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SQUARING THE CIRCLE: CANADIAN GHG EMISSIONS

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EXECUTIVE SUMMARY

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- In this paper, we explore the 'plumbing' of federal-provincial collaboration needed to square the circle of meeting Canada's 2030 GHG emissions target.
- Canada's four largest provinces currently have existing or proposed plans to implement carbon pricing, the approach favoured by the federal government.
- The federal government can assume a number of roles to support collaboration: 'target setter', 'convenor', 'transformation funder' and 'systems integrator', knitting together diverse provincial carbon pricing policies.
- We construct an example illustrating how the federal government, using existing methods of intergovernmental environmental collaboration, could play the 'systems integrator' role.
- Finally, through another example we illustrate the importance of international carbon markets in reducing the cost of transforming to a low carbon society and, in particular, allowing time for the optimal replacement of the existing capital stock.

INTRODUCTION

In December 2015 in Paris, the Prime Minister, accompanied by a group of Provincial Premiers,[1] confirmed that Canada was committed to reducing annual GHG emissions in 2030 to 30 percent below 2005 levels, setting a 2030 target of 524 Mt. Currently (2013), Canadian emissions stand at 726 Mt.

In the first paper in this series, we laid out the basic arithmetic of Canada's GHG emissions by province and in comparison to top global emitters.[2] Reducing Canada's GHG emissions by 200 Mt from current levels will require a wholesale transformation of Canadian society.

Of the many challenges embedded in Canada's 2030 commitment, one of the most daunting is how to share the burden of transformation to a low-carbon society among provinces with diverse economies and emissions intensities. The second paper in the series explored some alternative approaches to this issue and concluded that while there are diverse philosophical rationales to burden sharing, some of the key alternatives yield similar results in practice.[3]

In this third and final paper, we examine the 'plumbing' of federal-provincial collaboration on GHG emissions reduction. We begin by summarizing existing and proposed provincial carbon pricing systems. Next, we look at the role the federal government could play as a 'systems integrator' of the diverse provincial systems. Finally, we look at the role that carbon trading can play in making the transformation to a low carbon society more affordable.

PROVINCIAL GHG REDUCTION SYSTEMS

Canada is known internationally as country with high per capita emissions relative to many of its industrialized peers. However, Canada is also known as one of the few countries that has functioning carbon-pricing policies within its borders. These policies are wholly the result of provincial actions, ranging from BC's carbon tax to Quebec's cap and trade system. Alberta recently announced that it would be adopting a carbon-pricing policy, while Ontario and Manitoba have made related announcements of future cap and trade systems. In this section we describe the BC and Quebec policies as well as provide some preliminary information on the Alberta and Ontario policies.

British Columbia: BC currently has carbon emissions of 62.8 Mt or 13.7 tonnes per capita.[4] The Province was an early adopter of carbon pricing with a carbon tax first implemented in 2008 at $10 a tonne followed by $5 annual increases. The carbon price rose to $30 per tonne by 2012 and has remained at that level. The tax covers approximately 70 percent of total provincial emissions. The current $30 per tonne tax adds about 7 cents per litre to the price of gasoline.

The carbon tax is revenue neutral by law. Enabling legislation requires the BC government to make equivalent cuts to other taxes. BC currently boasts the lowest personal income tax rate in Canada (for individuals earning up to $122k).

Elgie and McClay (2013) judged the BC carbon tax to be a success: fossil fuel consumption dropped 17.4 percent per capita (and fallen by 18.8 percent relative to the rest of Canada) while BC's rate of economic growth (measured as GDP growth) kept pace with the rest of Canada's over that period.[5]

The BC government established a panel of experts to submit recommendations on the province's future climate targets and policies. The Climate Leadership Plan process began in the summer of 2015 and has already submitted

