The Cost of Compliance to the Paris Agreement and its Distribution: An Input-Output Analysis of Canada's Commitment

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December 2017

A thesis submitted to McGill University in partial fulfillment of the requirements of the degree of Master of Science

ABSTRACT

To fulfill its Paris Agreement commitment, Canada must find a way to substantially reduce its greenhouse gas emissions. Given the Canadian political system, where regulation and taxation powers are divided between different levels of government, a nation-wide action plan against climate change calls for a high level of coordination and agreement between provinces. The goal of this research is to propose a way to limit Canada's GHG emissions without placing an unacceptable burden on the highly emitting provinces. Using a subnational interregional input-output model with interprovincial trade and GHG emissions, the economic impact of an hypothetical carbon pricing policy is assessed according to three burden allocation scenarios and nine sub-scenarios accounting for technological changes. The first allocation evenly assigns the GHG emission reduction across all industrial sectors. The second and third allocations put the burden of the abatement costs on the largest GHG emitting sectors of the Canadian economy. By simulating these different policy scenarios, this study looks at the trade-offs between their overall economic costs and the geographical distribution of those costs amongst provinces. Results show distributing the GHG emission cut evenly across industrial sectors is the highest cost alternative. On the other hand, targeting only the largest GHG emitting sectors places an excessive burden on the western provinces, preventing the policy to be realistically implemented in Canada. A compromise between these two options is proposed.

RÉSUMÉ

Afin de respecter l'engagement contracté sous l'Accord de Paris, le Canada doit trouver comment réduire de façon substantielle ses émissions de gaz à effet de serre (GES). Étant donné les particularités du système politique canadien, où les pouvoirs de taxation et de réglementation sont divisés parmi les différents niveaux de gouvernement, un plan national de lutte aux changements climatiques nécessite un niveau de coordination et de coopération important entre les provinces. Le but de cette recherche est de proposer une façon de limiter les émissions de GES canadien sans attribuer un trop lourd fardeau aux provinces particulièrement polluantes. En utilisant un modèle entrée-sortie interrégional liant les différentes régions canadiennes et intégrant les émissions de GES en unité de masse, l'impact économique d'un hypothétique prix sur le carbone est évalué selon trois scénarios distribuant différemment le fardeau de l'effort environnemental et selon neuf sous-scénarios impliquant des changements technologiques. La première distribution considérée répartit la réduction de GES également parmi tous les secteurs industriels canadiens. Les deuxième et troisième distributions répartissent l'effort environnemental aux secteurs industriels produisant le plus de GES. En simulant ces trois scénarios de politique environnementale, cette étude examine les compromis à faire entre leurs coûts totaux et la distribution de ces coûts parmi les provinces. Les résultats de cette analyse démontrent qu'attribuer la réduction d'émission de GES également parmi les différents secteurs économiques est une option coûteuse. D'un autre côté, cibler uniquement le plus important producteur de GES place un fardeau très important sur les épaules des provinces de l'Ouest, empêchant ainsi la politique environnementale d'être appliquée sous le contexte canadien. Un hybride entre ces deux façons de procéder est proposé.

AKNOWLEDGEMENTS

The completion of this thesis would not have been possible without the precious inputs of the following people who, in their own specific way, helped me throughout this project.

First, I would like to thank my supervisor Prof. Paul J. Thomassin for his guidance and assistance. Early on, he managed to direct me to a fascinating topic, without failing to take my interest into account, and he kept leading me on the right path all along my studies at McGill. I also owe to Dr. Kakali Mukhopadhyay, whose suggestions and advice elevated this work to a greater standard. Additionally, I must show gratitude to the faculty for their financial support and to Statistics Canada's staff who helped me acquire crucial data and information. In particular, Ziad Ghanem from the Industry Division, who proved himself to be essential to the success of this study with the clarifications and help he provided me during the realization of my model. I would also like thanking Prof. Laurence Baker for willingly agreeing to examine my work and for his insightful advices.

My friends and colleagues Julien Neves and Lisa Di Marzo are to thank as well. Julien, with his expertise in programming, helped me make sense of the many subtleties of coding, and Lisa, with her keen eyes and patience, made this thesis a readable thing.

On a more personal tone, I would like to thank my mother and father, Colette and Roger, for allowing me to focus entirely on the completion of this thesis during my last few weeks of redaction. You were truly helpful. Lastly, Camille, I thank you for your resilience, friendship and love, without which those last two years would have been unbearable.

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INTRODUCTION

1.1 What does the Paris Agreement mean for Canada

Since its withdrawal from the Kyoto protocol in 2011, the Canadian government has not engaged in many major international initiatives to limit its greenhouse gas (GHG) emissions. However, the 2015 elections changed the tone with the departure of Stephen Harper's conservative government and the arrival of the more environmentally friendly leader of the Liberal Party of Canada, Justin Trudeau, as the head of the State. To date, the most striking sign of the State's commitment to a greener future for Canada was the signing of the Paris Agreement in New York during the twenty-first session of the Conference of the Parties and its ratification in October 2016. These events marked the return of Canada in the fight against climate change. It showed the leaders of the world and the population of Canada that the government has a renewed political will to tackle the problem that is global warming.

The ultimate goal of the Paris Agreement is to encourage the world's nations to limit their annual GHG emissions such that Earth's average temperature increase from the pre-industrial level stays below 2 ºC (United Nation 2015). Even if the accord was labelled as a multilateral diplomatic success, it falls to the participating States to implement their own plans and policies domestically to reduce the overall GHG flow into the atmosphere. Canada's commitment to the United Nation Framework Convention on Climate Change (UNFCCC) is particularly ambitious and echoes its 1998 commitment under the Kyoto protocol (Environment Canada 2002). In Paris, Canada pledged to cut its annual GHG emissions by 30% from its 2005 level and to do so by 2030. It is the equivalent of a 291 megaton reduction of GHG emissions in 15 years

(Environment and Climate Change Canada 2016a). By comparison, the Kyoto protocol, which Canada failed to fulfil, asked for a 240 megaton reduction of annual carbon output in a 10-year horizon, from 2002 to 2012 (Environment Canada 2002).

The real problem with GHG emissions is their overall level in the atmosphere, since climate change is a result from the pollution stock. However, most efforts to limit global warming are directed at the flow of GHG emissions from economic activity. This is because the amount of GHG emissions that could be emitted before a certain harmful is attained is limited (IPCC 2014). The Paris Agreement, and the Kyoto protocol before that, tend to constrain this flow of gas. Nevertheless, such an exercise requires a complex institutional design and a high level of cooperation between nations.

Air pollution has been the concern of economists for a long period of time. For most of them, GHG emissions into the atmosphere, and climate change by extension, is an example of a negative environmental externality (Ayres and Kneese 1969) and an open access problem (Perman 2003). It is an externality issue since GHG emissions are a by-product of one's economic activity that has an unintended and uncompensated effect on the utility or profit of someone else. It is an open access problem since the atmosphere is a rivalrous and non-excludable public good, which means that there is yet no institution that could physically prevent one's GHG emissions from being emitted into the atmosphere.

The non-exclusiveness of a resource, in this case clean air, is likely to undermine the property rights necessary for the achievement of its Pareto efficient use (Randall 1972). As Bergstrom and Randall (2010, 172) state, "without exclusion, it is impossible to collect a price for use" and individuals are not facing the adequate market indicator (the right price) that is supposed to lead them to their efficient economic behaviour. So, when it comes to global climate

change, the release of pollutants in the air is greater than the amount that is Pareto efficient. This creates a market failure and more GHG emissions are emitted than are socially desirable.

In the absence of a proper common-property management scheme, the cost of atmospheric depletion (or the cost of climate change) cannot be privatized. Therefore, economic incentives that usually guarantee the efficiency of a private property regime cannot apply. Private agents like firms and consumers have no motivation to restrain their own emissions of GHG. This kind of problem can be dealt with by using a variety of economic instruments. One such instrument would be a Pigouvian tax. In the particular case studied here, it would be a tax on carbon and/or other GHG. A tax on carbon emissions puts a price on an otherwise "free" good and can potentially internalize the cost of GHG emissions to bring the level of pollution abatement back to its efficient or socially desirable level. Theoretically, such an instrument should be cost effective since firms can freely adjust their production until the marginal benefit they get from GHG emissions equals the marginal cost of the tax. Meanwhile, consumers are allowed to change their consuming habits to act according to their preferences and the new price of carbon.

A carbon tax could be one of many ways for Canada to meet its Paris Agreement reduction target. The current government seems to favour this alternative over other possibilities such as a cap and trade system, but ultimately, all these instruments, if they succeed in their task, should yield the same result: a cost effective cut in GHG emissions. Even if the GHG reduction policy of Canada is still to be implemented and if some provinces seem to disregard a coast to coast unique tax for the moment (Government of Saskatchewan 2016), it is relevant to study what would be the impact of an environmental policy that will grant Canada the possibility to

achieve its environmental commitment because Canada now has a duty to comply with the Paris Agreement.

However, if there is to be a price on carbon, an understanding of the complexity of Canadian politics (and more precisely the fact that taxation powers are shared among the federal and provincial levels) will be essential for its feasibility. Implementing a carbon tax in Canada brings its fair share of complications due to the need for intergovernmental coordination. It is important to keep in mind that the emissions of GHG in Canada are not evenly distributed geographically, and the effects of a carbon price on the economic activity of the provinces will thus vary. Consequently, the geographical distribution of costs is an important matter to be considered if the federal government wants the provincial legislative assemblies to embrace domestic action against climate change.

1.2 The problem

Knowing that the Canadian commitment to the Paris Agreement is now legally binding (Globe and Mail 2016) and assuming that Canada must hit its target, this research addresses the problem of domestic GHG emissions mitigation. It assesses the consequences to the Canadian economy of the government implementation of a mechanism to restrain its annual domestic GHG emissions to meet its Paris Agreement target. To do so, a decrease in industrial output echoing the needed GHG reduction is used as a proxy for a hypothetical price on carbon.

Three main policy scenarios are considered for reducing GHG emissions. The first scenario assesses the impact of an evenly distributed abatement of carbon emissions among industrial sectors, the second scenario allocates the entirety of the economic burden to a single sector and the third one focuses on the impact of a differentiated sector reduction. These last two

scenarios put the burden of the abatement costs on the most GHG emitting sectors of the Canadian economy, since it appears to be the least costly way to limit total GHG emissions through industrial output reduction (de Souza et al. 2016, Lixon et al. 2008, San Critobal 2008). In order to simulate these policy scenarios, industrial GHG emissions are coupled with the provincial *supply* and *use* tables (SUTs) in a macroeconomic model similar to Smith (1991). Then, the modelled economy is projected to 2020 and shocked by a mandatory reduction of industrial output such that the total reduction of GHG emissions (direct and indirect) matches the one of the first phase of Canada's commitment to the UNFCC (Environment and Climate Change Canada 2016a).

1.3 Objectives

The goal of the present research is thus to seek out which policy scenario will tend to be the most workable as a policy solution that could be implemented in the Canadian context. Workability, as defined by J.R. Commons (Rutherford 1983), involves a degree of efficiency and a distribution of benefits and burdens that allows the system to survive, but inefficiencies and injustices may remain. Thus, this study seeks to find which environmental policy best balances the distributional effect of the GHG reduction and its overall impact on the Canadian economy.

More precisely, this research pursues the following objectives: for each policy scenario, it investigates the trade-offs between an arbitrary cut in GHG emissions on employment, gross domestic product (GDP), and industrial output in Canada; it will also assess the distribution of those costs among provinces. Then, another layer of analysis is added to the research, since it also aims to estimates how the impacts on economy are distributed so that the burden, under a specific scenario, can be compared to alternative scenarios. By comparing the overall impact of the GHG emission reduction, under each the different policy scenarios, a statement on their

relative economic efficiency is made. Additionally, by comparing the specific cost of such reduction in each province, it is possible to see which scenario yields the most even distribution of the burden. By combining these results for each scenario, a comment on their respective workability is articulated.

