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Saskatchewan and Climate Change

The Challenges, Policy Options and Implications

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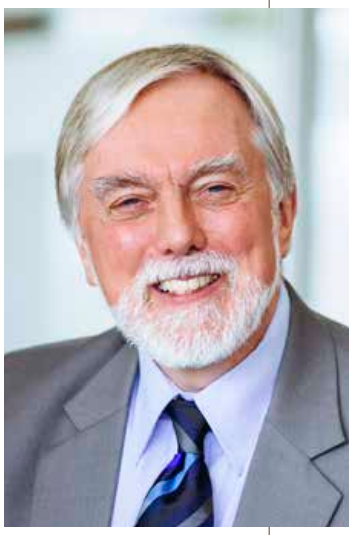

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Photo credit: Dave Stobbe

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Margot Hurlbert's research focuses on governance and climate change; interrogating laws, policies and practices that will address both the problem of climate change and adaptation to the changing climate. She has participated in and led research projects focusing on aspects of governance including water, agricultural producer livelihoods, drought, flood and energy. The geographical focus of her study is western Canada and South America.

Hurlbert has authored numerous journal articles, book chapters and scholarly papers on a broad range of topics but more recently on the subjects of energy, Aboriginal justice, water and climate change adaptation. She has co-authored a book entitled *School Law and the Charter of Rights and Freedoms* (second edition) (1992), edited a book, *Pursuing Justice, An introduction to the Study of Justice* in 2010 (currently working on a second edition) and co-edited *Vulnerability and Adaptation to Drought: The Canadian Prairies and South America*, in 2016.

Photo credit: Dave Stobbe

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01

The Policy Conundrum

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01

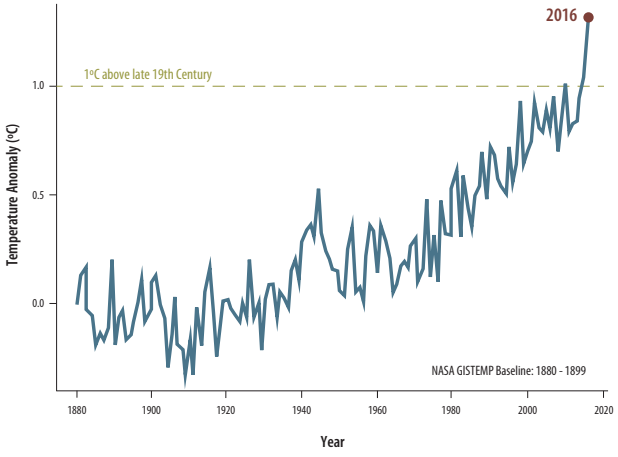
The Policy Conundrum

In the vernacular of public policy, climate change is what you call a "wicked problem", and for good reason. Next to world peace, it's difficult to imagine an issue more complex, challenging and difficult to address. It combines all the thorniest dimensions of policy - vagaries, uncertainty, conflicting economic and political interests, geopolitics, and a time horizon stretching for decades. If that isn't daunting enough, it adds the need for coordinated global action in pursuit of a common objective.

Getting one country to agree on climate change policy is difficult on its own. All you need for evidence is the unraveling of the climate change agenda in the U.S. with President Donald Trump's decision to withdraw the U.S. from the Paris Climate Accord. Then there is the repeal of a carbon tax in Australia. On a much smaller scale is the on-going feud between the Government of Saskatchewan and the Government of Canada over Ottawa's plan to establish a national carbon price in 2018. Now, magnify those challenges with the realization that more than 190 countries around the globe need to act in concert. You don't have to be a cynic to conclude "it ain't going to happen."

But, if it doesn't happen, then what? The overwhelming scientific consensus is that the rise in global temperature is caused by human activity, specifically due to the increase of greenhouse gas emissions. According to the United Nations Intergovernmental Panel on Climate Change (UNIPCC), "it is extremely likely [95–100 percent probability][1] that human influence has been the dominant cause of the observed warming since the mid-20th century."[2] We know that the 20th century was the warmest in human history, that the last decade was even warmer, and, as Figure 1 indicates, that 2016 was the hottest year on record.[3] The Paris Agreement of December 2015 commits nations to take the steps believed necessary to keep the rise in average global temperature below two degrees Celsius above pre-industrial levels, and to pursue efforts to limit the temperature increase even further, to 1.5 degrees Celsius.[4] It's worth noting a word of caution raised by Christiana Figures, the former executive secretary of the United Nations Framework Convention on Climate Change (UNFCCC). In assessing the total effect of Intended Nationally Determined Contributions (INDCs) set out in Paris, Figures said: "The INDCs have the capability of limiting the forecast temperature rise to around 2.7 degrees C by 2100, by no means enough."[5] If global warming, and its offspring climate change, is not arrested, the experts tell us the environmental, economic and social consequences will be severe.

Figure 1: Global mean surface temperatures (January-June)



Source: Nasa Global Climate Change

This paper looks at Saskatchewan's role in addressing climate change as part of the national context. It seeks to explore the issue in all its dimensions – economic, fiscal, social and impact on behaviour. The effort is premised on the imperative that "all politics is local", and is coupled with the admonition to "think globally, act locally". The objective is to understand the issue and the challenges it presents in terms of policy, politics, the environment, the economy and public opinion. In so doing, it outlines and explores options and effects on how Saskatchewan can reduce GHG emissions to meet national goals. The options include a price on carbon—such as a carbon tax or regulatory measures including a cap-and-trade approach—new technology, or a combination of those and other regulatory factors. For its part, the federal government's Pan-Canadian Framework on Clean Growth and Climate Change (PCF) acknowledges that flexibility and a combination of policy tools are required. While it proposes a carbon price as an important component of the policy toolkit, it is only one of many that need to be used. It states: "The Pan-Canadian Framework has four main pillars: pricing carbon pollution; complementary measures to further reduce emissions across the economy; measures to adapt to the impacts of climate change and build resilience; and actions to accelerate innovation, support clean technology, and create jobs. Together, these interrelated pillars form a comprehensive plan."[6]

The effects of greenhouse gases (GHGs), such as carbon dioxide (CO_2), on the earth's atmosphere are well known. GHGs absorb solar thermal radiation reflected from the earth's surface, so as GHG atmospheric concentrations increase, more heat is trapped and the earth's temperature rises. It is estimated that human activities have been a growing source of GHG emissions, particularly from the burning of fossil fuels since the Industrial Revolution. During that period, CO_2 levels have gone up by 40 per cent, with more than half the increase occurring since 1970. The average global temperature has risen 0.8 C (1.4 F) since 1900.[7]

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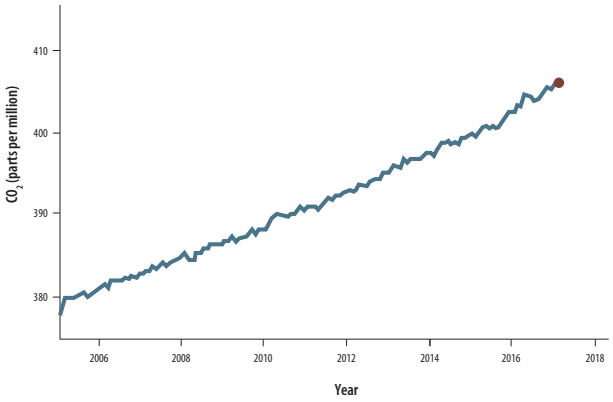
In terms of global carbon pricing policy, according to the World Bank in 2016, 40 countries and more than 20 cities, states and regions, or sub-national jurisdictions, have or are planning to have some form of a carbon price. The in-place total equals about seven gigatons of CO_2 equivalent, or 13 per cent of the world's emissions.[8] The price ranges dramatically, from $160 (USD) per tonne in Sweden to as little as less than $1 in Mexico. In Canada, the carbon price, in U.S. dollars, is approximately $23 a tonne in B.C., $15 in Alberta, and $13 a tonne in Quebec.[9] The global share of GHG emissions covered by regional, national and subnational carbon pricing initiatives has increased significantly in the last six years, growing from four per cent in 2005. Even if the estimated share for China in 2017 is included, the global amount is approximately 23 per cent. Without the projected China emission measures, the total falls to approximately 13 per cent of global emissions.[10]

Figure 2: Direct measurements, CO_2 in atmosphere parts per million: 2005-PRESENT



Source: NOAA

Nicholas Stern, former advisor to the UK Government on the economics of climate change, famously said "climate change is the result of the greatest market failure that the world has seen." He argued "those who damage others by emitting greenhouse gases generally do not pay."[11] If so, putting a price on carbon so that emitters no longer reap the benefits of their activities, while forcing everyone else to share the costs, may be a critical first step in tackling the problem. But a single policy instrument is highly unlikely to solve a complex problem. The danger of symbolic politics - announcing a carbon price and complacently assuming we can now carry on with business more or less as usual – has

been widely noted.[12] In its assessment and analysis of carbon pricing, the World Bank Group speaks to the challenge of policy co-ordination. It notes that effective carbon pricing requires alignment with a "broader policy context" for the country where it is being applied. "A key objective is to combine carbon pricing with complementary policies in a way that enhances the performance of each of the policies. This will ensure that carbon pricing is effective in changing behaviours and that its consequences are acceptable to society," the World Bank states.[13] It is that very issue which is at the core of the disagreement on the best way forward between the Governments of Canada and Saskatchewan. As well, the Government of Manitoba has to date refused to sign the PCF. Recently, the Manitoba government received independent legal advice stating the federal government did have constitutional authority to impose a carbon pricing scheme on the province.[14]

Economists are generally united in asserting that pricing carbon—whether by tax, cap and trade or some other device—is the most cost-effective way of reducing carbon emissions.[15] However, as University of Alberta economist Andrew Leach and others have argued,[16] from the point of view of public policy, cost effectiveness is only one criterion used to assess a policy instrument. We also need to know whether the instrument will actually be effective in solving the policy problem that prompted us to propose the instrument in the first instance. And we need to know whether it is politically feasible to implement the instrument at levels and intensities that will enable it to be effective. It must impose a cost that induces a change in behaviour by emitters and consumers that reduces carbon emissions. The key question becomes how high must the carbon price be to achieve our policy goals and what prospect is there that politicians facing election or re-election will have sufficient motivation to set the price at that level? According to economists David Sawyer and Chris Bataille the stringency of a carbon price will determine its effectiveness in changing behaviour. They estimate that a national carbon price would have to reach $150 a tonne if Canada is to meet its 2030 target.[17]

Economists are generally united in asserting that pricing carbon - whether by tax, cap and trade or some other device - is the most cost-effective way of reducing carbon emissions.

1.1 THE PROBLEM OF RHETORIC

Few issues carry the emotionally weighted language of climate change. The eventuality of a warming climate and its environmental, social and economic effects are often cast in stark, even dire, terms. The National Academy of Sciences and the Royal Society say "climate change is one of the defining issues of our time."[18] In its Pan-Canadian Framework on Clean Growth and Climate Change, the Government of Canada states: "The science is clear that human activities are driving unprecedented changes in the Earth's climate, which pose significant risk to human health, security and economic growth." The Framework document estimates that climate change will cost Canada $21-$43 billion a year by 2050.[19]

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Others present the issue in more dramatic, even existential terms. Bill McKibben a prominent climate change activist and founder of 350.org says that nothing less than the future of humanity depends on arresting climate change. Citing numbers from *The Sky's Limit*, a 2016 report issued by Oilchange International, McKibben says the numbers are not only ominous, but show the environment cannot withstand any further fossil fuel development. "If we're serious about preventing catastrophic warming ... we can't dig any new coal mines, drill any new fields, build any more pipelines. Not a single one. We're done expanding the fossil fuel frontier. Our only hope is a swift, managed decline in the production of all carbon-based energy from the fields we've already put in production," McKibben argues.[20] In others words, we are at the tipping point.

One of the most dramatic scenarios was expressed by James Hansen, former lead climate scientist at the National Aeronautics and Space Administration (NASA), in a 2015 report. "Our analysis paints a very different picture than IPCC (2013) … if GHG emissions continue to grow. In that case, we conclude that multi-meter sea level rise would become practically unavoidable, probably within 50-150 years. Full shutdown of the North Atlantic Overturning Circulation would be likely within the next several decades in such a climate forcing scenario. Social disruption and economic consequences of such large sea level rise, and the attendant increases in storms and climate extremes, could be devastating. It is not difficult to imagine that conflicts arising from forced migrations and economic collapse might make the planet ungovernable, threatening the fabric of civilization."[21] The report goes on to state that the 2 degrees C "guardrail" set in the 2009 Copenhagen Accord "does not provide safety, as such warming would likely yield sea level rise of several meters along with numerous other severely disruptive consequences for human society and ecosystems."[22]

Others, however, are less apocalyptic in their assessment of climate change. They argue that, while climate change is a serious challenge that needs to be addressed, there are greater and more urgent threats to human health and global stability. Bjorn Lomborg of the Copenhagen Consensus Center, a think tank that includes 300 academics,[23] maintains the global policy focus should be on eradicating extreme poverty and addressing epidemics, deadly diseases and making affordable energy available to those who need it. He argues that the Paris target of limiting climate change to less than 2 degrees C is too expensive and difficult to achieve. He says the trillions of dollars in funding would be better spent on reducing poverty, illiteracy and disease.[24] Moreover, writing in *Global Policy Journal*, Lomborg says the climate policy adopted as part of the Paris Accord will have only a small, marginal effect. "Even optimistically assuming that promised emission cuts are maintained throughout the century, the impacts are generally small ... Current climate policy promises will do little to stabilize the climate and their impact will be undetectable for many decades," Lomborg argues.[25] The fact that the positive effects of taking action on climate change, on the condition the global targets are reached, will not be known for many years, if not decades, makes the challenge even more problematic in terms of mobilizing the political will to act.

One other dimension seldom mentioned in the climate change debate is impact on standard of living. Simply put, energy is the lifeblood of any economy and Canadians enjoy high and rising living standards and quality of life in no small part because of access to affordable, reliable and plentiful supplies of carbon-based energy. Much of the political challenge posed by carbon pricing stems from the fact that raising energy costs to change behaviour and reduce energy consumption as part of climate change policy may mean lower standards of living for many in the developed world. Making it even more challenging is that the policy is in pursuit of an outcome that won't be realized during the lifetime of many people living today. Even those who argue that the transition to a low-carbon economy envisaged in the federal plan provides more, rather than fewer, economic opportunities in the future, agree that economic disruption and lost livelihoods are likely in the short term. How we handle the early stages of that transition will have a huge impact on future outcomes.[26] We need to be honest about our expectations.

1.2 THE MORAL DILEMMA

These divergent opinions on the relative urgency of addressing climate change and uncertainty of the outcome, underline a troubling moral dimension to the issue. As the World Bank notes, "energy underpins every aspect of economic development" and billions suffer from "energy poverty." The Bank estimates that about 2.9 billion people use solid fuels—wood, charcoal, coal, and dung—for cooking and heating, and 1.1 billion do not have access to electricity.[27] So with energy the foundation for economic development, billions live in a state of energy poverty because they lack access to secure, reliable and affordable energy that have given rich, developed nations like Canada high standards of living. Now, in pursuit of a common, global good, and after doing damage to the environment, the developed world is expecting poor, under-developed nations to not exploit the very same GHG emitting resources that allowed us to prosper.

The other moral issue is how to measure our responsibility to future generations. One reality of climate change is that as the earth's temperature increases, it is likely to persist, even if emissions stop climbing or even fall. As some have argued: "The earth's thermostat is essentially being turned up and there are no readily foreseeable ways to turn it back down. It's a shocking realization, especially given how little progress has been made in slowing carbon dioxide emissions. But it is precisely the long-term nature of the problem that makes it so urgent for us to limit emissions as quickly and radically as possible."[28] Implicit, therefore, in the climate change debate are ethical considerations that require assessing costs today versus future benefits. How do we judge the action we take now, and at what cost, for the benefit of generations to come?

How do we judge the action we take now, and at what cost, for the benefit of generations to come?

In the 1992 United Nations Framework Convention on Climate Change (UNFCCC), these moral issues are addressed in the abstract by asserting the principle of "common but differentiated responsibilities". Article 3.1 states:

"The Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities. Accordingly, the developed country parties should take the lead in combating climate change and the adverse effects thereof."

In practice, of course, the principle is hard to operationalize and has failed to satisfy either developed or developing country signatories with respect to each other's' particular obligations.[29] In the developed world, interpretation of the principle marks a fault line between conservatives and liberals, with the former arguing that taking the lead cannot mean shouldering all the responsibilities.

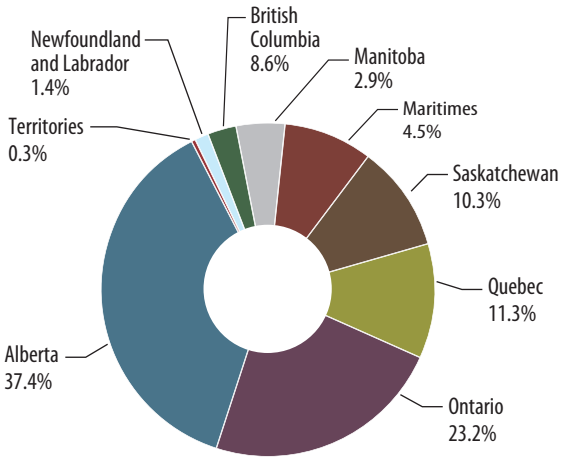
1.3 CANADA AND SASKATCHEWAN: IN A GLOBAL CONTEXT

These global challenges and moral abstractions form the context for the climate change policy debate in Canada, Saskatchewan and the world. It is an issue no one jurisdiction can resolve, yet

not acting makes the problem worse for everyone. But it is also an issue with metrics that help shape the debate and provide useful perspective. For example, by 2014 Canada's GHG emissions had increased approximately 20 per cent above 1990 levels, which was the benchmark year established by the 1992 UNFCCC and validated by the Kyoto agreement on climate change in 1997.

An observation often made about Saskatchewan, as reflected in the chart below from NRCan's 2016 Energy Fact Book showing GHG emissions by province, is that with its oil and gas, mining, and agriculture sectors, it is a province with the fourth highest total emissions and highest per capita emissions in Canada. The reason for Saskatchewan's level of GHG emissions reflects the structure of its economy. As a major energy producer in terms of oil, gas and coal, Saskatchewan's mining and agriculture sectors are also significant consumers of energy.

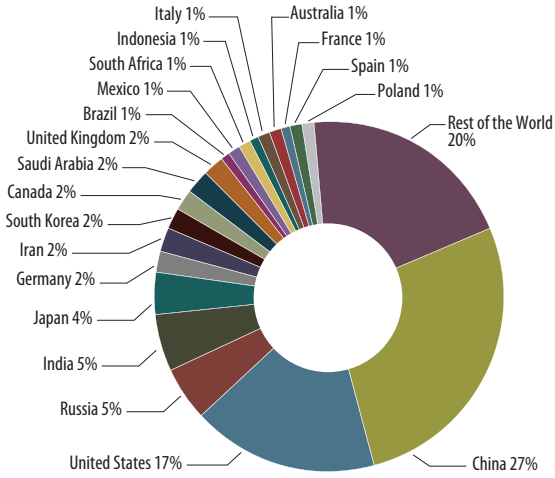
Figure 3: GHG emissions by province, 2014



Source: NRCan's Energy Fact Book

But what's also true is that Canada and Saskatchewan, as shown in Figure 4, are inconsequential factors in terms of total global GHG emissions. Canada represents less than two per cent of global emissions. Of that two per cent, Saskatchewan represents about 10 per cent, or .002 of global emissions.[30] If Saskatchewan emissions ended today it would have virtually no measurable effect on global emissions. Conversely, the refusal of an already wealthy jurisdiction to make minor adjustments to its standard of living sends an unmistakable signal to the developing world about our commitment to tackle the issue.

Figure 4: Global GHG emission, by country 2014

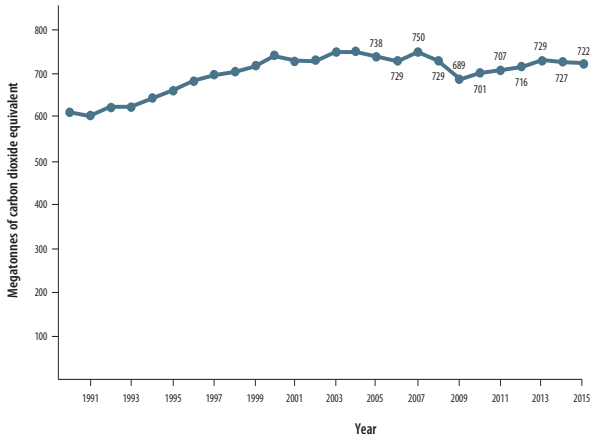


Source: Union of Concerned Scientists: Each Country's Share of CO2 Emissions

As a resource-based economy that, on a per capita basis, produces and consumes significant amounts of energy, Saskatchewan clearly is a key actor in any national strategy to reduce GHGs. The pivotal policy question is what is the most effective and efficient approach that balances GHG reductions with maintaining a vibrant economy that supports jobs and growth?

The Government of Canada has made the determination that a price on carbon is an important, effective and economically neutral mechanism. But it is only one of several tools Ottawa proposes. Coupled with other complementary measures in the PCF, including a wide range of regulations, and investments in clean energy initiatives, the federal government believes a carbon price is an essential pillar of the broader policy framework needed to meet its 2030 goal. Support for carbon pricing is based on the long-established belief in price as the primary mechanism to affect supply and demand. Simply put, if you wish to affect behaviour and reduce demand for something, increase its price relative to alternatives. The price mechanism is also the critical instrument to determine the most efficient allocation of scarce resources between competing needs and uses. The federal government believes the most effective, straightforward way to reduce GHG emissions is to price carbon sufficiently so that consumers and industry will act rationally and consume less of it. A rising carbon price is the fundamental underpinning for the mix of policies the federal government believes will allow Canada to reach its target of 30 per cent reduction of GHGs from 2005 levels by 2030.[31] The reality is that, in spite of other policy efforts over the last 20 years focused on information to consumers and the regulation of industry, emissions in Canada have steadily grown, other than a brief decline during the 2008 recession.

Figure 5: Greenhouse Gas Emissions, Canada 1990-2015



Source: www.ec.gc.ca/indicateurs-indictators

Chris Ragan, chair of the Ecofiscal Commission and economics professor at McGill University agrees a "simple tax" is the correct approach to reduce GHG emissions. "With broadly applied carbon pricing, all households and firms would be required to pay for the carbon emissions directly resulting from their activities, such as driving, or home heating, but also for the emissions embedded within the supply chains of the many goods and services they purchase," Ragan says.[32]

In establishing a national approach and calling on all provinces to implement a carbon price, the federal government says that all revenue raised from a carbon price, whether applied provincially or federally, will remain or be returned to the province where the money was captured. In that sense, the carbon price would be revenue-neutral to each jurisdiction, which could then use the money in any way it sees fit, be it tax cuts, program spending, debt repayment, rebates to taxpayers or other fiscal measures.
It sounds simple. But, as the last two decades have demonstrated,

> ... the federal government says that all revenue raised from a carbon price, whether applied provincially or federally, will remain or be returned to the province where the money was captured.

when it comes to public policy and climate change, nothing is ever easy. The Government of Saskatchewan has taken a position strongly opposed to a carbon price, arguing that it will do competitive damage to an economy where oil-and-gas production and resource extraction are critical to prosperity and growth.
The province also challenges the effectiveness of a carbon tax in reducing GHGs based on the pricing scenario set out by the federal government. The Government of Saskatchewan argues that "if the sole metric of success is cutting GHG emissions, a carbon tax does not appear to work"—although it does not cite any sources to support this statement—and that carbon pricing will have harmful economic effects, especially on a globally-exposed, trade-dependent economy like Saskatchewan's.

The province advocates for an approach designed to offer solutions both domestically and globally, specifically the development of "transformational clean technology for use in Canada and around the world."[33] It points to Saskatchewan's development of what it considers world-leading carbon capture and storage technology now operating at SaskPower's Boundary Dam coal-fired installation as evidence of GHG mitigation that successfully produces measurable, quantifiable reductions in CO_2 emissions. The Saskatchewan government also maintains that the imposition of a carbon price by Ottawa on the province is unconstitutional and intends to challenge the legality of the forced implementation of a carbon price by the federal government. The Saskatchewan legal argument pivots on the point that the Canadian constitution expressly forbids one order of government imposing a tax on another. In this case, the carbon price would apply to SaskPower and SaskEnergy, both provincially-owned Crown corporations.

The Government of Canada insists that a carbon tax is constitutional and is steadfast in its position that a national carbon price must be a primary instrument used if Canada is to meet its GHG reduction target by 2030. It has stated that a national carbon price of $10 per tonne will be in place by 2018, rising by $10 per year to $50 a tonne by 2022.[34] Moreover, either the carbon price will be voluntarily applied by provinces, or imposed by Ottawa, in which case the revenue would be returned to the province where it was generated.[35] It maintains any negative economic effects can be offset in each jurisdiction by using the revenue raised by the carbon price as part of meeting Canada's GHG objective.

They both can't be right. Or can they?

02

No Unified National Policy Approach

Photo credits: iStock by Getty images

02

No Unified National Policy Approach

One way to describe the climate change policy landscape in Canada is as varied and diverse as the geography and economy of the nation itself. Another word that comes to mind is incoherent. Simply put, it's a hodge-podge of taxes here, technology there and targets everywhere, without a connecting policy thread beyond the aspirational goal of reducing GHG emissions.

There are many reasons why Canada lacks a national climate change strategy and implementation plan. They range from the shared jurisdiction over the environment as part of the constitutional division of powers between the federal and provincial governments, conflicting economic interests and diverging ideological approaches to the role of government. To date, the challenge of climate change, the need to address it as part of a global effort, and the consequences of not acting have not been enough to override the varied and conflicting political and economic interests. The policy reality is that addressing climate change by reducing GHG emissions presents different challenges in different economic contexts and will have uneven effects depending on the province or region. That, in part, explains the lack of a unified plan. For example, with the highest per capita GHG emissions in Canada, Saskatchewan faces a particular challenge. With significant oil and gas, mining and agriculture sectors that are GHG intensive, and part of a globally exposed, trade-dependent economy, how climate change is addressed carries significant economic, social and, inevitably, political implications. It's for that reason the Saskatchewan government has resisted the federal government's dictum of a national carbon price, arguing a one-size-fits-all carbon price fails to recognize the reality of Canada's regions and divergent economies.

The policy reality is that addressing climate change by reducing GHG emissions presents different challenges in different economic contexts and will have uneven effects depending on the province or region.

For its part, the Government of Canada is trying to provide strategic unity to the existing policy landscape. The Pan Canadian Framework (PCF) reflects the unanimous agreement of all provinces as part of the Vancouver Declaration which endorsed the 2030 GHG reduction target. The federal government maintains that applying the primary economic tool of a pricing mechanism for carbon—whether through a carbon tax or the application of a regulatory cap-and-trade system on emissions—is the most cost-effective manner to affect behaviour that will result in lower GHG emissions. Moreover, it argues a carbon price helps drive innovation "to provide low-carbon choices for consumers and business."[36] As with any commodity, its price affects its consumption. So, by putting a price on carbon that is equal across Canada, and escalates gradually, Canadians will avoid the price by adjusting their carbon consumption behaviour. In the words of Environment and Climate Change Canada Minister Catherine McKenna: "We will set a benchmark price for carbon pollution, which will help reach our emissions targets and will also provide certainty to markets and Canadian businesses."[37] The federal government argues the existing patchwork of policies not only weakens the effectiveness of climate policy, but in itself raises competiveness issues between provinces.

In its proposed national carbon pricing scheme, the Government of Canada has set out minimum carbon prices for what it terms an initial period of 2018-2022. As Table 1 (next page) shows, and outlined in the government's technical paper on carbon pricing, fuels subject to the levy will be established at $10 per tonne of CO_2 in 2018, increasing by $10 a tonne annually until reaching $50 a tonne by 2022. "The rates will be based on global warming potential factors and emission factors used by Environment and Climate Change Canada to report Canada's emissions to the UNFCCC, and will be expressed in standard commercial units to facilitate the compliance with, and the administration of, the levy," the technical paper states.[38]

Table 1: Rates of levy of liquid fossil fuels from 2018-2022

LIQUID FUEL	UNIT	2018 ($10/TONNE)	2019 ($20/TONNE)	2020 ($30/TONNE)	2021 ($40/TONNE)	2022 ($50/TONNE)
GASOLINE	¢/L	2.33	4.65	6.98	9.30	11.63
DIESEL / LIGHT FUEL OIL	¢/L	2.74	5.48	8.21	10.95	13.69
HEAVY FUEL OIL	¢/L	3.19	6.37	9.56	12.75	15.93
AVIATION GASOLINE	¢/L	2.49	4.98	7.47	9.95	12.44
AVIATION TURBO FUEL / JET FUEL / KEROSENE	¢/L	2.58	5.16	7.75	10.33	12.91
METHANOL	¢/L	1.10	2.20	3.29	4.39	5.49
NAPHTHA	¢/L	2.25	4.51	6.76	9.02	11.27
PETROLEUM COKE	¢/L	3.84	7.67	11.51	15.35	19.19

Technical Paper on the Federal Carbon Pricing Backstop, Government of Canada

Many economists believe pricing carbon is the most effective and efficient means of reducing GHG emissions.[39] So if the objective is to reduce carbon emissions by changing people's behaviour, then carbon must be priced in a way that individuals and companies will seek means to reduce their carbon footprint to avoid the high cost. For example, if there is no additional and escalating cost to the burning of fossil fuels, which make up the largest component of GHG emissions, then there is no economic incentive to reduce their use. Other economists argue that regulations can be more effective at a higher per-unit cost in reducing emissions.

