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Thermometer Rising—Climate Change and Canada's Economic Future

Introduction

It is my privilege to speak to you about the economic implications of climate change—one of the biggest challenges facing Canada and the world in the 21st century.

Let me first congratulate the Finance and Sustainability Initiative for your leadership in promoting responsible investment for sustainable development. Your work is vital to putting finance at the service of environmental sustainability—helping the private sector to identify the risks and opportunities inherent in climate change and green finance.

The connection between climate change and the Bank of Canada's responsibilities for the stability of prices and the financial system is not an obvious one. We are not experts on climate science, nor do we control the tools to limit global warming. However, climate change itself and actions to address it will have material and pervasive effects on Canada's economy and financial system. While many of these will play out over many decades, I will argue that they are already starting to become important. So, the Bank needs to consider these effects as we deliver on our mandate to promote the economic and financial well-being of Canadians.

In the time I have with you, I would like to share the Bank of Canada's perspective on the economic effects both of global warming and of the tools and policies that can be deployed to address it. I will discuss some of the challenges—as well as the opportunities, because there are many—that lie ahead for Canada. I will also talk about how the work of the Bank connects with these issues.

The Future Becomes the Present

Here in Montréal in early March, it might be tempting to think that rising temperatures could be a welcome change for Canada. But, as we know, that

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would be wrong. Global warming is already having negative effects, with significant economic costs compounding a heavy human toll around the world, including in Canada. Climate scientists are convinced that global warming is, at least to a large extent, attributable to human activity.

Climate systems, like economic systems, are complicated: the forces at work can interact in unforeseen ways, so there are some significant unknowns. But these unknowns are all the more reason to act, especially if they imply even a small risk of a truly catastrophic outcome.[1]

Correspondingly, while the economic costs of climate change are uncertain they are likely to be significant. In Canada alone, it has been estimated that, in the absence of action to address global warming, we would face annual costs of between $21 billion and $43 billion by the 2050s.[2] Such costs would take a number of forms.

Global warming is associated with more frequent extreme weather events—such as floods, droughts and forest fires—which often have tragic consequences at the human level. In economic terms, such events can have a very high price tag. Take, as an illustration, the wildfires in Alberta, which deducted about 1 per cent of Canada's GDP in the second quarter of 2016. While the economy subsequently rebounded, this event was a setback to Canada's return to full potential.

We know that such extreme weather-related events are already more frequent than they were in the past. They will become even more so as average global temperatures continue to rise, even if action is taken now to address climate change. But in the absence of such action, the tab will be much larger.

There are also risks to specific sectors associated with climate change—some of which have started to materialize. For example, the forestry sector has seen the epidemic infestation of the mountain pine beetle, the agricultural sector is facing more frequent droughts and the mining sector encounters infrastructure challenges when ice roads become impassable. It is likely that further implications, as yet unknown, will become evident as global warming progresses.

In economic terms, such events have effects on both aggregate supply and demand. As a central bank, we can react to events as they occur. But we cannot build them into our economic forecasts or adjust our monetary policy in advance because each is unique and unpredictable. In the short run, they may be viewed as a downside risk to economic activity in Canada, which we would take into account in our risk management framework for monetary policy. Over a longer

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[1] Such outcomes are discussed in National Research Council, Committee on Abrupt Climate Change, *Abrupt Climate Change: Inevitable Surprises* (Washington: National Academy Press, 2002). See also P. Howard, *Omitted Damages: What's Missing From the Social Cost of Carbon,* Joint project of the Environmental Defense Fund, the Institute for Policy Integrity and the Natural Resources Defense Council, 2014).

[2] Estimate from the National Round Table on the Environment and the Economy, 2011, using 2006 dollars.

period, that downside turns from risk into near-certainty—that is, a lower growth track for the Canadian economy than we would otherwise achieve.

Let me turn to discuss two important tools that are at our disposal to address climate change: carbon pricing and green finance.

Getting the Price Right

In economic terms, climate change is a negative externality. Any individual or company that engages in activities that generate greenhouse gases imposes a cost on everyone else by contributing to climate change. Establishing a price for carbon emissions forces polluters to bear those wider societal costs—thus internalizing the externality.