Chapter 2

LITERATURE REVIEW

Since the Nobel prize-winner Wassily Leontief gave it its modern form in 1936, input-output (IO) analysis has been put to many uses in macroeconomics and regional studies (Rose and Miernyk 1989). One of the advantages of IO analysis is its versatility: it allows modellers to tackle problems such as environmental pollution and cost distribution issues. Leontief himself was one of the first to use his model as a tool to address pollution as an economic problem (Leontief 1970). Since then, the literature linking pollution to economic activity through IO models has grown and became more sophisticated. IO analysis remains a relevant method to address environmental problems such as climate change.

2.1 GHG and IO in Canada

Following Leontief's footsteps, and building upon the work of other IO modellers, Victor (1972) developed a complex model of the economy by accounting for ecological goods. His augmented economical-ecological framework, which incorporated the physical laws of the conservation of mass, integrated physical data measured in mass units into his analysis. Victor's approach includes monetary value of economic commodities and mass value of ecological ones. Victor employed the commodity by industry framework for his model, the framework used in Canada (Statistics Canada 2016a). In his study, ecological commodities act as inputs and as outputs. Even if Victor's modelling framework can be empirically estimated (Carpentier 1994), such a level of integration of ecological and economic commodities is unnecessary when addressing the issue of climate change. To assess GHG emissions going into the atmosphere, one needs only to account for some specific wastes. Still, Victor (1972) offers a practical way to

relate ecological output to the demand for economic commodities. This relation between ecological and economic commodities has thereafter been used by other economists to address GHG emissions.

One of these economists is Robert Smith (1991), who developed an extended ecological IO model for of Statistics Canada. Smith's goal in his paper *The Linkage of Greenhouse Gas Emissions to Economic Activity Using an Augmented Input/Output Model* is to give "those engaged in economic/environmental research" (1991, 3) a way to incorporate environmental data into economic models. To do so, he developed an augmented IO framework based on the Canadian national accounts. Like Victor (1972), Smith added an environmental component (in units of mass) to his model, but he limited himself to greenhouse effect relevant air pollutant outputs since his research was a direct response to Canada's Green Plan (Government of Canada 1990). This plan was to provide Canada with a coherent strategy to reduce its overall GHG emissions. The most interesting contribution of Smith's paper, or at least the most relevant to this study, is its integration of Canada's detailed environmental data to a macroeconomic model that could be used for empirical analysis.

More recently, the Kyoto protocol opened the way for a new generation of economic studies addressing GHG emission mitigation and its cost. Lixon, Thomassin and Hamaïde (2008) adapted Smith's work to address Canada's 1997 commitment to the UNFCCC, which was to reduce national GHG emissions by 6% below its 1990 level (Government of Canada 2002). Like Victor (1972) and Smith (1991), Lixon et al. (2008) built their model around the commodity by industry framework and adopted the industry-based technology assumption. The novelty of this research was to push the ecological-economic IO analysis further by simulating different policy scenarios.

More precisely, Lixon et al. (2008) allocate the GHG emission reductions following three policy scenarios. In the first one, each industrial sector had to reduce their industrial output proportionally in such a way that their overall output generates no more GHG emissions than was allowed under the Kyoto protocol. The second and third scenarios, in addition to the direct reduction of GHG emissions associated with a decrease in direct industrial output, accounted for the backward linkages in the economy. The difference between those two scenarios is that the former allocates the burden of GHG emission reduction proportionally to every industrial sector and the latter targets only the 12 most emitting sectors. The cost of reducing Canada's GHG emissions is then evaluated through the decrease in gross domestic product (GDP) and the increase in unemployment. By comparing the first and second scenarios, Lixon et al. (2008) showed that taking into account the direct and indirect effects of an output reduction resulted in a far less negative impact on GDP and employment than not doing so. Additionally, their study illustrated that targeting the largest polluters by allocating the environmental burden on them is a cheaper way to deal with a GHG emission reduction policy than enforcing a uniformly distributed output reduction. Even if Lixon et al. (2008) results are particularly enlightening for this study, their work does not account for spatial considerations and needs to be updated to a post-2008 world. The Canadian economy has changed and the task it is facing with the Paris Agreement is greater than with the Kyoto protocol in the absence of a formal flexibility mechanisms. In addition, as time has passed by, the urgency to act on climate change has grown.

2.2 Insights from other empirical studies

The use of IO analysis to study environmental problem is not limited to Canada. This tool is actually a prominent one when it comes to GHG emissions accounting or mitigation all over the world. Andrew and Forgie (2008) employed IO analysis to investigate the roots of GHG

emissions in New Zealand, Kratena and Schleicher (1999) measured the economic impact of a CO_2 reduction in Austria with an econometric IO model, and Butnar and Llop (2006) developed an IO framework to account for Spanish GHG emissions. Moreover, one can find an interesting literature survey on CO_2 accounting using IO analysis in Munksgaard et al. (2005) and there is an overview of the use of IO analysis for carbon footprint applications in Minx et al. (2009).

Another, more recent, example of economic-ecological modelling comes from San Cristobal (2010), who utilizes an IO model coupled with a linear programming (LP) analysis. He found that GHG emission reductions under the Kyoto protocol would have varying effects over different Spanish economic sectors. As one could expect, his study shows that sectors with the highest GHG emission levels suffer the highest decrease in output value. It turns out that this conclusion is valid for the Canadian compliance to the Kyoto protocol as well (Dissou et al. 2002). Also, San Cristobal (2010, 234) claims that: "because of the KP [Kyoto protocol] emission targets and climate change policies, it is essential that national policy measures and environmental regulations be defined and introduced in as many sectors of the economy as possible, whether it be to a greater or lesser extent". However, San Cristobal does not give explicit results to back this statement. Even if his study is helpful in predicting the impact of an environmental policy, San Cristobal (2010) analysis does not give policy makers many hints about which sectors should bear the burden of GHG emission reductions as well as the extent to which the burden should be evenly distributed among economic sectors.

Using a similar method to San Cristobal (2010), de Souza et al. (2016) address this last issue in their study of GHG emissions in Brazil. With an IO-LP model, they were able to limit GHG emissions accordingly to a specific reduction target and did so by putting the burden only on the most emitting sector. Their findings show that it is the way to go to minimize overall

economic costs. However, for political reasons specific to Brazil, they rejected this alternative as a feasible solution. The most emitting sector in their case is livestock production and it happens to be the main source of income for many people in Brazil, most of them being the poorest of the country. Moreover, de Souza et al. argued that "a policy that controls one sector does not create incentives for others to invest in environmentally cleaner forms of production" (de Souza et al. 2016, 491). On the other hand, their study shows that when the reduction effort is shared by many sectors, the negative economic impact is substantially greater. de Souza et al. (2016) thus argue that the burden must be shared by multiple sectors, allowing for trade offs between production and emission, but the most polluting sectors should have to put the most effort into the GHG reduction task. de Souza et al. (2016) did not propose a specific or detailed policy, but rather advocated for structural change in the Brazilian economy that will aim to transition to greener industrial activities.

2.3 The Canadian political context

As for Brazil, the political context in Canada can also be considered as a constraint to any national action aimed at limiting GHG emissions. Canada's political system is characterized by its decentralized federal nature. This fact complicates environmental regulation, and especially climate change-related actions. It leaves the right to take part in international initiatives to the federal government, but the provincial and territorial powers have exclusive jurisdictions over their non-renewable natural resources. It also involves both federal and regional levels of government when it comes to policing critical sectors such as agriculture and transportation (Bernstein 2002, Harrison 2007, Rabe 2007). So, it was easy for Canada to ratify the Paris Agreement since provinces cannot directly veto any national commitment, however,

implementing an international treaty that steps over provincial jurisdictions is not necessarily guaranteed (Burke and Ferguson 2010).

Moreover, provinces' self-interest can put a national environmental commitment into jeopardy. In addition to the unwillingness they usually show when the federal government tries to meddle with their natural resource regulations (Burke and Ferguson 2010), "the economies of some Canadian provinces are dominated by only a few industries, making those industries very powerful" (Paehlke 2000, 174). Knowing this, considering the will of the provinces is more than essential in the Canadian political context and asking them to make too much of a sacrifice could be the end of Canada's national climate change plan. As such, policy makers must develop a policy that will grant Canada the power to fulfill its commitment without alienating any specific province or group of provinces.

Chapter 3

METHOD AND DATA

3.1 Input-Output specifications

The model specifications used in this research closely follows the one put forward by Statistics Canada (Ghanem 2010) that describes the mathematical derivation of the national and interprovincial model for Canada.

3.1.1 The regional model

First, in order to be in line with the traditional input-output literature, the *supply* matrix from the SUTs published by Statistics Canada is inverted to yield the more common *make* matrix. This matrix features the value of goods produced by the different industries in a region *p* (*p* = 1, …, 14).

$$\mathbf{V_p} = \mathbf{S_p}' \tag{1}$$

The elements of the total commodity output vector **q** and the total industry output vector **g** can be computed by summing the **V** matrix over the industry (*j*) and commodity (*i*) dimensions, respectively.

$$q_{ip} = \left(\sum_j v_{ijp} \right)' \tag{2}$$

$$g_{jp} = \sum_i v_{jip} \tag{3}$$

Each element of the market share matrix **D** is defined by the ratio of commodity production by industries to total commodity output.

$$d_{jip} = \frac{v_{jip}}{q_{ip}} \tag{4}$$

The input coefficient matrix **B** elements are defined in a similar fashion, with the intermediate inputs and total industrial output.

$$b_{ijp} = \frac{u_{ijp}}{g_{jp}} \tag{5}$$

Alternatively, the total commodity output vector from a province *p* can be directly derived from the SUTs, since it is the sum of the intermediate and final uses (including imports as negative values) of a product *i.* In their vector and matrix forms, and defining **i** as a vector of ones:

$$\mathbf{q_p} = \mathbf{U_p i} + \mathbf{f_p} \tag{6}$$

Rearranging equation (5) and replacing its matrix form into (6)

$$\mathbf{q_p} = \mathbf{B_p g_p} + \mathbf{f_p} \tag{7}$$

Reorganizing the matrix form of equation (4) and replacing it into (2) yields

$$\mathbf{g_p} = \mathbf{D_p q_p} \tag{8}$$

Then, to get the industry-by-commodity total requirement matrix needed to model the direct and indirect impacts on industrial output resulting from a shock in commodity final demand, one needs to replace (7) into (8) and solve for **g**.

$$\mathbf{g_p} = \mathbf{D_P}(\mathbf{B_p g_p} + \mathbf{f_p}) \tag{9}$$

$$\left(\mathbf{I} - \mathbf{D_p B_p}\right)\mathbf{g_p} = \mathbf{D_p f_p} \tag{10}$$

$$\mathbf{g_p^*} = [\left(\mathbf{I} - \mathbf{D_p B_p}\right)^{-1}\mathbf{D_p}]\mathbf{f_p} \tag{11}$$

3.1.2 The interprovincial model

Every single region *p* can be treated as a whole economy with its own input, output, and trade structure. However, these regions are part of a greater ensemble and it is more relevant to analyze them within a single model; a model that can capture their interconnections through trade. The information needed to capture the economic links between provinces and territories can be found in the *international and interprovincial trade flows* tables, but first, a vector representing the domestic final demand in each region must be defined. This vector $\mathbf{e_p}$ includes the following final use categories from the *use* table: domestic personal expenditures by residents and non-residents, personal expenditure by non-residents, government and non-profit organization expenditures, private and public capital expenditures, and inventory additions. Each $\mathbf{e_p}$, is then stacked into its interprovincial version. The same goes for vectors $\mathbf{g_p}$ and $\mathbf{q_p}$.