Table 2: Canada GHG by province

	% CHANGE 1990 TO 2013	% OF TOTAL 1990	% OF TOTAL 2013	DIFFERENCE
TERRITORIES	-6.80%	0.40%	0.30%	-0.10%
SK	66.00%	7.40%	10.30%	2.90%
QC	-8.00%	14.70%	11.40%	-3.30%
ON	-6.20%	29.70%	23.50%	-6.20%
MB	14.40%	3.00%	2.90%	-0.10%
CANADA TOTAL	18.50%			
BC	20.90%	8.50%	8.60%	0.20%
ALTANTIC PROV.	-8.20%	7.90%	6.10%	-1.80%
AB	53.00%	28.50%	36.80%	8.30%

Source: Canada GHG by province. https://climatechangeconnection.org/emissions/ghg-emissions-canada/canada-ghg-by-province/

There are other means to reduce GHGs, whether through development of clean energy technologies or regulation. Those instruments do not explicitly put a uniform price on carbon, but are not cost free. In some cases, governments provide subsidies as incentives for people to adopt lower-carbon practices. The previous federal government opposed carbon pricing, arguing the negative economic consequences would outweigh the potential benefits of a reduction in GHGs. It preferred a regulatory approach, by affecting behaviour of end users through, for example, mandating lower tailpipe emissions that were equivalent to the U.S., or requiring large emitters, such as coal power, to gradually phase out production. The fragmented policy reality at the provincial level today reflects the diverse policy levers to achieve lower GHG emissions.

To get a sense of the policy mechanisms currently in place, the following is a brief summary of various provincial approaches to dealing with climate change. In each case, and where applicable, it includes a brief literature review and analysis of the impact in terms of GHG reductions and economic effects resulting from the applied policy approach. It must be noted that a significant barrier in assessing the success of the various policy instruments is that most have not been in place long enough to determine their impact on meeting the policy goal of changing behaviour to reduce GHG emissions. It reflects a fundamental reality of the long-term nature of the climate change issue – that results from policies enacted now will not become evident for several years, or even decades.

2.1 BRITISH COLUMBIA

In 2008, the Government of British Columbia positioned itself as a leader in terms of taking significant steps to tackle climate change by reducing GHG emissions. In its "Climate Leadership Plan", the government set a 2050 emissions reduction target of 80 per cent below 2007 levels.[40] It introduced what it termed a "revenue-neutral" carbon tax that was applied to the purchase and use of

fossil fuels in the province, specifically gasoline, diesel, natural gas, heating fuel, propane, coal and certain other materials used in the production of energy. The tax was set at $10 per tonne in 2008, rising by $5 a tonne each year until 2012, when it reached $30 per tonne. The carbon tax has remained at that level to this day.[41] However, the recently elected NDP government intends to increase the tax by $10 a year beginning in 2018 to meet the federal $50 a tonne mandate.[42] As "revenue neutral", the money it generates for government is returned to the economy, either through tax cuts, rebates to individuals or other fiscal spending measures.

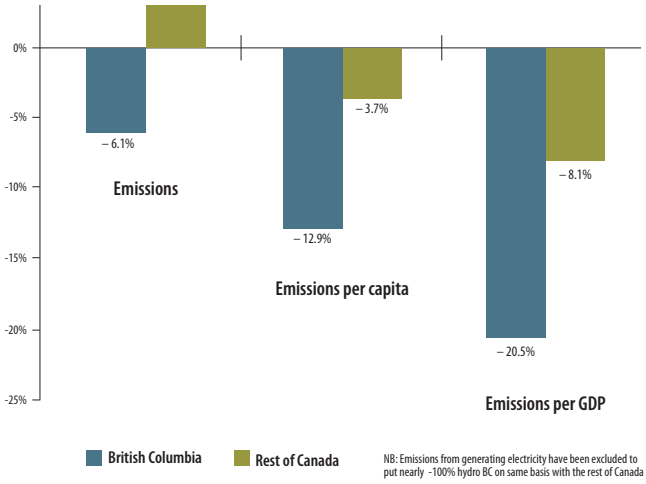
In addition, British Columbia last year announced further new measures to its climate change policy in six areas: natural gas; transportation; forestry and agriculture; industry and utilities; communities and built environment; and, public sector leadership. Initiatives include developing regulations to enable carbon capture and storage; increasing low-carbon-fuel standard requirements; rehabilitating under-productive forests to enhance carbon sinks; new energy efficiency standards for gas-fired boilers; and, creation of 10-year emissions reduction plans for provincial public sector operations.[43]

2.11 Review/Analysis

As a jurisdiction that has had a carbon price in place for more than eight years, British Columbia provides the best test case to assess whether a carbon tax has effectively achieved its policy goal of reducing GHG emissions. But like so much in the climate change debate, one set of facts can be offset by another set of facts.

In terms of overall GHG emissions, it would appear that the B.C. carbon tax has had its desired effect – B.C. emissions on average from 2008-13 declined and over the same period have grown in the rest of Canada. Moreover, the graph below indicates that, both per capita and relative to GDP, emissions in B.C. have declined significantly more than the Canadian average.

Figure 6: Change in GHG emissions, post tax (2008 - 2013 avg) vs pre-tax (2000 - 2007)



Source: British Columbia's Carbon Tax: By the Numbers. A Carbon Tax Center Report

Thus, according to the 2015 Carbon Tax Centre analysis by Charles Komanoff and Matthew Gordon, the carbon tax has worked. "The 12.9% decrease in British Columbia's per capita emissions in 2008-2013 compared to 2000-2007 was three-and-a-half times as pronounced as the 3.7% per capita decline for the rest of Canada. This suggests that the carbon tax caused emissions in the province to be appreciably less than they would have been, without the carbon tax," the authors conclude.[44]

In a working paper entitled "Carbon Tax Salience and Gasoline Demand", authors Nicholas Rivers and Brandon Schaufele of the University of Ottawa determined that the B.C. carbon tax had a significant impact on reducing gasoline demand. The study found that the effect on demand of a carbon tax specifically applied to gasoline had a significantly greater effect in lowering demand than an identical increase in the market price from excise or other non-specific taxes. "We find that the B.C. policy reduced carbon dioxide emissions by more than 3 million tonnes. Of this total, 79.1 per cent, or 2.4 million tonnes, is due to the additional saliency of the carbon tax – i.e., it is an environmental bonus that would not have been achieved if individuals responded to carbon taxes in the same way as to identical changes in gasoline prices caused by other factors," the authors state.[45]

They conclude the carbon tax resulted in a demand response 4.9 times greater than an equal change in the price from a carbon tax-exclusive price. "A five cent increase in the market price of gasoline yields a 2.2 per cent reduction in the number of litres of gasoline consumed in the short run, while a five cent increase in the carbon tax, a level approximately equal to a carbon price of $25 a tonne, generates a 10.6 per cent short-run reduction in gasoline demand."[46]

Others disagree. In a 2016 Canadian Centre for Policy Alternatives study of the B.C. results, economist Marx Lee warns people not to believe the "hype" about the B.C. carbon tax. "It's a great story, but unfortunately it's fiction," says Lee. His argues that two factors —the 2008 recession and slower GDP growth in B.C. than in many other provinces—account for the decline in emissions. When the trough of the recession of 2008-09 is excluded, the total GDP growth rate in B.C. from 2010-14 was 11 per cent, while in Alberta it was 22 per cent and Saskatchewan 15 per cent. "The reality is that since 2010, BC's GHG emissions have increased every year; as of 2013 they are up 4.3 per cent above 2010 levels."[47] While B.C. emissions have increased, the key is a counterfactual question – how much would have they increased without the carbon tax?

Simon Fraser economist Marc Jaccard maintains the policy that had the biggest impact on reducing CO_2 emissions in Canada was not B.C.'s carbon price, but Ontario's ban on coal-fired power, which Jaccard says reduced annual emissions by 25 megatonnes. Moreover, he says rather than B.C.'s carbon price having the biggest impact on GHG reductions in that province, it was the 2007 clean energy regulation "that forced BC Hydro to cancel private coal plants and its own gas plant."[48]

In terms of demand for gasoline, which is the most direct measurement of the impact the B.C. carbon tax had on sale of gasoline, the data points to only a temporary dampening effect on demand in that province. As Table 3 below indicates, in 2012 and 2013, total gasoline sales in B.C. declined, while during the same period total sales in Canada increased. Following increased total sales in 2010 and 2011, gross B.C. sales showed a brief two-year decline, from 4.741 billion litres in 2011, to 4.682 the following year and dropped to 4.5 billion in 2013. During the same years, gross Canadian sales climbed from 42 billion litres in 2011 to 49.2 billion in 2013. However in 2015, sales of gasoline in B.C. spiked up by 17 per cent, while Canada's total gasoline sales rose only 4.5 per cent.[49]

Photo credit: iStock by Getty images

Table 3: Gasoline Sales, Canada, B.C.

GEOGRAPHY	TYPE OF FUEL SALES	2009	2010	2011	2012	2013	2014	2015
CANADA	Net sales of gasoline	39,708,461	40,101,125	40,412,210	40,444,101	41,449,632	41,418,428	42,563,098
	Gross sales of gasoline	41,028,454	41,452,699	42,076,411	42,032,522	42,902,507	42,651,789	44,580,201
	Net sales of diesel oil	16,188,394	16,778,508	17,797,512	17,455,650	17,893,224	18,118,660	17,988,762
	Net sales of liquefied petroleum gas[1]	271,838	286,202	304,464	299,342	313,487	291,949	277,205
BRITISH COLUMBIA	Net sales of gasoline	4,536,112	4,560,666	4,537,496	4,348,707	4,336,807	4,422,297	4,656,988
	Gross sales of gasoline	4,646,008	4,715,626	4,741,085	4,682,115	4,504,633	4,687,564	5,481,062
	Net sales of diesel oil	1,647,876	1,838,578	2,221,338	1,761,637	2,145,516	1,922,523	1,852,896
	Net sales of liquefied petroleum gas[1]	0	0	0	0	0	0	0

Footnotes:

1. Total net sales in litres of liquefied petroleum gas (LPG) for Canada does not include data for British Columbia which are unavailable.

2. On November 14, 2016, the data for 2015 have been revised for British Columbia as part of an unplanned revision.

Source: Statistics Canada. Table 405-0002 - Gasoline and Other Petroleum Fuels Sold, annual (litres), CANSIM (database). (accessed:)

2.2 ALBERTA

The climate change policy of Alberta took a decisive turn with the election of an NDP government in May 2015. Previously, policy in that province focused on an intensity-based Specified Gas Emitters Regulation (SGER) approach for large emitters. It applied to emitters of more than 100,000 tonnes per year, which affected slightly more than 100 large facilities, such as oil sands producers, natural gas processing, electricity generation, and chemical manufacturing, among others. In total about 50 per cent of the province's total emissions were covered by the policy.[50] After incenting the development of carbon capture and storage (CCS) projects through a special fund, the Alberta government later abandoned the CCS approach in 2014, citing its cost and uncertain results.[51]

In 2016, the Alberta government set out a "Climate Leadership Plan" that focused on four policy levers: an economy-wide carbon price, the phase out of coal-fired generation, incentives for the development of renewable energy, and investment in energy efficiency.[52]

Key elements of the policy approach include a $20 per tonne carbon price that took effect Jan. 1, 2017. The price, or tax, is applied to all sectors of the economy, and will increase to $30 per tonne on Jan. 1, 2018.[53] Certain fuels, such as marked gas and diesel used on farms, will be exempt from the levy, which also doesn't apply to electricity. The carbon tax is earmarked to help diversify the economy, with all revenue going to fund:

- efforts to reduce greenhouse gas emissions;
- development of renewable energy projects and green infrastructure;
- research and innovation; and,
- rebates for Albertans to offset cost increases.[54]

Similar to the federal "backstop" proposal. which proposes legislation and regulation to be applied in jurisdictions without carbon prices aligned with the national benchmark, the Alberta policy transitions in 2018 from its SGER to an output-based emissions allocation policy for emissions-intensive, trade-exposed industries.

Table 4: Carbon levy on major fuels

TYPE OF FUEL	JANUARY 1, 2017 $20 / TONNE	JANUARY 1, 2018 $30 / TONNE
MARKED FARM FUELS	Exempt	Exempt
DIESEL	+5.35 ¢/L	+2.88 ¢/L
GASOLINE	+4.49 ¢/L	+2.24 ¢/L
NATURAL GAS	+1.011 $/GJ	+1.011 $/GJ
PROPANE	+3.08 ¢/L	+1.54 ¢/L

Source: Alberta Climate Change Office

Beyond the carbon tax, the plan proposes to phase out coal power generation by 2030, replacing it with cleaner energy sources such as wind, solar, natural gas and biomass. In 2015, 51 per cent of Alberta's electricity was generated by coal power. Wind accounted for five per cent and biomass three per cent.[55] Coupled with the phase out of coal, the Alberta climate change policy proposes to develop new and expanded sources of renewable energy. It sets a target of an additional 5,000 megawatts of renewable electricity capacity by 2030,[56] including measures to increase the limit from one to five megawatts, allowing "micro-generation" of electricity by individual users.[57]

The other major component of Alberta's climate policy suite imposes a legislated limit of 100 MT a year for oil sands producers. "This limit will help drive technological progress and ensures Alberta's operators have the necessary time to develop and implement new technology that takes more carbon emissions out of every barrel and helps bend Alberta's overall emissions trajectory downward," the Alberta plan states.[58]

2.21 Review/Analysis

Given Alberta's "Climate Leadership Plan" was introduced in 2016, and the province's carbon price took effect only in January of this year, there is not sufficient data available to make any judgments on whether the policy is meeting its GHG reduction objective. But what's clear has been the trajectory of emissions growth in Alberta. During the last 25 years, Alberta's emissions have increased substantially, rising 56% since 1990, primarily due to the increase in the oil and gas sector for export markets.[59]

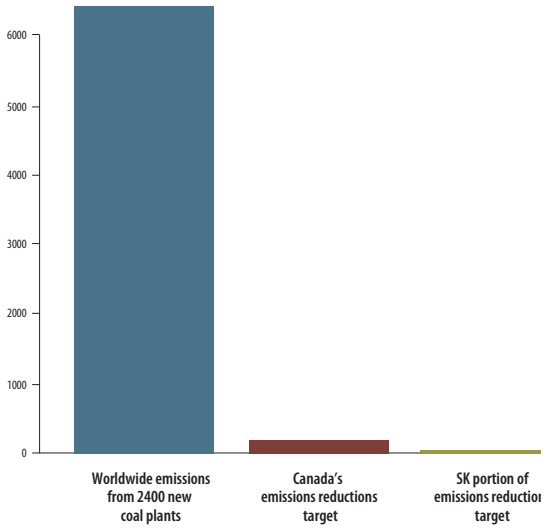
What can be assessed is the province's large emitters' levy, or Specified Gas Emitters Regulation (SGER), that was implemented in 2007. As described above, the levy applies to industrial facilities that emit more than 100,000 tonnes of GHGs a year. There are four options for facilities covered by the levy which exceed their emissions limits:[60]

- make improvements at their facility to reduce emissions;
- use emission performance credits generated at facilities that achieve more than the required reductions;
- purchase Alberta-based carbon offset credits; and/or
- contribute to Alberta's Climate Change and Emissions Management Fund.

Facilities that contribute to the Climate Change and Emissions Management Fund pay $30 for every tonne over their reduction target as of January 1, 2017. The previous levy was $15 a tonne. The change in industrial pricing is a crucial dimension of the new climate change plan as it provides the same carbon price signal, which can be felt and incorporated into the initial design of a facility. In effect, the Alberta approach is a partial cap-and-trade system. According to the Pembina Institute, as of 2012 only four per cent of Alberta's total emissions were covered by the SGER.[61] Emissions Reduction Alberta, which oversees the fund, reports that as of 2015 the total additional GHG emissions reduction from the policy is nine megatonnes. As well, total investment in the fund as of that date was almost $360 million, which leveraged a further $2 billion of investment in 109 clean energy technology-related projects, valued at more than $2.3 billion.[62]

2.3 SASKATCHEWAN

Figure 7: New coal emissions vs Canada's emissions targets



Source: The Coal Gap, Climate Action Tracker. December 1, 2015

The Government of Saskatchewan's climate change approach is focused on technological and renewable energy remedies to reduce GHG emissions. Notionally, the primary policy instrument is the 2010 Management and Reduction of Greenhouse Gases and Adaptation to Climate Change Act. Similar to the former large emitters' legislation in Alberta, it proposes to establish a

baseline limit for large emitters, an amount that is then reduced annually. The legislation states: "For each prescribed year, every regulated emitter shall reduce its greenhouse gas emissions by the prescribed amount below the baseline emission level for the regulated emitter" as established in regulation.[63] If emitters exceed their annual limit, they will be required to pay what is termed a "carbon compliance payment" into a technology fund. However, limits have yet to be set by regulation, so the Act remains on the books but has not come into force.

A key Saskatchewan GHG reduction initiative that is in place and operating is carbon capture and storage (CCS). The province invested approximately $1.5 billion in SaskPower's Boundary Dam generating station, establishing an operating CCS system that, according to SaskPower, captures up to 90 per cent of carbon emissions from the coal-fired plant. The government argues CCS is critical to addressing global efforts to reduce emissions. With coal accounting for approximately 40 per cent of global electricity needs, CCS technology is essential if global GHG reduction targets are to be achieved.[64] However, in 2014 SaskPower also conceded there were "serious design issues" in the CCS operation that had led to regular breakdowns and the system operating at only 40 per cent capacity.[65] A study by the Parliamentary Budget Office found that the implied cost of CCS was the equivalent of a carbon price of almost $60 a tonne.[66] Crown-owned SaskPower generated 46.4 per cent of its electricity in 2015 from coal, down from 53.7 per cent in 2011.[67] As well, SaskPower has committed to double the percentage of its energy generated by renewable sources to 50 per cent by 2030.

Saskatchewan and Ottawa last year reached a draft equivalency agreement, which has yet to be formally enacted, that recognizes the province's plan to reach 50 per cent renewable energy. It gives Saskatchewan credit for its CCS investment, allowing coal power to continue, providing the province meets it renewable energy targets.

Strongly opposed to the imposition of a carbon price by the federal government, the Saskatchewan government argues a carbon tax will significantly harm the Saskatchewan economy. It maintains investments in technology, renewable sources and CCS would have fewer negative economic consequences and more effectively reduce GHGs. Saskatchewan has signaled its intent to challenge as unconstitutional the proposed imposition of a federal carbon price on provinces that do not set an equivalent price.

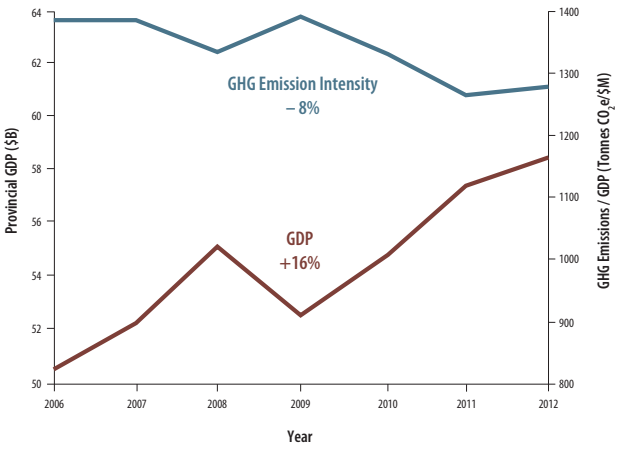
> ... the Saskatchewan government argues a carbon tax will significantly harm the Saskatchewan economy.

2.31 Review/Analysis

To date, Saskatchewan's primary approach to addressing climate change is through technology and transitioning to renewable and clean energy options. The highest-profile policy endeavour has been the province's investment in carbon capture and storage (CCS).

Saskatchewan's total GHG emissions have grown by 4.6 million tonnes, or 6.6 per cent, since 2006.[68] But in terms of GHG-to-GDP intensity (calculated in tonnes CO_2e per $1 million), emissions declined during the 2008 recession and since 2011 have stabilized, despite strong economic and population growth, which slowed in 2015 and 2016. The government cites more than $5 billion of investments in low-carbon technologies as contributing to slowing emission growth, although it specifically references only $60 million provided through the Go Green Fund.[69] Energy efficiency improvements and technological innovation reduced the intensity of GHG emissions by eight per cent during the 2006–2012 period, while provincial GDP increased by 16 per cent during the same period. This represented a decline of six per cent in GHG emission intensity per billion dollars of GDP growth.[70]

Figure 8: Intensity of Saskatchewan GHG emission (2006-2012)



Source: Stats Canada, NIR 1990 - 2012

The Saskatchewan Ministry of the Environment in its 2015 *State of the Environment* report says the decline in emission intensity has resulted from two key factors – gains from energy conservation and efficiency, and industry investments in low-carbon technologies. The government argues evidence suggests that economic growth "is becoming decoupled or delinked from GHG emission growth." It maintains "decoupling GHG emissions from economic growth is critical for mitigating climate change impacts, while supporting sustained growth in key sectors such as coal-fired electricity generation, oil and gas and mining."

A measurable result from policy is the CCS project by SaskPower on its Boundary Dam coal-fired generator. SaskPower says the system captured 800,000 tonnes of GHG emissions in its first 12 months of operation, which is equivalent to removing 200,000 vehicles off the road over the same period.[71]

One other Saskatchewan policy instrument to reduce GHG emissions is regulatory. The government in 2015 imposed

Photo credit: iStock by Getty images

mandatory requirements for upstream oil and gas operators to reduce and conserve gas flaring, incinerating, and venting associated with their production operations, which apply to flares and vents greater than 900m3/day. According to the government, the directive "is the first phase of the overall plan to reduce emissions from the upstream oil and gas industry."[72]

2.4 ONTARIO

The Government of Ontario in 2015 announced its climate change plan covering the five-year period 2016-2020. Based on ambitious targets, and using 1990 as its measurement baseline, it proposes to reduce emissions levels by 15 per cent in 2020, 37 per cent in 2030 and 80 per cent by 2050.[73]

A cornerstone of the Ontario approach is cap-and-trade. As part of the Western Climate Initiative with California and Quebec, the system limits total amount of emissions by large industry. In effect a market for carbon emissions is created, allowing businesses covered by the cap to create a price for carbon through the trading of carbon credits. The notion is that a carbon price is set by the market, which ensures it meets the needs of the industry covered by the cap. As a result, individual emitters have an incentive to reduce emissions below their allowable limit. The unused portion can then be auctioned to other businesses which are unable to meet their individual limit. While there is trading of emission credits between businesses, the total amount of emissions cannot exceed the cap set by legislation. As the limit is gradually reduced, so too are total emissions. The system, which came into effect January 1, 2017 added 4.3 cents a litre to gasoline and approximately $80 a year to home heating costs. The government expects the cap-and-trade system to bring in about $1.9 billion in additional revenue a year.[74]

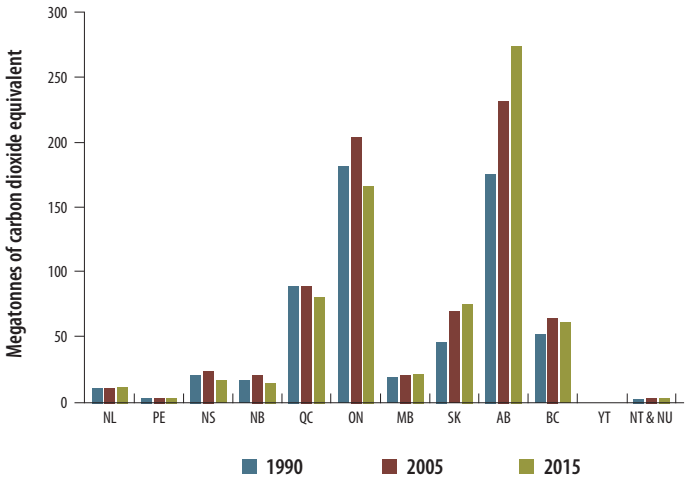
Coupled with cap and trade, Ontario has a wide array of other programs and incentives to reduce emissions. They include: a "green bank" to help homeowners and business access energy-efficient technologies; a cleaner transportation system by increasing zero-emissions vehicles; incentives for solar energy, battery storage, improved insulation and heat pumps; and, a commitment to make government operations carbon neutral. One major advantage Ontario has is the existing structure of its electrical generating capacity. More than 50 per cent of Ontario's electricity is from nuclear power,[75] which life-cycle GHG emissions are on average 30 times less than those of coal power plants, and 17 times less than emissions from natural gas.[76]

The plan is reported to contain 80 distinct policies that are grouped into 32 separate actions, with each "action" having a price tag attached. The cost of the four-year climate change plan that extends from 2017-2021, is estimated at $7 billion.[77]

2.41 Review/Analysis

As a recent member of the Western Climate Initiative's cap-and-trade program, it is too early to judge the effect of a carbon price on the emissions profile of Ontario. But what is evident is that Ontario is one province that has seen a significant reduction in GHG emissions during the last 25 years. In 2015, total GHG emissions in Ontario were 166.2 mt, a reduction of more than 38 mt compared to 204.4 in 2005, and down 15 mt from 181.3 in 1990.[78] In 1990, due to its large manufacturing sector, Ontario's emissions were the highest in the nation. In its report on provincial emissions, ECCC says the decline in Ontario's emissions from 1990 to 2015 was "primarily because of the closure of coal-fired electricity generation plants."[79]

Figure 9: Greenhouse gas emissions, Canada, by province and territory



Source: www.ec.gc.ca/indicateurs-indicators

2.5 QUEBEC

A year ago, the Government of Quebec announced its 2030 Energy Policy. The policy has four major aspirational objectives: "decarbonize" Quebec; reduce energy consumption and improve energy efficiency; make greater use of Quebec's natural resources; and, innovate and develop its green economy.[80] The policy

initiative is particularly ambitious, seeking to integrate three streams – energy policy, climate change, regional development, and industrial policy into a unified policy framework.

As with Ontario, the key policy instrument in the Government of Quebec's climate change plan is cap and trade. It applies to businesses that emit 25,000 metric tons or more of CO_2 a year. The province instituted a carbon market integrated with California in 2013, which this year included Ontario. A minimum price of $10.75 a metric tonne was established the first year, with prices rising by five per cent a year (plus inflation) until 2020. In 2007, Quebec imposed a tax of less than one cent per litre on energy producers.

The other major component to the Quebec climate change framework is the Transportation Electrification Action Plan. In December 2015, Quebec joined the International Zero Emission Vehicle Alliance, with an objective to make all new passenger vehicles in its jurisdiction zero-emission by no later than 2050.[81] Quebec also proposes by 2020 to increase electric and hybrid vehicles in the province by 100,000 and reduce the amount of fuel consumed by 66 million litres. The Maritime Strategy seeks to enhance energy efficiency in marine transport through new energy sources, such as liquefied natural gas, and Plan Nord will expand electricity and natural gas supply to northern communities and mines.[82]

2.51 Review/Analysis

As with Ontario, and most other provinces, there is insufficient data to assess the impact of the Quebec climate change plan on GHG emissions in the province. But, as with Ontario, Quebec's total emissions in 2015 were lower than in 1990, down by 24 mt from levels 25 years earlier. What also slightly differentiates Quebec on the carbon price issue is that it has been part of the cap-and-trade system in the Western Climate Initiative since 2013. However, its full application to large emitters was not in place until 2015. According to Steven Guilbeault, director of Montreal-based environmental group Equiterre, it is too early to assess definitively the impact of the Quebec cap-and-trade system.[83]

The Quebec cap-and-trade system allows for some sectors exposed to national and international competition initially to receive free GHG emission limits that are based on their production levels. All proceeds from the auctioning of credits go to the Quebec Government's Green Fund to help fund clean energy initiatives. To date, more $107 million has been raised by the province through the sale and auctioning of carbon credits.[84]

2.6 CONCLUSION

The fact there is no coordinated, unified approach to climate change policy in Canada, as the various provincial approaches demonstrate, reflects the fundamental challenge in addressing the subject. As stated in Chapter One, the core of the issue is to get policymakers to work in a collaborative and synchronized fashion. The federal Pan-Canadian Framework, based on the unanimous agreement among provinces of the 2030 GHG reduction target reached as part of the Vancouver Declaration, is an attempt to achieve the collaboration and policy coordination necessary for effective policy.