1. Throughout the paper, we use the term 'province' to denote both provinces and territories.
2. Boothe P. and F.-A. Boudreault (2016a) "By the Numbers: Canadian GHG Emissions." Lawrence National Centre for Policy and Management, Ivey Business School at Western University. Available at: **http://www.ivey.uwo.ca/cmsmedia/2112500/4462-ghg-emissions-report-v03f.pdf**
3. Boothe P. and F.-A. Boudreault (2016b) "Sharing the Burden: Canadian GHG Emissions." Lawrence National Centre for Policy and Management, Ivey Business School at Western University. Available at: **http://www.ivey.uwo.ca/cmsmedia/2169603/ghg-emissions-report-sharing-the-burden.pdf**
4. National and provincial emissions data used in this study are taken from Canada's Second Biennial Report on Climate Change (February, 2016). Available at: **https://www.ec.gc.ca/GES-GHG/default.asp?lang=En&n=02D095CB-1**
5. Elgie, S. and J. McClay (2013) "BC's Carbon Tax Shift Is Working Well after Four Years". Canadian Public Policy, Vol. XXXIX, 2013. Available at **http://dx.doi.org/10.3138/CPP.39.Supplement2.S1**

a number of recommendations that the government is evaluating. Recommendations include a $10 per year increase to the carbon tax starting in 2018 and a 2030 GHG emissions reduction target of 40 percent below 2007 levels to 39.5 Mt.

Quebec: Quebec's emissions stand at 82.6 Mt or 10.1 tonnes per capita. The Province's cap and trade system came into effect on January 1, 2013 and was linked with the California cap and trade system one year later. The system initially covered large industrial emitters and electricity generators with annual emissions exceeding 25,000 tonnes of CO2. In 2015, fuel distributors were added to capture the downstream emissions associated with their products. Quebec's emissions cap now applies to approximately 85 percent of the province's emissions.

Sectors that are not covered by the cap and trade policy can participate through the offsets system, subject to the provincial government developing a quantification protocol. However, regulated entities are limited to using a maximum of 8 percent offset credits towards overall compliance. Sectors eligible to participate in the offset system include manure storage facilities, landfill sites, and some ozone depleting substances.

Free allocations, representing approximately 30 percent of all allowances in 2016, are provided to address the competitiveness concerns of emissions-intensive-trade-exposed (EITE) industries. Free allowances will decline by 1-2 percent per year. Electricity producers and fossil fuel distributors are not eligible to receive free allocations. Emissions allowances that are not allocated for free are auctioned jointly with California four times per year. The auction floor price was set at C$10.75 in 2013 and increases by 5 percent plus inflation every year until 2020, adjusted for the CAD-USD exchange rate. The latest auction (held on February 16, 2016) had a minimum price of $17.64 CAD. All of the auction proceeds go to the Quebec Green Fund and are earmarked to help Quebec transition towards a low-carbon economy. Quebec has set a 2030 target of 56.1 Mt.

Alberta: Alberta's emissions currently stand at 267 Mt or 66.6 tonnes per capita. The Province announced their "Climate Leadership Plan" in November 2015, following recommendations put forward by the Climate Change Advisory Panel.[6] While details of the final strategy are currently being developed, the Government announced it will be moving forward in four key areas: 1) acceleration of the federally-mandated phase out of coal-generated electricity and the development more renewable energy, 2) implementation of a new carbon price on greenhouse gas emissions, 3) a legislated limit on oilsands emissions, and 4) implementation of a new methane emissions reduction plan.

With respect to coal-fired electricity generation, existing plants will be phased out completely by 2030. The province has set a target of up to 30 percent of electricity to come from renewable sources by 2030, with the rest generated by natural gas.

Carbon pricing will apply to 78-90 percent of the province's emissions and will replace the current intensity-based system. The price will be set at $20 per tonne in 2017 and rise to $30 per tonne in 2018. The carbon price will then increase each year at a rate of 2 percent plus the rate of inflation. The conventional oil sector will be exempted until 2023 to allow it to focus on methane emissions reduction. When fully implemented, the new carbon price should raise about $6B a year.