$$\mathbf{e} = \begin{bmatrix} \mathbf{e_1} \\ \vdots \\ \mathbf{e_{14}} \end{bmatrix} \qquad \mathbf{g} = \begin{bmatrix} \mathbf{g_1} \\ \vdots \\ \mathbf{g_{14}} \end{bmatrix} \qquad \mathbf{q} = \begin{bmatrix} \mathbf{q_1} \\ \vdots \\ \mathbf{q_{14}} \end{bmatrix}$$

The input coefficient matrix and interprovincial market share matrix are diagonalized into two 14nx14m and 14mx14n matrices, respectively.

$$\mathbf{B} = \begin{bmatrix} \mathbf{B_1} & \mathbf{0} & \cdots & \mathbf{0} \\ \mathbf{0} & \mathbf{B_2} & & \mathbf{0} \\ \vdots & & \ddots & \vdots \\ \mathbf{0} & \mathbf{0} & \cdots & \mathbf{B_{14}} \end{bmatrix} \quad \mathbf{D} = \begin{bmatrix} \mathbf{D_1} & \mathbf{0} & \cdots & \mathbf{0} \\ \mathbf{0} & \mathbf{D_2} & & \mathbf{0} \\ \vdots & & \ddots & \vdots \\ \mathbf{0} & \mathbf{0} & \cdots & \mathbf{D_{14}} \end{bmatrix}$$

From the *trade flow* tables, a variable t_{iod} can be extracted. This variable represents the value of imports from the region of origin *o* to the region of destination *d* for every product *i*. Summing this variable over the origin dimension yields the total interprovincial imports m_{ip}^R for region *p* (including imports into itself).

$$m_{ip}^{R} = \sum_{o} t_{iod} \ (where\ d = p) \tag{12}$$

Similarly, summing the value of commodity shipments over the destination dimension yields total interprovincial exports x_{ip}^{R} for region *p* (including exports into itself).

$$x_{ip}^{R} = \sum_{d} t_{iod} \tag{13}$$

Using the trade flows t_{iod}, total interprovincial imports m_{ip}^{R}, and the total international imports m_{ip}^{D} extracted from the *trade flow* tables, a trade coefficient variable for every commodity in each region can be defined.

$$r_{iop} = \frac{t_{iop}}{m_{ip}^{R} + m_{ip}^{D}} \tag{14}$$

Stacking these coefficients into a vector $\mathbf{r_{op}}$ and diagonalizing them yields the provincial commodity share matrix **R**.

$$\mathbf{R} = \begin{bmatrix} \widehat{\mathbf{R}}_{\mathbf{1,1}} & \widehat{\mathbf{R}}_{\mathbf{1,2}} & \cdots & \widehat{\mathbf{R}}_{\mathbf{1,14}} \\ \widehat{\mathbf{R}}_{\mathbf{2,1}} & \widehat{\mathbf{R}}_{\mathbf{2,2}} & & \widehat{\mathbf{R}}_{\mathbf{2,14}} \\ \vdots & & \ddots & \vdots \\ \widehat{\mathbf{R}}_{\mathbf{14,1}} & \widehat{\mathbf{R}}_{\mathbf{14,2}} & \cdots & \widehat{\mathbf{R}}_{\mathbf{14,14}} \end{bmatrix}$$

For the model to be complete and free of distortions, leakages into the economy must be accounted for. These leakages are flows of scraps and inventory withdrawals into production. These leakages are defined as a share of total domestic supply for every commodity *i* and in each region *p*.

$$\beta_{ip} = \frac{-n_{ip}^{W}}{q_{ip} - n_{ip}^{W} - s_{ip}} \tag{15}$$

$$\alpha_{ip} = \frac{-s_{ip}}{q_{ip} - n_{ip}^{W} - s_{ip}} \tag{16}$$

Stacking and diagonalizing these coefficients yields:

$$\boldsymbol{\beta} = \begin{bmatrix} \widehat{\boldsymbol{\beta}}_{\mathbf{1}} & \mathbf{0} & \cdots & \mathbf{0} \\ \mathbf{0} & \widehat{\boldsymbol{\beta}}_{\mathbf{2}} & & \mathbf{0} \\ \vdots & & \ddots & \vdots \\ \mathbf{0} & \mathbf{0} & \cdots & \widehat{\boldsymbol{\beta}}_{\mathbf{14}} \end{bmatrix} \qquad \boldsymbol{\alpha} = \begin{bmatrix} \widehat{\boldsymbol{\alpha}}_{\mathbf{1}} & \mathbf{0} & \cdots & \mathbf{0} \\ \mathbf{0} & \widehat{\boldsymbol{\alpha}}_{\mathbf{2}} & & \mathbf{0} \\ \vdots & & \ddots & \vdots \\ \mathbf{0} & \mathbf{0} & \cdots & \widehat{\boldsymbol{\alpha}}_{\mathbf{14}} \end{bmatrix}$$

Using the previously defined interprovincial matrices and the international exports vector **x**, computable from the *trade flows tables*, the interprovincial model is derived in a similar fashion to the regional one.

$$\mathbf{g}^{*} = [\mathbf{I} - \mathbf{D}(\mathbf{I} - \boldsymbol{\beta} - \boldsymbol{\alpha})\mathbf{RB}]^{-1}\mathbf{D}(\mathbf{I} - \boldsymbol{\beta} - \boldsymbol{\alpha})(\mathbf{Re} + \mathbf{x}) \tag{17}$$

Equation (17) captures how regional gross industry output is linked to final expenditures in every regions.

3.2 GHG emissions intensity coefficients

To link national GHG emissions to provincial industry output, provincial share of total emissions can be computed with a simple rule of thumb.

$$ghg_{jp} = \left(\frac{g_{jp}}{g_{jCAN}}\right) ghg_{jCAN} \tag{18}$$

From those physical emissions, province specific GHG emission intensity coefficients (EIC) are defined as the ratio of GHG emissions by industry and region to output by industry and region.

$$\varepsilon_{jp} = \frac{ghg_{jp}}{g_{jp}} \tag{19}$$

As before, these elements are stacked into regional vectors, $\mathbf{ghg_p}$ and $\boldsymbol{\varepsilon_p}$, and then into interprovincial ones.

$$\mathbf{ghg} = \begin{bmatrix} \mathbf{ghg_1} \\ \vdots \\ \mathbf{ghg_{14}} \end{bmatrix} \qquad \boldsymbol{\varepsilon} = \begin{bmatrix} \boldsymbol{\varepsilon_1} \\ \vdots \\ \boldsymbol{\varepsilon_{14}} \end{bmatrix}$$

This method assumes that the same technology (in terms of pollutants output) is used to produce a dollar's worth of industry output g_j in every region. Such an assumption can hardly be made considering the varying nature of production structures in Canada. As an example, one cannot assume that producing a dollar's worth of electricity in the hydroelectricity rich province of Quebec generates the same amount of GHG emissions than producing the same good in a fossil fuel powered province like Alberta.

To overcome this problem and to loosen the assumption on regional industry technology, provincial and industry-specific data from the National Inventory Report (NIR) was used. This allows for the definition of an alternate GHG emission vector specific to each province, where a subset of the industrial GHG emissions is scaled using their NIR equivalents. This procedure to incorporate the environmental data better captures the regional specificities in terms of production to pollution intensity. New and more accurate values for provincial industries' GHG emissions and emission coefficients can then be defined as:

$$ghg'_{jp} = \left(\frac{ghg_{jp}^{NIR}}{\sum_p ghg_{jp}^{NIR}}\right) ghg_{jCAN} \tag{20}$$

$$\varepsilon'_{jp} = \frac{ghg'_{jp}}{g_{jp}} \tag{21}$$

These elements are then stacked into interprovincial vectors.

$$\mathbf{ghg}' = \begin{bmatrix} \mathbf{ghg}'_{\mathbf{1}} \\ \vdots \\ \mathbf{ghg}'_{\mathbf{14}} \end{bmatrix} \qquad \boldsymbol{\varepsilon}' = \begin{bmatrix} \boldsymbol{\varepsilon}'_{\mathbf{1}} \\ \vdots \\ \boldsymbol{\varepsilon}'_{\mathbf{14}} \end{bmatrix}$$

3.3 Ecological-Economic model

The vector resulting from equation (21) can then be used to compute the differences between the targeted level of industrial atmospheric pollution and its projected level in 2020. This last value is obtained by projecting the modelled 2013 economy 7 years into the future according to sector-specific economic growth predictions.

$$\mathbf{ghg}'_{\mathbf{projected}} = \mathbf{g}_{\mathbf{projected}} * \boldsymbol{\varepsilon}' \tag{22}$$

$$\Delta\mathbf{ghg} = \mathbf{ghg}'_{\mathbf{projected}} - \mathbf{ghg}_{\mathbf{target}} \tag{23}$$

From this equation and the emission coefficient vector (21), one can compute the resulting change in industrial output after a GHG emission cut.

$$\Delta g_{jp} = \frac{\Delta ghg_{jp}}{\varepsilon'_{jp}} \tag{24}$$

After creating the interprovincial vector $\Delta\mathbf{g}$, the impact on industrial output of a GHG emissions reduction policy can be modelled.

$$\Delta\mathbf{g}^{*} = [\mathbf{I} - \mathbf{D}(\mathbf{I} - \boldsymbol{\beta} - \boldsymbol{\alpha})\mathbf{RB}]^{-\mathbf{1}}\Delta\mathbf{g} \tag{25}$$

Equation (25) represents the change on gross output by industry ($\Delta\mathbf{g}^{*}$) resulting from an exogenous shock applied to industry output ($\Delta\mathbf{g}$).

3.4 Impact assessment

Assuming a constant relation between industrial output and GDP, the impact of the industrial output reduction on GDP can also be assessed.

$$\Delta gdp^*_{jp} = \left(\frac{gdp_{jp}}{g_{jp}}\right)\Delta g^*_{jp} \tag{26}$$

With similar assumptions regarding the relation between GDP and employment, one can assess job losses resulting from the shock. Defining l_{jp} as the absolute number of jobs in sector *j* and region *p*:

$$\Delta l^*_{jp} = \left(\frac{l_{jp}}{gdp_{jp}}\right)\Delta gdp^*_{jp} \tag{27}$$

3.5 The policy scenarios design

Three main policy scenarios were simulated for this research using the previously presented framework, all of which bring the overall level of GHG emissions under the one set by the Canadian government as their 2020 environmental target (Environment and Climate Change Canada 2016a). Since emissions coming from households are not considered here, the industrial GHG mitigation target is set as a proportion of total Canadian emissions. The ratio between industrial emissions and total emissions is assumed to be constant from 2013 to 2020.

To reach the GHG abatement goal, industrial output values from the targeted industries are decreased by 0.1% from their original values following a successive iteration process. At each iteration, the new level of output is converted into GHG emissions and the operation goes on until the overall industrial GHG emissions fall below the needed level. This process allows

for this analysis to account for both direct and indirect GHG emissions resulting from industrial activity. Since the direct industrial shock is carried out by the model before being converted into GHG emissions, reducing industrial output more than is strictly necessary is thus avoided. Otherwise, failing to account for both direct and indirect emissions would greatly overestimate the needed initial industrial output reduction (Lixon et al. 2008).

3.6 The technological shocks

To deepen the analysis and relax, to a certain extent, the previous assumptions concerning the fixed nature of the GHG EICs, some sub-simulation were run under the main policy scenarios. These scenarios aim to include technological change in the analysis through changes in the GHG EICs. Under these sub-scenarios, technological shocks are applied to the model in three different ways. The first one projects the 2013 GHG EICs up to 2020, the second one deals with best practices techniques, and the third one decreases the value of the said coefficient to emulate the use of greener technologies. The first two technological shocks were complementary to the industrial output reduction under their respective policy scenarios, and the last one substitutes it.