Climate change is a global issue that requires a global approach, which means a degree of policy coordination that spans not only nations, but sub-national governments. In a federal state like Canada, where there are clear divisions of jurisdiction between the federal and provincial governments, achieving that level of a united policy approach is itself a microcosm of what is being played out internationally as conflicting economic, political and social issues shape the climate change debate.

Climate change is a global issue that requires a global approach, which means a degree of policy coordination that spans not only nations, but sub-national governments.

03

The impact of policies on GHG emissions

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03

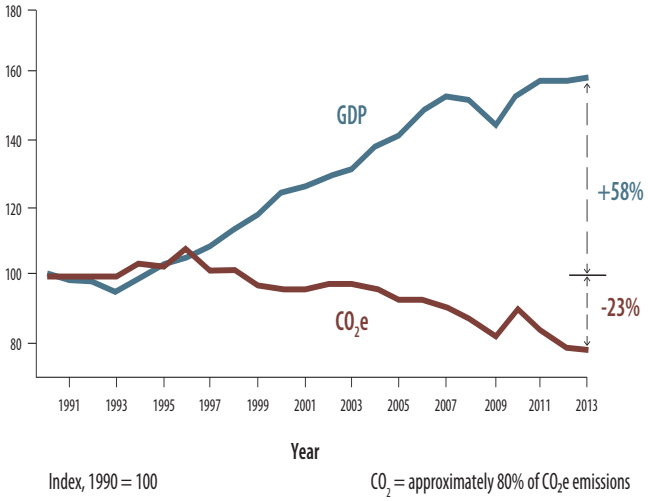
The impact of policies on GHG emissions

In the development of public policy, the identification and application of best practices can help create a road map to the most effective options. This chapter attempts to do that by examining the experience and outcomes of climate change policies in other nations. To assess the effectiveness of a carbon tax or price, or technological options, on reducing GHG emissions, most of the empirical evidence is a result of action taken in Europe. But the European experience is not necessarily applicable to Canada. Differences in population density and dispersion, vastly different geographies, economies and cultures all make extrapolation between Europe and Canada on the likely effects of a carbon price less than certain. Other key variables that affect emission levels are regulatory policy instruments distinct from a carbon price, such as vehicle registration levies, as well as fuel efficiency and tailpipe emission standards.

3.1 CARBON TAX

One nation with a significantly long history of a carbon tax, and therefore among the best test cases for the effectiveness of a tax in reducing GHG emissions, is Sweden. It has had a tax on carbon emissions since 1991, which has gradually increased over the years. Sweden's carbon tax of EUR137 a tonne (approx. US $160), as of 2016, ranked as the highest carbon price in the world.[85] As Figure 10 (next page) indicates, the impact of Sweden's carbon price provides significant evidence that CO_2 emissions can be decoupled from economic growth.

Figure 10: Real GDP and CO_2e emissions in Sweden



Source: Swedish Environmental Protection Agency, Stastics Sweden

What is interesting to note is that emissions have decreased in absolute terms, while the economy has continued to grow. In other words, not only has emissions intensity in the economy declined, the total amount of emissions has also dropped 23 per cent from 1990 levels, while GDP grew by 58 per cent. However, in judging whether a carbon price would have the same effect in Canada, or is appropriate as the primary instrument of climate change policy, it is important to recognize the significant differences between the economies and geographies of Sweden and Canada. While both are northern nations, Canada has a much more energy-intensive, resource-based extraction economy. Moreover, the dispersion of the Canadian population across a much larger geographic area, and the importance of the transportation sector to the economy and society of Canada, presents significant issues for Canadian policymakers that are not necessarily faced by those in Sweden.

A 2011 study in the journal *Energy Policy* on the effect of carbon tax on per capita CO_2 emissions in Sweden, Denmark, Finland, Norway and the Netherlands, found "the effects of a carbon tax are two sided." While it can induce substitution of fuel products and advance energy efficiency, it also has negative effects, such as the costs to business that "in the short run, carbon tax will … weaken the competitiveness of energy intensive industries and impose negative impacts on economic growth." It noted "if revenues generated by a carbon tax are not recycled (actually, carbon tax revenue can be used to lower income tax, or be returned to the enterprises to subsidize technological development), carbon tax will impose a higher cost to polluters than an emissions trading system or command-and-control policies, which may decrease public acceptability."[86] As previously noted, the Government of Canada's climate change plan proposes that revenue from a carbon price—whether in the form of a tax or cap and trade —will be recycled back into the economy of the jurisdiction where it is raised.

The study also found that the "mitigation effect of carbon tax differs across countries." For example, it found a carbon tax in Finland reduced growth of $C0_2$ per capita emissions by 1.69 per cent, compared to what would have occurred without the tax. In other countries, it found the impact did not pass the significance test, noting that in Norway the tax "hardly has any impact on CO_2 mitigation." "The different impacts of carbon tax in different countries mainly come from the different carbon tax rates, different scopes of tax exemption as well as different usage of carbon tax revenue," the study states.[87]

As with Sweden, Norway also implemented a carbon tax in 1991. Evidence of the Norway experience points to relatively small emission reductions resulting from the increased price. In their analysis "Greenhouse gas emissions in Norway; do carbon taxes work?", authors Annegrete Bruvoll and Bodil Larsen conclude: "Despite politically ambitious carbon taxes, this policy measure has had only a modest influence on GHG emissions."[88] They report that, from 1990-99, CO_2 emissions increased by 19 per cent, while GDP growth was 35 per cent during the same period. Emissions per unit of GDP—or emissions intensity—fell by 12 per cent over the period. During the 10-year span from 1990-99 the study focused upon, the tax reached its highest point of $51 (USD) a tonne in 1999 and averaged $21 over those years.

Evidence of the Norway experience points to relatively small emission reductions resulting from the increased price.

"The model simulations indicate that the tax contributed to a reduction of emissions of 2.3 per cent. Also, the effect of the carbon taxes in Norway is strongly dominated by the Norwegian oil and gas sector. For onshore sectors, the carbon tax effect on emissions is 1.5 per cent," the authors state. They argue a key reason for the small impact on emissions is "partly related to the exemption from the carbon tax for a broad range of fossil fuel intensive industries, exemptions which have been principally motivated by concern about competitiveness."[89]

The issue of how broadly exemptions to a carbon tax are applied is a critical issue identified in numerous other studies in determining the effectiveness of the tax in achieving the stated objective of reducing CO_2 emissions. The variations in impact based on application and use of revenue from a carbon tax was noted in the 2011 study "The effect of carbon tax on per capita CO_2 emissions." The authors conclude: "The different impacts of carbon tax in different countries mainly come from the different carbon tax rates, different scopes of tax exemption, as well as different usage of carbon tax revenue."[90]

Table 5: Estimated emissions reductions in jurisdictions with carbon taxes
Carbon Taxes: a review of experience and policy design considerations, Climate Policy 11 (2011)

JURISDICTION	START DATE	CHANGE IN CO_2 EMISSIONS	SOURCES
Finland	1990	Emissions were 7% lower in 1998 than they would have been without a tax	Prime Minister's Office, Finland (2000)
Netherlands	1990	Emissions were expected to be reduced by 1.7-2.7 million metric tonnes CO_2 annually in 2000. In covered sectors, emissions were expected to be reduced by approximately 5%	Netherlands Ministry of Housing Spatial Planning and the Environment (2004)
Norway	1991	Emissions increased by 15% - and GDP increased by 70% - from 1991 to 2008	Abboud (2008)
Sweden	1991	Emissions were reduced by about 15% from 1990 to 1996 because of the carbon tax Emissions decreased by 9% from 1990 to 2006 Emissions decreased by more than 40% from the mid-1970s to 2008	Johansson (2000); Ministry of the Environment, Sweden (2008)
Denmark	1992	Emissions decreased by 15% per capita from 1990 to 2005	Prasad (2008)
United Kingdom	2001	Emissions decreased by more than 58 million metric tonnes CO_2 from 2001 to 2005 Emissions are expected to be reduced by 12.8 million metric tonnes CO2 per year (15% of commercial and public sector energy demand) in 2010 because of the CCL"	Cambridge Econometrics (2005) cited in HMT (2008:101)
Boulder, CO	2007	Emissions in 2007 and 2008 decreased from 2006 levels. Greatest reductions due to programmes funded by the carbon tax: - Renewable energy activities (600,000 metric tonnes CO_2e) - Transportation (33,000 metric tonnes CO_2e) - Energy efficiency (6,700 metric tonnes CO_2e)	City of Boulder (2009b)
Quebec	2007	Emissions were expected to be reduced by 11.2 million metric tonnes CO2 by 2012 due to the carbon tax	Quebec (2008)
British Columbia	2008	GHG emissions were expected to be reduced emissions by up to 3 million metric tonnes CO_2 annually in 2020 due to the tax	Ministry of Finance, British Columbia (2008)

NOTES: Unless otherwise noted, decreases in emissions represent total emission reductions, not emission reductions that are due to a carbon tax. A BAAQMD implemented a carbon tax in 2008 and is tracking data, but has not issued a report. CARB has proposed but not implemented a programme.

One difficulty in assessing the effect of a carbon price is the need to isolate it from other policy instruments that impact public behaviour, and other determinants of emissions. For example, in pan-European terms, the European Union (EU) does not have a common carbon tax for its member nations, but rather a blend of policy measures. They include voluntary agreements by automobile manufacturers to reduce $C0_2$ emissions intensity, fiscal measures to affect consumers' choice in favour of cars that are more fuel efficient, and more consumer information on fuel-efficient vehicles.

A 2008 study on the effect of the basket of measures in Europe had on CO_2 intensity and passenger vehicle sales, concluded that "vehicle circulation taxes seem to have" the largest effect on vehicle purchasing behaviour. In other words, the total cost of driving, whether from tax on gasoline, vehicle registration and other circulation taxes reduced emissions and emissions intensity. The study noted fuel prices "have an important impact" on vehicle ownership. "The short run petrol price elasticity of -0.03 with respect to CO_2 fleet emissions intensity means that an increase in petrol prices of 10 per cent could lead to a reduction of CO_2 emissions of approximately 0.5 gram per kilometre on average for the fleet and up to nearly 2.8 g per km in the longer term," the study concludes.[91] To put that in percentage terms, a 10 per cent increase in price would reduce emissions of the fleet by 0.3 per cent per kilometre, and 1.5 per cent over the average life of the vehicle fleet.

In terms of the effect of a carbon tax in the U.S., where approximately 34 per cent of CO_2 emissions come from the transportation sector, a 2009 study in the *Journal of Applied Econometrics*, concluded that a 10-cent tax increase would reduce

U.S. carbon emissions from the transportation sector by an estimated 1.5 per cent, while reducing total U.S. carbon emissions by about 0.5 per cent. "To put this estimate in context, total U.S. carbon dioxide emissions increased by 1.1 per cent annually between 1990 and 2007, so a 10-cent gasoline tax increase would approximately offset half a year of growth in total U.S. emissions," the study projects.[92]

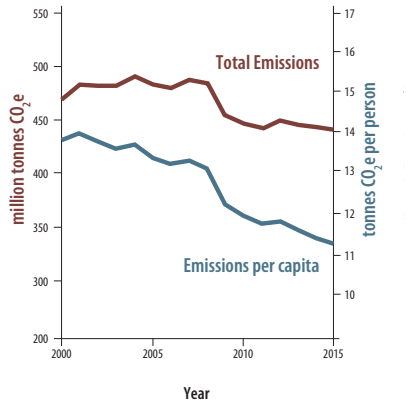
3.2 THE REGULATORY OPTION – CAP AND TRADE

As a policy to reduce GHG emissions, a cap-and-trade approach is considered by some lawmakers to be a politically more attractive option than a carbon tax. Unlike a tax, which is purposefully visible to consumers so that it affects behaviour, cap and trade is sometimes viewed as more politically palatable for the very reason that the cost of emissions is imposed by regulating specific sectors of the economy. Thus, the cost is less visible and perceived to be less of a burden on households, as is evident with an explicit carbon tax. But studies also show the effects are virtually identical. Under a cap-and-trade system, the government applies a limit to emissions from a specific entity or enterprise. If it wants to exceed its imposed limit, it must buy permits on a carbon trading market from other enterprises that have used less than their allowable limit.

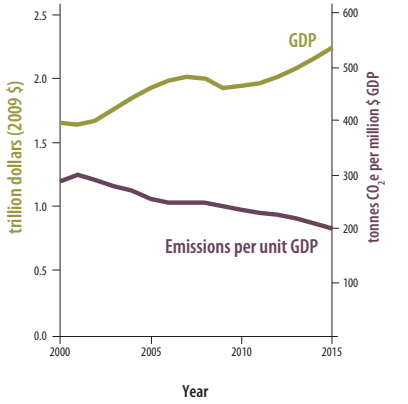
An analysis entitled "Who Pays for Climate Policy" by the Washington, D.C.–based Tax Foundation, found no differential in costs between the two approaches. "In the language of supply and demand, both policies shift the supply curve for carbon-intensive products upwards, forcing up consumer prices for these products. Carbon taxes achieve this with a simple per-unit tax, while cap and trade achieves it with a regulatory quantity restriction. But from the standpoint of consumers bearing the ultimate burden, both policies have exactly the same impact."[93]

A central argument among those who advocate for a system of cap and trade is one of certainty. They assert that because a limit is imposed on large emitters through regulation, a limit that can be gradually reduced each year, there is a measurable, quantifiable reduction in GHG emissions. In the case of California's system of cap and trade, since 2013 the cap on emissions has been declining at about three per cent a year. The California Air Resources Board (CARB) established limits on emissions that cover approximately 85 per cent of the state's emissions. Under the California cap-and-trade system, any facility releasing more than 10,000 metric tons of carbon annually must report, but only those above 25,000 metric tons are covered by cap and trade. As the graphs in Figure 11 indicate, total and per-capita emissions, as well as carbon intensity have declined since 2000. However, what's unclear is how much is a result of cap and trade, or other lower carbon energy policies and initiatives. As Dave Clegern, an official at CARB points out: "It's really too early to separate out cap-and-trade reductions from other programs. Cap-and-trade compliance began at the start of 2013, and fuels and natural gas came in January 1 of 2015, and that's about half of the overall emissions covered by cap and trade."[94]

Figure 11:
California total and per capita GHG emissions



Carbon intensity of california's economy



Source:

The single biggest emissions trading market is Europe, where 28 European Union member nations are part of its emissions trade system (ETS) that was established in 2005. The system includes more than 11,000 power plants and manufacturing installations, as well as emissions from flights between airports in Europe. The ETS covers approximately 45 per cent of the EU's greenhouse gas emissions. The EU's objective is to reduce emissions by 21 per cent from 2005 levels in the sectors covered by the cap-and-trade system.[95] According to the European Commission, the carbon market has achieved its desired effect of annually reducing total emissions from the sectors covered. It reports that GHG emissions "from stationary installations amounted to 1.75 billion ton of CO_2 equivalent in 2016. These emissions were around 2.7 per cent below the 2015 level."[96]

As with most issues when it comes to climate change and pricing carbon, there is no unanimous agreement that cap and trade necessarily achieves the objective of reductions in GHG emissions. One criticism comes from the Swiss banking giant UBS. In 2011 it maintained that the EU's emissions trading system cost European consumers $287 billion and had "almost zero impact" on reducing emissions. It went on to argue that if the money would have been spent on eliminating Europe's most carbon intensive power plants, emissions could have been reduced by 43 per cent.[97]

Table 6: Million metric tonnes of CO_2 yearly allowances

MEMBER STATE	1ST PERIOD CAP	2005 VERIFIED EMISSIONS	2008-2012 CAP	
			STATE REQUEST	CAP ALLOWED
AUSTRIA	33.00	33.40	32.80	30.70
BELGIUM	62.10	55.58 t	63.33	58.50
BULGARIA	42.30	40.60	67.60	42.30
CYPRUS	5.70	5.10	7.12	5.48
CZECH REPUBLIC	97.60	82.50	101.90	86.80
DENMARK	33.50	26.50	24.50	24.50
ESTONIA	19.00	12.62	24.38	12.72
FINLAND	45.50	33.10	39.60	37.60
FRANCE	156.50	131.30	132.80	132.80
HUNGARY	31.30	26.00	30.70	26.90
GERMANY	499.00	474.00	482.00	453.10
GREECE	74.40	71.30	75.50	69.10
IRELAND	22.30	22.40	22.60	21.15
ITALY	223.10	222.50	209.00	195.80
LATVIA	4.60	2.90	7.70	3.30
LITHUANIA	12.30	6.60	16.60	8.80
LUXEMBOURG	3.40	2.60	3.95	2.70
MALTA	2.90	1.98	2.96	2.10
NETHERLANDS	95.30	80.35 tt	90.40	85.80
POLAND	239.10	203.10	284.60	208.50
PORTUGAL	38.90	36.40	35.90	34.80
ROMANIA	74.80	70.80	95.70	75.90
SLOVAKIA	30.50	25.20	41.30	30.90
SLOVENIA	8.80	8.70	8.30	8.30
SPAIN	174.40	182.90	152.70	152.30
SWEDEN	22.90	19.30	25.20	22.80
UNITED KINGDOM	245.30	242.4 ttt	246.20	246.20
TOTALS	**2298.50**	**2122.16**	**2325.34**	**2080.93**

Note: Totals may differ due to rounding.
Source: EU press release IP/07/1614: 26 October 2007 [50] Access to the previous press release (Nov 2006 October 2007) in the linked page.

Another argument against cap and trade is that, in effect, what happens is that "polluters" can simply buy credits to increase emissions, especially if purchasing credits is less costly than investing in new low-carbon technology. As well, a carbon-trading market is created, with the financial sector seeing it as new means to make money by speculating on the trading of credits. Another variable is how broadly a system of cap and trade is applied. Often, specific industries or sectors are exempted as part of political considerations.

3.3 TECHNOLOGY TO REDUCE EMISSIONS

Aside from a specific price on carbon, whether in the form of a tax or cap and trade, there are multiple technology options as mechanisms to reduce GHG emissions. They largely focus on clean energy sources for electricity generation and can range from carbon capture and storage (CCS) to solar, wind and nuclear power, among others. Most jurisdictions have multiple mechanisms in place – in some cases a carbon price and other regulatory and technological tools, as part of a suite of climate-change policies to reduce emissions.

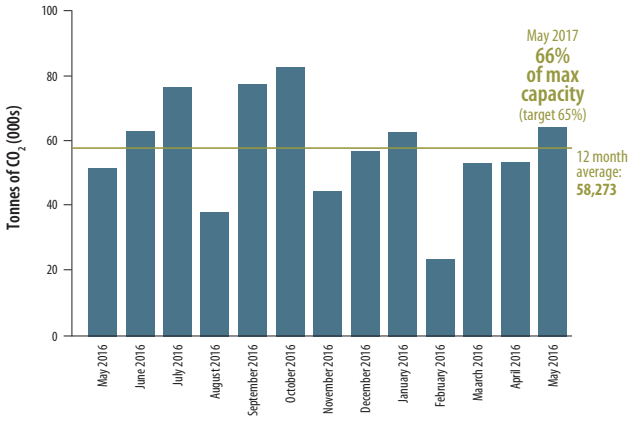
The fact that, in most cases, several policy levers are used by governments to reduce GHG emissions, assessing the impact and isolating a specific outcome to any one is often difficult. The exception is generation of electricity from non- or low-emitting sources, such as CCS, solar, wind or nuclear. In those cases, the additional generation of electricity can be compared to the counterfactual of the emissions that would result from the burning of fossil fuel. The key factor is what would have been the emissions outcome without the technology being deployed.

The fact that, in most cases, several policy levers are used by governments to reduce GHG emissions, assessing the impact and isolating a specific outcome to any one is often difficult.

It is that issue which, in large measure, frames the policy debate between the governments of Canada and Saskatchewan. In terms of Saskatchewan and the federal government's decision to ensure a carbon price is in place nationally by 2018, the province argues that a one-size-fits all carbon-price approach is not the appropriate policy. It maintains the province should be recognized and given credit for its investment in the development and application of CCS. The climate change policy showpiece for the Saskatchewan government is the application of carbon capture and storage technology to SaskPower's Boundary Dam, coal-fired generating station at a cost of approximately $1.5 billion. Since it became operational in 2015, CCS has captured almost 1.6 million tonnes of CO_2 emissions from Boundary Dam as of May 2017.[98] The graph below (Figure 12) produced by SaskPower shows the volume of CO_2 captured by month over the past year.

Photo credit: Dave Stobbe

Figure 12: Volume CO_2 captured



Source: SaskPower

Aside from a quantifiable amount in CO_2 reductions from what otherwise would have been the case without the application of CCS technology, the Saskatchewan government argues its potential impact far exceeds the province's borders. Given that climate change is a global problem and that, as noted earlier, coal generates approximately 40 per cent of the globe's electricity, CCS can become a critical and practical tool to reduce emissions from coal power around the world, particularly in China. For its part, the Government of Canada argues that establishing a carbon price is a necessary ingredient to make CCS a financially viable alternative.

The International Energy Agency agrees CCS has a role to play. It notes that coal is the largest source of energy-related CO_2, and about 50 per cent China's emissions come from coal-fired power. It has more than 900 gigawatts of installed coal fired power and another 200 GW under construction. Moreover, China's coal fleet is young, with two-thirds constructed since 2005 and a majority of its plants could operate for another 30-40 years. One solution to reducing China's emissions, the IEA says, is CCS.[99]

"Reducing greenhouse gas emissions while expanding electricity use in China's growing economy is likely not achievable without early retirement of many coal plants or carbon capture and storage retrofits. CCS presents a significant opportunity to match energy security and climate goals while avoiding cancelling or scrapping otherwise productive generating capacity," the IEA

states.[100] It goes on to point out that compared to investing in new generating capacity, CCS retrofits on existing coal-fired plants is more efficient and cost effective.

A similar view is expressed by Daniel Schrag, a contributor to "Acting In Time on Energy policy", a 2009 publication by the Washington-based Brookings Institution. Schrag states: "Demonstration and deployment of technologies to capture carbon dioxide from large stationary sources, storing the waste CO_2 in geological formations, is likely to be an essential component of any carbon-reduction strategy, both for the United States and for the world, and is also consistent with economic and security concerns." While admitting that scientific and engineering challenges remain, "in particular, how to capture and store carbon dioxide from existing power plants that were not designed with this in mind, but none is serious enough to suggest that CCS will not work at the scale required to offset billions of tons of carbon dioxide emissions per year."[101] Clearly, CCS is an option. It not only has the potential to reduce emissions in a predictable and quantifiable manner, but can be an effective tool in addressing climate change, at both a local and global scale.

However, the key question in terms of CCS as a viable and widespread option to reduce GHG emissions is its cost. Ironically, in terms of the Saskatchewan government position opposing a carbon tax, CCS becomes more likely if a price on carbon creates an incentive for its use, or if CCS is subsidized by governments, which embodies a high, implicit carbon price.

3.4 CONCLUSION

Consistent with the complexity of climate change policy approaches and the need for coordination, there is no definitive evidence of what specific policy instrument is most effective. While the economic argument that price is the best mechanism to ensure rational market behavior by firms and individuals, if the equivalent price is not applied uniformly to CO_2, there will be inevitable market distortions, resulting in competitiveness imbalances. As we will see in the following chapters, those effects can be at least partially offset through the application of revenue raised from a carbon price. But how it is used, and the extent of the offsetting economic impact depends on the choices made.

04

Impact Assessment of the Carbon Tax Option

Photo credits: iStock by Getty images

04

Impact Assessment of the Carbon Tax Option

Earlier chapters have examined some of the many complexities inherent in the issue of climate change and in the design of effective government policies to address it. The discussion of policy alternatives often focuses on how policies will affect businesses and individuals, especially in an economic sense, but in a behavioural sense as well.

The next three chapters focus on the mechanisms of different policy alternatives. They explore two key factors: How each option might affect the behaviour of businesses and individuals and, therefore, their respective emissions of greenhouse gases; and the impact of each option on general and specific economic conditions.

Although the issue of climate change and the appropriate policy response to the problem is pan-global in nature, the practical reality is that policies are developed and implemented at a national or local level. For this reason, the analysis of policy options is undertaken from a Saskatchewan perspective. The objective is to examine how various policy options would work in Saskatchewan, how they would affect Saskatchewan people and households, as well as business and industry.

The analysis will focus on three alternative policy approaches, namely:

- the imposition of a carbon tax,
- the imposition of an output-based allowance system as an example of a regulation-based policy; and,
- the pursuit of technological alternatives to a carbon-based economy.

It is not the intent of this paper to evaluate the proposed policy response of any particular government. As was discussed above, most of the responses by the federal and provincial governments in Canada and by governments in other jurisdictions include a complex array of policy instruments, as is expected in responding to a complex problem. Rather, the objective of the next three chapters is to examine specific policy instruments at governments' command in terms of their relative strengths and weaknesses.

This examination will draw on specific elements of individual proposals as examples of the use of a particular policy instrument to allow for assessment of its expected economic and fiscal consequences. However, it should not be taken to suggest that this analysis draws conclusions about any government's overall policy response to climate change, nor should it be taken to be an examination of any particular bundle of policy responses that include a number of individual elements.

So, for example, the assessment of a carbon tax as a policy instrument will focus on the effects that could be expected from such a tax if it were imposed in the manner that the federal government is proposing, even though there are many other elements to the whole of the federal government's proposed policy response to climate change.[102]

A carbon tax relies on the basic mechanism of establishing a "price" for carbon, using market-based approaches to change behaviour. Regulatory approaches such as cap and trade or output-based allowances are sometimes referred to as alternative carbon-pricing systems, but they are essentially regulatory approaches. They impose penalties for breaking regulations and rewards for improved emissions performance. The third approach of technological alternatives uses more desirable technologies (cleaner technologies) to produce energy and/or reduce the reliance on energy.

In practice, there are any number of "hybrid" options based on combinations of the approaches listed above. For example, clean technologies are usually promoted by a combination of regulation and subsidies. The analysis that follows does not imply that hybrid approaches are not viable – in fact, this report recommends using a mix of policy instruments. But, by focusing on these three popular options as distinct alternatives, and their general advantages and disadvantages relative to each other, each will be more clearly described to provide the basis for an informed discussion about policy alternatives.

4.1 CARBON TAX OPTION

There are many variations of taxes under the general description of "carbon tax" and few of them are actual taxes on carbon as the term might imply. For practical reasons, the term has most commonly been applied to a tax on things that lead to emissions of greenhouse gases, especially CO_2, and not carbon per se.

4.11 How do Carbon Taxes Work?

In theory, it could be possible to levy a tax more closely aligned with actual emissions of greenhouse gases within a jurisdiction. But it would also be a daunting and unrealistic challenge. It would require an assessment of every entity or activity within the jurisdiction. The assessment would cover every business, organization, household or individual. It would monitor their daily, monthly or annual emissions of greenhouse gases, including CO_2, as well as methane, nitrous oxide, water vapour, or any of the other gases and compounds that have the potential to advance the greenhouse effect.

Photo credit: iStock by Getty images

Once this assessment is done, each of those entities could be levied a tax which, in effect, would be more like a fine based on their distinct contribution to greenhouse gases. This levy would have to be reassessed periodically to ensure that any individual or business that reduced emissions was recognized for doing so and, therefore, rewarded with a lower tax levy. Those increasing their emissions would be further penalized with higher fines.

The administrative complexity of such a system is obvious. Clearly, conducting routine and regular audits of emissions by everyone in a jurisdiction and issuing fines according to the outcome of those would be an onerous and prohibitively complex process. In all likelihood, it would be impossible to conduct on a reliably consistent basis.

> The administrative complexity of such a system is obvious.

Instead, most jurisdictions that have "carbon taxes" choose one of two routes to narrow the focus to a more administratively manageable target, namely:

- apply the process described above, but only to a few large entities or industrial operations in a jurisdiction; or,
- tax specific products whose use will inevitably lead to emissions and apply that to everyone within the jurisdiction using those products.

This latter approach is more common in western jurisdictions. It works on a fundamental economic principle – if the price of something goes up, you are likely to want to use less of it and will look for other products you can use. The more the price goes up, the greater the incentive to use less of it. The longer the price stays high, the more effort you will put into finding alternatives or changing your lifestyle to use less of the good and avoid the cost. This adjustment in behaviour may take time extending over many years and depend on a number of factors.