Based on this logic, setting the right price for carbon is at the core of Canada's strategy to tackle climate change.[3] In a market economy, prices are the mechanism through which decisions of individuals and companies are coordinated. Using that mechanism to address carbon emissions aligns environmentally sustainable goals with the self-interests of individuals and companies. Of course, the right pricing does not mean that greenhouse gas emissions and global warming would stop. It only means that environmental costs are properly weighed against the benefits of the activities that generate the emissions.

We can set a price for carbon through a carbon tax or a cap-and-trade system. Either way, we create incentives to reduce greenhouse gas emissions in the most efficient way possible. These incentives motivate several kinds of changes in behaviour by

- encouraging the use of existing technologies to reduce carbon emissions,
- inspiring the development of new technologies, and
- helping shift consumption and investment toward those goods and services that require less carbon to produce.

While some are skeptical that pricing will motivate changes in behaviour, experience confirms that price incentives work. An example is British Columbia's carbon tax, which is estimated to have reduced greenhouse gas emissions by 5 to 15 per cent below what they would have been otherwise.[4] Other examples include the widespread switch to smaller cars, prompted by the oil price spikes of the 1970s, and the displacement of coal by cheaper natural gas for power generation in recent years.

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[3] *The Pan-Canadian Framework for Clean Growth and Climate Change*, 2017. Carbon pricing is discussed in a report by Canada's Ecofiscal Commission, *The Way Forward: A Practical Approach to Reducing Canada's Greenhouse Gas Emissions* (April 2015). (www.ecofiscal.ca).

[4] B. Murray and N. Rivers, "British Columbia's Revenue-Neutral Carbon Tax: A Review of the Latest 'Grand Experiment' in Environmental Policy," Working Paper NI WP15-04 (May 2015).

Properly aligned incentives can reduce the need for pervasive regulation. Of course, regulation has its place as a complement to pricing. But given how energy is used in a modern economy, and the magnitude of the changes required, regulation alone cannot possibly do as comprehensive and consistent a job of changing the behaviours and activities that generate greenhouse gases.

Of course, carbon pricing has economic consequences: most directly, it is costly for households and businesses to transition to a smaller carbon footprint. But those consequences need not all be negative. They depend very much on how the revenues from carbon pricing are used. For example, the revenues from carbon taxation could be used to lower the burden of other taxes.[5] That is the approach followed in British Columbia, where the carbon tax enabled the provincial government to reduce personal income taxes and corporate taxes by a roughly equal amount. Such revenues could also be used to smooth the transition for affected industries and households and to address concerns about how the cost of carbon pricing is distributed.

Carbon pricing is more effective if the same price is in place everywhere in the world, so that the steps to lower emissions can be at the lowest economic cost. Further, a consistent global regime reduces incentives for high-emission activities to be relocated to another country rather than scaled back and encourages more effective long-range planning for carbon use. This is one reason why global agreements on climate change, such as the 2016 Paris Agreement, are so important.

It has been pointed out, though, that even if there were no global agreement, it would be in the interest of a single country like Canada to set a meaningful carbon price. Emissions pose other health and environmental costs, even within Canada, that would motivate a public policy response.[6]

Concerns that carbon pricing could result in a loss of Canadian competitiveness can also be partly addressed through the use of the new revenue streams. For example, Alberta's carbon tax has been designed to help address competitiveness concerns in energy-intensive, trade-exposed industries.[7]

Financing the Shift

I've made the case that carbon pricing is a powerful tool for meeting climate change targets. So is green finance, which facilitates private-sector financial flows into environmentally sustainable investments.

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[5] Similar issues arise if carbon pricing is achieved through cap-and-trade, depending on whether carbon permits are auctioned or granted to existing emitters.

[6] See, for example, I. Parry, C. Veung and D. Heine, "How Much Carbon Pricing is in Countries' Own Interests? The Critical Role of Co-Benefits," International Monetary Fund Working Paper 14/174 (2014).

[7] M. Lowey, "Alberta Will Protect Energy-Intensive, Trade-Exposed Industries in Implementing Climate Plan: Environment Minister," *EnviroLine: The Business Publication for the Environmental Industry* (2016).

Green finance works hand-in-hand with carbon pricing. With the right pricing on carbon, more green investments become profitable. However, enhanced transparency and analytical tools are also needed to enable investors to exploit those opportunities, particularly when the benefits may accrue over a long period of time. In this vein, growing numbers of investors—including some of you in this room—have signed on to the Montréal Carbon Pledge for greater disclosure of climate-related risks.

