying the proportion of assets (e.g., equities and corporate bonds) held in sectors most at risk from the transition to a low-carbon economy. While these approaches capture first-round effects, they may not fully incorporate the wider risks of financial contagion from an unanticipated economic transition. As a first step, the Bank intends to evaluate direct and indirect exposures of Canadian financial institutions to climate-related risks based on available data.

Some studies have combined exposure data and scenario analysis using network models to account for second-round effects. These are current state-of-the-art frameworks in climate stress testing. An ultimate goal of the Bank is to develop climate stress-testing frameworks to assess the resilience of the financial system to supposedly extreme but plausible situations. One of the key barriers to assessing climate-related exposures is the availability of data to support granular, bottom-up, quantifiable analysis. To address this gap, central banks and regulatory authorities must co-operate and combine standard macroeconomic, financial market and supervisory reporting data with new climate databases.

**The economic response to climate change**

There is no single pathway to achieving climate targets. A whole systems approach to carbon elimination is needed if we are to limit the climate extremes that cause such damage to human wellbeing, the economy and the environment.

While we don’t know what the low-carbon transition will cost, as it depends on the [choices and investments we make today](http://eprints.lse.ac.uk/109823/1/Ekins_Zenghelis2021_Article_TheCostsAndBenefitsOfEnvironme.pdf) and in the future,the longer we wait to manage that change, the higher the costs and the graver the environmental risks.

Most progress towards a low-carbon economy to date has been thanks to decreases in coal from energy production, and the final pact agreed at COP26 should ensure even greater reductions. The [International Energy Agency estimates](https://www.iea.org/reports/renewables-2020) that ‘Renewables will overtake coal to become the largest source of electricity generation worldwide in 2025’, and the world now invests [more in renewable power generation](https://iea.blob.core.windows.net/assets/5e6b3821-bb8f-4df4-a88b-e891cd8251e3/WorldEnergyInvestment2021.pdf) (excluding nuclear and hydro) than in oil, gas and coal generation combined (see Figure 4).

**Figure 4: Global energy supply investment by sector**

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Source: International Energy Agency, 2021

This is encouraging progress, but far more action is needed across all sectors. An intricate range of economic policy options could propel us along the path towards net zero, offering hope that we will avoid the worst of climate change’s effects.

**Investing in green innovation**

One route of many towards a low-carbon future is investment in green technologies. Greener energy production may be the success story of climate change mitigation efforts so far, but there is still plenty more innovation to be achieved in the sector that could bring further benefits.

[A wide range of energy technologies can bring us closer to net zero](https://www.economicsobservatory.com/can-uk-achieve-net-zero-emissions-post-covid-19-economic-recovery), and could also help to decarbonise the vehicle sector. Promising developments that may benefit from continued savings in research efforts include:

* Nanotechnology-based supercapacitors – energy storage devices with graphene nanotube electrodes could offer superior performance to batteries in powering electric cars, and potentially even aircraft and trains.
* Small modular nuclear reactors, based on the well-developed nuclear-powered engines in submarines.
* Vehicle-to-grid (V2G) systems – whereby the nation’s electric cars are networked to form a vast electric storage system, akin to the National Grid’s storage.

While many responses to climate change lie in technology, the right economic conditions are needed to develop greener technologies and for these to thrive commercially. [Technological innovation creates a virtuous cycle](https://www.economicsobservatory.com/what-are-the-likely-costs-of-the-transition-to-a-sustainable-economy) that outgrowths economies of scale in manufacture and discovery. As solutions are brought closer to reality and become cheaper to develop and apply, there is more incentive for deployment.

**Conclusions**

Using the results from formal economic models, the Review estimates that if we don't act, the overall costs and risks of climate change will be equivalent to losing at least 5% of global GDP each year, now and forever.

If we do not take action now, our world will undergo drastic changes that will negatively affect our environment for thousands of years.

**Where can I find out more?**

<https://www.bankofcanada.ca/2019/11/researching-economic-impacts-climate-change/>

<https://www.economicsobservatory.com/climate-change-what-are-the-economic-impacts-and-potential-solutions>

* [BBC: Six graphics that explain climate change](https://www.bbc.co.uk/news/resources/idt-5aceb360-8bc3-4741-99f0-2e4f76ca02bb)
* [Measuring the real-world costs of climate change](https://impactlab.org/): Climate Impact Lab
* [Global Warming of 1.5°C](https://www.ipcc.ch/sr15/chapter/spm/): Summary for policy-makers of the IPCC’s 2018 Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change

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Dietz, S. and N. Stern. 2015. “Endogenous Growth, Convexity of Damages and Climate Risk: How Nordhaus’ Framework Supports Deep Cuts in Carbon Emissions.” *Economic Journal* 125 (583): 574–620.

Gillingham, K., W. Nordhaus, D. Anthoff, G. Blanford, V. Bosetti, P. Christensen, H. McJeon, J. Reilly and P. Sztorc. 2015. “Modeling Uncertainty in Climate Change: A Multi-Model Comparison.” Cowles Foundation Discussion Paper No. 2022.