4.12 The Federal Proposal – One Example of a Carbon Tax as a Policy Instrument

In May of 2017, the Government of Canada released a report that outlined its expectations for a program to establish carbon pricing in Canada. One of the options offered as a part of the overall federal strategy was a carbon "levy" on fossil fuels. The rates for this levy would be established at the equivalence of $10 per tonne of emissions in 2018, rising to $50 per tonne in 2022. The calculated rates for these equivalences for various fuels are shown in Tables 7, 8, and 9 (next page).

Table 7: Rates of levy on liquid fossil fuels from from 2018 to 2022

LIQUID FUEL	UNIT	2018 ($10/TONNE)	2019 ($20/TONNE)	2020 ($30/TONNE)	2021 ($40/TONNE)	2022 ($50/TONNE)
GASOLINE	¢/L	2.33	4.65	6.98	9.30	11.63
DIESEL / LIGHT FUEL OIL	¢/L	2.74	5.48	8.21	10.95	13.69
HEAVY FUEL OIL	¢/L	3.19	6.37	9.56	12.75	15.93
AVIATION GASOLINE	¢/L	2.49	4.98	7.47	9.95	12.44
AVIATION TURBO FUEL / JET FUEL / KEROSENE	¢/L	2.58	5.16	7.75	10.33	12.91
METHANOL	¢/L	1.10	2.20	3.29	4.39	5.49
NAPHTHA	¢/L	2.25	4.51	6.76	9.02	11.27
PETROLEUM COKE	¢/L	3.84	7.67	11.51	15.35	19.19

Source: Environment and Climate Change Canada, Technical Paper on the Federal Carbon Pricing Backstop, 2017.

To understand these rates a simple calculation might help. Every time you use 430 litres of gasoline (every 8 or 10 fill-ups at the gas station), for example, you emit a tonne of CO_2 into the atmosphere. So, to charge $10.00 for those emissions, would translate into 2.33 cents per litre for the gasoline at time of purchase ($10.00/430 l.). If the levy is $50 per tonne of emission, the tax on gasoline has to be set at 11.63 cents per litre ($50.00/430 l.).

These charges have to be higher for carbon intensive fuels like heavy fuel oil and lower for less intensive fuels such as methanol. As seen in Table 8, many of the gaseous fuels, like natural gas and methane, are less carbon intensive. From Table 9 we can see that burning 0.56 tonnes of lignite coal causes 1.0 tonnes of CO_2 emissions, so the tax rate needs to be set at $17.72 per tonne of lignite to equate to $10.00 per tonne of CO_2 emissions. Again, more carbon-intensive fuels like coke and anthracite coal would have a higher tax rate assigned.

Table 8: Rates of levy on gaseous fossil fuels from 2018 to 2022

GASEOUS FUEL	UNIT	2018 ($10/TONNE)	2019 ($20/TONNE)	2020 ($30/TONNE)	2021 ($40/TONNE)	2022 ($50/TONNE)
MARKETABLE NATURAL GAS	¢/m3	1.96	3.91	5.87	7.83	9.79
NON-MARKETABLE NATURAL GAS	¢/m3	2.59	5.17	7.76	10.34	12.93
PROPANE	¢/L	1.55	3.10	4.64	6.19	7.74
BUTANE	¢/L	1.78	3.56	5.34	7.12	8.90
ETHANE	¢/L	1.02	2.04	3.06	4.08	5.09
GAS LIQUIDS	¢/L	1.67	3.33	4.99	6.66	8.32
STILL GAS	¢/m3	2.70	5.40	8.10	10.80	13.50
PENTANES PLUS	¢/L	1.78	3.56	5.34	7.12	8.90
COKE OVEN GAS	¢/m3	0.70	1.40	2.10	2.80	3.50

Source: Environment and Climate Change Canada, Technical Paper on the Federal Carbon Pricing Backstop, 2017.

Table 9: Rates of levy on solid fossil fuels from 2018 to 2022

SOLID FUEL	UNIT	2018 ($10/TONNE)	2019 ($20/TONNE)	2020 ($30/TONNE)	2021 ($40/TONNE)	2022 ($50/TONNE)
LOW HEAT VALUE COAL (I.E., SUB-BITUMINOUS COAL; LIGNITE)	$/tonne	17.72	4.65	53.17	70.90	88.62
HIGH HEAT VALUE COAL (I.E., BITUMINOUS COAL; ANTHRACITE)	$/tonne	22.52	45.03	67.55	90.07	112.58
COKE (COAL)	$/tonne	31.80	63.59	95.39	127.19	158.99
WASTE FUEL / TIRES	$/tonne	19.97	39.95	59.92	79.89	99.87

Source: Environment and Climate Change Canada, Technical Paper on the Federal Carbon Pricing Backstop, 2017.

4.2 IMPACT ON HOUSEHOLDS

We can use some of the information from these tables to highlight the impact a tax of this sort might have on a typical Saskatchewan household. The products listed above include a number that are not likely regular purchases for a household, such as aviation gasoline, coking coal or naptha. But, several products listed do form a substantial portion of household expenses. We will focus on those products, specifically: gasoline, diesel fuel and natural gas.

4.21 Motive Fuel

According to a popular website, recent gasoline prices in Regina ranged from a low of 89.9 cents per litre to 102.9 cents per litre for regular grade gasoline. Premium gasoline ranged from 102.9 cents per litre to 115.9 cents per litre, and prices for diesel fuel ranged from 95.9 to 97.9 cents per litre.[103]

Using a price of $1.00 per litre for gasoline and diesel fuel, a tax as proposed in Table 7 would add between 11.6 per cent and 13.7 per cent to the cost of automobile fuel for a typical family in Saskatchewan. It is notable that Saskatchewan's current fuel taxes are levied at a rate of 15.0 cents per litre on gasoline and 9.0 cents per litre on diesel fuel.[104]

Statistics Canada's survey of household expenditures[105] identifies that an average household in Saskatchewan spent $2,320 for "gas and other fuels for all vehicles and tools" in 2015.

Assuming the tax proposed by Ottawa at its mature rate of $50 per tonne in 2022, and using this as a base suggests that the average household in Saskatchewan would see its costs for motive fuels increase by between $269 and $316 per year (11.6% to 13.7%), depending on the type of fuel they use in their vehicles. This increase would be gradual, rising by one-fifth of this amount per year. It would be less than the calculated amount if a household reduced its fuel consumption in response to the tax. In any event, the estimated cost of around $300 per year is probably an upper limit to the impact of the tax.

4.22 Heating

According to Table 8, the federal system would tax natural gas at a rate of 9.79 cents per cubic meter (m^3) once the tax is fully implemented in 2022. SaskEnergy's current price for natural gas for residential purposes is 13.87 cents per cubic meter, plus a delivery charge of 8.83 cents per cubic meter, or a total of 22.7 cents per cubic meter.[106] So, a tax like the one proposed by the federal paper will raise household natural gas prices by about 8.6 per cent in the first year and about 43.1 per cent from current levels in the fifth year when it reaches its mature rate in 2022.

Again, according to Statistics Canada's survey of household expenditures,[107] the typical household in Saskatchewan spent about $877 for natural gas for household heating in 2015. So, an increase of 43.1 per cent for a fully-implemented carbon tax would cost such a household an additional $378 per year, if it continues to consume natural gas at the same rate as before the tax is implemented.

Also, according to SaskEnergy,[108] the current price for home heating fuel is 92.4 cents per litre. From Table 7, the proposed federal carbon tax would add 15.93 cents (or 17.2 per cent) to that amount when fully implemented in 2022. Statistics Canada[109] notes the average Saskatchewan household spent about $115 for "other fuel for principal accommodation" in 2015, about 13 per cent of what we spend on natural gas. Assuming this was mainly for heating oil, the tax proposed by the federal government would add about $20 per year to individual household costs in the province.

4.23 Electricity

The last item that would have a major impact on household costs in Saskatchewan from a carbon tax is through the price of electricity. Statistics Canada[110] notes that an average Saskatchewan household spent $1,496 on electricity for principal accommodation in 2015.

The Saskatchewan Government's Climate Change White Paper estimated that the proposed federal carbon tax would add $757 million to the costs of producing electricity in Saskatchewan.[111]

According to SaskPower's latest annual report,[112] an increase of this amount would add about 34 per cent to the company's operating costs or about 35.5 per cent of the value of electricity sales in Saskatchewan in 2015.

Applying this ratio, and assuming no change in consumption of electricity and the full cost is passed on to consumers, it would appear the proposed tax on hydrocarbons in the federal program could be expected to add about 36 per cent to the annual cost of household electricity use, or about $531 per year.

4.24 Summary of Household Impact

The key impacts of a carbon tax on Saskatchewan households would seem to be through the impacts on motive fuel, household heating and on electricity costs.

Collectively, these approximate annual impacts could be estimated as:

Motive Fuel	$ 300
Home heating (all fuels)	$ 400
Electricity	$ 530
Total Annual Impact	**$1,230**

Of course, one should note that this is an impact calculated assuming there is no change in consumption patterns in response to the imposition of a tax. Given that reducing consumption is exactly the purpose of the tax, it is not clear if that is a reasonable assumption.

One should also note that this is an incomplete analysis in the sense that the impact on households of government decisions to use the revenue generated from the carbon tax is not included in this calculation, as will be discussed below. For example, the government could choose to disperse the revenue from a carbon tax through reducing other taxes or through direct spending programs that could, potentially, leave households better off on a net basis.

It should also be noted that households can be affected indirectly through reduced earnings in affected sectors and/or through higher costs of products produced in affected sectors and consumed within households. These indirect effects can be significant but, requiring a general equilibrium model to estimate, are beyond the scope of this analysis.

As well, these estimates are based on the fully implemented rate of tax as proposed by the federal system. According to the federal paper, the full rate will only come into force in 2022 and estimates for years before that should be reduced accordingly. For example, in 2018 the impact on households would be only one-fifth of those calculated or about $290 per year on the average household in Saskatchewan.

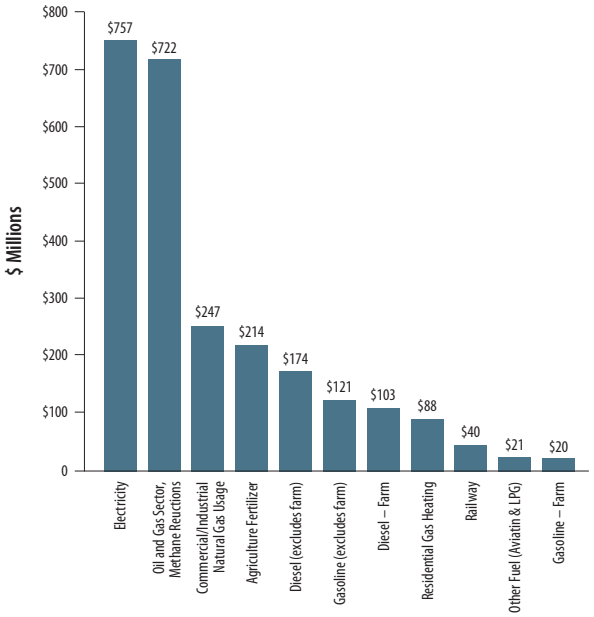
An impact of $1,230 per year on household disposable income may also be expected to have a broader effect on the economy as those households make room for the tax in their budgets, perhaps by curtailing other activities. But, estimating the magnitude of this effect requires a general equilibrium econometric model of household behaviour and is beyond the scope of this analysis.

The more direct macro-economic impacts of a carbon tax, as through its effect on business and industry, can be examined through the use of an input-output model and is the focus of the next section of this paper.

4.3 IMPACT ON KEY BUSINESSES AND INDUSTRIES

In 2016, the Government of Saskatchewan released its Climate Change White Paper[113] in which it identified the expected impact of the proposed carbon tax at $50 per tonne on Saskatchewan industries. The results of its analysis are shown below in Figure 13.

Figure 13: Impacts of national $50 carbon tax on Sask's economy ($ millions)



Source: Government of Saskatchewan, Climate Change White Paper, 2016, p. 25.

The information included in Figure 13 is the basis for an examination of the impact the proposed carbon tax might be expected to have on key business sectors and industries in Saskatchewan and, through them, on the larger Saskatchewan economy.

Setting aside the impacts on the household sector above the business and industry analysis will focus on four key sectors:

- Electricity;
- Oil and Gas Sector;
- Agriculture; and
- Railways.

As indicated in Table 13, the annual impact, as estimated in the Saskatchewan report on each sector is:

Electricity	$757 million
Oil and Gas	$722 million
Agriculture	$214 million[114]
Railways	$ 40 million

There is also a large impact estimated from Commercial/Industrial Natural Gas usage ($247 million) but, as this is spread over all other economic sectors not identified in the Saskatchewan report, impact analysis of this factor is not possible.

While the analysis of the proposed carbon tax impact on households focused on the impact on the costs to consumers, there has also been an interest in examining the impact such a tax would have on the broader economy.

The mechanism for such an impact is fairly straightforward. As business costs rise and fall, they will react accordingly in their level of activity. If costs rise, for example, production will tend to scale back. If costs fall, businesses tend to increase production levels. This adjustment will not necessarily occur quickly. In fact, it may unfold over a very long period of time. The timing of effects will be discussed in a later section.

Using Statistics Canada's input-output multipliers[115] for the province of Saskatchewan, it is possible to estimate the effects on business behaviour and, therefore, on the overall level of economic activity that is likely to occur as a result of a new tax on carbon.

These multipliers allow an estimation of the impact of a shock, or change in circumstances to a particular sector of the economy and on the broader economy as a whole. When a sector experiences a change in circumstances, such as a rise in costs or a decrease in sales, it can be expected to reduce production. This is the "direct effect" of the change. In reducing activity, that sector will also reduce its use of inputs from other sectors. This is the "indirect effect" of the change in circumstance.

Finally, people who work in the target sector and those who work in the supplying sectors, faced with reduced incomes, will also reduce their economic activity. This is called the "induced effect" of the change.

Adding together the direct, indirect and induced effects of the change will yield the total effect of a change such as a tax increase, on the whole economy that is caused by its application to the sector examined.

This set of impacts can be examined by industry to see the nature of consequences a proposed tax increase has on the broader economy.

4.31 Electrical Impact

According to the Statistics Canada data, the total effect of a "price shock" to the sector identified as "electrical power generation, transmission and distribution" has an impact on provincial Gross Domestic Product (GDP) at a rate of 0.80 times the value of the shock.[116] So, an increase in costs of producing electricity of $757 million per year as shown in Figure 13 above, could be expected to have an overall negative impact on GDP of $606 million per year.

The Statistics Canada tables also estimate the impact of a change in circumstance on overall provincial employment. In the case of utilities, a change of costs or revenues would result in a reduction or increase of 2.60 jobs for every million dollars of change.[117] In other words, a tax increase of $757 million on electrical utilities would reduce the number of jobs in Saskatchewan by about 1,968 by 2022.

Photo credit: iStock by Getty images

4.32 Oil and Gas Impact

The input-output multipliers for the "oil and gas extraction" sector are 0.79 for GDP and 1.08 for jobs within the province.[118] Thus, a tax of $722 million imposed on the oil-and-gas sector (as estimated in Figure 13) would reduce GDP by an estimated $570 million per year and reduce the number of jobs within the province by 780 once the tax is fully implemented.

4.33 Agriculture Impact

Figure 13 estimates the impact of a carbon tax on the agriculture sector at $214 million, assuming that farming is exempt from taxes on gasoline and diesel fuel as the federal government has indicated. But the tax would still impact on the costs of fertilizer as estimated by the Government of Saskatchewan and indicated in Figure 13.

The multipliers for "crop and animal production" in Saskatchewan are 0.70 for GDP at basic prices and 6.56 for jobs.[119] Using these multipliers, the proposed carbon tax would have an impact of reducing basic GDP by $150 million per year and the number of jobs in Saskatchewan by 1,404 once the tax is fully implemented.

4.34 Railways Impact

The Government of Saskatchewan has estimated that a carbon tax of $50 per tonne would have an impact on railway operations of $40 million per year as shown in Figure 13.

Applying the input-output multipliers for "rail transportation" of 0.81 for GDP and 7.5 for jobs,[120] this level of tax impact would result in a decrease in Saskatchewan GDP of about $32 million per year and a loss of about 300 jobs in the province by the time the tax is fully implemented in 2022.

4.35 Other Sectors

As noted, the data in Figure 13 suggest that the imposition of a carbon tax in Saskatchewan would add approximately $2.5 billion in additional taxes in the province. The analysis above has focused on those sectors of the economy that have clearly been identified in that earlier provincial analysis and that can be examined with the use of an input-output model, such as that available from Statistics Canada.

While these defined sectors add up to about $1.733 billion, or about 69 per cent of the total impact of a tax, there is a substantial tax impact that cannot be identified or analysed using an input-output model. The remaining $774 million in tax is likely also to have negative impacts on the Saskatchewan economy but, since it affects mostly the "household sector" and many other undefined business sectors, estimation of its impact remains beyond the capacity of this particular methodology.

4.36 Summary of Economic Impact through Businesses

While it is difficult to summarize the overall impact that a carbon tax would have on the Saskatchewan economy without including the impact on "other sectors", a sense of the order of magnitude can be gained as shown in Table 10, which summarizes the likely initial impact through the four key sectors identified in the Government of Saskatchewan report.

Table 10: Estimated economic impact of proposed carbon tax

Industry	Direct Carbon Tax Cost ($ millions)	Direct, Indirect and Induced Impact on GDP ($ millions)	Total Impact on Jobs
ELECTRICAL	$757	$606	1,968
OIL AND GAS	$722	$570	780
AGRICULTURE	$214	$150	1,404
RAILWAYS	$ 40	$32	300
TOTAL*	**$1,733**	**$1,358**	**4,452**

**Not including "Other Sectors". It should be noted that inter-sectoral effects may be included in these "totals" and the data presented should only be considered as indicative of the overall magnitude of impact.*

It is notable that the overall initial impact on the economy, at least through the specific sectors identified, is somewhat less, in dollar terms, than the value of the tax imposed on those sectors, suggesting that a tax levied at a rate of around $2.5 billion per year might be expected to have an overall impact of about $2.0 billion per year on provincial GDP. This is important to note in the context of the effect of offsetting policies to be discussed below.

In addition, while it appears the initial impact of the tax on the job market would be to reduce annual employment levels by about 4,500 jobs through the four identified sectors, inclusion of "other sectors" in the analysis might increase this initial impact to as much as around 6,400 jobs, again, before consideration of offsetting policies.

As was noted in the analysis of household impacts above, the impact on businesses was calculated assuming there is no change in consumption patterns in response to the imposition of a tax and, similarly, it is not clear if that is a reasonable assumption.

Again, it is vital to note that this analysis does not include any positive impact resulting from government decisions to use the revenue generated from the carbon tax, which will be discussed below. If government chooses to disburse the revenue from a carbon tax through reducing other taxes or through direct spending programs that could, potentially, leave any particular business or industry better off on net, and could more than offset the economic impacts shown above.

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As well, these estimates are based on the fully implemented rate of tax as proposed by the federal system. According to the federal paper, the full rate will only come into force in 2022 and estimates for years before that should be reduced accordingly.

4.4 THE OTHER HALF OF THE STORY – OFFSETS AND THEIR IMPACTS

The examination above does not tell the whole story of the economic consequences of carbon taxation. As noted from Figure 13, it has been estimated that a tax of the magnitude proposed by the federal government will generate additional revenue for the province in the order of $2.5 billion[121] when it is fully implemented in 2022. This assumes there would be no economic sectors fully, or partially, exempted from the impact of the tax.

Levying a tax has a negative impact on any sector to which it applies and, by extension to the overall level of economic activity. However, the disbursement of government funds raised by the tax can have a positive effect on economic activity. The magnitude of the effect will depend on the nature of that disbursement.

The province could choose to spend the $2.5 billion by reducing other taxes, on government programming or on some combination of initiatives. Direct spending on programs can be analyzed using input-output models.

For example, according to Statistics Canada's model, spending on "educational services" has a GDP multiplier of 0.90 and a jobs multiplier of 22.36 per million dollars.[122] Thus, if the government were to spend the whole $2.5 billion it derived from the carbon tax on such services, it would raise GDP by $2.25 billion per year and would create 56,057 jobs, substantially more than was lost through the imposition of the tax.

Similarly, the multipliers for "health care and social assistance" are 0.85 for GDP and 11.04 for jobs.[123] Spending $2.5 billion in this area of programming would have the effect of growing GDP levels by $2.2 billion per year and adding 27,677 jobs in the province.

Spending on operating universities has an even bigger impact, with multipliers of 1.05 for GDP and 11.35 for jobs,[124] such that a $2.5 billion boost in university spending would raise GDP by more than $2.6 billion and add 28,454 jobs in the province.

This is not to suggest there are good policy reasons to spend $2.5 billion more in any of these specific areas—they are examined solely to quantify the multiplier effect in context. But any of these areas of disbursement of proceeds from a carbon tax have a far bigger positive impact on the economy than the negative impact of the tax calculated above, whether they are the sole focus of disbursement or form part of a bundle of potential uses for those proceeds.

The government also has the potential to use the proceeds from the carbon tax to lower other taxes it currently collects. According to its 2017-18 Budget, the Government of Saskatchewan[125] will collect $2.542 billion in revenue from individual income taxes and $729 million from corporate income taxes, along with $2.049 billion from provincial sales taxes and $515 million from fuel taxes in the province.

While the full value of a carbon tax will not be realized until it is fully implemented in 2022, if such an amount were available today, the province could cut income taxes (personal and corporate) by 76.6 per cent or virtually eliminate all the personal income taxes currently paid in the province.

Alternatively, the $2.5 billion expected to be collected from the carbon tax would be enough to eliminate 97.8 per cent of provincial sales and fuel taxes.

If a government were to use the proceeds from a carbon tax to implement output-based credits which rewarded efforts to reduce emissions, for example, not only would the economic impacts on industries be substantially reduced for those calculated above, efforts to reduce emissions could be substantially enhanced. An input-output model will not allow analysis of the economic impact of taxes as it focuses on business and the primary impact of tax policy is through the household sector. However, it would seem that the potential for significant offsets to the economic consequences of a tax on carbon are likely to be found in either additional government spending or in reductions in other provincial tax rates.

Nor will an input-output model allow the estimation of impacts that may result from behavioural changes due to major policy initiatives, such as economic activity which may result in alternative sectors due to conservation efforts or moves to alternate energy sources.

4.41 Caution on Methodology

The analysis above was conducted using a standard input-output table. One shortcoming of this approach is that such models are "static", which is to say they work on the basis of a fixed economic structure as exists at one point in time (in this case, the Saskatchewan economy as it was in 2010). The use of static models faces limitations when trying to assess the possibility of changed behavior. This is similar to trying to derive the plot of a movie from a single still picture taken from the middle of the movie.

Input-output multipliers are useful in examining relatively small policy measures over a relatively short period of time. Imposing a fairly massive tax change (equivalent to the elimination of sales tax and the fuel tax in Saskatchewan) over a five-year period is not likely to accurately reflect the eventual movement in an economy that is constantly evolving in the face of multiple influences domestically and internationally.

It should also be noted that the approach taken, by necessity, compares economic consequences of the policy option to current economic conditions. Although it may be suggested that current conditions are unsustainable in the face of climate change, the nature of some future economic state inclusive of that impact, while it may be an appropriate counterfactual against which to benchmark any policy initiative, remains far too ill-defined to provide such a standard.

4.42 Other Considerations

A number of other factors should be considered in examining a carbon tax as a policy option, some of which may be significant to a final decision in choosing the best option.

4.43 Administration

As noted in Tables 7 through 9, the federal government's current proposal for a carbon tax involves the imposition of a tax on 21 specific hydrocarbons. All of these products are already subject to some form of taxation at either the federal or provincial level. Adding these items to those collection processes or layering the proposed carbon tax onto existing tax collection processes would add minimal cost to the operations of either the federal or provincial government, in tax collection and enforcement, or to businesses and individuals, in tax compliance costs.

Therefore, a major advantage of this approach is the administrative ease with which it can be implemented and operated.

4.44 Time to Effect

Carbon taxes will have an immediate effect on the cost of using high-emissions technology. The imposition of a carbon tax will make low-emissions technology immediately more attractive than less-efficient methods. But, nevertheless, the replacement of all the existing capital infrastructure will take many years to show the full effect of a carbon tax imposition.

For example, a carbon tax may change the cost of a high-efficiency furnace relative to its medium- and low-efficiency counterparts. But, it is unlikely that a homeowner would rush out and replace their furnace just because of the tax, especially if they have a fairly new furnace. Instead, when their existing furnace needs replacing, they will consider the high-efficiency model in a new, more attractive light.

it is unlikely that a homeowner would rush out and replace their furnace just because of the tax, especially if they have a fairly new furnace.

But, since a furnace may last an average of 20 years, only one in 20 is being replaced through normal practice in any given year. Thus, even with a carbon tax, only half of its ultimate effect on household purchases of more energy-efficient furnaces would be felt after 10 years, and its full behavioural impact would not be seen for at least 20 years from its initial imposition.

Some progress can be achieved through interim efforts, such as turning down the thermostat even if a household may not be replacing its current furnace for several years.

This delay can be even longer in business and industry where the rate of capital replacement (the turnover of machines) can be far slower than for the average household furnace—perhaps 30 or 40 years—or in the case of housing and commercial or industrial buildings, which may turnover in eighty or one-hundred years. So, implementation of a carbon tax may be the first step towards behavioural change, but will not yield its full effects for many years, or even generations.

4.45 Treatment of "Embodied Carbon"

If a jurisdiction levies a tax on hydrocarbons, it will, by design, raise the costs of operation for any business operating in that jurisdiction and raise the cost of living for individuals living within that jurisdiction, at least to the extent they use hydrocarbons in their business and household operations. That, precisely, is the purpose of a tax that seeks to change behaviour.

However, a domestic tax of this sort has no impact on the costs of operations for businesses and individuals living and operating outside the jurisdiction. As a result, products produced in non-tax jurisdictions can become cheaper to purchase than those produced in jurisdictions with a carbon tax.

In the long-run this can result in production and population gradually migrating from high-tax jurisdictions to low-tax jurisdictions. In the case of carbon taxes, this can be especially problematic if those low-tax jurisdictions are even less efficient in their operations than was the case in the high-tax jurisdictions. These competitive effects are one reason why coordinated action among nations on climate change is crucial. It also explains the federal government's rationale that a carbon tax or price must be applied equally in all provinces.

For example, someone could be operating a greenhouse in Saskatchewan using natural gas heating but taking advantage of the notably greater hours of sunlight in the province. If that operator has to pay a higher tax on their operating fuel, it is possible that they will no longer be able to compete with growers elsewhere in the world. If Saskatchewan tomatoes become more expensive than tomatoes from other foreign jurisdictions, the local producer may find they can no longer cover the cost of operations from tomato sales. Of course, effective use of the revenue generated from a carbon tax could counter this competitive disadvantage, depending on the policy choices made.

But, in this instance, it may be the case that there has been no reduction in overall worldwide emissions of greenhouse gases. In fact, it may be that the foreign producer is less efficient in their operations and, when shipping is considered, imported tomatoes may generate significantly more emissions than the displaced Saskatchewan tomatoes did.

If the same example is extended to all the multitude of products that do or could flow to Saskatchewan, the implications become clear. Much of what Saskatchewan consumes comes from elsewhere and much of what we produce goes elsewhere. The Saskatchewan Economic Accounts note that, in 2015, the province exported $50.8 billion in goods and services and imported $44.2 billion in goods and services.[126] On a total Gross Domestic Product of $79.4 billion (current dollars) in that year,

that represents an import ratio of 55.7 per cent and an export ratio of 64.0 per cent.

For a jurisdiction that imports much of what it consumes, a domestic carbon tax will not address the issue of taxing embedded carbon in the things we consume. And, for a jurisdiction that exports much of what we produce, taxing hydrocarbon usage within the province may place significant competitive disadvantages on Saskatchewan businesses.

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4.46 Treatment of other Greenhouse Gases

As proposed by the federal government, a Canadian carbon tax would tax 21 specific hydrocarbons as listed in Tables 7 through 9. The tax would not apply to any production processes or household activities which produce any of the other seven greenhouse gases listed in the federal discussion paper (CH4, N2O, hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride and nitrogen trifluoride).[127]

Some of these compounds may have even greater effect on climate than is the case with CO_2 and their exclusion from policy may severely limit the effectiveness of a carbon tax in addressing the problem of climate change.

4.47 Failure to Measure Results

Unlike some other policy options to be considered, there is not a mechanism inherent in the carbon tax for measuring the extent to which it actually reduces climate change or makes progress on the interim measure of reducing greenhouse gases. While such measuring activities can be introduced alongside a carbon tax, the fact they are not inherent in the operations of a tax system implies that monitoring would only occur at additional expense to the system.

There are many other methods for testing the effectiveness of this policy approach in reducing emissions, some of which are detailed in the review of the literature elsewhere in this report.

In other words, the ease of administration of a carbon tax addressed above does not address the fundamental shortcoming in the approach, which does not automatically provide evidence of its effectiveness in reducing the rate of climate change.