6. Climate Leadership – Report to Minister (2015). Available at: **http://www.alberta.ca/climate-leadership-plan.cfm**

About half of the carbon pricing revenue will be redistributed back to industry as a subsidy per unit of output based on "sector-specific, output-based allocations of emissions rights." Firms will pay a carbon tax of $30 per tonne and the Province will then rebate a portion of the revenue back to large emitters based on a subsidy per unit of production, calculated from the top quartile emissions performance. Thus, an oil sands facility with top quartile emissions intensity performance would get the tax fully rebated, while more emissions-intensive facilities would receive only a partial rebate. Remaining revenues will fund complementary climate action policies and will provide transition help to individuals and families, small businesses, Indigenous communities and people working in the coal industry.

A cap will be set on oil sands emissions at 100 Mt in any year with provisions for cogeneration and new upgrading capacity. Oil sands emissions in 2013 were 62 Mt and expected to grow under BAU scenarios to 90 Mt by 2020 and 116 Mt by 2030. Thus, even under a BAU scenario, the cap is unlikely to constrain oil sands development for at least the next 15 years when provisions for cogeneration and new upgrading capacity are included.

Finally, Alberta has set a target for reducing methane emissions in 2025 by 45 percent reduction. Reductions will be voluntary until 2020, after which they will be backstopped by mandatory standards. While Alberta has not formally announced a 2030 target, its Climate Leadership Plan calls for 2030 emissions of 270 Mt.

Ontario: Ontario emissions stand at 171 Mt or 12.6 tonnes per capita. The Province announced in April 2015 that it will implement a cap and trade policy in conjunction with Quebec and California beginning in January 2017. Draft legislation and regulations were tabled in February 2016.

Ontario's cap-and-trade system will go into effect January 2017 and will cover about 80 percent of Ontario's emissions, an amount roughly similar to the Quebec system. Industrial facilities, institutions, electricity generators and energy distributors emitting over 25 kt CO2 will be covered. Also similar to Quebec's system, five different types of allowances will be accepted for compliance purposes: offset credits, early reduction credits, allowances distributed for free, auctioned allowances and allowances from Ministerial direct sales (to act as a safety valve in case prices rise too sharply).

In the early years of the system's operation, trade-exposed sectors such as cement, steel and lime businesses, as well as auto manufacturers, will receive free allowances to avoid any risk of 'carbon leakage' (e.g. when facilities move to another jurisdiction with lower environmental regulations). Free allocations are expected to represent roughly 25 percent of the total allowances in 2017, consistent with the amount of free allowances in the Quebec system.

Revenues from the auctioning of allowances are projected to be $1.9B per year starting in 2017. All of the revenue will flow into a 'Greenhouse Gas Reduction Account' to be reinvested in emissions-reduction initiatives.

Some estimated cost increases for Ontarians based on the current minimum auction price in the Quebec-California system ($17-18/tonne price) include 4.3 cents per liter of gasoline and about $5 per month on average household natural gas heating bill.

The system's total emissions cap will decrease by approximately 4.3 percent per year until 2020. However, the electricity generation sector will be spared from a decreasing cap due to the significant cut to emissions resulting from the elimination of coal-fired plants. Ontario has set a 2030 target of 114.7 Mt.

THE ROLE OF THE FEDERAL GOVERNMENT

With a number of provinces' climate actions already well underway, what role should the federal government play in helping to transform Canada into a prosperous, low-carbon society? A range of possibilities exists. For example, the federal government could play the role of 'target setter', 'convenor', 'transformation funder' and 'final decision maker'. Whatever roles the federal government decides to fill, it can draw on Canada's extensive experience with environmental collaboration among governments.