So why is transparency so important?

Those investors who choose to make environmentally responsible investments need clarity on the environmental impact of the activities they are financing.

All investors need to know whether and how companies are exposed to any risks associated with climate change, including the impact of policy changes. For example, will the shift to a lower-carbon economy affect an oil company's profitability, either through tax changes or reduced demand for oil? Will certain oil reserves become uneconomic—aka "stranded assets"? [8]

These questions are also important for regulators who assess whether vulnerabilities are building in the financial system. Physical, liability and policy-transition risks could result in the repricing of financial assets—if that were to occur suddenly, it could potentially pose financial stability concerns.

The Financial Stability Board's Task Force on Climate-related Financial Disclosures is helping to address the information gap. The Task Force recently released a draft set of recommendations for private sector firms on the effective disclosure of their climate-related risks. I don't want to prejudge any of the specific recommendations that may end up in the final report, which is to be released later this year. But the new guidelines should be a helpful step forward in promoting more informed investment, credit and insurance underwriting decisions.

While disclosure is an important piece of the puzzle, green investments face other financing challenges. For instance, their returns may accrue over a long-term horizon, which poses issues similar to those faced by many other infrastructure projects. As another example, green technology companies, like other tech companies, may face financing hurdles in growing to an efficient scale. Creditors and investors may also lack the sophisticated analytical tools needed to properly assess environmental risks and returns.

To address these issues, in 2016 the G20 launched the Green Finance Study Group, of which Finance Canada and the Bank of Canada are active members. The group issued a report last year with options to address green finance barriers at both the international and national levels. The study group will continue to build on this progress in 2017.

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[8] These and other financial stability issues were addressed in M. Carney, "Breaking the Tragedy of the Horizon—Climate Change and Financial Stability" (speech to Lloyd's of London, London, England, 29 September 2015).

Despite the challenges, green finance has the potential to become an integral part of mainstream finance. During the transition, there will be many opportunities for investors and financial institutions to find innovative ways of filling the gaps in the existing financial structure. Some of you are probably already working on those opportunities.

Last year was a record year for global green bond issuance at US$81 billion.[9] In Canada, Export Development Canada, the Government of Ontario and TD have all issued green bonds in recent years. Just last week the Government of Quebec issued its first green bond. These are small steps in the grand scheme of things, but they will help catalyze greater market interest in this sector.

Shifting to a Lower-Carbon Economy

Make no mistake: the move to a lower-carbon economy is a major structural shift for the global and Canadian economies. It is a change in the kind of energy that is used toward sources that emit less carbon. It is a change in in *how* goods and services are produced—lowering their energy-intensiveness. And it is a shift in *what* goods and services are produced and consumed—away from more energy-intensive products toward other products and activities.

While many countries will be undergoing a similar structural transformation, adapting to a lower-carbon economy will likely mean more profound structural changes for Canada than for many other countries. Canada is an important producer of fossil fuels. Our manufacturing sector is closely linked to energy—notably our automotive and aerospace industries—and will be affected by measures to address climate change. And Canadians use more energy per capita than residents of many countries, given the size of our country as well as our climate, living standards and lifestyles.

At the same time, Canada has certain advantages in facing this transition. It is already a large producer of renewable energy, notably hydroelectric power. And, given our highly educated population, Canada has the capacity to innovate in green technologies—while the magnitude of the transition itself provides a strong motivation for such innovation.

While the coming shift does present some unique challenges, Canada has shown an ability to adapt. We have experienced major structural changes brought about by changes in relative prices. Think of the past two and a half years, when the drop in commodity prices drove production and employment away from resource industries toward other sectors of the economy. This shift represented a meaningful setback to Canadian economic growth and much economic pain to many families in the energy-intensive provinces.

But the Canadian economy has proven itself resilient. Our flexible exchange rate helped provide a boost to our non-resource industries, including services and manufacturing. Our labour markets are adaptable—employment has kept growing at the national level in the face of job losses in the oil industry. Our financial system is strong and resilient and has been able to finance the transition

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[9] Climate Bonds Initiative

rather than amplifying the resource downturn. Our governments' sound fiscal positions have given them room to provide support for aggregate demand. And at the Bank of Canada, we had room to ease monetary policy further to buffer the shock to the economy. Thus, as the effects of the oil shock have bottomed out, the Canadian economy is expected to return to its potential around the middle of next year.