Some other approaches are more likely to provide this information as a matter of their normal course of operations, as will be seen below.

4.5 CONCLUSION

In this chapter the focus has been on the expected or probable economic and financial impacts of one of the three policy options that could be pursued to reduce greenhouse gas emissions and address climate change: the imposition of a carbon tax.

The carbon tax option is the most intrusive of the three options examined in that it would apply to more sectors of the economy than is the case with other options. However, because it applies only to products that cause the emission of CO_2, it has no effect on other greenhouse gas emissions.

The imposition of a carbon tax at a rate of $50 per tonne as proposed by the federal government would have significant cost implications in a number of Saskatchewan sectors and would add substantially to the cost of maintaining and operating households, unless significant behavioural change occurred. These financial impacts could also be expected to have a negative impact on the Saskatchewan economy in terms of the level of GDP and the number of jobs in the province, were it not for the potential of fiscal offsets to this effect.

Importantly, the disposition of the proceeds from a carbon tax, whether through increased spending on government services or through reductions in other taxes, could have an offsetting positive impact on the economy and could reduce overall household costs even below current levels.

As the only one of the three options specifically designed to apply to products consumed by households, the carbon tax option might realistically be the one most expected to affect or change the current behaviour of individuals and households, which is an important policy consideration.

As is common in all policies to combat climate change, a carbon tax is likely to have little immediate impact on individual or business behaviour. One does not rush out and buy a new car simply because the price of gasoline rises a few cents. But, as the vehicle fleet ages and is replaced and households and businesses replace their basic mechanical systems, behavioural adjustments are likely to occur.

Moreover, a locally-imposed carbon tax does not address the issue of embedded carbon or embedded emissions—those that are caused in the production of imported goods. Because of this, adopting a carbon tax will require a leap of faith in the willingness of other jurisdictions to act in parallel as discussed in earlier chapters.

05

Impact Assessment of the Regulatory Options – Cap and Trade and Output-Based Emission Allowances

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05

Impact Assessment of the Regulatory Options – Cap and Trade and Output-Based Emission Allowances

Regulatory systems to address the drivers of climate change have many variations, but operate on the fundamental use of regulatory and monitoring powers of governments – establishing a "cap" for emissions and a system of penalties for exceeding that cap and rewards for meeting the guidelines.

The upper allowance or "cap" can be established in terms of total emissions, as is the case in a cap-and-trade system. Or it can be applied in terms of emissions per unit of output, or "emission-intensity" as in the case of output-based emission allowances.

In either scenario, allowable maximum emissions can be established at current levels or at target levels, or anywhere in between.

Most of these approaches have elements of a "carbon-pricing" approach only in the sense that they also allow for a market to trade credits in carbon emissions to be used to offset fines for exceeding targets.

5.1 HOW DOES CAP AND TRADE WORK?

In principle, this approach establishes an upper limit, or cap, on the emission level of any given entity or activity. Any emissions beyond that cap are subject to a levy or fine as a deterrent against emissions.

Most cap-and-trade systems allow entities that operate below their allowed cap to sell their unused "credits" to other entities that may have difficulties lowering their emissions to the capped level. This is the "trade" part of cap and trade. Those who purchase the credits can use them to offset their emissions excesses, in effect avoiding fines by buying "indulgences".

As was the case in the discussion of carbon taxes above, there can be many variations on this theme depending on how far from a theoretically pure system one needs to wander in the aim of practicality. In theory, a cap-and-trade system could establish allowable maximum emissions levels for every business and every household in a jurisdiction. Then the system would monitor the actual emissions of each of those businesses and households and, for those which exceeded their limit, levy a fine while, for those whose emissions were actually below their allowance, issue "credits" for good behavior.

The businesses and households below the allowed limits could take their credits and sell them to those who were over limit. Those latter entities could avoid the "fine" by turning in the credits they bought, against their emissions overage, while the former entities would be reimbursed for their efforts to reduce emissions through the trading of credits. The concept of "credits" is demonstrated already in the practice of purchasing "carbon offsets", a system that allows people to fund carbon-reduction projects through contributions. One popular website prices "carbon offsets" at the equivalent of $10.00 (US) per tonne, or about $13.50 (CDN) per tonne.[128]

Over time, a market would be established for these credits such that an agreed upon "price" for greenhouse gas emissions would evolve through the trading mechanism. Those who can find ways to reduce emissions would be rewarded with valuable and marketable credits. Those who cannot reduce their emissions, or for whom such reductions would be expensive to achieve due to technological limitations, can still support the reduction in overall emissions by buying credits from others, thus funding their efforts to reduce emissions.

It is thought that the use of cap and trade ensures that the least costly ways to reduce emissions are sought out first. If a business cannot reduce its emissions without a large cost, it can buy credits from other businesses that have found less costly ways to reduce emissions, effectively subsidizing the more effective emission-reduction effort. This mechanism means that, as a society, we pursue emissions reductions from the most cost-effective to the least cost-effective, thereby maximizing the returns on emissions reductions by taking the most effective first.

It is thought that the use of cap and trade ensures that the least costly ways to reduce emissions are sought out first.

As was the case with carbon taxes, by putting a value on greenhouse gas emissions, either in the form of tradable credits for reducing emissions, or in the form of fines for exceeding limits, there is a strong financial incentive for people to reduce emissions or support the reduction in emissions by others.

But, of course, in a real-world model there are practical limitations on the application of this comprehensive approach. As mentioned, the cap needs to be established for every business and every household and there needs to be constant monitoring and assessment of actual emissions performance to apply the fines for overages and the credits for success. This would obviously involve a very extensive and complex administrative network and an enormous monitoring system. And it would be the case that some very small players from households, for example, would have to take part in an emissions trading market with very minor credits to be traded.

So, in practice, it is generally the case that cap-and-trade systems deliberately exempt smaller players: households, small businesses and even some smaller industrial enterprises.

But, as was the case with carbon taxes, the behavioural change sought by implementing cap and trade still takes time to show results as new technologies need to be developed and implemented over time.

5.11 The Ontario Example

Beginning in January 2017, Ontario established a cap-and-trade system for businesses operating within the province.[129] The Ontario system applies to electricity importers, production facilities and natural gas distributors that emit 25,000 tonnes or more of greenhouse gases per year and fuel suppliers that sell more than 200 litres of fuel per year.[130] Other firms, not included in these mandatory sectors, can apply to join the Ontario program. They may choose to do so to be allocated allowances which may have a market value, if they feel they can reduce their overall emissions during the program.

The initial cap for the Ontario system is set at 143,332,000 tonnes of emissions for 2017 and will be reduced every year until 2020. "Allowances", or permits to allow emissions up to this level, will be provided free of charge to producers and the number of allowances will be reduced each year of the program. Starting in 2018, the number of allowances will be reduced at a rate of 4.57 per cent per year until allowances reach about 87 per cent of current emissions levels in 2020.[131]

If a company is unable to reduce its emissions to match its allowances, it can purchase allowances that other companies do not need through an auction program or, to a limited extent, directly from the Ontario government, which will issue additional allowances at a price expected to be higher than the auction value in quarterly sales. If a company does not have enough allowances to cover its emissions and it has not purchased those allowances through one of the mechanisms above, the province will levy a charge or fine on the company equivalent to the lowest successful bid price at the latest auction.

In this way, Ontario firms that are successful in reducing emissions will have extra allowances that they can sell to those which have not been as successful, gaining income from the sale to offset expenses involved in their reduction efforts.

5.2 HOW DO OUTPUT-BASED ALLOWANCES WORK?

Another regulatory approach can be found in output-based allowance systems, which function like cap-and-trade systems by establishing allowable maximum emissions. But, in this case, the "cap" is established in terms of emissions per unit of output, or emissions intensity, rather than in absolute levels of emissions, as is the case with the Ontario system.[132]

The use of output-based systems allows participating companies to reduce their need for allowances either through lowering their overall emissions while maintaining output, or through raising their output while maintaining emissions. Some may argue that a straight cap-and-trade system as in use in Ontario provides continuing marketable allowances to firms that are reducing overall emissions, perhaps as their production declines and, therefore, provides a subsidy to prolonging dying industries. An output-based system of regulation avoids this problem because lowering overall emissions while lowering output may not leave a company with tradable allowances.

5.3 THE FEDERAL PROPOSAL

In its May 2017 paper, the federal government proposed to allow provinces to adopt, instead of a carbon tax, an output based regulatory control system pricing system.[133]

Under the proposal, any entity (business or industrial producer) with annual emissions of greenhouse gases greater than the CO_2 equivalent of 50,000 tonnes or 50 kilotonnes (kt) will be subject to restrictions on their emissions. Some specifically listed sectors will be exempt, such as municipal buildings, hospitals, universities, schools, commercial buildings, and waste and wastewater facilities.[134]

But, unlike the carbon tax, this restriction would apply to seven main greenhouse gases, not just CO_2, with the emissions of other gases to be included based on their equivalence to carbon dioxide in terms of the level of greenhouse effect they cause. This is called "CO_2 equivalent" or "CO_2e". Since methane has 25 times the impact on climate change than CO_2 has, the CO_2e of a tonne of methane emissions is 25 tonnes of CO_2, for example.

Given the 50,000 tonnes per year threshold, the federal proposal would only apply to large industrial emitters. Industrial producers who emit less than 50 kilotonnes per year are allowed to "opt in" to the federal system, perhaps to earn credits for their conservation efforts, but the system will only be mandatory for those large industrial emitters in the country.[135]

The federal document also suggests that the system will also apply to the upstream oil and gas sector by including venting, flaring and fugitive emissions[136] but the exact method of their inclusion is not discussed in the document.

For those large emitters, an assessment of their emissions will be conducted. Based on that assessment, each firm would be compared to the most efficient producers in their industrial category or that produce the same products, calculated as a ratio of emissions per unit of output. Any emission in excess of that "best-in-class"[137] producer would be subject to a levy based on the number of kilotonnes of emissions by which they exceed the standard. That levy would start at $10 per tonne in 2018, growing to a mature rate of $50 per tonne in 2022.

Companies subject to the levy are reassessed on an annual basis. If their emission levels fall below the "standard" they are issued credits for every tonne of emission they are below the standard. Those credits can be saved for future use or traded with other companies which are over their standard and used to "pay" their levies. In this way, it is assumed the credits will soon trade at a rate roughly equivalent to the levy, since that is the value that they hold to the buying firm.[138]

Any facility exceeding their limit will need to use credits saved from previous years or acquired at other facilities, purchase credits from another producer through an offset framework or pay a levy.

In the end, the system would have a levy of $50 per tonne of CO_2e on all producers exceeding the standard for their industry. It would also establish a set of credits or rewards available to all those producers who are under the standard allowance, which are likely to become worth about $50 per tonne each on the open market.

It should be noted the federal proposal suggests an imposition of an output-based emission allowance system in 2019 with an interim measure to impose the carbon tax on industry in 2018 while the administration of the more complicated regulatory structure is developed.[139] This allowance provides a hint to the administrative complexity of regulatory systems such as output-based allowance systems and cap-and-trade systems, which will be discussed below.

5.31 Impact on Households

Since it is doubtful there are any households in Saskatchewan which exceed the 50 kt threshold for the application of the federal output-based allowance system, it is not likely that there would be any direct impact of such a system on Saskatchewan households.

However, that is not to say households would not be affected by such a system. As was noted in the examination of a carbon tax above, households can be affected indirectly through reduced earnings in affected sectors and/or through higher costs of products produced in affected sectors and consumed within households. These indirect effects can be significant but, requiring a general equilibrium model to estimate, are beyond the scope of this analysis.

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Indirect impacts on households would be expected through the application of the system to business and industry as we will see below.

5.32 Impact on Key Businesses and Industry

It is difficult to assess which particular business enterprises would be subject to an output-based allowance system. Data are collected on emissions of large industrial emitters, but so far these data are not published, especially in light of the protection of proprietary information collected by governments.

Some data exist on an industry-wide basis as collected by Environment Canada as part of its annual National Inventory Report[140] and a table summarizing the emissions for Saskatchewan is included in Appendix A (page 48). The table identifies 44 separate activities or industries and their estimated emissions of greenhouse gases, measured in terms of their CO_2 equivalent and estimated total emissions for the province at 74,800 kilotonnes in 2013.

Much of these emissions occur in activities that would not be subject to limitations, either because the sectors would be exempt, such as agricultural activity and, it is assumed, municipal activities like waste disposal, or because the activities involve a very large number of emitters, none of which is likely to surpass the 50-tonne minimum emission rate for cap and trade to apply.

Once those sectors are dropped from the table we are left with seven sectors that could involve application of cap and trade to at least some of their participants, as shown in Table 11.

Table 11: Saskatchewan sectors subject to cap and trade and level of emissions, 2013

SECTOR	ESTIMATED 2013 GHG EMISSIONS (kt CO_2e)
PUBLIC ELECTRICITY AND HEAT PRODUCTION	16,000
PETROLEUM REFINING INDUSTRIES	1,100
MINING AND UPSTREAM OIL AND GAS PRODUCTION	7,810
DOMESTIC AVIATION	230
OIL AND NATURAL GAS	13,000
PRODUCTION AND CONSUMPTION OF HALOCARBONS, SF6 AND NF3	230
NON-ENERGY PRODUCTS FROM FUELS AND SOLVENT USE	620
TOTAL	**38,990**

Source: Environment Canada, National Inventory report, 1990-2013

The 38,990 kt of emissions from these key sectors represents about 52 per cent of the province's total emissions estimated for 2013. It should be noted, that in some cases the emissions are from many producers in a sector, so it is difficult to estimate how many of these producers would ultimately be subject to the levies under an output-based allowance.

It should also be noted that the emissions subject to levies under such systems are also only those from an individual producer that exceeds the "standard" established for their particular industry. So, for example, companies involved in domestic aviation in Saskatchewan may all operate within "best in class" standards and, therefore, will not have to pay cap-and-trade levies.[141]

Unfortunately, the standards for "best in class" have yet to be established for the federal proposal. Outside of electrical production, which one could assume involves no emissions for at least some Canadian producers, one can only assume that some Saskatchewan businesses and industries are likely to meet industry standards for "best in class" in other categories. That would leave as little as 16,000 kt of emissions from electrical generation subject to the levies in the proposed approach.

If, on the other hand, none of the Saskatchewan producers is as efficient as its counterparts in the industry, the cap on emissions could apply to some or all of the production in the other six sectors shown in Table 11, or an additional 22,990 kt of emissions within the province.

The total emissions covered under this scenario would increase to 38,990 kt, the total in Table 11, and would have a significantly larger economic and fiscal impact than discussed below. Nevertheless, it would still only include 52.1 per cent of the total emission in the province in 2013 as shown in Appendix A (page 48).

For now, it will be assumed that the best-in-class standard to be established by the federal cap-and-trade option would be established on an industry-by-industry basis and that, outside of electrical production, Saskatchewan producers meet or exceed the standard and will be exempt from any cap established in such a system.

5.33 Electrical Impact

The imposition of a levy through an emissions cap at the mature rate of $50 per tonne on electrical generation in Saskatchewan would add about $800 million to the cost of electrical generation in the province based on the 16,000 tonnes of emissions shown in Table 11. This is very close to the $757 million estimated previously for a carbon tax at a similar rate of $50 per tonne.

In the analysis of the carbon-tax option above, it was noted the Statistics Canada Input-Output multipliers for "electrical power generation, transmission and distribution" in 2010 were a ratio of 0.80 for GDP and 2.60 for jobs per million dollars of impact.[142]

Applying those ratios to the likely application of an output-based levy in Saskatchewan would suggest that such a levy would reduce annual GDP by about $640 million and would have a job loss impact of about 2,080 jobs on full implementation. This is a slightly greater impact than was calculated for the carbon-tax option, reflecting our estimation of a higher cost of cap and trade in the electrical industry.

Of course, one is reminded that this is the estimated impact at full implementation in 2022 at $50 per tonne. It would be proportionately smaller at a lower rate of cap-and-trade credits and does not reflect the offsetting benefit which could result from government uses of the revenue generated from a cap-and-trade system as discussed below.

The increased costs of generation in electrical production are also likely to affect electricity prices in the province. Those, in turn, are likely to have a very similar impact on household costs as estimated under the carbon tax above, as an indirect, rather than direct, effect of cap and trade on households, along with the loss of jobs cited above.

If SaskPower passes on the entire costs of cap and trade through increased electrical rates, it would amount to a 37.5 per cent increase in the corporation's sales rates.[143] Such an increase would amount to an increase of about $561 (or about 37.5 per cent) to a typical household's current annual spending of $1,496 as identified by Statistics Canada.[144]

5.4 THE OTHER HALF OF THE STORY – OFFSETS

As was noted in the examination of the carbon tax impacts, the negative impact of regulatory caps on industry or on households does not tell the whole story of economic impacts.

If the government charges $50 per tonne on emissions from electrical generation, it would generate a revenue flow of $800 million from the levy, assuming that the 2013 emissions rates are still appropriate once the system is in place.

As was noted in the discussion of the carbon tax and the disposition of its proceeds, the availability of an additional $800 million for government to spend on other programs would have a positive offsetting economic impact on GDP between 5 per cent and 30 per cent greater than the negative impact through electrical generation.

Or, conversely, the additional $800 million in revenue would allow the Saskatchewan government to eliminate the Corporate Income Tax in the province, or the fuel tax and still have some money left over. Or, the $800 million could reduce Individual Income Taxes by 31 per cent or the sales tax rate by 39 per cent.

If the government were to use the proceeds from levies to fund output-based credits which rewarded efforts to reduce emissions, for example, not only would the economic impacts on industries be substantially reduced for those calculated above, efforts to reduce emissions could be substantially enhanced.

Tax reductions and tax initiatives of this magnitude would also be expected to provide a substantial boost to economic activity in the province, which, unfortunately is beyond the scope of this study to estimate.

Tax reductions and tax initiatives of this magnitude would also be expected to provide a substantial boost to economic activity in the province.

5.41 Caution on Methodology

It is worth repeating that this analysis above was conducted using a standard input-output table. As discussed previously, the shortcoming of static models in the examination of the carbon-tax option also apply in this analysis, especially the fact that such models face severe limitations when one is trying to assess the possibility of changed behavior.

While input-output multipliers are useful in examining relatively small policy measures over a relatively short period of time, imposing an $800 million impact on one sector of the economy over five years is not likely to accurately reflect reactions in a real-world setting.

Again, it should also be noted that the approach taken, by necessity, compares economic consequences of the policy option to current economic conditions as opposed to some potential future state more reflective of the impact of climate change. But, such a benchmark remains far too ill-defined to provide such a standard.

5.42 Other Considerations

There are a number of other factors that should be considered in examining regulatory approaches as a policy option, some of which may be significant to a final decision in choosing the best option.

5.43 Administration

As noted, the federal government's current proposal for output-based allowances involves the estimation of actual emissions from industries and the determination of a minimum standard to be applied as best in class in each industry. But, to ensure proper application, it will be necessary to assess the emissions output of many individual producers that operate below the 50 kilotonne floor, but may eventually exceed the allowable limit, or may choose to "opt in" to the federal system which is allowed in the proposal.

The development and application of a regulatory approach requires at least annual assessments of emissions for all enterprises which are, may be, or choose to be part of this system. This could amount to thousands of individual enterprises across the country and would require a very large administrative structure just to determine the allowable limits for each enterprise, assess their actual emissions levels, apply the levies as appropriate, collect the levies and deal with any appeals of the process.

Since none of the infrastructure required to accomplish these tasks currently exists, all that administration would be additional to the current government operations. A major disadvantage of the imposition of a regulatory system, where none currently exists, is the need to develop and operate a large administrative infrastructure just to get the system operational.

As is the case with any regulatory regime, an output-based allowance system also requires an extensive enforcement mechanism beyond the monitoring role to collect and enforce fines for exceeding caps and/or to identify, assess and evaluate credits for excess enterprises that operate below allowed limits and to track all such credits through an exchange mechanism.

The cost of operating such administrative systems can be very large and, ultimately, must be borne by all taxpayers in the jurisdiction operating such systems, drawing significant resources away from other economic activities.

5.44 Time to Effect

As was the case in carbon taxes, regulation would have an immediate effect on the cost of using high-emissions technology and would make low-emissions technology immediately more attractive than less efficient methods in the industries to which it applied. But, nevertheless, the replacement of all the existing capital infrastructure will still take many years to show the full effect of cap and trade simply because businesses cannot replace their entire technology immediately in response to a change in their costs.

As we saw before, the change in technology may take many years to be fully implemented within some industries depending on the rate at which those industries replace their capital equipment. For example, a coal-fired electrical generating facility may have an operative life span of 40 years or more and is not likely to be replaced much before that useful lifespan is over, although some hastening of turnover may be expected.

Some progress can be achieved through interim efforts such as turning down the thermostat, even if a household may not be replacing its current furnace for several years.

So, implementation of any regulatory approach may also be the first step towards behavioural change, but may not yield its full effects for many years, or even generations.

5.45 Treatment of "Embodied Carbon" or Embodied Emissions

As was the case with the carbon tax, regulatory approaches do not deal with the issue of embedded carbon or embedded emissions as long as there are other jurisdictions which do not have such a system in place. As was discussed in the case of the carbon tax, there is little to be gained from the imposition of an output-based allowance approach if all production of emissions-intensive products simply migrates to jurisdictions where producers can operate without such restrictions in place.

For a jurisdiction like Saskatchewan where much of what we consume comes from elsewhere and much of what we produce goes elsewhere, this is an important consideration in the choice of policy instruments.

For a jurisdiction that imports much of what it consumes, a domestic regulatory system will not address the issue of controlling embedded carbon in the things we consume. And, for a jurisdiction that exports much of what we produce, discouraging hydrocarbon usage within the province may place significant competitive disadvantages on Saskatchewan businesses.

However, advocates of the output-based allowance approach have argued that it is relatively easy to adapt the approach to protect sectors that are potentially exposed to competition from less heavily regulated competitors in other countries, so-called "trade exposed, emissions intensive" sectors such as oil and gas. This is done by relaxing the calculation of the allowance in such sectors compared with less trade exposed or emissions intensive activities, e.g. by basing the calculation for purchasing allowances on the performance of the top 25 per cent of emitters for the former, and the top 10 per cent for the latter and/or by regulating only very large emitters in the former case and including smaller ones in the latter. For these reasons, output based allowances have been treated with some scepticism and alarm in the environmental community. They are seen as having the potential to needlessly weaken the policy in a number of cases where no genuine need for protection from unfair competition has been demonstrated.[145]

Photo credit: iStock by Getty images

5.46 Treatment of other Greenhouse Gases

As proposed by the federal government, the cap-and-trade system would include all identified greenhouse gases at their CO_2 equivalent basis. This makes the cap-and-trade or output-based allowance approaches far more comprehensive in addressing the issue of climate change in terms of the types of emissions it addresses than was the case in the carbon tax, which applied only to products that would produce CO_2 when they were consumed. Given that some of the other compounds that would be included in such approaches are far more significant in their impact on climate change, their inclusion in regulatory approaches is a significant advantage of this system over the application of a carbon tax.

5.47 Measuring Results

Unlike the carbon tax analyzed above, cap and trade and output-based allowances include an inherent system of measuring results on emissions of greenhouse gases. Since every participant in the system is subject to an annual assessment of their emissions, there is a built-in annual record of emission levels and their rate of decline in the operation of cap and trade.

The routine operation of regulatory systems provides a mechanism for indicating progress (or lack thereof) towards reduced emissions.

5.48 Exclusion of Households and Individuals

As noted earlier, the proposed federal approach only applies to large industrial emitters. Although one could design a system that also included household direct emissions, the administrative network required to maintain this approach would be prohibitive and its expense would far exceed any benefit in terms of changed behavior.

But, the usual exclusion of households, individuals, small businesses and small industrial producers from regulation means that the system does not evoke a behavioural change in any of those players in our society, at least directly. The analysis above suggested that regulation may only apply to as little as 21 per cent of the total greenhouse gases emitted in Saskatchewan on an annual basis. So, even if the system evokes a behavioural change on the sectors to which it does apply, it has no direct mechanism to change behavior in the vast majority of activities to which it does not apply.

This is a major disadvantage of regulatory approaches as compared to a carbon tax as a policy instrument to address climate change.

5.5 ISSUES AND BENEFITS OF OTHER REGULATORY APPROACHES

The peculiar combination of strengths and weaknesses of a carbon price as a policy instruments have prompted some policy analysts to revisit the idea that the optimum policy mix to tackle climate change must include regulatory instruments. In Canada, this view is particularly associated with Simon Fraser University economist and climate policy expert, Marc Jaccard.[146]

As we have seen, a critical weakness of carbon pricing is uncertainty about the price level needed to meet Canada's Paris commitments. On the basis of the evidence, particularly from experience of the B.C. carbon tax, few doubt that consumers will initially respond to a carbon price as economic theory predicts, that is, they will reduce their carbon emitting activities. But how intense this effect will be and how long it will last before consumers simply factor the increased price into their budgets and start buying larger vehicles or turning up the thermostat again is uncertain.

One advantage of a regulatory approach is to restore a greater degree of certainty to calculations of the emissions savings that will be achieved by policy intervention. If a particular kind of activity or technology is banned, for example, coal-fired power generation, then, barring evasion, the emissions attributable to that activity or technology will be eliminated (they may appear again in less heavily regulated jurisdictions—the problem of "leakage"—but we'll consider that later).

One advantage of a regulatory approach is to restore a greater degree of certainty to calculations of the emissions savings that will be achieved by policy intervention.

Equally important in Jaccard's view is that regulations seem to be the answer to the problem of the political feasibility of bringing about necessary changes that will inevitably be painful to consumers. As noted in this report, there are many difficulties in calculating the price that carbon must reach to reduce emissions to the levels found in our 2030 and 2050 targets. However, a consensus has emerged that the price will have to be much greater and apply to a much broader range of activities than it currently does in all but a handful of jurisdictions today. Something in the range of $150 to $200 per tonne before 2030 is usually quoted. Given the contemporary political backlash against $30 per tonne, reaching that level is a daunting prospect for any politician facing re-election.

Traditionally, economists have disliked regulation as a policy instrument, in part because of its lack of transparency. While federal regulations are required to go through a prescribed, and often extensive, public consultation period, this does not mean that their effects are necessarily transparent when applied. In reality, consumers have a hard time determining how much a particular regulation—for example an emissions standard for a vehicle—adds to their budget and, unless they are technical experts on regulatory policy, will be unlikely to find out. However, Jaccard argues, this lack of transparency is exactly what is needed in climate change policy if we are ever to achieve the targets that climate scientists and international negotiators have recommended. Precisely because they don't know why buying a new gas-guzzling vehicle or an energy-inefficient home has become so much more expensive, consumers can't respond by punishing the politicians who made the regulation.

Not surprisingly, this is a troubling recommendation for many politicians and policy analysts. To assume that we have to treat our fellow citizens as incapable of making rational decisions, and then to take those decisions on their behalf by what amounts to a calculated deception, is a bitter pill for many democrats to swallow. Conversely, those who advocate it would respond that this is precisely what we mean by identifying climate change as a wicked problem.

Part of its wickedness lies in the fact that we must compromise some of our most deeply-held principles if it is to be solved and, of course, whether we are willing to do that depends on just how seriously we take the problem of climate change in the first instance. For those who believe that the problem has been overblown, it's not worth the sacrifice. Those who believe that we are facing the greatest challenge of our time will likely take the plunge into technocratic policy making.

Reasonable people can and will disagree about the urgency of the problem and about the likely consequences of trading off some degree of democratic accountability and economic efficiency to achieve an effective climate change policy, which is one reason why the climate policy debate is so heated.

But if we do press on, we find ourselves on much more familiar ground for policy analysis. The next task is to find the best kind of regulation to achieve our climate change goals and the challenge is how to compromise efficiency by the least amount needed to achieve those goals when designing regulations. Jaccard poses the challenge as a choice between prescriptive and flexible (sometimes called "smart") regulations.

One reason why regulations are inefficient is that, in some of their most common versions, they take a "one-size-fits-all" approach to changing behaviour. Think of a 50km/hr speed limit in a residential neighbourhood. Some drivers, in some combination of road and weather conditions, could safely drive at a higher speed, arriving at their destination more quickly. Others shouldn't be on the road at all, but everyone is supposed to drive at the same speed. Properly enforced, the speed limit is inefficient but effective. It's an example of a prescriptive regulation.

In climate change policy, prescriptive regulations are such things as biofuels mandates that require gasoline at the pump to contain a certain proportion of ethanol or, on a much larger scale, the elimination of coal-fired electricity generation, unless the power plant has been retrofitted with carbon capture and storage technologies. The approaches prescribe a particular way of doing things and bans all the others, even if the other ways may also achieve the goals of climate change policy.