The federal government has already begun to act in several of these roles. As the only government able to negotiate with other sovereign states in the UNFCCC, the federal government has assumed the role of 'target setter', committing Canada to reduce annual GHG emissions to 524 Mt by 2030. As well, it has assumed the role of 'convenor', bringing together Premiers to hear from climate scientists in November 2015. A follow-on meeting to discuss climate action is scheduled for March 2016. Finally, the federal government promised in the fall 2015 general election campaign that it would assist provinces as a 'transformation funder' – funding infrastructure and other investments that will help with the transformation to a low carbon society.

Should the federal government assume the role of 'final decision maker', seeking to impose a uniform approach to emissions reduction across the country? While it is important that governments at all levels acknowledge their shared responsibility to meet Canada's 2030 target, there are a number of reasons that imposing a uniform approach would be counter productive. First, environmental stewardship is a shared responsibility under the Canadian Constitution. Neither federal nor provincial governments can claim constitutional pre-eminence. Second, several provinces have already taken or proposed significant steps to reduce emissions using carbon pricing, the instrument favoured by the federal government in its election platform. Third, and perhaps most importantly, the diversity of provincial economies, natural resource endowments and capacity for renewable energy generation means that provincial actions tailored to regional circumstances and preferences are most likely to be effective in reducing emissions.

There are a number of recent examples of federal-provincial collaboration on environmental issues where the federal government has played the role of 'systems integrator'. For example, the Canadian Environmental Protection Act (CEPA) allows the federal government to enter into Equivalency Agreements with provinces on environmental regulations. In 2012, the federal government concluded an agreement with Nova Scotia to substitute the province's regulations for the national regulations of GHG emissions from coal-fired electricity generators. CEPA requires that provincial regulations achieve the same environmental outcome as the federal regulations they replace and that, as with CEPA, citizens be given the right to request an investigation of alleged offences under the regulations.

Another example of federal-provincial collaboration comes from the federal Wastewater System Effluent Regulations. In this case, in addition to using Equivalency Agreements, the federal government has also entered into administrative arrangements with some provinces for reporting. These arrangements allow for single window reporting to provinces and thus reduce the reporting burden for regulatees.

A third example is the Canada-Wide Air Quality Management System currently being implemented. Designed to control air pollution, this framework uses a 'backstop' approach, where provincial regulations 'sit on top' of federal regulations. With provincial regulations designed to be marginally more stringent than federal regulations, the province is the regulator of first instance, although the federal government retains a right of enforcement if there are repeated, serious violations of federal regulations.

These examples illustrate ways that the federal and provincial governments could collaborate to implement regionally-tailored actions to meet Canada's 2030 GHG emissions target. How might such a collaboration work in practice when some provinces have carbon taxes and others are using cap and trade systems and all will require complementary regulations in areas where carbon pricing is not feasible or effective?

Suppose the process began with federal and provincial governments collaborating on the economic modelling required to estimate the carbon price consistent with Canada's 2030 target.[7] Provinces could agree to implement a carbon tax equal to the estimated price or, if they were using a cap and trade system, accept an allocation of carbon emissions consistent with an agreed burden sharing policy.[8] The federal government could use equivalency agreements or a backstop approach to allow provinces to be regulators of first instance and to recycle the revenue from the tax or carbon auction to accomplish provincial transformation goals. Provinces would need to allow trading of carbon allocations (in the case of cap and trade) or offsets (in the case of a carbon tax) from other provinces to ensure firms had access to the lowest cost emissions reductions available.

Further, the federal government could collaborate using equivalency or backstop approaches to enact complementary regulations (in areas such as building codes). Finally, the federal government could provide cost-sharing funds to provinces that invest in public infrastructure that facilitated the transition to a low-carbon society.

This is just one example of how federal and provincial governments could collaborate to meet Canada's 2030 emissions target. There are undoubtedly others. However, this example illustrates that it is possible for the federal government to play a role as a 'systems integrator', building on the work and progress that provinces have already made in transforming Canada to a low-carbon society.