3.6.1 Forecasting GHG emission coefficients

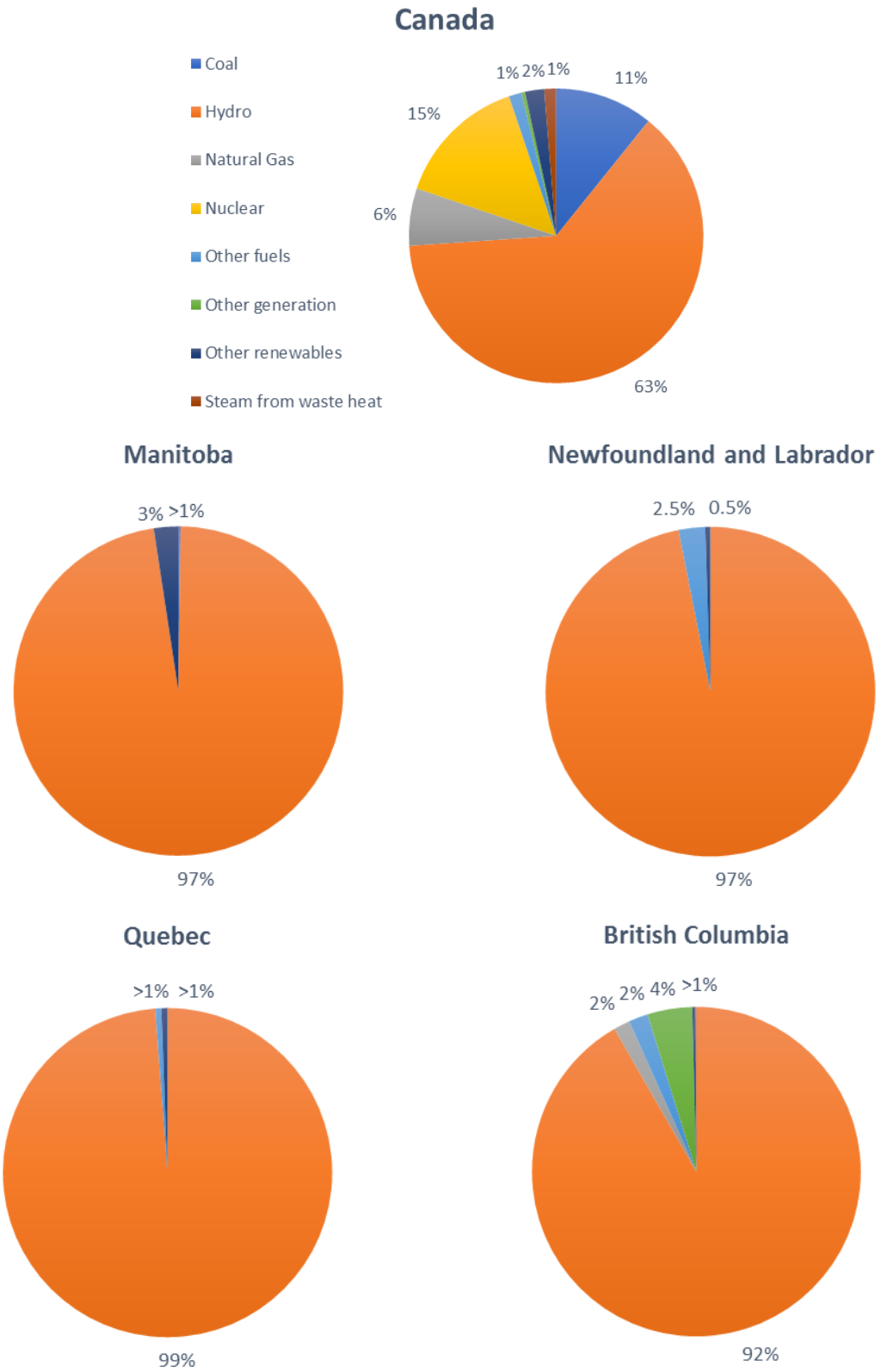
The first simulations of the impacts of an environmental policy in 2020 borrow their GHG EICs from the 2013 model. However, to assess the greening of the economy, these EICs can be updated using the procedure by Mukhopadhyay and Thomassin (2009). To update the coefficients, the recent trends in their evolution were forecasted 7 years into the future using least square fitting. Each EIC evolution trend is modelled individually for every commodity and in every province.

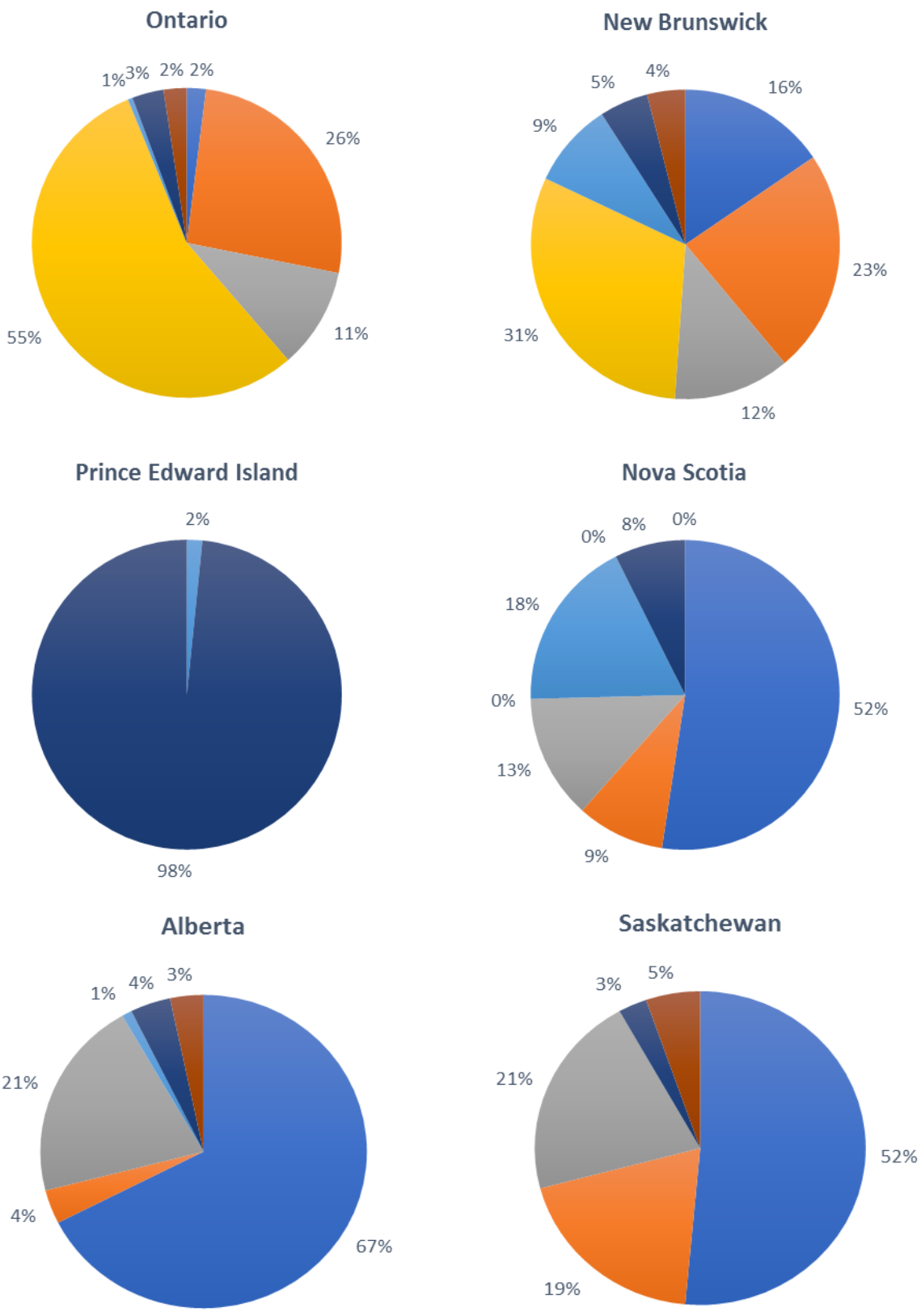
3.6.2 Adopting best practices

The second sub-scenario emulates how EICs would change if economic sectors across provinces were to adopt the best practices (BP) in their own field of activities. Using the 2013 data, the EIC from the greenest province in a specific industrial sector replaces its equivalent in all the other provinces. For at least two specific industries, simply swapping the EIC of a specific region with the one from any other province is inappropriate. To overcome this problem, the best practitioner was set within groups of similar provinces.

To choose the best practitioner for a specific industry, the province with the lowest EICs was chosen. However, in some cases the exercise was not this straightforward. When a province has almost no activity in a certain field, and thus has an artificially low coefficient since only major polluters have to report their emissions (Environment and Climate Change Canada 2016b), it was not considered a best practitioner. This was also true when no assumption on a specific province technology could be made. Otherwise, it was assumed that technology from a certain province could be adopted by any other province. As an example, one can safely guess that if paper can be manufactured in a certain way in British Columbia, it can also be manufactured in this way in Quebec or Saskatchewan. Two industries were treated differently: for *crop and animal production* and *electricity power generation, transmission and distribution* geographical and climatic realities call for cautions when it came to picking the best practitioner. To account for those specificities, the BP EICs were defined as the lowest ones amongst a subgroup of provinces sharing similar production characteristics. As illustrated in **figures 3.1** and **3.2**, for agriculture, provinces were grouped together according to the type of commodity they produce (Statistics Canada 2016a), and for electricity, they were grouped by similar energy mix (The Conference Board of Canada 2017).

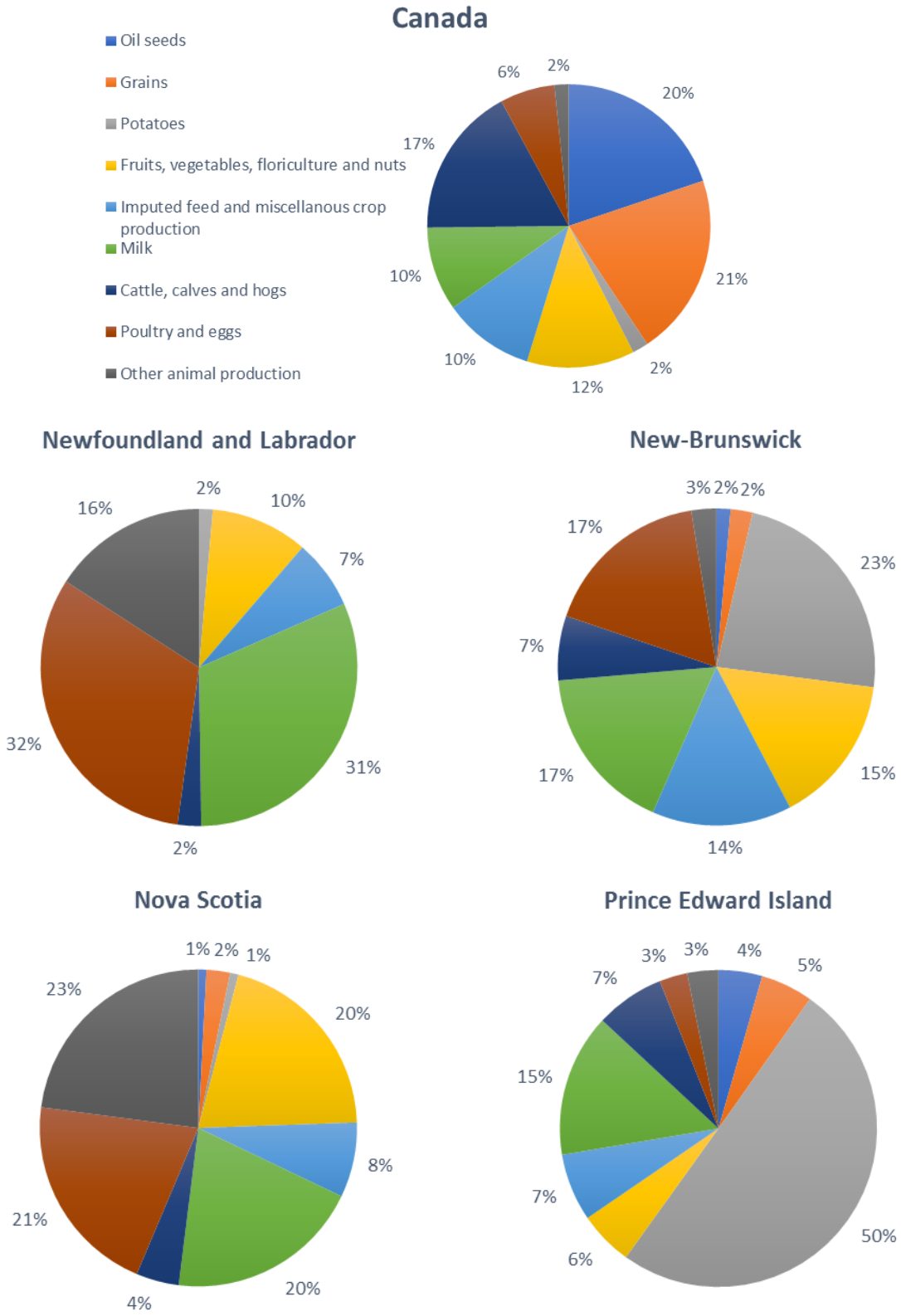
Figure 3.1. Provincial electricity energy mix decomposition[a]