Flexible regulation, on the other hand, usually sets a target and allows producers to achieve that target in a variety of different ways, sometimes in any way they choose. Failure to achieve the target, however, is a regulatory offence and carries a penalty. Flexible regulation restores an element of choice and avoids the problem of picking technologies or practices that regulators happen to believe, often erroneously, are the best.

Jaccard's favourite example is California's flexible vehicle emissions standard. For more than 25 years, California has required vehicle manufacturers to achieve a steadily increasing market share for zero- and low-emission vehicles sold in the state. From Jaccard's point of view, the beauty of this approach is that the government doesn' t choose between electric, hydrogen or biofuel-powered vehicles. Provided they meet the emissions standard defined in the regulation, all technologies count in calculating market share.

Moreover, the market share calculation will deliver a near certain level of emissions reduction every year. Zero- and low-emission vehicles get access to the market because producers cross-subsidize. That is, they have raised the prices of light trucks and SUVs to subsidize the price of low or zero emissions in order to sell enough of the latter to achieve the targets set out in the regulation. Consumers still get to choose between a low-emission vehicle and a gas-guzzling truck. The latter are not banned as some environmentalists have advocated; they just cost more. As a side effect, California has become a leader in R&D and production for these technologies with all the economic benefits that implies. And, best of all from Jaccard's point of view, the government doesn't get blamed for the price increases.

But flexible regulation is not always practical or desirable. Imagine trying to reduce traffic accidents by removing posted speed limits, setting an upper limit on the number of fatalities from road accidents, and holding drivers accountable by imposing a collective punishment in the form of higher insurance premiums for all if that limit is exceeded. Sometimes the goal is too important, the target population too diffuse or the activity being regulated too risky to allow the degree of choice provided by flexible regulation. Even Jaccard is a proponent of the regulated phase-out of coal-fired electricity generation (albeit with some flexibility in the power mix for jurisdictions currently dependent on fossil fuels). And, as the defenders of carbon pricing will be quick to point out, flexible regulations are still regulations and, as such, are less efficient than a carbon price. The California vehicle standard may nudge consumers into choosing a low-emission vehicle that comes with a hidden cross-subsidy from the mega-SUV in the neighbour's driveway. But a carbon price would allow consumers to make economically rational decisions about their preferred form of transport across the board, including public transit or bicycles, charging them appropriately for the emissions they create.

But flexible regulation is not always practical or desirable.

In fact, of course, while less transparent to the end user, flexible regulations always come at a cost which can be expressed as the "implied price" of carbon in the mind of the regulator. As noted, in this report, while cap-and-trade systems are often treated as versions of carbon pricing (as they are by the federal government in its current approach to setting a national minimum carbon price), cap and trade is more appropriately seen as a form of flexible regulation with an unusually transparent implied price of carbon.

The cap is a regulated maximum level of emissions, usually for a particular emissions-intensive sector, such as steel or cement production that can be easily monitored. The flexibility comes in offering producers the choice of finding innovative ways of meeting the cap or of buying credits to cover the cost of exceeding the cap as a result of a business as usual approach to production.

As the defenders of cap and trade point out, cap and trade comes with the same incentive to innovate that is found with most flexible regulatory schemes, because of the provision that producers who come in under the cap can sell their credits to those who have gone over the limit. The drawback, which is an under-researched feature of any flexible regulation, is that governments come under intense pressure from well-organized industry associations to set the cap at a generous level and to "prime the pump" with extra credits. However, both reduce the incentive to innovate and ultimately risk destroying the market in credits altogether by rendering them worthless. The same kind of political feasibility questions that dog carbon taxes apply to cap and trade.

5.6 CONCLUSION

A cap-and-trade or output-based allowance system would be less intrusive than a carbon tax on Saskatchewan households as it would only apply to large industrial emitters. This limitation, however, is likely to limit its effectiveness in changing the behaviour of households and individuals since they only feel its effects indirectly, through their electrical power bill, for example.

Output-based allowances may also have negative consequences for the economy through raising operating costs for some sectors within that economy, but again, depending on the disposition of the revenue it generated, an offsetting positive effect could also be accomplished.

The primary advantage of a regulatory approach is its built-in monitoring of progress on the reduction of greenhouse gases. Its major disadvantage is the enormous administrative and enforcement infrastructure required to implement and operate it, a common feature of regulatory regimes of any sort. The current federal proposal for output-based allowances uses the common approach of limiting the number and size of regulated bodies to large emitters. While this helps to reduce the administrative burden and enforcement costs, which are also a common problem in regulatory approaches, it also impinges on the likely effectiveness of such an approach in changing the behaviour of individuals and households.

The fact that industrial regulation is more likely to operate in a way that is unseen by individuals and households could be expected to have a reduced impact on their behaviour as emitters of greenhouse gases.

As was the case with a carbon tax, the local imposition of a cap-and-trade system or an output-based allowance system will not address the issue of embedded carbon or embedded emissions —those that are caused in the production of imported goods. Because of this, adopting a regulatory approach will require a leap of faith in the willingness of other jurisdictions to act in parallel, as discussed in earlier chapters.

Appendix A: Greenhouse gas emission summary for Saskatchewan 1990–2013

GREENHOUSE GAS CATEGORIES kt CO_2 equivalent	1990	2000	2005	2009	2010	2011	2012	2013
TOTAL	**45 000**	**68 100**	**69 500**	**70 200**	**69 800**	**69 200**	**71 700**	**74 800**
ENERGY	**36 300**	**55 800**	**55 100**	**56 700**	**57 100**	**56 000**	**57 600**	**59 500**
a) Stationary Combustion Sources	**20 300**	**27 000**	**27 600**	**29 400**	**29 600**	**29 100**	**29 300**	**29 700**
Public Electricity and Heat Production	11 200	14 600	15 300	16 500	16 300	15 700	16 200	16 000
Petroleum Refining Industries	620	630	780	950	1 100	980	1 200	1 100
Mining and Upstream Oil and Gas Production	4 150	6 750	7 540	7 420	7 710	8 010	7 490	7 810
Manufacturing Industries	792	1 100	533	556	628	705	808	882
Construction	70.4	49.1	42	49.1	70.8	55.7	37.3	35.7
Commercial and Institutional	985	1 650	1 490	1 610	1 380	1 280	1 110	1 200
Residential	2 180	1 980	1 660	1 830	1 970	1 820	1 770	1 890
Agriculture and Forestry	296	272	257	533	531	615	661	772
b) Transport[1]	**9 330**	**11 200**	**11 800**	**14 300**	**15 000**	**14 400**	**15 200**	**16 600**
Domestic Aviation	260	220	190	180	190	190	220	230
Road Transportation	4 100	5 700	5 870	7 050	7 290	7 210	7 590	7 770
Light-Duty Gasoline Vehicles	1 240	1 330	1 080	1 330	1 370	1 270	1 380	1 450
Light-Duty Gasoline Trucks	902	1 790	1 810	2 240	2 310	2 140	2 330	2 450
Heavy-Duty Gasoline Vehicles	596	372	360	462	481	449	493	524
Motorcycles	2.29	6.14	7.33	9.41	9.81	9.15	10	10.7
Light-Duty Diesel Vehicles	10.1	10.6	11.2	16	17.2	16.7	18.7	20.4
Light-Duty Diesel Trucks	58.4	209	233	306	319	300	329	346
Heavy-Duty Diesel Vehicles	1 230	1 950	2 360	2 670	2 770	3 020	3 030	2 960
Propane and Natural Gas Vehicles	65	26	11	12	11	10	13	9.7
Railways	590	410	x	x	x	x	x	x
Domestic Navigation	0.1	-	x	x	x	x	x	x
Other Transportation	4 400	4 900	5 300	6 600	6 900	6 300	6 900	7 900
Off-Road Gasoline	1 200	690	920	1 300	1 500	980	1 500	1 600
Off-Road Diesel	1 600	1 900	2 500	3 000	3 200	3 300	3 300	4 300
Pipeline Transport	1 590	2 340	1 900	2 290	2 170	2 070	2 040	2 030
c) Fugitive Sources	**6 700**	**18 000**	**16 000**	**13 000**	**12 000**	**12 000**	**13 000**	**13 000**
Coal Mining	20	20	20	20	20	20	20	20
Oil and Natural Gas	6 700	18 000	16 000	13 000	12 000	12 000	13 000	13 000
d) CO_2 Transport and Storage	**-**	**0.09**	**0.09**	**0.09**	**0.09**	**0.09**	**0.09**	**0.09**
INDUSTRIAL PROCESSES AND PRODUCT USE	**36 300**	**55 800**	**55 100**	**56 700**	**57 100**	**56 000**	**57 600**	**59 500**
a) Mineral Products	**98**	**16**	**12**	**12**	**8.5**	**12**	**18**	**18**
Cement Production	88	-	-	-	-	-	-	-
Lime Production	-	-	-	-	-	-	-	-
Mineral Products Use	10	16	12	12	8.5	12	18	18
b) Chemical Industry[2]	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Adipic Acid Production	-	-	-	-	-	-	-	-
c) Metal Production	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Iron and Steel Production	-	-	-	-	-	-	-	-
Aluminum Production	-	-	-	-	-	-	-	-
SF_6 Used in Magnesium Smelters and Casters	-	-	-	-	-	-	-	-
d) Production and Consumption of Halocarbons, SF_6 and NF[3]	**1.8**	**140**	**180**	**200**	**200**	**210**	**220**	**230**
e) Non-Energy Products from Fuels and Solvent Use	**210**	**470**	**580**	**490**	**510**	**660**	**580**	**620**
f) Other Product Manufacture and Use	**6.2**	**14**	**11**	**7.8**	**7.9**	**9.1**	**12**	**12**
AGRICULTURE	**7 900**	**11 000**	**13 000**	**12 000**	**11 000**	**11 000**	**12 000**	**13 000**
a) Enteric Fermentation	**3 300**	**4 700**	**6 100**	**5 200**	**4 900**	**4 800**	**4 900**	**4 800**
b) Manure Management	**790**	**1 100**	**1 400**	**1 200**	**1 200**	**1 100**	**1 200**	**1 200**
c) Agriculture Soils	**3 500**	**4 700**	**4 700**	**4 900**	**4 500**	**4 900**	**5 600**	**6 600**
Direct Sources	2 900	3 700	3 700	3 900	3 500	3 800	4 400	5 100
Indirect Sources	600	900	1 000	1 000	1 000	1 000	1 000	1 000
d) Field Burning of Agricultural Residues	**70**	**50**	**30**	**30**	**20**	**20**	**20**	**30**
e) Liming, Urea Application and Other Carbon- containing Fertilizers	**200**	**400**	**400**	**600**	**600**	**600**	**700**	**900**
WASTE	**590**	**750**	**820**	**860**	**890**	**900**	**920**	**850**
a) Solid Waste Disposal on Land	**550**	**710**	**780**	**820**	**840**	**860**	**870**	**810**
b) Wastewater Handling	**40**	**42**	**41**	**42**	**43**	**43**	**44**	**45**
c) Waste Incineration	**0.51**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Source: Environment Canada, National Inventory Report, 1990-2013, Part 3 at: http://publications.gc.ca/collections/collection_2016/eccc/En81-4-2013-3-eng.pdf, accessed June 7, 2017.

06

Impact Assessment of a Technological Option

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06

Impact Assessment of a Technological Option

Another option often proposed in response to the climate change issue involves adopting alternative technologies to displace current sources of greenhouse gases. Any number of such technologies have been proposed and/or are currently under development or application, including:

- Nuclear power options;
- Hydroelectric power;
- Photovoltaic electricity generation;
- Solar thermal electric generation;
- Geothermal energy options;
- Use of carbon offsets, sinks and carbon capture;
- Wind power; and,
- Biomass thermal electric power.

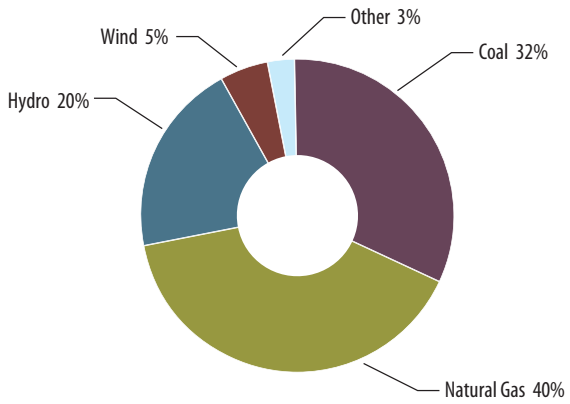
The potential combinations are almost endless. There is a continuing effort to improve on these technologies and to develop even newer technologies that could provide options to advance policy. Of course, with limitless combinations of these approaches available, it is a challenge to analyze their potential impacts without choosing a specific package or collection of choices.

One application of this approach has been proposed by SaskPower in its own "Plans for a Sustainable Power Future",[147] which employs some of the technological options discussed above in a specific package of initiatives to address its greenhouse gas emissions. So, as an example of the application of "the technological alternative", which is already in the public domain as a proposal, this option will be the basis of the analysis of one of the alternative technology options—the only one that is currently "on the table" in Saskatchewan.

6.1 THE SASKPOWER PROPOSAL

In its proposal, SaskPower, the province's largest electrical utility, suggests a plan to expand its current generating capacity with an increasing share of renewable energy sources, while it continues its plan to reduce emissions from its current capacity through the application of carbon-capture-and-storage technology. The current (2016) mix of electrical sources is shown in Figure 14.

Figure 14: SaskPower generating capacity, 2016

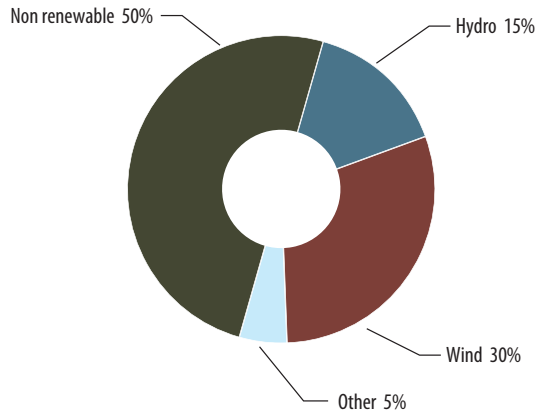


Total = 4400 MegaWatts

Source: Plans for a Sustainable Power Future, power point presentation, November 17, 2016 at: http://www.saskpower.com/wp-content/uploads/SaskPower_Plans_Sustainable_Power_Future_Nov2016.pdf, accessed June 13, 2017.

In the proposal, SaskPower projects an alternative mix of sources to be put in place by 2030 as shown in Figure 15.

Figure 15: Proposed SaskPower generating capacity, 2030



Total = 7000 MegaWatts

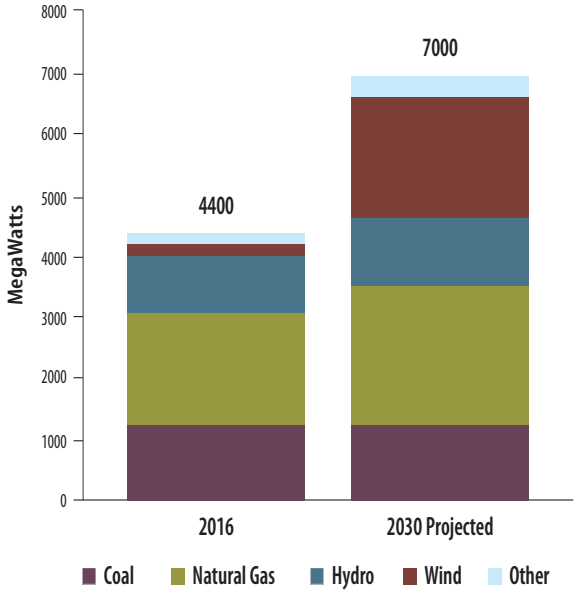
Source: Plans for a Sustainable Power Future, power point presentation, November 17, 2016 at: http://www.saskpower.com/wp-content/uploads/SaskPower_Plans_Sustainable_Power_Future_Nov2016.pdf, accessed June 13, 2017.

Unfortunately, the presentation of the proposal has combined the sources from coal and natural gas in 2030. As a result, it limits the comparability of the utility's current capacity with the proposed sources of electrical power in 2030, an issue that will be addressed in the analysis to follow.

It is also notable that SaskPower suggests that this strategy will reduce its overall emissions of greenhouse gases by 40 per cent from current levels,[148] assuming the stated "goal" is achieved by the mix suggested above.

Another presentation of the data above as provided in Figures 14 and 15 is shown in Figure 16 to allow a side-by-side comparison of the 2016 and 2030 (proposed) generation structures. In Figure 16, it is assumed that the current coal capacity remains in place at about 80 per cent of the utility's coal capacity, and is projected to last until near 2030.[149]

Figure 16: SaskPower proposed generation structures



Source: Plans for a Sustainable Power Future, power point presentation, November 17, 2016 at: http://www.saskpower.com/wp-content/uploads/SaskPower_Plans_Sustainable_Power_Future_Nov2016.pdf, accessed June 13, 2017.

It would appear that, if SaskPower's proposal includes a retention of its current coal-generating capacity, supplemented by alternative sources, the proposal involves an overall increase in capacity of 59.1 per cent from the current level of 4400 MW, including increases in wind-powered capacity of 854 per cent, in natural gas fueled capacity of 18.9 per cent, and in hydroelectric capacity of 19.3 per cent.

It appears, therefore, that the SaskPower proposal relies very heavily on a significant increase in the use of wind power (from the current 220 megawatt capacity to the proposed 2100 megawatt capacity) and, to a lesser extent, on using more hydroelectric power and more natural gas power in its generating

capacity. At the same time, the introduction and full application of carbon capture, utilization and storage on the remaining coal-fired capacity appears to be contributing to its planned reduction in emissions levels even if the coal-fired capacity is stable.

It is also important to note that capacity and actual generation rates can vary significantly, especially by source of energy. In 2016-17, for example, SaskPower's generating capacity included 20 per cent in the form of hydro power and 5 per cent in the form of wind power. But in actual generation, only 14 per cent of their electricity came from hydro power and 3 per cent came from wind power. Conversely, the actual generation from coal- and gas-fired generation exceeded their share of electrical capacity by 10 and 4 percentage points, respectively.[150]

6.11 Electrical Impact

The mix planned for 2030 in the SaskPower proposal is important in assessing the package since there are clear cost differences between sources of power. For example, in the last SaskPower rate application it estimated that the fuel and purchased power prices for different sources were as shown in Table 12.

Table 12: SaskPower estimates of fuel and costs to purchase of alternative sources, 2016

SOURCE	2016 COST per MWh
NATURAL GAS	$37.25
COAL	$20.56
WIND	$86.38
HYDRO-ELECTRIC	$4.72

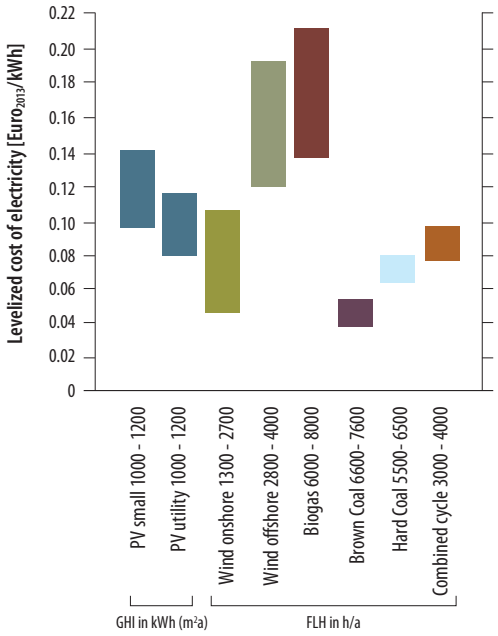
Source: SaskPower, Rate Application to the Saskatchewan Rate Review Panel, 2016 and 2017, p. 28 at: http://www.saskratereview.ca/docs/saskpower2016/2016-and-2017-rate-application.pdf, accessed June 14, 2017.

As Table 12 indicates, hydro-electric power is the lowest cost option available at a purchase cost of only $4.72 per MWh, compared to coal-fired capacity which costs $20.46 per MWh just for the coal, and natural gas which costs $37.25 per MWh just for the natural gas. The most expensive option is the use of wind power at a cost of $86.38 for the full purchase price. Unfortunately, the comparison above is not really complete as it refers to the purchase cost in two instances (hydro-electric and wind power) and to just the fuel costs in two other instances (natural gas and coal). In the latter cases, the fuel purchased still has to be turned into electricity while in the former case, the prices above refer to electricity after conversion.

So, the data provide by SaskPower does not provide an adequate basis for estimating the likely cost of an alternative mix of technologies to the one it is currently using. Because of this inconsistency in the data available from SaskPower, more consistent comparative data from elsewhere will have to form the basis of our analysis.

A 2013 study in Germany examined the levelized cost of electricity (LCOE) and found the comparable final costs of producing electricity as identified in Figure 17.

Figure 17: Levelized cost of electricity in Euro/kWh



Source: Franhaufer Institut for solar Energy Systems, Levelized Cost of electricity Renewable Energy Technologies, November 2103, p. 2 at: https://www.ise.fraunhofer.de/content/dam/ise/en/documents/publications/studies/Fraunhofer-ISE_LCOE_Renewable_Energy_technologies.pdf, accessed June 14, 2017.

As Figure 17 illustrates, the cost of electricity from brown (lignite) coal ranged from about 38 Euros to 53 Euros per MWh (CDN$57 to CDN$79), while onshore wind ranged from 45 Euros to 107 Euros per MWh (CDN$67 to CDN$159) and Combined Cycle Natural Gas systems ranged from 75 Euros to 98 Euros per MWh (CDN$112 to CDN$146).

A similar study by the US Energy Information Administration[151] estimated the LCOE of hydroelectric developments to range from US$69 to US$107 per MWh (CDN$92 to CDN$142). At the same time, it estimated the difference between conventional coal generation and coal generation with carbon capture and storage (CCS) at US$49 per MWh (CDN$65).

Using the medians for these ranges, a table can be constructed to calculate the expected cost impact of SaskPower's proposed climate change plan by comparing the cost per MWh of the 2030 proposed system with the cost per MWh of the current mix of sources employed by SaskPower as shown in Table 17.

Table 13: Implications of the SaskPower proposal for costs of operations (in 2016 dollars)

	Median LCOE per MWH	2016 Capacity MW*	2016 Cost/yr. Millions	2030 Capacity MW*	2030 Cost/yr. Millions
Coal	$68	1408	$95.7	0	$0
Coal with CCS	$133	0	$0	1408	$187.3
Natural Gas	$129	1760	$227.0	2092	$269.9
Hydro	$117	880	$103.0	1050	$122.9
Wind	$113	220	$24.8	2100	$237.3
Total	**Na**	**4268**	**$354.8**	**6650**	**$817.4**
Weighted Cost per MW			$83		$123

Source: SaskPower, Annual Report, 2015-16, p. 62, at: http://www.saskpower.com/wp-content/uploads/2015-16_SaskPower_annual_report.pdf, accessed June 15, 2017.

(Excluding "Other Sources" of 132 MW or 3% in 2016 and 350 MW or 5% in 2030)*

From Table 13 it can be seen that the weighted cost of electrical generation in 2030 of $123 per MW is 48.2 per cent higher than the estimated costs of $83 per MW in 2016 if current relative costs of production continue. While these assumptions are challenging, they are illustrative of the magnitude of cost changes that may be faced by SaskPower, even if their experience may vary significantly from these calculations.

The SaskPower Annual Report for 2015-16 identifies a total corporate cost for "Fuel and Purchased Power", "Operating, Maintenance and Administration" and "Depreciation and Amortization" at $1.646 billion in 2015 (12 month basis).[152] Unfortunately, these identified costs include costs of distribution and administration as well as costs of electrical generation, so it is difficult to identify what proportion applies to those specific costs.

If these costs were to experience an increase of 48.2 per cent as calculated in Table 13, due to a change in the mix of sources of electricity as proposed by SaskPower, the corporation could see an increase in its operating costs of ($1.646 billion x .482) about $790 million. This estimation allows for the adjustment from the 2016 mix of sources to the 2030 mix of sources proposed but holds the level of total generation constant to allow estimation of a cost per unit of output comparison.

An impact of $790 million per year on the operating costs of SaskPower through the adoption of alternative technologies in the generation of electricity is remarkably similar in magnitude to the estimated impact of a carbon tax ($757 million) or the imposition of a cap-and-trade option ($800 million) as discussed above.

6.12 Overall Economic Impact

In the analysis of the carbon tax and the cap-and-trade options above, it was noted the Statistics Canada Input-Output multipliers for "electrical power generation, transmission and distribution" in 2010 were a ratio of 0.80 for GDP and 2.60 for jobs per million dollars of impact.[153]

Applying those ratios to the projected annual cost increase in the technological solution would suggest the increased costs of production under that option would have an overall impact on the economy of $632 million on GDP. It would also reduce the number of jobs in the province by 2,054 in 2030 and thereafter.

6.13 Household Impact

As identified above, Statistics Canada[154] notes that an average Saskatchewan household spent $1,496 on electricity for principal accommodation in 2015.

Increased electrical generation costs calculated at $790 million per year under the proposed SaskPower technology option would add about 35.5 per cent to SaskPower's total operating costs, or about 37 per cent to its value of electricity sales in Saskatchewan.[155]

Applying this ratio, and assuming no change in consumption of electricity and the full cost is passed on to consumers , it would appear the proposed tax on hydrocarbons in the federal program could be expected to add about 37 per cent to the annual cost of household electricity use, or about $553 per year in 2030.

Of course, households would also be indirectly affected through the economic impacts discussed above in terms of job impacts and overall GDP impact, but these are not directly attributable.

6.2 THE OTHER HALF OF THE STORY – OFFSETS

As was noted in the examination of the carbon tax impacts and cap and trade, the negative impact of the technological option through increased cost to SaskPower does not tell the whole story of economic impacts.

Additional spending by SaskPower could also impact, in a positive way, other sectors of the economy since it could represent additional revenue to those sectors. The adoption of alternative technologies could provide input into sectors to the extent that it flows to Saskatchewan-based activities, such as Carbon Capture and Storage or the natural gas sector, but would not do so to the extent that imported technologies, such as wind power and, potentially, hydroelectric power, are used in the technology.

Unfortunately, such an analysis would require the application of general equilibrium modelling and is beyond the scope of this study to estimate.

6.21 Caution on Methodology

The economic impact assessment was conducted using a standard input-output table and that the shortcoming of static models, as discussed previously, also applies in this analysis, especially the fact that such models face severe limitations when one is trying to assess the possibility of changed behavior.

While input-output multipliers are useful in examining relatively small policy measures over a relatively short period of time, imposing a $790 million impact on one sector of the economy over thirteen years is not likely to accurately reflect reactions in a real-world setting.

6.22 Other Considerations

There are a number of other factors that should be considered in examining technological solutions as a policy option, some of which may be significant to a final decision in choosing the best option.

6.23 The Availability of Alternatives

As with the regulatory approach, discussions of alternative technologies sometime neglect two crucial factors. One is the question of availability of alternatives. The other is they seek to deflect the availability issue by overly-generous assumptions about the potential for reduction in demand through efficiency gains, or even major lifestyle changes. However, assuming that security of supply remains a key component of energy policy, especially where electricity is concerned, maintaining supply at a reasonable cost to consumers is a significant constraint on policy options.

Photo credit: iStock by Getty images

We have already started to see rising electricity costs becoming an election issue in Ontario and, as a result, politicians in other provinces are likely to be cautious. Long lead times for the planning and regulatory approval of major infrastructure projects such as hydro-electric dams, nuclear or gas-fired power stations, or even interprovincial power lines, mean that we cannot simply assume that alternative sources of power will be readily available.

One of the advantages of small-scale renewables is that they can be brought on stream relatively quickly compared with larger power projects. But the challenge remains how to bring more intermittent sources of electricity onto the grid without compromising security of supply. Jurisdictions such as Saskatchewan, where there are relatively few connections to other sources of power outside the province to back up intermittent generation, are generally taking a cautious, incremental approach to adding renewable. They are right to do so.

The question of security of supply is especially important in the longer term. Most studies of how Canada might be able to reach its 2050 commitments on emissions have concluded that "deep decarbonization" will be required.[156] This will include phasing out any kind of fossil-fuel home heating and a general switch to electric vehicles, except for long-distance trucking and air travel (where biofuels will be required). Contrary to some of the claims about reducing electricity demand, deep decarbonization is going to require more electricity rather than less, and having access to electricity at a reasonable cost will more than ever be a requirement for social inclusion. Tackling energy poverty, defined as spending more than 10% of disposable income on energy, will be closely tied to our ability to generate clean electricity relatively cheaply. Technology, including storage options for intermittent power generation, will be vital to success and we need to acknowledge the importance of provincial policies that are investing in and experimenting with these technologies now.

The question of security of supply is especially important in the longer term.