THE ROLE OF INTERNATIONAL MARKETS

The ultimate goal of climate action is to transform Canada into a prosperous, low-carbon society at minimum cost. The cost of reducing carbon emissions varies greatly depending on the initiative. For example, conservation, behavioural change and some forms of energy-efficient technology may actually result in financial benefits. Alternatively, other initiatives, such as carbon capture and storage retrofits of coal-fired electricity plants may be relatively costly. The key to managing costs is to permit firms to access low cost reductions at home and abroad. International markets can give Canadians access to the lowest cost options for reducing CO2 emissions. Indeed, one of the key benefits of Quebec and Ontario (and potentially, Manitoba) participating with California in the Western Climate Initiative is gaining access to lower-cost emissions reductions in the US.

7. This is a non-trivial exercise. Although the statistical models to form such an estimate are well developed, the results will be sensitive to key assumptions regarding economic growth by sector and region as well as energy and commodity prices.
8. In our previous paper (Boothe and Boudreault, 2016b) we showed that for Canada's 2020 target, using historical shares to allocate carbon was similar to provincial demands for carbon allocations under a common price consistent with meeting the target.

A simple example illustrates (Box 1) how access to international carbon markets can substantially lower the overall cost of reducing emissions, and give Canadian governments, firms and individuals the time and flexibility to replace long-lived assets like machinery, buildings and infrastructure without stranding capital. Of course, the quality, verifiability and environmental integrity of carbon reductions on offer in international carbon markets is an important consideration. Canada should ensure that only high-quality reductions are eligible to meet our emissions target. That said, access to international carbon markets can form an important part of Canada's overall transformation strategy.

BOX 1
INTERNATIONAL MARKETS AND THE COST OF REDUCING EMISSIONS

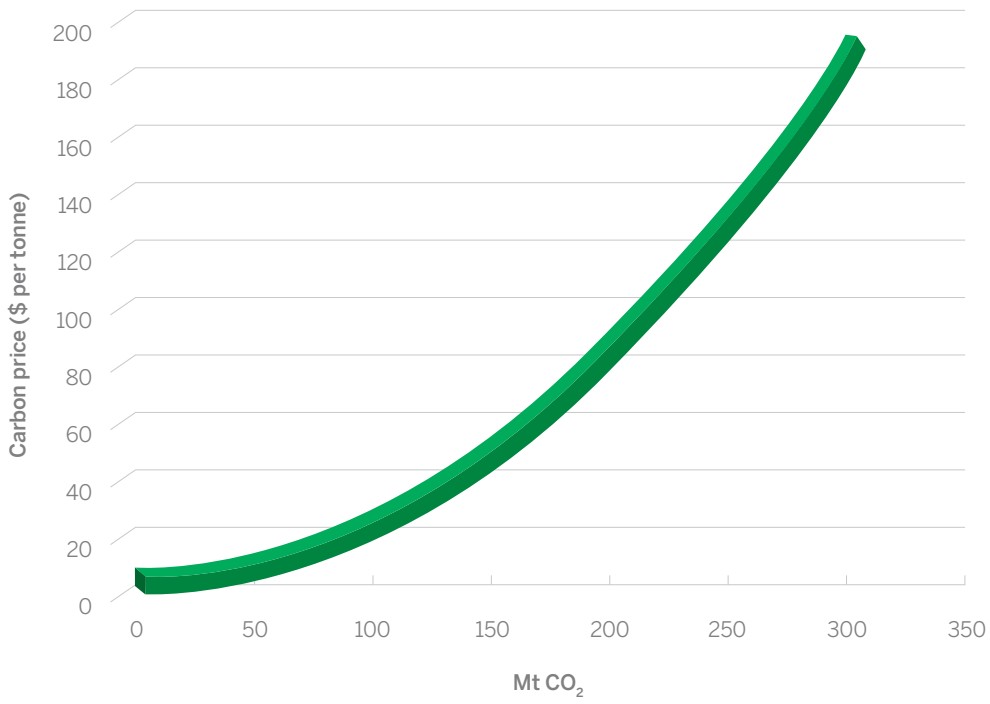
To illustrate the role that carbon markets can play, we construct a simple example. Environment Canada estimates that in absence of further climate action (BAU) Canadian GHG emissions would be about 815 Mt in 2030. Canada's target, confirmed in Paris in December 2015, is 524 Mt or about 290 Mt below BAU. This is the amount of CO2 that needs to be eliminated from the atmosphere through Canadian action taken at home or abroad. Modellers, such as Mark Jaccard of Simon Fraser University and David Sawyer of EnviroEconomics, estimate that the domestic carbon price consistent with the 2030 target is about $160 - $180 per tonne.[9] For the purposes of this example (and to construct a conservative estimate) we assume the carbon price needed in 2030 is $175 per tonne. Finally, we assume that the cost of reducing a tonne of emissions grows exponentially as more emissions reductions are needed.