Of course, adjusting to a lower carbon economy will likely be more profound and involve different, more complex challenges. But the same factors that have made Canada resilient to the oil shock should serve us well as this adjustment proceeds. Through the adjustment and beyond, we also will rely on the innovative capacity of Canadians to recognize the many opportunities to develop new products and technologies for a lower-carbon world.

Another important factor is that Canada's policy strategy for addressing climate change is being mapped out for the future—which will help in maintaining sustained growth and low, stable and predictable inflation through these adjustments. Indeed, this is in sharp contrast to a scenario where we do not succeed in staving off climate change which, as I have stressed, entails major downside risks and uncertainties.

The Bank of Canada's Role

Now, how does the Bank of Canada fit into the picture? Obviously we are not at the front line dealing with climate change, but the issues I have been discussing have important implications as we carry out our responsibilities.

Let me take a moment to talk about our mandate. The Bank has a role to promote a sound and efficient financial system, including robust markets. We share our financial stability responsibilities with other federal and provincial agencies. In contrast to some other central banks, the Bank of Canada is not directly responsible for regulating banks, insurance companies and similar financial institutions. It is therefore not for us to decide how these institutions should prepare for risks related to climate change or for those associated with the structural changes I have just discussed. We do not regulate financial markets and thus do not have the mandate to establish standards of transparency and disclosure in support of green finance.

We do, however, have a broader set of responsibilities to support financial stability, including identifying, analyzing and assessing both imminent and emerging systemic risks. We bring this risk assessment into our discussions with other agencies that control the relevant policy levers. We also share our analysis with the public in our semi-annual *Financial System Review* and in various staff publications—not to mention in speeches like this one.

Climate change also ultimately has implications for monetary policy. We will continue to pursue low, stable and predictable inflation amid the structural shift to a lower-carbon economy. The introduction of carbon pricing itself will have a transitory effect on inflation—indeed, such an effect is evident in the most recent monthly CPI figures. But since this effect is due to a one-off structural change, we look through it in making monetary policy—just as we have looked through the transitory effect of lower oil prices in the past couple of years. But the more profound structural changes that will be taking place are likely to have important

consequences for both aggregate supply and demand, which we will need to consider carefully as we conduct monetary policy. By the same token, if rising temperatures were to bring increasingly frequent adverse shocks, we would need to factor that into our policy stance in the context of our risk management framework.

Many of these forces are difficult to incorporate directly into our economic models, and we should be modest about the degree of precision we can bring to these issues.[10] But models are nonetheless very helpful for characterizing the forces at work and capturing their interactions.

We can also play an important role by being part of the policy dialogue, in Canada and internationally. I have already mentioned our contribution to the G20's work on green finance, one of a number of settings in which we can—and do—bring ideas and analysis to the table.

All our efforts are guided by research to analyze the economic and financial forces at work. Indeed, the Bank of Canada's Medium-Term Plan includes an emphasis on "considering alternative futures." That label seems tailor-made for thinking about climate change—where we can envisage a lower-carbon future or another future where our economy is increasingly subjected to the shocks stemming from rising global temperatures. We are committed to analyzing the change that is here today and where it may take Canada's economy and financial system far into the future.

Conclusion

In these remarks, I have been focusing on the future. But these changes are already in motion and are becoming increasingly important for decisions on a wide range of policies. The effects of climate change are already being felt, and action to address climate change is being taken now. If it is on a sufficient scale to address the problem, it is also on a sufficient scale to have a meaningful economic impact.

The issues are complex, but basic economics can cut through some of the complexity. Putting a price on carbon is a core element of Canada's strategy for addressing climate change. And if we get the price right, we can do a lot right. Early steps are also being taken to make the financial system an effective tool for green finance, including here in Canada. There are signs that momentum is building.

We at the Bank of Canada will do what we can, within our mandate, to help the Canadian economy through these changes. This is an integral part of our commitment to a better Canada.

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[10] These modelling challenges, including those associated with the integrated models that seek to capture both environmental and economic forces, are reviewed in R. S. Pindyck "Climate Change Policy: What Do the Models Tell Us?" *Journal of Economic Literature* vol. 51 no. 3 (September 2013): 860–872.