6.24 Administration

The adoption of technology is, in effect, a layering on of additional capacity within the electrical generation infrastructure that already exists within the province. As such, there is a minimal additional administrative burden from this option since the agency involved, the electrical power utility, would be engaged in this as a "business as usual" activity.

Aside from some additional costs in terms of diversification of the capacity and the learning of new technologies in production, the administrative ease with which new technologies can be adopted is a major advantage to this option.

6.25 Time to Effect

Unlike the case in carbon taxes and cap and trade, the adoption of new technologies does not operate through a "pricing" mechanism and, therefore, would have no immediate effect on the cost of using high-emissions technology, or on making low-emissions technology more attractive. The ultimately higher cost of electricity in the province may encourage other behavioural changes away from electrical use which, in the SaskPower proposal, would still be reliant for 50 per cent of its sourcing from non-renewable resources, albeit using cleaner technologies than currently in place.

But, again, the replacement of the existing capital infrastructure will still take many years to show the full effect of a technological solution because businesses and households cannot replace their entire technology immediately in response to a change in their costs. In fact, this option, reaching maturity in 2030, would take thirteen years to fully develop as compared to the five years in the options included in the federal proposal.

So, implementation of technological options may be considered a first step towards behavioural change, but may not yield its full effects for many years, or even generations.

6.26 Treatment of "Embodied Carbon" or Embodied Emissions

The technological solution also does not deal with the issue of embedded carbon or embedded emissions as long as there are other jurisdictions which do not have such a system in place. As discussed in the case of the carbon tax and cap and trade, there is little to be gained from reducing the emissions from electricity in Saskatchewan if all production of emissions-intensive products simply migrates to jurisdictions where producers can operate without having to pay for the costs of using such methods.

For a jurisdiction like Saskatchewan that imports much of what it consumes, the technological option will not reduce the level of embedded carbon in the things we consume. And, for a jurisdiction that exports much of what we produce, raising the cost of electricity may place significant competitive disadvantages on Saskatchewan businesses.

6.27 Treatment of other Greenhouse Gases

The SaskPower solution is predominantly focused on reducing CO_2 emissions in electrical production through the adoption of carbon capture and storage on existing coal generation and through adding more renewable-sources of electrical production.

But, this approach does very little to address the emissions of other greenhouse gases within SaskPower's operations or, as we will see, in other sectors of Saskatchewan's economy.

6.28 Measuring Results

The technological option provides a mechanism for monitoring the overall level of CO_2 emissions within the SaskPower's operations. For example, the application of carbon capture and storage will yield evidence of the number of tonnes of $C0_2$ captured and stored. In addition, the corporation will be able to estimate its emissions rates and emissions intensity on an annual basis to report on the extent it has moved towards a low carbon economy.

This is also an advantage of the technological option as it was with cap and trade.

6.29 Exclusion of Other Sectors, Households and Individuals

As proposed by SaskPower, the technological solution only applies to the generation of electricity in Saskatchewan. As indicated in Table 11, the electrical sector is certainly the largest emitter of greenhouse gases in the province but, even at that, the total emissions covered by this option only amount to 21.4 per cent of the total emissions identified in Appendix A (page 48) in 2013. The exclusion of other industries, households and individuals from the technological option means that the system does not evoke a behavioural change in any of those players in our society, at least directly, except, perhaps through slightly higher electrical charges.

Even if the technological approach were to result in a complete elimination of greenhouse gas emissions within the electrical sector, it would still leave nearly 80 per cent of the emissions in the province untouched. And, it should be remembered, the SaskPower proposal has only promised to reduce its emissions by 40 per cent by 2030. If this is accomplished, emissions levels in the province would still be 91.4 per cent of their 2013 levels once the option was fully implemented.

The major disadvantage of this option is the fact that it has no direct mechanism to change behaviour in the vast majority of activities to which it does not apply. A carbon tax, as examined in Chapter 4 and a regulatory approach, as examined in Chapter 5 would each apply to a much more significant proportion of human activity in the province, suggesting that the technological approach as proposed by SaskPower could be expected to have much less success in reducing overall emissions in the province than either of those approaches.

6.3 CONCLUSION

Addressing climate change through a technological approach has the advantage of targeting results and providing ready measures of reduction in emissions. And, the use of alternative technologies can be adopted on a "business as usual" basis within the electrical utilities.

Without any government involvement, there are no fiscal consequences and there is not a flow of funds into and out of the government hands, making the technological option less intrusive from a policy perspective, at least at first blush.

That is not to say there would not be a significant flow of funds involved. The conversion can add additional cash needs onto the electrical utilities, in line with the costs to them of either the carbon tax or the cap-and-trade approach, and that would likely require a significant increase in household and business expenses. Wind, solar and carbon capture technologies, for all their cleanliness, are more expensive to operate than a thermal-electric technology based on lignite coal. Someone will have to pay for that increased cost of operation, either through higher electrical rates, lower dividends to the government (and the tax/service implications of that), or subsidies from the government supported by higher tax collections.

As we have seen, alternative technologies to SaskPower's current reliance on hydrocarbon generating, especially through its use of lignite coal, tend to cost much more to operate. These costs will be paid by someone, either consumers or shareholders in the company, unless they are directly subsidized by government and passed on in higher taxes to taxpayers, or unless some technological advancement significantly lowers costs from their current level.

The primary disadvantage of the SaskPower technological proposal, and many like it, is that it only applies to electrical generation which accounted for only 21.4 per cent of Saskatchewan emissions in 2013.[157] That would leave unaffected the behaviour of households, individuals and all other industries—roughly 80 per cent of the emissions sources within the province.

As with the other option discussed in Chapters 4 and 5, adopting alternative technologies in the production of electricity in Saskatchewan would not address the issue of embedded carbon or embedded emissions—those that are caused in the production of imported goods. As with the other options, adopting new, more expensive electrical technology will also require a leap of faith in the willingness of other jurisdictions to act in parallel, as discussed in earlier chapters.

07

The Constitutional Challenge of Climate Change
– A story of natural resources, electricity, environment, and beer

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07

The Constitutional Challenge of Climate Change – A story of natural resources, electricity, environment, and beer

This chapter asks the question, who has the power to legislate in relation to greenhouse gas emissions and climate change? Is it the federal government, or the provinces? The Government of Saskatchewan's position is that this is a provincial domain as set out in the Canadian Constitution, which would make a federal carbon tax illegal. The provincial government has indicated it is prepared to back up the assertion with legal action. The actions of other provinces to adopt carbon taxes or cap-and-trade schemes would intuitively support this stance. It is noteworthy that recently the Government of Manitoba received independent legal advice that the federal government has constitutional authority to impose a national price on carbon. But what are the constitutional arguments?

An analysis of the legislative domain surrounding GHG emissions within the Canadian Constitution entails more than an analysis based on past and current provincial and federal practices, but includes constitutional laws and policies in energy and related fields.[158] To explore this issue constitutionally, we will consider a few constitutional rules, reflect on Canadian constitutional history, and speculate on future constitutional trends.

7.1 THE DIVISION OF POWERS

The legislative powers of the provincial and federal governments were initially carved out in the British North America Act negotiated in 1867 by Canada's founding members. Sections 91 and 92 set out specific lists of matters within the provincial and federal jurisdictions respectively in what is now the Constitution Act. Basically the federal government's powers include such things as interprovincial and international trade, trade affecting the whole Dominion, the Criminal Code and direct taxation. Provincial powers include matters that were considered more localized in nature, including property and civil rights, intra-provincial trade, and natural resources. As automobiles and light bulbs were things of the future, environmental conservation and protection concerns were of little significance in 1867. Such specific topics were not detailed within the British North America Act. It is left for people, constitutional lawyers, politicians and judges to attempt to determine whether such new matters are of federal or provincial jurisdiction, or possibly both. When governments, and ultimately courts, determine whether a matter is within provincial or federal jurisdiction, a conclusion is made of the 'pith and substance,' or essence, of specific legislation in order to ascertain if it falls within the jurisdiction of one or the other order of government. For example, the federal government would not have jurisdiction to enact legislation concerning provincial rules of property ownership and provincial governments would not have jurisdiction to enact rules of international trade.

This gives rise to the question of the pith and substance of GHG emissions and the order of government with jurisdiction over GHG emissions. This issue is not entirely clear. Therefore, this chapter will not be definitive and is not to be considered legal advice, but merely thoughts on possible legal interpretations. The answer is probably that neither level of government has exclusive jurisdiction. But given the wicked nature of the problem of climate change, there is still legislation addressing the issue of GHG emissions that may not be within the federal government or provincial government's legislative jurisdiction. Arguments of provincial jurisdiction will be reviewed, followed by avenues of federal jurisdiction.

7.2 THE PROVINCIAL ARGUMENT

GHG emissions result primarily from activities in the oil, gas, mining industry, electricity, agriculture, and transportation sectors, all of which are within the jurisdiction of the province (with the last two, agriculture and transportation being both provincial and federal). Provinces have the ability to create a carbon tax that applies within the province via s. 92(2) of the Constitution. Or it can create a cap-and-trade scheme via its powers of regulating provincial business and in relation to local provincial undertakings (92 (10)), property and civil rights (92(13)), and its specific rights in 92A relating to the development and management of non renewable natural resources, forestry resources, and electrical energy and its taxation.

Section 92A (enacted in 1982) provides the provinces with jurisdiction to make laws in relation to exploration for, development, conservation and management of non-renewable natural resources, forestry, and electrical energy production. It extends as well to the export to other parts of Canada of primary production of non-renewable natural resources and production from electrical generation facilities. Such laws can't discriminate between different provinces.

Due to this 1982 amendment, revenue-raising powers in relation to non-renewable natural resources and sites and facilities in the province for the generation of electrical energy and production there from, are matters of provincial jurisdiction. However, this taxation power can't be used to levy an 'export' tax at the boundaries of the producing province, which would include the coupling of tax measures with a rebate program that favours consumption or use within the province. The taxation powers of the producing province can't be used as an indirect means of interfering with extra-provincial trade in resource production (Cairns et al. 1985). This interference will be revisited in relation to the subject of beer and the Comeau case addressed by the Supreme Court discussed at the end of this chapter.

Having jurisdiction over these subject areas also allows for the possibility of provincial command-and-control regulations setting GHG emission limits or mandating specific technology to limit GHG emissions. In order to oppose federal legislation surrounding GHG emissions, the argument will be made that the legislation is in pith and substance pertaining to these matters that are provincial matters. Clearly, the sources of GHG emissions are within the jurisdiction of the province. The argument will also have to be made by the Government of Saskatchewan that the essence of the issue is not properly within the jurisdiction of the federal government. This raises the question of what justification the federal government will argue for its carbon legislation.

> Clearly, the sources of GHG emissions are within the jurisdiction of the province.

7.3 THE FEDERAL ARGUMENT

It can be anticipated that the federal government will argue that its GHG emission legislation is in its essence a matter within the federal jurisdiction and/or is shared with the provinces. Although the federal government doesn't have jurisdiction over the causes of GHG emissions (such as oil, gas, mining and electricity sectors), it may have jurisdiction over the effects of GHG emissions. The courts have considered the environment as a domain not exclusively under the jurisdiction of one or the other level of government, given the environment's importance and pervasiveness.

In the 1992 case of the Friends of the Oldman River, the Supreme Court of Canada determined that each level of government can legislate in relation to environmental matters when it is acting from the basis of one of its constitutional powers. Although the provincial role is particularly germane with its jurisdiction in relation to crown land, property and civil rights and natural resources, provinces can't address the cross-border aspects of pollution, which is necessarily a matter of federal jurisdiction. In 1988 the Supreme Court, in the case of *R. v. Crown Zellerback*, recognized the federal government's ability to prohibit the dumping of waste into the sea under the national concern doctrine of the "peace order and good government" clause of the constitution. Matters that are of concern for Canada as a whole, and can't be cooperatively solved by the provinces, or where failure of one province impacts the residents of another, are those that are of 'national concern.' In order to assert jurisdiction over GHG emissions, their impacts—resulting sea level rise, increasing variability of weather, increasing length and intensity of extreme dryness (drought) or precipitation (flood)—would need to be regarded as matters of national concern.

An argument that supports the national concern position includes Section 132 of the Constitution, which empowers the federal government to perform its international treaty obligations, such as the Paris climate change commitments. International conventions have been used as evidence advancing the federal argument of

national concern, and one that will help qualify GHG emissions as a single distinct matter, thereby separate from the provincial sectors of oil, gas, electricity etc. However, the federal government can't overpower the provincial powers that were previously detailed, and must act cooperatively in doing so. Clearly Manitoba and Saskatchewan are not viewing the federal government's position as cooperation, but as overpowering.

Lawyers, government bureaucrats, and judges rarely agree on the law or its application. Hsu and Elliott (2009) argue that the national concern doctrine is not appropriate for the regulation of GHG emissions by the federal government. In the Crown Zellerbach case referred to above, the national concern test was described as:

> (f) or a matter to qualify as a matter of national concern… it must have a singleness, distinctiveness and indivisibility that clearly distinguishes it from matters of provincial concern and a scale of impact on provincial jurisdiction that is reconcilable with the fundamental distribution of legislative power under the Constitution.

The implication is that provincial failure to legislate on a matter would have significant harmful effects on extra-provincial interests. This argument is hard to make given the United States' current intransigent position in relation to climate change and withdrawal from its Paris commitments. What impact would one province such as Saskatchewan have in light of such actions of a very large southern neighbor? As well, the finding of a matter as one of national concern would render it within the exclusive jurisdiction of the federal government. Such a finding would negate the climate legislation and policies of the other Canadian provinces. It would be counterproductive to Canada's climate change efforts and contrary to the international practice of all levels of government having a role to play in climate mitigation.

Alternatively, an argument can be made that the federal government could regulate GHG emissions using the national emergency branch of the 'peace, order and good government' power. Although this legal argument has rarely been used, the argument can be made based on comments by a Judge of the Privy Council in 1882 in the Local Prohibition Reference. It was postulated that the federal government could legislate in times of 'exceptional' circumstances, such as war or famine when the Dominion as a whole was truly 'imperiled'. This legislative power would allow not only response to emergencies, but also the prevention of emergencies. Unlike the 'national concern' branch of peace, order and good government, this branch allows the provinces concurrent legislative power in relation to the matter. Climate change impacts increasingly include extreme weather events of drought and flood. Not only have these situations given rise to emergency declarations by local and provincial governments in recent years, but also have caused massive strain on the coffers of the federal government in relation to disaster assistance payments that have escalated rapidly in the past decade.

It can also be argued that the federal government has power to regulate GHG emissions pursuant to its criminal law power in s. 91(27). Historically the Privy Council was the ultimate court of review of Canada decisions. Its decisions circumscribed federal powers, such as that of criminal law making, finding that federal legislation would not qualify as criminal law merely because it created an offence. However, the Supreme Court of Canada has taken a more expansive view of the federal government's criminal law-making authority, especially in relation to the environment. In the decisions of Crown Zellerback mentioned above, the criminal power of the federal government allowed it to make it illegal to dump toxic chemicals in the ocean. A similar decision by the Supreme Court of Canada in 1997 regarding Hydro-Quebec found the federal government acting within this criminal law power when making the emission of polychlorinated biphenyls (PCBs) illegal. Again, the Supreme Court of Canada expressed sentiment that stewardship of the environment was, "a major challenge of our time", "an international problem, one that requires action by governments at all levels" (paragraph 127).

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GHG emissions arguably don't have the same level of toxicity, nor the same direct and immediate environmental harm as the substances that were the subject matter of these previous decisions. There is an argument that these decisions might not act as precedent for the federal criminal law making power. However, the sentiment of the Supreme Court of Canada to date has been one of allowing the federal government an expansive criminal law power to protect the Canadian environment. In 2012 the federal government passed restrictions on the amount of emissions from coal-fired power generation pursuant to this criminal law power. SaskPower cannot emit beyond a prescribed level after a certain date or it is subject to penalties (fines and jail). It would be possible to expand this regulatory scheme to natural gas power plant emission regulations, methane emissions from oil and gas operations, and a clean-fuel standard. However, one of the federal government's proposals is a carbon tax. It is worth noting there is currently an excise tax on gasoline and diesel imposed by the federal government.

Thus, the question arises as to whether the federal government can impose a carbon tax. The federal government has greater taxation powers than the provinces. Subsection 91(3) authorizes the "raising of Money by any Mode or System of Taxation." There is no limit on the kinds or territorial limits of taxes that the federal government can create. The provincial governments are limited to direct taxation[159] within the province to raise revenue for provincial purposes pursuant to subsection 92(2). Both governments must impose taxes for the purposes of raising revenue. However, the federal government states that the revenue raised from a carbon tax will be returned to the Province; it will not be revenue raising and thus will contravene this principle.

Hsu and Elliott (2009) are 'confident that federal legislation creating a carbon tax… would be upheld under subsection 91(3)" (p. 489). They dismiss arguments that the tax will not satisfy the requirements of the federal government's constitutional powers. They feel it is a bizarre situation that if the federal government retained the funds, the legislation will be constitutional, but because the funds flow back to the provinces, they will be unconstitutional. Hsu and Elliott (2009) call foul on this argument of revenue neutrality:

> Perhaps most importantly, it is factually untrue that a provincial carbon tax does not raise revenue. It clearly does raise revenue. The province has simply chosen to raise revenue in a different manner than it did previously. It would seem meddlesome to hold that a province that chose to raise revenues by taxing carbon instead of income could not make that change. Moreover, if revenue neutrality is constitutionally troublesome, how revenue neutral would a tax have to be to fall afoul of that rule? And how could the courts be sure that a particular tax would in fact be revenue neutral? A revenue-neutral carbon tax, which shifts taxation from income taxes to another source, may reflect a different method of revenue raising but it indisputably raises revenues" (485).

They dismiss arguments that the tax will not satisfy the requirements of the federal government's constitutional powers.

If the federal government's taxation power is, as suggested by Hsu and Elliott the one silver lining for Saskatchewan in the taxation area, it is that the federal government is unable to tax the property and natural resources of the provincial Crown located within the province or in respect of intra-provincial transactions (Re Exported Natural Gas Tax [1982] 1 SCR 1004) pursuant to section 125. This would render the federal government unable to impose a carbon tax directly on the provincially owned SaskPower, one of the province's largest GHG emitters, or its lands, property or provincial natural resources. However, can carbon be classified as property or provincial natural resources? And will this reasoning apply when the entire supply chain of coal includes actors other than SaskPower that might be subject to tax?

To complicate matters, the federal government is suggesting a tax of fuels for small consumers of gasoline and diesel, however, for large final emitters (LFEs) such as large industrial and mining operations, including SaskPower, a hybrid carbon tax is proposed. Special rules will allow LFEs exposed to economic damage because of trade exposure (competition with businesses not subject to such tax in jurisdictions such as the United States) to reduce the amount of carbon tax through trading, emission or offset credits. It is unclear that such a scheme is really in 'pith and substance' taxation and not a regulatory model. This model is not of the 'criminal' law power discussed earlier in relation to penalties and fines for exceeding prescribed emission limits. If this proposed schema is not in essence taxation, and not based on another federal government power, such as the criminal law power, there is an argument that the provisions have significant effect on provincial electricity generating facilities and their operations and management. In that case, they may be unconstitutional because they are in relation to provincial property and civil rights and local works and undertaking powers (See Lucas and Yearsley 2011).

7.4 THE CASE FOR BEER AND ITS IMPLICATIONS

What does beer have to do with it? Initially it might appear nothing. In 2012, a man named Gerard Comeau was fined $292.50 for purchasing beer in Quebec and bringing the beer into New Brunswick. New Brunswick law prohibited anyone in the province from having more than 12 pints of beer not purchased through a New Brunswick Liquor board store. Historians argued that s.121 of the British North America Act was adopted with the express intention of avoiding all forms of non-tariff barriers or duties in interprovincial trade in order to keep the Canadian market open at a time trade barriers were being erected by the Americans. The section states "All articles…of any one of the provinces shall.. be admitted free into each of the other Provinces." This reasoning harkens back to the caveat surrounding the provincial power of taxation in relation to non-renewable resources and production of electrical energy in relation to section 92A discussed above.

The previous Gold Seal Ltd. versus Dominion Express Company decision had interpreted this section narrowly as applying to inter-provincial customs duties. Interpreting the section more broadly advances freer interprovincial trade. A more robust interpretation of this section could interfere with provincial economic regulation. Specifically, those relating to marketing boards (eggs, milk, poultry, provincial liquor monopolies), different tax policies, different professional accreditation and licensing standards, policies encouraging development of provincial economic sectors including natural resources, and government procurement policies

favouring domestic suppliers of goods and services within the province. In short, different regulatory regimes in one province versus another could be seen as a non-tariff barrier.

So how does beer relate to climate mitigation? Simple. The federal government's climate legislation allowing provincial discrepancy could be, on its face, advancing inter-provincial non-tariff barriers and contrary to s. 121 of the *British North America Act*. Each province is imposing a carbon tax and remitting it back to their residents, but not to the residents of other provinces that pay the tax. If challenged, and if the courts agreed, such a transgression would result in the law being ultra vires, or of no force and effect.

7.5 CONCLUDING THOUGHTS

As Canada celebrates its 150th birthday and reflects on the 1867 *British North America Act*, this analysis revisits that momentous Constitutional achievement in order to shed light on the current policy problem of climate change. This constitutional analysis is as challenging as the climate change issue itself as its cause - GHG emissions - and its impacts – global warming - were not understood in 1867 As a result, arguments surrounding interpretation of the original 1867 *British North America Act*, its amendments, and court cases (not exactly on point) must be used to speculate and hypothesize what the outcome of a potential court challenge might be to federal carbon mitigation legislation. Further, future interpretation of sections of the *British North America Act*, and specifically interprovincial non-tariff barriers, may not be the same. The changing climate, literally and figuratively, render federal and provincial legislation, regulations, and policies less than certain in constitutional justification. As always, cooperative federalism provides less uncertainty and more flexibility, as long as ultimately the policy problem of climate change is addressed.

08

Conclusion

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Conclusion

The purpose of this paper has been to consider the options in addressing climate change, taking into consideration the environmental, economic, fiscal and political factors that shape public policy. In so doing, it has sought to fully contextualize the policy challenge of reducing carbon emissions that affects the change required to meet Canada's greenhouse gas reduction targets. It has been motivated, in part, by the on-going policy debate over carbon pricing between the governments of Canada and Saskatchewan, which in a small, but instructive way, exposes the conflicting policy opinions on how best to tackle the climate change challenge.

Clearly, the scale and complexity of the policy issue is daunting. It is reflected in the divergent opinions and approaches about the best path forward and the on-going struggle of getting governments, at national and sub-national levels, to act in a coordinated way that tackles what is manifestly a global challenge. The clash of opinion has been a barrier to significant progress globally in reducing GHG emissions since the first climate change accord of 1992.

But, while there might be differing opinions regarding the policy levers that should be used, there is unanimity among governments in Canada that climate change is real and is an urgent issue that needs to be addressed now. Part of that agreement is all jurisdictions must work together to achieve the common goal of a 30 per cent reduction in GHGs from 2005 levels by 2030. All governments, including Saskatchewan, signed the Vancouver Declaration on Clean Growth and Climate Change that set out the objective in 2016.[160] So there is agreement on the end point. The issue is how best to get there, as Saskatchewan and Manitoba have refused to sign the subsequent Pan-Canadian Framework on Clean Growth and Climate change that set out the federal government's policy framework. Underlying that is a crucial variable: strength of political will, which is the necessary and most critical ingredient for all public policy decisions.

A snapshot of climate change policy at the federal provincial level in Canada demonstrates the many policy tools currently in place. They range from a carbon price, either by a carbon tax or regulation through a system of cap and trade; technology instruments such as carbon capture and storage, clean energy subsidies; and, a menu of other regulatory measures such as emissions standards, including the phasing out of coal-fired power generation, that reduce greenhouse gases being emitted. But even with those policies applied in varying degrees, Canada's emissions have continued to increase. So unless other steps are taken, Canada will not meet its Paris Accord commitment of 2015.

Plainly, the breadth and depth of the climate change issue is such that no one policy instrument is sufficient to meet Canada's 2030 GHG reduction target. There is no magic bullet. The full extent of the policy challenge is evident in the array of approaches governments across Canada, and around the world, have taken to try and change behaviour to the extent required so that the growth in GHG emissions is halted and reversed. All the tools in the policy toolkit—whether a carbon price, regulation or technology—must be used if governments are truly serious about tackling an issue that has defied a public policy solution for decades. Each has an important role to play, and each comes with economic and fiscal costs, environmental benefits and the attendant political considerations. And each must be approached from the perspective of how one interacts with and supports other measures, all with the common objective of reducing GHG emissions.

There is no magic bullet.

8.1 THE CARBON TAX OPTION

A central component of the federal climate change policy approach is a national price on carbon in the form of an explicit carbon tax. The federal government intends to have a national price of at least $10 a tonne in place by 2018, rising to $50 a tonne by 2022.[161] If provinces do not implement an equivalent price on carbon, Ottawa says it will impose the price. All revenue raised from the carbon price, whether in the form of a tax or cap and trade, will remain, or be returned—in the event that the tax is federally imposed—to the jurisdiction where the revenue is generated. The revenue can then be used for whatever fiscal measures the province deems appropriate, whether a tax cut, rebates to taxpayers, program spending or debt reduction.

The argument for a carbon price is market based. Simply put, the emission of greenhouse gases creates an externality that damages the environment at no cost to those responsible for the emissions. A carbon price at the appropriate level would impose a cost equal to the marginal social cost, in this case its contribution to GHGs that cause global warming. The Government of Canada, and many economists believe a carbon price is the cornerstone of a policy foundation to reduce GHG emissions. For its part, the federal government maintains a carbon price must be equally applied across Canada to ensure costs are equitably distributed amongst all Canadians.

In any consideration of carbon pricing it is always worth reminding ourselves that the policy objective is climate change mitigation, not balancing budgets or improving the commercial prospects for renewable energy companies. Simply put, governments want to alter their citizens' behaviour so that they engage in less carbon-intensive activities. In addition, most governments' stated objective in the international agreements they have ratified is to alter citizens' behaviour fast enough to make a noticeable difference in climate change impacts by mid-century. Bjorn Lomborg's scepticism aside, the consensus of climate scientists is that this objective can be met by limiting surface warming to "well below" 2 degrees Celsius by that date and we have increasingly reliable estimates of the actual reductions in emissions needed to achieve it.[162]

To be effective, the price of carbon must be high enough and apply to a suitably broad array of carbon-emitting activities to make it reasonable for consumers to change their behaviour and emit less carbon. If the price is too low or, equally, if the cost of alternatives is too high, and if the scope of the pricing instrument too narrow so that some carbon-emitting alternatives can escape pricing altogether, then the incentive will be weak or non-existent. The result would be a carbon price without achieving our goals—an ineffective carbon price.

What level of a carbon price is required to significantly change behavior is uncertain. But what can be said is that, based on the experience of other jurisdictions, the federal proposal of a $10 a tonne price in 2018, which the federal government says will equal 2.3 cents a litre on gasoline, is likely to have virtually no effect.[163] Even at its mature level of $50 a tonne, it's unclear how effective the price will be in changing behaviour.

The question of political feasibility is even more difficult. The case of British Columbia's carbon tax is instructive. The original legislation called for an automatic annual increase in the price. This "escalator" was suspended by former BC Premier Christy Clark in the face of mounting popular opposition and not restored even when her own panel of experts created to review the legislation recommended that she do so.[164] Simon Fraser University economist Mark Jaccard has concluded that the transparency of a carbon price—one of the key elements that recommends it to most economists—is actually a disabling drawback when it comes to political feasibility and he now supports approaches where costs are more difficult to discern, such as through regulation.

The question of political feasibility is even more difficult.

At the very least, it's intuitive to assume the costs that citizen-consumers are willing to bear are related to their perception of the reality and urgency of climate change and its impacts. Saskatchewan residents consistently demonstrate relatively low levels of concern compared with other Canadians. In a 2015 Environics poll, for example, 45 per cent of Saskatchewan residents replied that they were "extremely" or "definitely" concerned about climate change compared with 61 per cent

of British Columbians. Only Albertans were less concerned and levels of concern have consistently fallen since the financial crisis of 2008.[165] An important factor that shapes public opinion in an energy-producing provinces like Saskatchewan and Alberta is the very nature of their economies. A significant portion of the CO_2 generated in both provinces is a function of producing oil and gas that is exported to meet demand in other provinces or the U.S., where emissions actually occur.

In this political climate, it is a brave, or perhaps a foolhardy politician who contemplates imposing a carbon price at levels that consumers might actually notice.

8.2THE REGULATORY OPTION: CAP AND TRADE

The federal proposal also includes, as an alternative, an opportunity for provinces to implement a regulatory framework instead of a carbon tax system. This regulatory framework would operate in the form of an output-based emissions allowance system, somewhat similar to the cap-and-trade approach being implemented in Ontario and Quebec, and linked, in their case, to the California model.