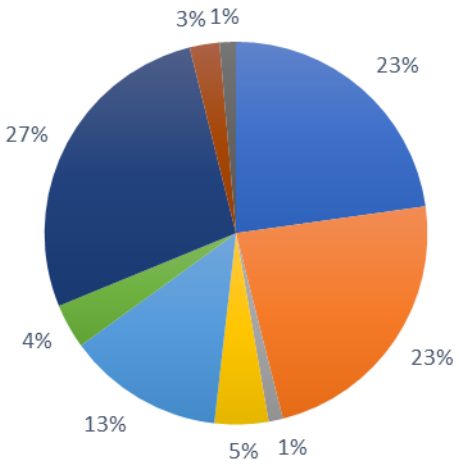


[a]adapted from The Conference Board of Canada, Low-Emitting Electricity Production, 2017

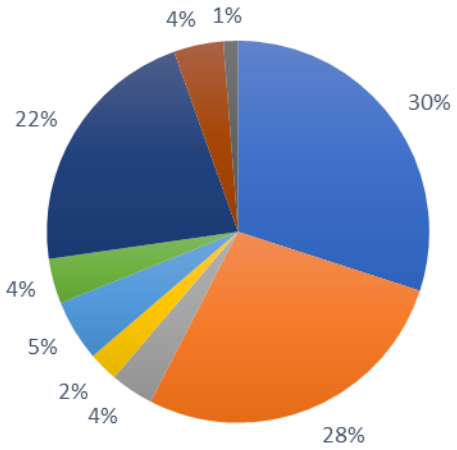
Figure 3.2. Primary agricultural production decomposition



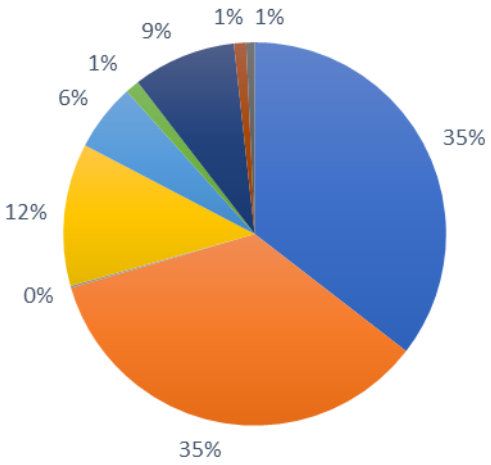
Alberta



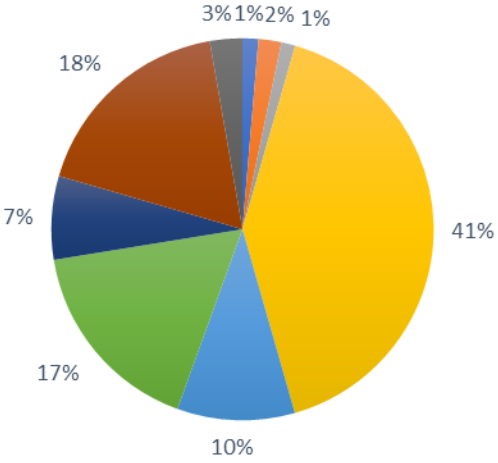
Manitoba



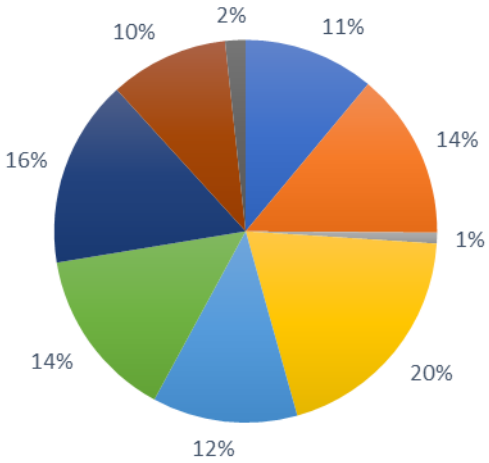
Saskatchewan



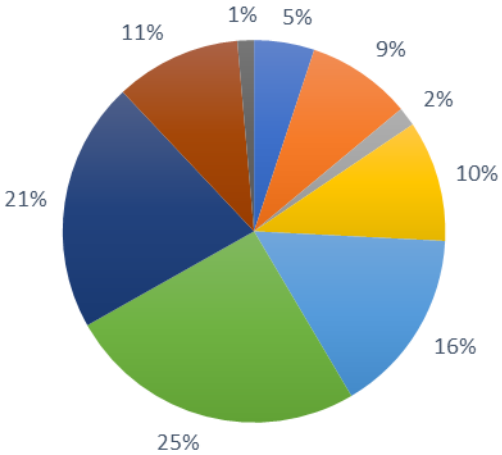
British Columbia



Ontario



Quebec



For electricity, the first group was British Columbia, Manitoba, Prince Edward Island and Quebec. The second was Nova Scotia, Saskatchewan and Alberta. The third one was Ontario and New Brunswick. For agriculture, the Maritimes (including Newfoundland and Labrador) formed the first group, the western provinces of Alberta, Manitoba and Saskatchewan the second, and Ontario, Quebec and British Columbia form the last one. The new coefficients resulting from this exercise are displayed in **table 3.1**.

3.6.3 The effect of research and development

The third and last technological shock focused only on the EICs and does not limit industrial output in any way. In a similar fashion to the main policy scenarios, 0.1% of the targeted EICs were taken off until the total GHG emission reduction matches Canadian's commitment to the UNFCC. This simulation assesses the extend by which industries should improve their technology in order to sufficiently limit their GHG output. It could be interpreted as how much research and development (R&D) is needed to decrease their emissions.

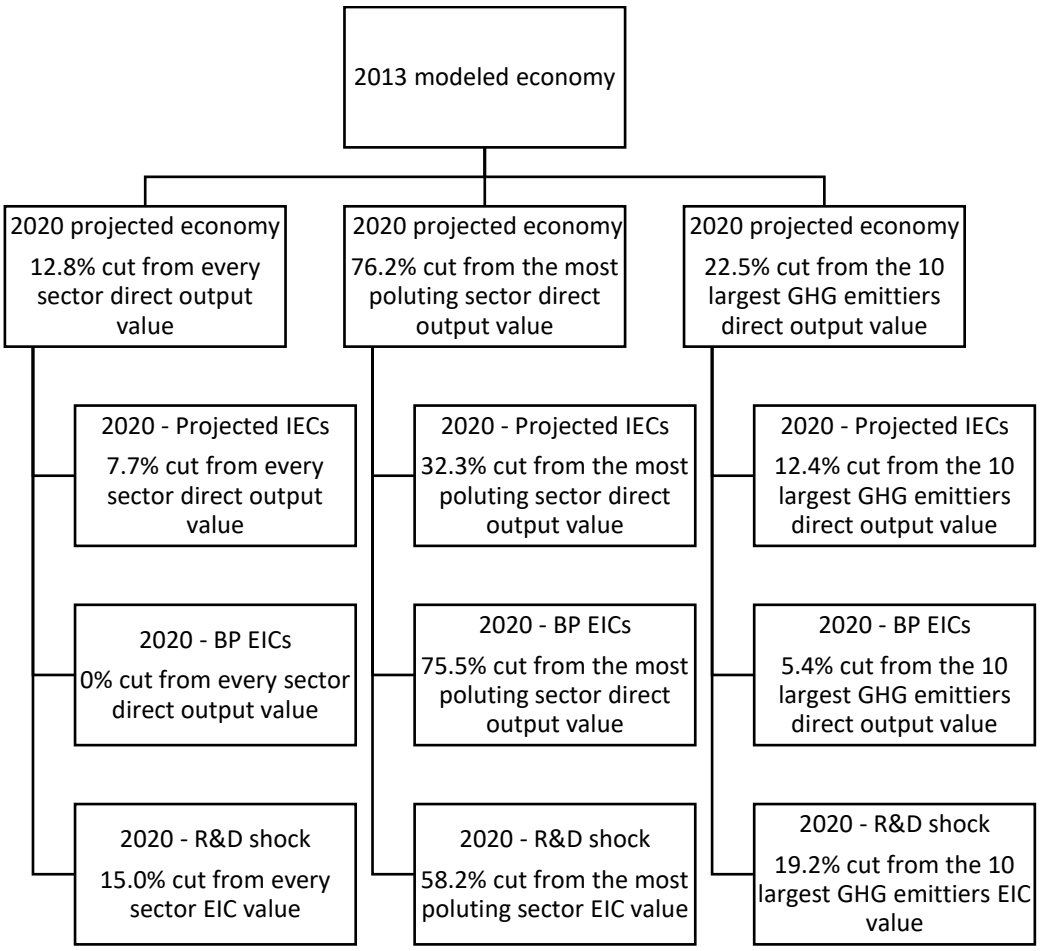
3.6.4 *The 12 simulations at a glance*

One can see in **figure 3.3** how the different simulations were linked to one another. Also, this figure displays which initial shock was applied to the model under each scenario and sub-scenario.