With these simple assumptions, we can calculate the marginal cost of abatement, i.e. the cost of eliminating (or abating) each additional tonne of carbon. A graph of the abatement cost curve is presented in Figure 1.[10] The graph shows how costs of reducing emissions rise as the amount of emissions to be reduced increases. For example, while the cost per tonne to reduce 290 Mt is $175, the cost to reduce 100 Mt is only about $21.

To complete the example, suppose that Canadians purchased emission reductions on international markets equal to 40 percent of the total reductions needed in 2030 (i.e. 116 Mt), leaving 60 percent or 174 Mt of emissions reductions to be achieved domestically. Further, assume that international carbon prices in 2030 are $50 per tonne. This would reduce the cost of domestic reductions to $63 per tonne. Averaging over both domestic and international reductions, the blended cost of reducing emissions by 290 Mt in 2030 would be about $58 dollars per tonne, a reduction of almost two-thirds compared with the cost of reducing all 290 Mt domestically.

9. Jaccard, Mark (2016) "Want an effective climate policy? Heed the evidence." *Policy Options*, available at: **http://policyoptions.irpp.org/issues/want-an-effective-climatepolicy-heed-the-evidence/**. See also, Shawn McCarthy "Ottawa seeks to set national minimum on carbon pricing." Globe and Mail, February 17, 2016. Available at **http://www.theglobeandmail.com/news/politics/ottawa-seeks-to-set-national-minimum-on-carbon-pricing/article28792641/**
10. If the form of the cost curve is: cost = b • (tonnes of abatement)^2 , and $175 is the price needed to abate 290 tonnes, then the coefficient 'b' is equal to 0.0021.

FIGURE 1 – EMISSIONS ABATEMENT COSTS



CONCLUSIONS

In this paper, we looked at the 'plumbing' needed to underpin federal-provincial collaboration on meeting Canada's 2030 GHG emissions target. We began by reviewing the existing and proposed carbon pricing policies of BC, Quebec, Alberta and Ontario. Next, we looked at the roles that could be played by the federal government including 'target setter', 'convenor', 'transformation funder' and 'final decision maker'.

While the first three roles are entirely appropriate, we rejected the need to impose a common approach to GHG reduction across provinces. Instead we explored the possibility that the federal government could act as a 'systems integrator', connecting provincial carbon tax and cap and trade policies and enacting complementary regulations in areas where carbon pricing is not optimal. We showed how this 'systems integrator' role could be accomplished using existing modalities of intergovernmental environmental collaboration.

Finally, we used a simple example to illustrate the importance of international carbon trading to lowering the costs of transforming to a low carbon society and in particular, allowing long-lived capital to be retired in an optimal way.

Overall, the analysis presented in this series of three papers has left us optimistic that Canadian federalism can deliver the societal transformation we need to reach our 2030 GHG emissions target. It will not be easy, but Canada has overcome similarly difficult challenges in the past. To square the circle, our political leaders will need a sense of common purpose and the ingenuity for which Canadian federalism is rightly famous.

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