Such systems work on tight monitoring and control of emissions (the cap) enforced by a system of increasing fines for those who do not meet emissions standards. Those who reduce emissions more than they are required would accumulate credits for their additional efforts which they can sell to those who exceed the standard (the trade).

These regulatory frameworks have an additional twist. Enforcement allows that, if a company cannot meet its emissions standards, it can pay other companies that have met the standard rather than pay a fine to the government, thereby eliminating the government as the usual "middle man" in a regulatory regime.

These approaches are sometimes considered an alternate pricing mechanism to the carbon tax because they establish a price (the level of fines) at which credits should trade. In so doing, they encourage companies to pay subsidies to low-emissions companies, rewarding them for their efforts, if the offending company cannot meet its own obligations.

But, like all regulatory regimes, they can be cumbersome to operate and face significant administration and enforcement costs that must ultimately be borne by taxpayers. This additional tax burden has its own dampening effect on economic activity and, since it is of general application, its effects are widely felt.

As is usual with regulatory frameworks, administrative and enforcement costs can be controlled by limiting the application of the system to large, easily identified emitters. While narrowing the focus can control operational costs to the sytem, it also reduces the effectiveness of the approach as large parts of human activity escape emission controls.

As was the case with a carbon tax, regulatory approaches have the difficulty in taking many years to show demonstrable effects on the behavior of individuals. Even companies which would like to reduce their carbon footprint may have to wait to do so as the technology to which they are currently committed cannot be replaced until their current plant and equipment are due for replacement. In some industries, turnover of plant and equipment can take 30 years or more.

... regulatory approaches have the difficulty in taking many years to show demonstrable effects on the behaviour of individuals.

The system proposed by the federal government would establish fines of up to $50 per tonne on offenders. It remains to be seen whether such fine levels would provide adequate incentive for companies to lower their emissions since paying the fine may be a cheaper alternative to the cost of reducing emissions.

The national minimum carbon price announced by the Trudeau government should be recognized for what it is: a first step designed to create a level playing field across Canada. Even at $50 per tonne it is not going to come close to achieving the kinds of emissions reductions needed to achieve our commitments. It is a foundation on which provinces should be building their own emissions reductions policies secure in the knowledge that they will not be dramatically undercut by competition from provinces that have no carbon price at all.

Exactly what the mix of policies should look like is a matter for public debate and is certainly beyond the scope of this report. Some of it is already in place or relatively easy to transform. One example is SaskPower's commitment to 50 per cent renewable power generation capacity by 2030, which could be strengthened by a flexibile regulatory design that requires 50 per cent low carbon power output (not capacity) by a target date without specifying how that output is to be achieved. Alternatively, this kind of flexibility might be combined with a prescriptive approach to end coal-fired power production except where CCS is installed.

Other parts of the policy mix will be more challenging. For example, the design of flexible regulation for emissions intensive, trade-dependent sectors that recognizes the special challenges that these sectors face. Targets may be phased in over longer periods than for less exposed sectors, or targets may be less stringent and take into account the existing impacts of the federal carbon price in doing so. The problems are not impossible to overcome once the "one size fits all" approach to either market or regulatory instruments is dropped in favour of innovative policy design.

At this point the government may choose to take a less ambitious approach to carbon mitigation than we recommend in this report. Rather than building on the $50 per tonne carbon price, it may choose to calculate the implied carbon price of a policy mix involving both flexible and prescriptive regulation (the latter with specific technologies attached) and show that this is at least as high, or better, than the federal scheme. Doing so would require negotiating with the federal government to ensure that this is an acceptable approach to carbon pricing when the current interpretation of the legislation suggests that only a carbon tax or cap-and-trade scheme will be recognized.

Calculating the implied price of carbon for such a package is possible, though not without accompanying professional disagreement about how best to perform the calculation. One approach to resolving this could involve an independent agency to report annually on the implied price of carbon in the province.

8.3 THE TECHNOLOGY OPTION

A central argument of the Saskatchewan government is that the use of technology to reduce emissions, including clean-coal technology such as carbon capture and storage, is a critical tool in reducing CO_2 emissions.[166] In one sense, the Saskatchewan position merges both the local and global dimensions of climate change policy.

The Saskatchewan case hinges on the province's investment of approximately $1.5 billion in SaskPower's carbon capture and storage facility at its Boundary Dam coal-fired power station. When it became fully operational in 2015, the Boundary Dam project was the first successful CCS project in the world. Unlike other policy tools, such as a carbon price or incentives for clean energy production, CCS actually reduces GHG emissions with certainty, by a measurable, quantifiable amount. In the case of Boundary Dam, SaskPower says up to 90 per cent of emissions, or one million tonnes per year, are prevented from being released into the atmosphere.

But beyond the local benefits of GHG reductions, the Saskatchewan government says CCS is integral to addressing the climate change global challenge. With approximately 40 per cent of the world's electricity generated by coal power, and China continuing to expand its thermal coal production, any serious climate change policy needs to acknowledge that reality and include CCS technology. While coal is slowly being phased out in many jurisdictions, including in Canada, the International Energy Agency says coal production will still grow marginally over the next 25 years. It notes the long-term future of coal is closely tied to the commercial availability of CCS.[167]

The province is also proposing that renewable, clean energy technology such as wind and solar will displace coal power generation. It has set an objective that by 2030 SaskPower will double its generation of renewable energy to 50 per cent of its total load and in the process reduce emissions by 40 per cent. But, as the case with all climate change policy options, CCS and other technology measures come at a price to individuals and business. The $1.5 billion investment by SaskPower is reflected in higher power rates, and the issue becomes whether that public investment would be better spent on other clean energy options. For example, would public subsidies of an equal amount to support solar or wind energy sources that could replace coal-fired energy be a better use of scarce taxpayers' dollars?

Whatever the outcome of that debate, the technological solution does imply an additional cost burden to residents of the province, either through higher electrical bills or higher taxes. All of the technologies proposed to replace unfettered coal-fired electrical generation will add costs to the system beyond current electricity rates and can only be implemented as current capacity wears out and needs replacement, a process that could take decades to complete.

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8.4 THE CONSTITUTIONAL QUESTION

There may be outstanding issues with respect to the appropriate order of government to take action on climate change. The jurisdiction over the environment is shared between the federal and provincial governments which might give both the capacity to act but has, instead, lead to confusion about primacy and a reluctance on either part to act alone.

Constitutional tax provisions may seem clearer but are not without controversy. The federal government has sweeping tax powers while the powers of the provinces are more narrowly defined. However, there are questions about the federal government's power to act selectively on tax matters, especially those that affect non-renewable resources and/or electricity production and distribution, areas of clear provincial jurisdiction.

Yet, for all this confusion, there are means by which either the provinces or the federal government can act on climate change initiatives: the former through their powers to affect resources

and electricity and the latter through its power to enact policies aimed at meeting international obligations such as the Paris Accord.

In any event, there would seem to be capacity for these orders of government to act, in concert or individually, to address the problem. What is unclear is their willingness to do so.

8.5 THE LESSONS OF IT ALL

The fact of climate change linked to human activity is no longer in question. The process that leads to climate change is slow-moving but inevitable. It is accepted that the behavior of current generations will have consequences for generations far into the future. That implies that the corollary is also true: avoiding the consequences on future generations will require action on the part of current generations to change their behaviour. We cannot change the outcomes without changing our ways.

None of the policy choices available is without problems. They will make maintenance of our current lifestyle more expensive, difficult or just plain illegal. But our current lifestyle is the cause of the expected outcomes of climate change. However negative the effects of current action may appear to existing lifestyles, they must be evaluated against the serious consequences of unabated climate change for many years into the future.

While it is clear that action today will require the political leadership to act, it is not fair to expect politicians to take action that is completely counter to societal will. It is a policy challenge that requires governments to act in a coordinated, cooperative manner if real progress in reducing GHG emissions is to be made. Quite simply, failure to act is failure.

Quite simply, failure to act is failure.

The time is ripe for new approaches to emissions reduction. Now that the environmental euphoria prompted by the federal intervention has dissipated, voices across the political spectrum from greens to conservatives are arguing that other approaches are needed. They are supported by reputable policy analysis that is reviewed in this report.

A national strategy and plan to address climate change is an important and long overdue step. The introduction of a carbon price, providing a common foundation on which provinces can build their own policies tailored to their circumstances without undercutting each other's efforts, is a key component of this strategy.

For all its challenges and complexities, crafting effective climate change policy should be treated as an opportunity for government to demonstrate it has the capacity and ingenuity to address what is a notably wicked problem. It is time to demonstrate that Saskatchewan has not forgotten how to lead policy innovation on a critical issue for Canada, and the world.

References

[1] p.4, IPCC. 2013. Summary for Policymakers. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

[2] p.17, ibid.

[3] https://climate.nasa.gov/evidence

[4] http://unfccc.int/paris_agreement/items/9485.php

[5] http://newsroom.unfccc.int/unfccc-newsroom/indc-synthesis-report-press-release/

[6] https://www.canada.ca/en/services/environment/weather/climatechange/pan-canadian-framework/introduction.html#1_2

[7] p. 2, Climate Change Evidence and Causes, The National Academy of Sciences and The Royal Society

[8] p. 11, State and Trends of Carbon Pricing, 2016, World Bank

[9] P.13, ibid

[10] ibid

[11] Stern. Climate change a 'market failure', The Guardian, Nov. 29, 2007.

[12] Howlett, Michael. 2014. "Why Are Policy Innovations Rare and so Often Negative? Blame Avoidance and Problem Denial in Climate Change Policy-Making." *Global Environmental Change*, February. Elsevier Ltd. doi:10.1016/j.gloenvcha.2013.12.009.

[13] p.15, State and Trends of Carbon Pricing, 2016, World Bank

[14] http://news.gov.mb.ca/news/index.html?archive=&item=42321#.Wd5xqUFQZtk.twitter

[15] Effective Carbon Prices, 2013, Organisation for Economic Co-operation and Development (OECD). http://www.oecd-ilibrary.org/environment/effective-carbon-prices_9789264196964-en

[16] Government of Alberta, Climate Leadership Report to the Minister. November 2015

[17] https://beta.theglobeandmail.com/report-on-business/industry-news/energy-and-resources/carbon-prices-must-rise-to-meet-2030-ghg-targets-officials/article34510739/?ref=http://www.theglobeandmail.com&

[18] https://royalsociety.org/topics-policy/projects/climate-change-evidence-causes/0

[19] p. 1, Pan-Canadian Framework on Clean Growth and Climate change, Gov. f Canada 2016

[20] Recalculating the Climate Math, The New Republic, Sept. 22, 2016

[21] Hansen, James, Makiko Sato, Paul Hearty, Reto Ruedy, Maxwell Kelley, Valerie Masson-Delmotte, Gary Russell, et al. 2016. "Ice Melt, Sea Level Rise and Superstorms: Evidence from Paleoclimate Data, Climate Modeling, and Modern Observations That 2 °c Global Warming Could Be Dangerous." Atmospheric Chemistry and Physics 16 (6): 3761–3812. doi:10.5194/acp-16-3761-2016. http://www.atmos-chem-phys.net/16/3761/2016/acp-16-3761-2016.pdf.

[22] Ibid, p.13 Amicus Appendix

[23] http://www.copenhagenconsensus.com/

[24] A Development Investment For The Ages, Bjorn Lomborg, www.project-syndicate.com. See also "Cool It: A Skeptical Environmentalist's Guide to Global Warming", Knopf Publishing Group, 2007

[25] p.109. Lomborg, Bjorn. 2016. "Impact of Current Climate Proposals." Global Policy 7 (1): 109–18. doi:10.1111/1758-5899.12295.

[26] Sustainable Dialogues Canada. Re-energizing Canada: Pathways to a low carbon future. Online at https://www.generationenergy.ca/images/documents/May%2026%20Workshop%20Notes.pdf

[27] https://olc.worldbank.org/content/ending-energy-poverty-0

[28] David Rotman, Climate Change: The Moral Choice, MIT Technology Review, April 11, 2013

[29] Streimikiene, Dalia, and Stasys Girdzijauskas. 2009. "Assessment of Post-Kyoto Climate Change Mitigation Regimes Impact on Sustainable Development." Renewable and Sustainable Energy Reviews 13 (1): 129–41. doi:10.1016/j.rser.2007.07.002.

[30] p. 10, Gov. of Sask. Climate Change White Paper

[31] Government of Canada. Pan-Canadian Framework on Clean Growth and Climate Change.

[32] Saskatchewan and Climate Policy, Ecofiscal Commission Feb. 1 2017, University of Regina, Johnson Shoyama Graduate School of Public Policy panel discussion

[33] p. 6 Climate Change White Paper, Gov. of Sask. 2016

[34] p.49. Government of Canada. Pan-Canadian Framework on Clean Growth and Climate Change.

[35] Ibid.

[36] (Pricing Carbon Pollution in Canada: How It Will Work, Environment and Climate Change Canada, May 2017)

[37] Remarks for the Honourable Catherine McKenna, Minister of Environment and Climate Change at the Canadian Climate Forum. https://www.canada.ca/en/environment-climate-change/news/2016/12/remarks-honourable-catherine-mckenna-minister-environment-climate-change-canadian-climate-forum.html?wbdisable=true

[38] Technical Paper on the Federal Carbon Pricing Backstop, Government of Canada, May 2017

[39] Effective Carbon Prices, 2013, Organisation for Economic Co-operation and Development (OECD). http://www.oecd-ilibrary.org/environment/effective-carbon-prices_9789264196964-en

[40] p.4. Government of British Columbia. 2016. Climate Leadership Plan. https://climate.gov.bc.ca/app/uploads/sites/13/2016/10/4030_CLP_Booklet_web.pdf

[41] http://www2.gov.bc.ca/gov/content/environment/climate-change/planning-and-action/carbon-tax

[42] https://www.bcndp.ca/latest/read-premier-john-horgans-mandate-letters-new-bc-ndp-government-ministers

[43] pp. 5-6, Climate Leadership Plan, August 2016, Government of B.C.

[44] British Columbia's Carbon Tax: By the Numbers. A Carbon Tax Center Report. https://www.carbontax.org/wp-content/uploads/CTC_British_Columbia%27s_Carbon_Tax_By_The_Numbers.pdf

[45] p. 3, Carbon Tax Salience and Gasoline Demand, Nicholas Rivers, Brandon Schaufele, U of Ottawa, 2012

[46] Ibid, pp. 2-3

[47] Lee, Marc. 2016. Don't believe the hype on BC's carbon tax. http://behindthenumbers.ca/2016/03/03/dont-believe-the-hype-on-bcs-carbon-tax

[48] Jaccard, Mark. 2016. Want an effective climate policy? Heed the evidence. http://policyoptions.irpp.org/magazines/february-2016/want-an-effective-climatepolicy-heed-the-evidence/)

[49] CANSIM Table 405-0002, Stats Canada

[50] p. 2, Climate Change Policy in Alberta, Pembina Institute, July 2014. http://www.pembina.org/reports/sger-climate-policy-backgrounder.pdf

[51] http://business.financialpost.com/commodities/energy/jim-prentice-to-wind-down-carbon-capture-fund-in-alberta-new-projects-on-hold

[52] Climate Change Implementation Act, Gov of Alberta

[53] Alberta Government. Carbon levy and rebates. https://www.alberta.ca/climate-carbon-pricing.aspx

[54] Alberta Government. Climate Leadership Plan. https://www.alberta.ca/climate-leadership-plan.aspx

[55] Alberta Energy. Electricity Statistics. http://www.energy.alberta.ca/Electricity/682.asp

[56] Alberta Government. Climate Leadership Plan. https://www.alberta.ca/climate-leadership-plan.aspx

[57] Alberta Government. Albertans now allowed to generate more green electricity. https://www.alberta.ca/release.cfm?xID=450415A625D10-069C-4633-02E78D217D3C1929

[58] Alberta Government. Capping oil sands emissions. https://www.alberta.ca/climate-oilsands-emissions.aspx

[59] Greenhouse Gas Emissions by Province and Territory, May 2017, ECCC. https://www.ec.gc.ca/indicateurs-indicators/default.asp?lang=en&n=18F3BB9C-1

[60] Alberta Government. Carbon levy and rebates. https://www.alberta.ca/climate-carbon-pricing.aspx

[61] pp.2,3. Climate Change Policy in Alberta, Pembina Institute, July 2014. http://www.pembina.org/reports/sger-climate-policy-backgrounder.pdf

[62] http://annual-report-2015.ccemc.ca/#introduction

[63] http://www.publications.gov.sk.ca/freelaw/documents/english/FirstRead/2009/Bill-95.pdf

[64] Medium Term Coal Market Report 2016, IEA

[65] http://www.cbc.ca/news/canada/saskatchewan/snc-lavalin-carbon-capture-project-saskpower-1.3291554

[66] http://leaderpost.com/news/saskatchewan/sask-energy-minister-says-residents-already-paying-carbon-tax

[67] SaskPower 2015-16 annual report

[68] p.25. Government of Saskatchewan. 2015 State of the Environment Report. http://publications.gov.sk.ca/documents/66/82781-English.pdf

[69] p.24 ibid

[70] Ibid

[71] http://www.saskpower.com/about-us/media-information/another-ccs-milestone-reached/

[72] http://publications.gov.sk.ca/documents/310/85153-Directive%20S-10%20Saskatchewan%20Upstream%20Petroleum%20Industry%20Associated%20Gas%20Conservation%20Directive.pdf

[73] https://www.ontario.ca/page/climate-change-action-plan

[74] http://business.financialpost.com/news/energy/provinces-considering-carbon-pricing-are-watching-ontarios-first-cap-and-trade-auction)

[75] http://www.opg.com/generating-power/nuclear/Pages/nuclear.aspx

[76] p.6. World Nuclear Association. Comparison of Lifecycle Greenhouse Gas Emissions of Various Electricity Generation Sources. http://www.world-nuclear.org/uploadedFiles/org/WNA/Publications/Working_Group_Reports/comparison_of_lifecycle.pdf

[77] Ontario to spend $7-billion on sweeping climate change plan, The Globe and Mail, May 16, 2016

[78] Greenhouse Gas Emissions by Province and Territory, ECCC, 2017. https://www.ec.gc.ca/indicateurs-indicators/default.asp?lang=en&n=18F3BB9C-1

[79] Ibid

[80] http://www.canadianenergylaw.com/2016/04/articles/regulatory/quebec-releases-its-energy-policy-2030/

[81] https://www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=02D095CB-1#BR-Sec1-2

[82] Carbon and Greenhouse Gas Legislation in Quebec, Osler.com)

[83] https://www.thestar.com/news/canada/2015/04/13/quebecs-cap-and-trade-system.html

[84] http://www.mddelcc.gouv.qc.ca/changements/carbone/revenus-en.htm

[85] World Bank. When It Comes to Emissions, Sweden Has Its Cake and Eats It Too. http://www.worldbank.org/en/news/feature/2016/05/16/when-it-comes-to-emissions-sweden-has-its-cake-and-eats-it-too

[86] p. 5137-38, Lin, Boqiang, and Xuehui Li. 2011. "The Effect of Carbon Tax on per Capita CO2 Emissions." *Energy Policy* 39 (9): 5137–46. doi:10.1016/j.enpol.2011.05.050.

[87] p. 5144, ibid

[88] p. 501. Bruvoll, Annegrete, and Bodil Merethe Larsen. 2004. "Greenhouse Gas Emissions in Norway: Do Carbon Taxes Work?" *Energy Policy* 32 (4): 493–505. doi:10.1016/S0301-4215(03)00151-4.

[89] Ibid

[90] p. 5137, Energy Policy 39 2011

[91] p.374, Impact of fiscal and others measures on new passenger car sales and C02 emissions intensity: Evidence from Europe, Energy Economics 31 (2009)

[92] p. 1188. Davis, Lucas W., and Lutz Kilian. 2011. "Estimating the Effect of a Gasoline Tax on Carbon Emissions." *Journal of Applied Econometrics* 26 (7): 1187–1214. doi:10.1002/jae.1156

[93] p. 5 Tax Foundation Working Paper No. 6, March 2009. https://files.taxfoundation.org/legacy/docs/wp6.pdf

[94] Email correspondence

[95] https://ec.europa.eu/clima/policies/ets_en

[96] https://ec.europa.eu/clima/news/emissions-trading-emissions -fall-2016_en

[97] https://www.thegwpf.com/europes-287-billion-carbon-waste-ubs-report/

[98] http://www.saskpower.com/about-us/blog/bd3-status-update-may-2017/

[99] IEA. The potential for carbon capture and storage in China. https://www.iea.org/newsroom/news/2017/january/the-potential-for-carbon-capture-and-storage-in-china.html.

[100] Ibid.

[101] https://scholar.harvard.edu/files/dschrag/files/102._making_carbon_capture_and_storage_work_2009.pdf

[102] Government of Canada. Pan-Canadian Framework on Clean Growth and Climate Change at: https://www.canada.ca/en/services/environment/weather/climatechange/pan-canadian-framework.html , accessed September 28, 2017.

[103] GasBuddy.com at: http://www.reginagasprices.com/index.aspx?fuel=D, accessed May 25, 2017.

[104] Government of Saskatchewan at: http://www.finance.gov.sk.ca/taxes/ft, accessed June 2, 2017.

[105] CANSIM Table 203-0021, at: http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/famil130a-eng.htm, accessed May 25, 2017.

[106] SaskEnergy at: http://www.saskenergy.com/residential/conversioncalc.asp, accessed May 25, 2017.

[107] Op cit.

[108] Op cit.

[109] Op cit.

[110] Ibid.

[111] Government of Saskatchewan, Climate Change White Paper, 2016, at: file:///I:/carbon%20tax/Saskatchewan%20White%20Paper%20on%20Climate%20Change%20%20Saskatchewan%20%20Greenhouse%20Gas.htm, accessed May 25, 2017.

[112] SaskPower, op cit., p. 62.

[113] Government of Saskatchewan, Climate Change White Paper, 2016, op. cit.

[114] The federal paper notes that the proposed system will include an exemption for gasoline and diesel fuel used in "certain farming activities" (p.12) and, for our purposes, it will be assumed that relief will extend to all farming operations in Saskatchewan.

[115] Statistics Canada, Provincial Input-Output Multipliers, 2010, by industry classification, detailed aggregation, catalogue number: 15F0046XDB.

[116] Ibid.

[117] Ibid.,Link 1997 aggregation.

[118] Ibid.

[119] Ibid. Summary aggregation.

[120] Ibid. Link 1997 aggregation.

[121] Actually $2,507 million according to Figure 1 above.

[122] Ibid. Summary aggregation.

[123] Ibid.

[124] Ibid. Link 1997b aggregation.

[125] Government of Saskatchewan, *2017-18 Budget: Meeting the Challenge*, p. 72.

[126] Saskatchewan Bureau of Statistics, Saskatchewan Provincial Economic Accounts, Table 2.1 p. 30 at: http://www.stats.gov.sk.ca/stats/PEA%20February%202017.pdf, accessed May 29, 2017.

[127] Environment and Climate Change Canada, op.cit. pp. 17-18.

[128] See: Carbonfund.org at: https://carbonfund.org/individuals/, accessed June 8, 2017.

[129] Cap and Trade in Ontario at: https://www.ontario.ca/page/cap-and-trade-ontario , accessed September 5, 2017

[130] Ibid.

[131] Ibid.

[132] Yazid Dissou, "Output-Based Emissions Allowances and the Equity-Efficiency Trade-off", University of Ottawa at: https://sciencessociales.uottawa.ca/economics/sites/socialsciences.uottawa.ca.economics/files/0505E.pdf , accessed September 6 2017.

[133] Environment and Climate Change Canada, *Technical Paper on the Federal Carbon Pricing Backstop*, 2017, pp. 17-20 at https://www.canada.ca/content/dam/eccc/documents/pdf/20170518-2-en.pdf, accessed June 15, 2017.

[134] Ibid., p. 17.

[135] Ibid. p. 17.

[136] Ibid. p.18 and Government of Canada Proposed Regulations: regulations respecting Reduction in the release of Methane and Certain Volatile Organic Compounds (Upstream Oil and gas Sector) at: https://www.ec.gc.ca/lcpe-cepa/eng/regulations/detailReg.cfm?intReg=243 , accessed September 28, 2017.

[137] Ibid. p. 18.

[138] Any firm buying unused credits would be prepared to pay as much as $49.9999 per credit to avoid paying a $50.00 penalty.

[139] Ibid. p.21.

[140] Environment Canada, *National Inventory Report*, 1990-2013, Part 3, 2015.

[141] Environment and Climate Change Canada, Technical Paper on Federal Carbon Pricing Backstop, op. cit., p. 18.

[142] Statistics Canada, *Provincial Input-Output Multipliers*, 2010, op. cit.

[143] SaskPower, op cit., p. 62.

[144] Ibid.

[145] Clean Energy Canada. 2017. The Federal Carbon Pricing Backstop: Comments and Recommendations. http://cleanenergycanada.org/wp-content/uploads/2017/07/CEC-CarbonPricingSubmission-Backstop-WEB.pdf

[146] http://rem-main.rem.sfu.ca/papers/jaccard/Jaccard-Hein-Vass%20CdnClimatePol%20EMRG-REM-SFU%20Sep%2020%202016.pdf

[147] Plans for a Sustainable Power Future, power point presentation, November 17, 2016 at: http://www.saskpower.com/wp-content/uploads/SaskPower_Plans_Sustainable_Power_Future_Nov2016.pdf, accessed June 13, 2017.

[148] Ibid.

[149] SaskPower, Rate Application to the Saskatchewan Rate Review Panel, 2016 and 2017,p. 11 at: http://www.saskratereview.ca/docs/saskpower2016/2016-and-2017-rate-application.pdf, accessed June 14, 2017.

[150] SaskPower, Rate Application [2018], p. 15 at: http://www.saskratereview.ca/docs/saskpower2017/saskpower-2018-rate-application.pdf accessed September 28, 2017.

[151] U.S. Energy Information Administration, Levelized Cost and Levelized Avoided Cost of New Generation Resources in the Annual Energy Outlook 2015, at https://www.eia.gov/outlooks/archive/aeo15/pdf/electricity_generation_2015.pdf, accessed June 14, 2017.

[152] SaskPower, Annual Report, 2015-16, p. 62, at: http://www.saskpower.com/wp-content/uploads/2015-16_SaskPower_annual_report.pdf, accessed June 15, 2017.

[153] Statistics Canada, *Provincial Input-Output Multipliers*, 2010, op. cit.

[154] Ibid.

[155] SaskPower, Annual Report, 2016, op.cit., p.62.

[156] See the discussion of these studies in Sustainable Dialogues Canada, 2017. Re-energizing Canada: Pathways to a Low-Carbon Future, p. 13. http://sustainablecanadadialogues.ca/pdf_2017/ReEnergizing_Final.pdf

[157] Environment Canada, National Inventory Report, 1990-2013, Part 3 at: http://publications.gc.ca/collections/collection_2016/eccc/En81-4-2013-3-eng.pdf, accessed June 7, 2017.

[158] A full analysis and legal opinion on this issue is beyond the scope of this chapter and qualifications of its authors. The ultimate legal argument is better left to the provincial and federal constitutional lawyers and ultimately the courts to decide, should the issue not be resolved but left to the court for resolution.

[159] Direct taxes are taxes on people or other legal entities such as corporations (not on products- other than natural resources).

[160] http://pm.gc.ca/eng/news/2016/03/03/communique-canadas-first-ministers

[161] https://www.canada.ca/en/services/environment/weather/climatechange/pan-canadian-framework/introduction.html#1 2

[162] https://www.theguardian.com/environment/2017/may/21/experts-reject-bjorn-lomborg-centres-view-that-2c-warming-target-not-worth-it

[163] https://www.canada.ca/en/environment-climate-hange/news/2017/05/pricing_carbon_pollutionincanadahowitwillwork.html

[164] http://www.macleans.ca/economy/economicanalysis/why-christy-clarks-pause-on-carbon-pricing-in-b-c-makes-sense/

[165] http://www.environicsinstitute.org/uploads/institute-projects/environicsinstitute-dsf%20focus%20canada%202015%20-%20climate%20change%20survey%20-%20final%20report%20-%20english.pdf

[166] https://www.saskatchewan.ca/government/news-and-media/2016/october/18/climate-change-plan

[167] p. 8, Executive Summary, World Energy Outlook 2016, IEA

Chapter 7 Reference:

Cairns, R. D., chandler, M.A., Moull, W.D. 1985. The Resource Amendment (Section 92A) and the Political Economy of Canadian Federalism. Osgoode Hall Law Journal. 23(2): 253-274.

Hsu, S.L., and Elliot, R. 2009. Regulating Greenhouse Gases in Canada: Constitutional and Policy Dimensions. McGill Law Journal. 13(31): 463-516.

Lucas, A.R., Yearsley, J. 2011 The Constitutionality of Federal Climate Change Legislation. SPP Research Papers University of Calgary. 4(15) December 2011.