Table 3.1. Best practices GHG emissions intensity coefficients (and previous one) in t./M$

	AB	BC	MB	NB	NL	NS	ON	PE	QC	SK
Crop and animal production	1082 (1494)	914	1082	479 (762)	479	479 (822)	914 (983)	479 597	914 (1011)	1082 (1163)
Oil and gas extraction	1062 (1066)	1062 (2086)	275	75	182	1062 (1846)	1062 (4821)	0	0	1062
Coal mining	110 (958)	110 (487)	0	0	0	0	0	0	0	110
Metal ore mining	54	54 (148)	54 (187)	54 (226)	54 (272)	0	54 (168)	0	54 (370)	54 (505)
Non-metallic mineral mining and quarrying	51	51 (140)	51 (177)	51 (214)	51 (257)	51 (367)	51 (158)	0	51 (349)	51 (476)
Support activities for mining and oil and gas extraction	53	53 (144)	53 (182)	53 (220)	53 (264)	53 (377)	53 (163)	0	53 (359)	53 (490)
Electric power generation, transmission and distribution	5668 (10051)	39 (90)	39 (67)	749 (3432)	39 (1028)	5668	749	39 (50)	39	5668 (7001)
Natural gas distribution, water, sewage and other systems	166 (188)	166 (168)	166 (445)	166 (285)	0	166	166 (359)	0	166 (1970)	166 (1079)
Pulp, paper and paperboard mills	503 (2066)	503 (2015)	503 (1487)	503 (1583)	503 (915)	503	503 (3861)	0	503 (1220)	503 (1698)
Petroleum and coal product manufacturing	75 (610)	75 (95)	2	75 (127)	75 (115)	75 (176)	75 (186)	0	75	75 (409)
Pesticide, fertilizer and other agricultural chemical manufacturing	206 (2221)	206 (1062)	206 (587)	107	0	206 (701)	206 (3117)	44	206 (986)	206
Non-metallic mineral product manufacturing (except cement and concrete products)	179 (405)	179 (831)	179 (363)	179 (552)	6	3	179	26	179 (1502)	15
Cement and concrete product manufacturing	877	877 (1300)	1	18	2	877 (1850)	877 (1229)	0	877 (1134)	1
Primary metal manufacturing	17 (60)	17	17 (50)	3	17 (103)	10	162 (558)	5	162	17 (147)
Air transportation	521 (942)	521	521 (774)	521 (756)	521 (1135)	521 (1160)	521 (853)	521 (1880)	521 (895)	521 (1645)
Rail transportation	302 (546)	302	302 (448)	302 (438)	302 (657)	302 (672)	302 (494)	0	302 (518)	302 (952)
Water transportation	567 (1026)	567	567 (843)	567 (823)	567 (1236)	567 (1263)	567 (929)	567 (2047)	567 (975)	567 (1790)
Truck transportation	301 (545)	301	301 (448)	301 (438)	301 (657)	301 (671)	301 (494)	301 (1088)	301 (518)	301 (951)
Transit, ground passenger and scenic and sightseeing transportation, taxi and limousine service and support activities for transportation	81 (147)	81	81 (121)	81 (118)	81 (177)	81 (181)	81 (133)	81 (293)	81 (139)	81 (256)
Pipeline transportation	74 (519)	74 (815)	74 (149)	74	0	74 (185)	74 (993)	0	74 (1010)	74 (1464)
Waste management and remediation services	138	138 (506)	138 (482)	138 (666)	138 (1365)	138 (461)	138 (261)	138 (587)	138 (359)	138 (436)

Figure 3.3. The 12 simulations at a glance



3.7 Economic data

The provincial SUTs from the Canadian system of macroeconomic accounts (Statistics Canada 2016a) were used to build the economic model. These accounts provide the monetary flows similar to the IO tables from Leontief's early works (Blair and Miller 2009). Their main purpose is to reflect the "productive structure of the economy", as is stated by Statistics Canada (2017a). Unlike the tables developed by Leontief, Canada's own macroeconomic accounts are rectangular, which means that an industry j ($j = 1, \ldots, m$) can produce more than one single good

i j (i = 1, …, *n*). As in most rectangular framework, there are more commodities than industries such that $m < n$.

The most recent data available, which was used here, was from 2013. The information featured in these tables comes from surveys as well as administrative sources such as tax records, professional and industry organizations, and non-government institutions (Statistics Canada 2016b). **Table 3.2** illustrates the main features of the *supply* table, and **table 3.3** does the same for the *use* table. They are distinct, but balanced tables representing the input and output structure of the 14 interconnected economies composing Canada. Each region has its own set of tables.

Table 3.2. Supply table

	Industries (1 to n)	**International and interprovincial imports**	**Total**
Products (1 to m)	Commodities made by industries **S** (s_{ij})	Imports of goods for intermediate and final uses **M** (m_i)	Total supply at basic price

Basically, three interrelated matrices compose the *supply* table (**table 3.2**). Each element s_{ij} of the *m* by *n* **S** matrix shows the value of a good *i* domestically produced by the industry *j*. The matrix **M** provides the value of good *i* imported from abroad and from all other regions of Canada. Summing these matrices over the industry dimension yields the *total supply at basic price* for each product *i* in a specific region *p*.

Table 3.3. Use table

	Industries (1 to n)	**International and interprovincial imports**	**Total**
Products (1 to m)	Commodities used by industries **U** (u_{ij})	Commodities used by final purchasers **F** (f_i)	Gross output
Primary factors	Industry use of primary factors	-	Gross domestic product (GDP)

The *use* table mirrors the *supply* table. It is a block matrix composed of 5 sub-matrices. The elements u_{ij} of the **U** matrix represent the intermediate use of a commodity *i* by the industry *j*. It is the value of commodity inputs that goes into production. The value of commodities that are directly consumed are in the **F** matrix. This matrix combines the purchase of goods by domestic and foreign consumers, public administrations and industries, and capital formation expenditures. The value of exports and re-exports of goods are also included in **F**. Summing the columns and then adding matrices **U** and **F** to each other yields the *gross output in basic price* vector. It represents the value of the total intermediate and final uses of each commodity *i*.

Table 3.3 also features two other matrices that are included in the *use* table. For an industry *j,* the *industry use of primary factors* elements are: indirect taxes and subsidies, wages and salaries, employers' social contributions, gross mixed income, and gross operating surplus. The total value of those factors for an industry *j* is essentially the difference between the value of

its output and the total value of its intermediate consumption. It accounts for the value of industrial production used to pay the suppliers of services like labour and capital, and net taxes (Statistics Canada 2016b). The values of the primary inputs (excluding net taxes) are used to derive the contribution of each industry to the Canadian GDP at basic prices.

These SUTs originally featured 488 product categories, 236 industry categories, 289 final use categories (excluding international and interprovincial imports) and a set of 6 categories of primary factors. To fit the available environmental data, the number of industries had to be decreased to 111. This can be done by merging categories following the Input-Output Industry Codes classification (IOIC) (Statistics Canada 2017b), which is based on the North American Industry Classification System (Statistics Canada 2017c). A list of the products and industries, and a table showing how they are aggregated is provided in **appendix A**.

In addition to the 14 sets of SUTs representing the economic structure of each province, the three territories, and the Canadian enclaves abroad (an aggregate of Canada's foreign embassies and military bases*), international and interprovincial trade flows* tables are used to link every subnational region through the value of their exchanges (Statistics Canada 2016c). These tables feature the value of shipment of goods from one region to another $t_{o,d}$ (o being the region of origin and d the region of destination). The elements on the diagonal of this matrix ($t_{p,p}$where $p = p$) represents the value of goods produced and consumed in the same region (Généreux and Langen 2002). Also, these tables include total international exports and imports, by products and regions (**table 3.4**).

Table 3.4. International and interprovincial trade flows table

Origin \ Destination	Region 1	Region 2	…	Region 14	International exports
Region 1	$t_{1,1}$	$t_{1,2}$	…	$t_{1,14}$	x_1
Region 2	$t_{2,1}$	$t_{2,2}$	…	$t_{2,14}$	x_2
…	…	…	…	…	…
Region 14	$t_{14,1}$	$t_{14,2}$	…	$t_{14,14}$	x_{14}
International imports	m_1^D	m_2^D	…	m_{14}^D	-

3.7.1 Forecasting data

To allow for economic projections, the Canadian GDP was forecasted using data from The Conference Board of Canada (2016). For this analysis, sectorial GDP growth rates were used (**table 3.5**). However, no distinction could be made on a geographical basis, so each region's sectors growth rate was the same.

The economic data used to derive the historic trends in GHG EICs comes from two sets of tables, the first one covering the period from 1997 to 2009 (Statistics Canada 2011), and the second from 2009 to 2013 (Statistics Canada 2016d). These tables report Canadian, provincial and territorial gross output by economic sector.

Table 3.5. Sectorial GDP growth rate[b]

	GDP change (%)						
	2014	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Crop, forestry, fishing and trapping, and support	-7.2	3.2	1.6	1.2	2.1	2.0	1.7
Mining	6.8	-3.3	-1.6	2.5	1.9	2.1	1.7
Utilities	0.1	-0.6	1.0	2.8	2.2	2.0	1.6
Construction	1.3	-4.2	-2.7	0.8	0.4	1.1	1.4
Manufacturing	2.8	0.3	0.8	1.9	1.9	1.7	1.5
Wholesale trade and retail	4.3	1.6	2.9	2.2	1.6	1.6	1.6
Transportation and warehousing	4.4	3.4	2.6	2.1	1.9	1.9	1.9
Information and cultural services	0.0	-0.8	0.6	0.5	0.2	0.1	0.4
Finance, insurance, real estate, and rental and leasing	3.1	3.7	3.5	2.8	2.8	2.8	2.9
Professional, scientific, and technical services	2.1	1.3	1.6	2.9	2.0	1.9	1.9
Management of companies and enterprises	0.2	3.9	0.2	2.9	2.3	2.5	2.1
Administrative and support services	1.5	-0.6	0.7	2.9	2.5	2.3	2.5
Waste management and remediation services	4.9	2.0	1.4	2.3	2.1	2.3	2.1
Arts, entertainment, and recreation	0.3	4.5	1.7	2.4	1.8	1.8	1.7
Accomodation and food services	3.1	1.8	2.7	2.1	1.9	2.1	1.9
Other services	2.3	0.7	-0.1	2.9	2.3	2.6	2.8
Educational services	0.0	1.8	1.5	0.7	0.7	0.4	0.2
Health care and social assistance and hospital	1.7	1.9	2.4	1.9	2.0	1.9	1.9
Public Administration	0.9	0.6	2.3	2.1	1.1	0.6	0.5

[b]adapted from The Conference Board of Canada, Canadian Outlook Long-Term Economic Forecast, 2016

3.8 Environmental data

To account for industrial GHG emissions, one needs environmental data that fits the industrial classification used in the *supply* and *use* tables. Such data are published yearly by Statistics Canada through its Physical Flow Accounts (Statistics Canada 2017d). The physical

flows measure the "supply and use of natural inputs, products, or residuals by industry and households" in physical units (Statistics Canada 2015). The ones used for this analysis were the account for greenhouse gas emissions in kilotons of CO^2 equivalent (Statistics Canada 2017b). These emissions data were classified by industry as they are defined under the IOIC, allowing the possibility to link environmental data to the monetary flows featured in the *supply* and *use* tables. Thus, allowing for economic-environmental modelling. Historical GHG emission data, necessary to derive past EICs, were also from Statistics Canada and cover the period between 1997 and 2008 (Statistics Canada 2012), and between 2009 and 2013 (Statistics Canada 2017d).

Since only national data was available from this source, additional province specific knowledge of the different regions' GHG emissions patterns were needed. Such environmental data can be found in annex 12 of the National Inventory Report submitted annually by Environment and Climate Change Canada (2016b) to the UNFCC. This record acknowledges and quantifies the differences in pollution emission levels between Canada's regions. As stated before, the NIR data were used to weight the provincial share of total Canadian emissions according to their share of total emissions in the report. The regionally weighted sectors are the bold ones and the coefficients they yield are displayed in **table 3.6** and how they are aggregated in **appendix B3**.

Table 3.6. GHG emissions coefficients (CO_2 equivalent Mt./$)

	AB	BC	MB	NB	NL	NS	ON	PE	QC	SK
Crop and animal production	**1494**	**914**	**1082**	**762**	**479**	**822**	**983**	**597**	**1011**	**1163**
Forestry and logging	944	944	944	944	944	944	944	944	944	944
Fishing, hunting and trapping	252	252	252	252	252	252	252	252	252	252
Support activities for agriculture and forestry	226	226	226	226	226	226	226	226	226	226
Oil and gas extraction	**1066**	**2086**	**275**	**75**	**182**	**1846**	**4821**	**0**	**0**	**1062**
Coal mining	**958**	**487**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**110**
Metal ore mining	**54**	**148**	**187**	**226**	**272**	**0**	**168**	**0**	**370**	**505**
Non-metallic mineral mining and quarrying	**51**	**140**	**177**	**214**	**257**	**367**	**158**	**0**	**349**	**476**
Support activities for mining and oil and gas extraction	**53**	**144**	**182**	**220**	**264**	**377**	**163**	**0**	**359**	**490**
Electric power generation, transmission and distribution	**10050**	**90**	**67**	**3432**	**1028**	**5668**	**749**	**50**	**39**	**7001**
Natural gas distribution, water, sewage and other systems	**188**	**168**	**445**	**285**	**0**	**166**	**359**	**0**	**197**	**1079**
Residential building construction	11	11	11	11	11	11	11	11	11	11
Non-residential building construction	8	8	8	8	8	8	8	8	8	8
Transportation engineering construction	45	45	45	45	45	45	45	45	45	45
Oil and gas engineering construction	24	24	24	24	24	24	24	24	24	24
Electric power engineering construction	32	32	32	32	32	32	32	32	32	32
Communication engineering construction	50	50	50	50	50	50	50	50	50	50
Other engineering construction	40	40	40	40	40	40	40	40	40	40
Repair construction	13	13	13	13	13	13	13	13	13	13
Other activities of the construction industry	302	302	302	302	302	302	302	302	302	302
Animal food manufacturing	40	40	40	40	40	40	40	40	40	40
Sugar and confectionery product manufacturing	121	121	121	121	121	121	121	0	121	121
Fruit and vegetable preserving and specialty food manufacturing	82	82	82	82	82	82	82	82	82	82
Dairy product manufacturing	37	37	37	37	37	37	37	37	37	37
Meat product manufacturing	44	44	44	44	44	44	44	44	44	44
Seafood product preparation and packaging	22	22	22	22	22	22	22	22	22	0
Miscellaneous food manufacturing	63	63	63	63	63	63	63	63	63	63
Soft drink and ice manufacturing	33	33	33	33	33	33	33	33	33	33
Breweries	43	43	43	43	43	43	43	43	43	43
Wineries and distilleries	110	110	110	110	110	110	110	110	110	0
Tobacco manufacturing	0	8	0	0	0	0	8	0	8	0
Textile and textile product mills	79	79	79	79	79	79	79	79	79	79
Clothing and leather and allied product manufacturing	24	24	24	24	24	24	24	24	24	24
Wood product manufacturing	236	236	236	236	236	236	236	236	236	236
Pulp, paper and paperboard mills	**2066**	**2015**	**1487**	**1583**	**915**	**503**	**3861**	**0**	**1220**	**1698**
Converted paper product manufacturing	62	62	62	62	62	62	62	62	62	62
Printing and related support activities	44	44	44	44	44	44	44	44	44	44
Petroleum and coal product manufacturing	**610**	**95**	**2**	**127**	**115**	**176**	**186**	**0**	**75**	**409**
Basic chemical manufacturing	0	0	0	0	0	0	0	0	0	0
Pesticide, fertilizer and other agricultural chemical manufacturing	**2221**	**1062**	**587**	**107**	**0**	**701**	**3117**	**44**	**986**	**206**
Pharmaceutical and medicine manufacturing	19	19	19	19	19	19	19	19	19	19
Miscellaneous chemical product manufacturing	0	0	0	0	0	0	0	0	0	0
Plastic product manufacturing	34	34	34	34	34	34	34	0	34	34
Rubber product manufacturing	63	63	63	63	63	63	63	0	63	63

Non-metallic mineral product manufacturing (except cement and concrete products)	**405**	**831**	**363**	**552**	**6**	**3**	**179**	**26**	**1502**	**15**
Cement and concrete product manufacturing	**877**	**1300**	**1**	**18**	**2**	**1850**	**1229**	**0**	**1134**	**1**
Primary metal manufacturing	**60**	**17**	**50**	**3**	**103**	**10**	**558**	**5**	**162**	**147**
Fabricated metal product manufacturing	47	47	47	47	47	47	47	47	47	47
Machinery manufacturing	23	23	23	23	23	23	23	23	23	23
Computer and peripheral equipment manufacturing	6	6	6	6	0	6	6	0	6	6
Electronic product manufacturing	10	10	10	10	10	10	10	10	10	10
Electrical equipment and component manufacturing	17	17	17	17	17	17	17	17	17	17
Household appliance manufacturing	22	22	0	0	0	0	22	22	22	0
Motor vehicle manufacturing	11	11	11	0	0	11	11	0	11	11
Motor vehicle body and trailer manufacturing	44	44	44	44	0	44	44	44	44	44
Motor vehicle parts manufacturing	13	13	13	13	13	13	13	0	13	13
Aerospace product and parts manufacturing	14	14	14	14	14	14	14	14	14	14
Railroad rolling stock manufacturing	19	19	0	0	0	0	19	19	19	0
Ship and boat building	18	18	18	18	18	18	18	18	18	18
Other transportation equipment manufacturing	6	6	6	6	6	6	6	0	6	6
Furniture and related product manufacturing	37	37	37	37	37	37	37	37	37	37
Miscellaneous manufacturing	23	23	23	23	23	23	23	23	23	23
Wholesale trade	80	80	80	80	80	80	80	80	80	80
Retail trade	54	54	54	54	54	54	54	54	54	54
Air transportation	**942**	**521**	**774**	**756**	**1135**	**1160**	**853**	**1880**	**895**	**1645**
Rail transportation	**546**	**302**	**448**	**438**	**657**	**672**	**494**	**0**	**518**	**952**
Water transportation	**1026**	**567**	**843**	**823**	**1236**	**1263**	**929**	**2047**	**975**	**1790**
Truck transportation	**545**	**301**	**448**	**438**	**657**	**671**	**494**	**1088**	**518**	**951**
Transit, ground passenger and scenic and sightseeing transportation, taxi and limousine service and support activities for transportation	**147**	**81**	**121**	**118**	**177**	**181**	**133**	**293**	**139**	**256**
Pipeline transportation	**519**	**815**	**149**	**74**	**0**	**185**	**993**	**0**	**1010**	**1464**
Postal service and couriers and messengers	169	169	169	169	169	169	169	169	169	169
Warehousing and storage	57	57	57	57	57	57	57	57	57	57
Motion picture and sound recording industries	39	39	39	39	39	39	39	39	39	39
Radio and television broadcasting	8	8	8	8	8	8	8	8	8	8
Publishing, pay/specialty services, telecommunications and other information services	9	9	9	9	9	9	9	9	9	9
Depository credit intermediation and monetary authorities	10	10	10	10	10	10	10	10	10	10
Insurance carriers	4	4	4	4	4	4	4	4	4	4
Lessors of real estate	83	83	83	83	83	83	83	83	83	83
Owner-occupied dwellings	0	0	0	0	0	0	0	0	0	0
Rental and leasing services and lessors of non-financial intangible assets (except copyrighted works)	112	112	112	112	112	112	112	112	112	112
Other finance, insurance and real estate services and management of companies and enterprises	60	60	60	60	60	60	60	60	60	60
Legal, accounting and architectural, engineering and related services	14	14	14	14	14	14	14	14	14	14

Computer systems design and other professional, scientific and technical services	11	11	11	11	11	11	11	11	11	11
Advertising, public relations and related services	19	19	19	19	19	19	19	19	19	19
Administrative and support services	30	30	30	30	30	30	30	30	30	30
Waste management and remediation services	**138**	**506**	**482**	**666**	**1365**	**461**	**261**	**587**	**359**	**436**
Educational services	40	40	40	40	40	40	40	40	40	40
Health care and social assistance	33	33	33	33	33	33	33	33	33	33
Arts, entertainment and recreation	12	12	12	12	12	12	12	12	12	12
Accommodation and food services	25	25	25	25	25	25	25	25	25	25
Repair and maintenance	99	99	99	99	99	99	99	99	99	99
Personal services and private households	33	33	33	33	33	33	33	33	33	33
Professional and similar organisations	5	5	5	5	5	5	5	5	5	5
Repair and maintenance	0	0	0	0	0	0	0	0	0	0
Operating supplies	0	0	0	0	0	0	0	0	0	0
Office supplies	0	0	0	0	0	0	0	0	0	0
Advertising, promotion, meals, entertainment, and travel	0	0	0	0	0	0	0	0	0	0
Transportation margins	0	0	0	0	0	0	0	0	0	0
Non-profit education services	109	109	109	109	109	109	109	109	109	109
Non-profit social assistance	31	31	31	31	31	31	31	31	31	31
Non-profit arts, entertainment and recreation	121	121	121	121	121	121	121	121	121	121
Religious organizations	168	168	168	168	168	168	168	168	168	168
Miscellaneous non-profit institutions serving households	56	56	56	56	56	56	56	56	56	56
Educational services (except universities)	32	32	32	32	32	32	32	32	32	32
Universities	55	55	55	55	55	55	55	55	55	55
Hospitals	14	14	14	14	14	14	14	14	14	14
Nursing and residential care facilities	10	10	10	10	10	10	10	10	10	10
Other federal government services	31	31	31	31	31	31	31	31	31	31
Other provincial and territorial government services	9	9	9	9	9	9	9	9	9	9
Other municipal government services	100	100	100	100	100	100	100	100	100	100
Other aboriginal government services	30	30	30	30	30	30	30	30	30	30

Chapter 4

RESULTS

The modelled economy was shocked through a reduction of direct industrial output value. Three policy scenarios were designed to bring the total GHG emissions to their targeted level in 2020. The GHG emissions target is defined as the maximum level of emissions industrial production is allowed to generate according to the first phase of the Canadian commitment to the UNFCC. Assuming a constant ratio of industrial GHG emissions to total domestic GHG emissions (industries + households), the total industrial GHG output in CO_2 equivalent must be at most equal to 514,540 kilotons in 2020.

4.1 Policy scenario 1

Under this scenario, an uniform decrease in industrial output value is imposed on all industrial sectors. This scenario simulated what could happen if the federal government chooses to allocate the environmental burden uniformly across provinces and industries. It reflects the consequences of a command and control type of policy that does not account for sectorial and provincial specificities or a flat tax on carbon emissions. To fulfill its Paris commitment, Canada would have to limit each economic sector's direct industrial output by 12.8%.

4.1.1 Industrial production impact under scenario 1

Since the initial shock is transferred to the whole economy by the model, the direct and indirect effect of a mandatory direct output reduction can be assessed. Even if the primary shock is only 12.8%, the backward impacts within the economy are substantially greater. As examples (see **table 4.1** and **appendix C1**), the *forestry and logging* industry output total value is reduced

by 34.3% in Ontario, the *pesticide, fertilizer and other agricultural chemical manufacturing* industry by 40.2% in Prince Edward Island, and the *animal food manufacturing* industry by 34.6% in Manitoba.

In most provinces, the industries hit the hardest under this scenario are forestry related industries, construction industries, some manufacturing sectors, and human capital intensive service industries like *professional and similar organisations* and *radio and television broadcasting* (**table 4.1**). Within the provinces, the results show some important disparities between the different sectors: some see their output reduced just slightly more than the initial shock, and others, as stated before, are affected much more. This could be explained by the interconnections between sectors within the economy. If an industry is linked to many other industrial sectors, the effect of an even cut in production would be multiplied. This is the case since each industry would not only have to bare its own output reduction, but the they would also suffer the effects of the reduction in its supply chain and output markets.

Table 4.1. The five most affected industries in each province under scenario 1 in 2020

Industry (% value loss)				
AB	**BC**	**MB**	**NB**	**NL**
Support activities for agriculture and forestry (38.6)	*Support activities for agriculture and forestry* (40.6)	*Support activities for agriculture and forestry* (37.7)	*Support activities for agriculture and forestry* (44.6)	*Support activities for agriculture and forestry* (38.2)
Forestry and logging (37.6)	*Radio and television broadcasting* (36.4)	*Radio and television broadcasting* (36.3)	*Radio and television broadcasting* (36.3)	*Radio and television broadcasting* (36.0)
Radio and television broadcasting (37.3)	*Other activities of the construction industry* (34.2)	*Forestry and logging* (34.9)	*Animal food manufacturing* (34.9)	*Animal food manufacturing* (35.6)
Repair construction (35.1)	*Repair construction* (33.5)	*Animal food manufacturing* (34.6)	*Other activities of the construction industry* (34.3)	*Professional and similar organisations* (32.8)
Professional and similar organisations (34.2)	*Professional and similar organisations* (33.6)	*Other activities of the construction industry* (34.9)	*Repair construction* (33.8)	*Other activities of the construction industry* (31.7)
NS	**ON**	**PE**	**QC**	**SK**
Support activities for agriculture and forestry (42.1)	*Support activities for agriculture and forestry* (39.8)	*Pesticide, fertilizer and other agricultural chemical manufacturing* (40.2)	*Support activities for agriculture and forestry* (43.2)	*Radio and television broadcasting* (36.7)
Radio and television broadcasting (36.3)	*Repair construction* (35.2)	*Support activities for agriculture and forestry* (38.7)	*Animal food manufacturing* (36.8)	*Coal mining* (35.4)
Forestry and logging (36.3)	*Oil and gas extraction* (35.2)	*Primary metal manufacturing* (36.6)	*Pesticide, fertilizer and other agricultural chemical manufacturing* (36.6)	*Repair construction* (34.8)
Animal food manufacturing (34.3)	*Forestry and logging* (34.3)	*Radio and television broadcasting* (36.4)	*Forestry and logging* (35.9)	*Professional and similar organisations* (34.1)
Natural gas distribution, water, sewage and other systems (33.6)	*Professional and similar organisations* (34.3)	*Animal food manufacturing* (36.1)	*Radio and television broadcasting* (35.7)	*Support activities for agriculture and forestry* (34.1)

4.1.2 GDP and employment impact under scenario 1

The first scenario is the costliest on both the provincial and national level (see **table 4.2**). It is also the scenario showing the most even level of distribution of costs amongst provinces. In terms of GDP, every province has a similar decrease. The least affected being Newfoundland and Labrador, which suffers an 18.1% decrease in its GDP, and the most affected, with a 21.2% GDP loss, is Alberta. This means that each province sees their GDP cut by at least 18%. Keeping proportions in mind, the Maritime economies do a little bit better than their central and western counterparts. The national decrease in GDP value is important. If an environmental policy leads to an even reduction of industrial output, one could expect Canada to lose a fifth of its yearly GDP.

Table 4.2. Impact on GDP in basic price in 2020

	GDP reduction (%)		
	Policy 1	**Policy 2**	**Policy 3**
Direct reduction of industrial output	12.8% on every industry	76.2% on the largest emitter	22.5% on top 10 emitters
Alberta	21.2	20.8	11.9
British Columbia	19.3	2.3	4.2
Manitoba	19.7	2.5	6.9
New Brunswick	19.2	0.5	5.3
Newfoundland and Labrador	18.1	20.9	10.4
Nova Scotia	18.3	0.8	3.2
Ontario	20.3	0.7	4.8
Prince Edward Island	18.2	0.1	3.3
Quebec	19.7	0.4	5.0
Saskatchewan	19.8	14.8	12.4
Northwest Territories	18.7	6.5	6.6
Nunavut	19.5	0.5	4.8
Yukon	17.2	0.4	2.2
Enclaves Abroad	12.9	0.0	0.0
Canada (total)	20.1	5.6	6.5

Under this scenario, approximately 3,971,000 jobs are lost across the country. As shown in **table 4.3**, service industries are hit the harshest. There are over 400,000 jobs lost in both *retail trade*, *professional, scientific and technical services*, and *health care and social assistance*. Also, still on the national level, the historically high GHG emitting industries see their work force substantially less diminished than the average. Those are *mining, quarrying, and oil and gas extraction* and *utilities* (electricity producing).

Since the central provinces of Quebec and Ontario are the most populous, they suffer the greatest job loss in absolute numbers. The ten most affected sectors in terms of employment, if the provinces are pooled together, are in Ontario (7) and Quebec (3). There are more than a million and half jobs lost in Ontario alone. Even if the numbers are smaller for the other provinces, the impact is still important in proportion to their work force.

Table 4.3. Employment losses under scenario 1 (in thousands of jobs)

	AB	**BC**	**MB**	**NB**	**NL**	**NS**	**ON**	**PE**	**QC**	**SK**	**Tot.**
Agriculture and forestry	18.4	14.1	6.7	3.3	1.4	3.5	27.8	1.7	23.7	9.9	**110**
Mining, quarrying, and oil and gas extraction	42.2	6.3	1.7	1.4	2.9	1.1	9.1	0.1	4.9	5.6	**75**
Utilities	5.8	2.9	1.8	0.9	0.6	1.1	14.3	0.1	7.4	1.6	**37**
Construction	34.7	31.4	6.9	4.7	3.1	5.5	73.8	0.9	42.6	7.7	**211**
Manufacturing	39.1	33.9	14.0	5.9	2.5	6.8	166.4	1.0	114.2	8.0	**392**
Wholesale trade	22.5	20.0	5.0	2.9	1.4	2.9	57.2	0.3	34.0	5.9	**152**
Retail trade	52.8	58.8	15.6	9.6	6.7	12.7	173.0	2.1	106.8	13.4	**451**
Transportation and warehousing	35.5	36.4	11.5	5.2	3.2	5.8	106.3	0.6	54.2	8.3	**267**
Finance and insurance	20.4	24.4	6.8	3.1	1.5	3.9	105.8	0.4	45.3	5.8	**217**
Real estate and rental and leasing	8.4	10.2	2.0	0.9	0.6	1.3	28.0	0.1	11.1	1.6	**64**
Professional, scientific and technical services	57.4	52.9	8.6	4.7	2.8	8.2	173.4	1.0	94.5	8.7	**412**
Business, building and other support services	28.1	31.6	6.8	6.3	2.2	7.5	110.5	0.8	52.5	4.7	**251**
Educational services	18.1	24.5	6.7	4.0	2.6	5.0	71.1	0.8	41.1	6.1	**180**
Health care and social assistance	43.9	50.9	17.6	10.0	7.4	13.2	152.1	1.9	102.5	13.8	**413**
Information, culture and recreation	18.3	24.5	5.8	2.7	1.4	4.3	81.6	0.7	43.8	4.2	**187**
Accommodation and food services	28.3	34.5	8.1	4.8	2.9	6.1	88.4	1.1	50.1	6.4	**231**
Other services (except public administration)	28.6	21.3	6.0	3.5	3.1	3.8	62.5	0.6	38.5	5.8	**174**
Public administration	14.4	16.5	5.3	3.3	2.9	4.2	57.7	1.2	34.8	5.0	**145**
Total (rounded)	**517**	**495**	**137**	**77**	**49**	**97**	**1559**	**15**	**902**	**122**	**3971**

4.2 Policy scenario 2

The second scenario simulates a GHG output reduction equivalent to a 76.2% decrease in *oil and gas extraction* industrial output. This policy specifically targets the most GHG emitting sector in the Canadian economy. This scenario tried to minimize the overall cost of the environmental policy in the way it is recommended in the IO literature (San Cristobal 2010, de Souza et al. 2016). It models what could happen if the emissions of a single sector was to be priced or capped.

4.2.1 Industrial production impact under scenario 2

This policy scenario has huge implications for the targeted industry in each province (**table 4.4** and **appendix C2**). *Oil and gas extraction* output loses between 77.6% (Quebec) to 87.0% (British Columbia) of its total industrial output. In Alberta and Saskatchewan respectively, this industrial sector production value is cut by 81.5% and 84.6%. There is less "collateral damage" induced by the backward links in the economy in this scenario than in the other two. Except for a few sectors in Alberta, Saskatchewan and Newfoundland and Labrador, no other sector than *support activities for mining* and *oil and gas extraction* incurs value losses greater than 10%.

In Alberta, the *electric power generation, transmission and distribution*; *other finance, insurance and real estate services and management of companies and enterprises*, and *administrative and support services* industries suffer from output value losses between 18 and 20%. *Repair construction*; *waste management and remediation services*, and *primary metal manufacturing* output values are reduced by 10 to 14% in Saskatchewan.

Table 4.4. The five most affected industries in each province under scenario 2 in 2020

Industry (% value loss)				
AB	**BC**	**MB**	**NB**	**NL**
Oil and gas extraction (80.0)	*Oil and gas extraction* (85.7)	*Oil and gas extraction* (76.6)	*Oil and gas extraction* (76.6)	*Oil and gas extraction* (76.3)
Support activities for mining and oil and gas extraction (38.1)	*Support activities for mining and oil and gas extraction* (9.6)	*Support activities for mining and oil and gas extraction* (5.9)	*Support activities for mining and oil and gas extraction* (24.9)	*Support activities for mining and oil and gas extraction* (40.4)
Other finance, insurance and real estate services and management of companies and enterprises (18.9)	*Repair construction* (4.6)	*Electrical equipment and component manufacturing* (3.6)	*Administrative and support services* (4.0)	*Miscellaneous chemical product manufacturing* (16.4)
Electric power generation, transmission and distribution (18.7)	*Non-metallic mineral product manufacturing (except cement and concrete products)* (4.3)	*Other finance, insurance and real estate services and management of companies and enterprises* (3.3)	*Other finance, insurance and real estate services and management of companies and enterprises* (2.6)	*Basic chemical manufacturing* (12.1)
Administrative and support services (17.8)	*Pipeline transportation* (4.1)	*Motor vehicle parts manufacturing* (3.1)	*Postal service and couriers and messengers* (3.1)	*Waste management and remediation services* (10.0)
NS	**ON**	**PE**	**QC**	**SK**
Oil and gas extraction (77.2)	*Oil and gas extraction* (77.0)	*Support activities for mining and oil and gas extraction* (45.6)	*Oil and gas extraction* (76.2)	*Oil and gas extraction* (83.1)
Support activities for mining and oil and gas extraction (46.9)	*Support activities for mining and oil and gas extraction* (3.9)	*Other finance, insurance and real estate services and management of companies and enterprises* (3.7)	*Support activities for mining and oil and gas extraction* (3.1)	*Support activities for mining and oil and gas extraction* (20.1)
Primary metal manufacturing (8.7)	*Other finance, insurance and real estate services and management of companies and enterprises* (3.7)	*Radio and television broadcasting* (0.8)	*Other finance, insurance and real estate services and management of companies and enterprises* (3.1)	*Primary metal manufacturing* (13.6)
Non-metallic mineral product manufacturing (3.2)	*Administrative and support services* (2.1)	*Administrative and support services* (0.8)	*Fabricated metal product manufacturing* (1.5)	*Repair construction* (11.7)
Computer systems design and other professional, scientific and technical services (1.9)	*Tobacco manufacturing* (2.0)	*Computer systems design and other professional, scientific and technical services* (0.7)	*Radio and television broadcasting* (1.4)	*Miscellaneous chemical product manufacturing* (9.8)

4.2.2 GDP and employment impact under scenario 2

Out of the three main policy scenarios modelled, the second is the one that comes at the lowest cost on a national basis. It is much cheaper than the first scenario (5.6% GDP reduction vs. 20.1%) and still does well against the third one (6.5% GDP loss) as one can see in **table 4.2** (page 42). On the other hand, if this policy were to be implemented, one can expect great disproportions between the economic impacts on provinces. Most of the national GDP reduction comes from the fossil fuel-producing provinces: Alberta (-20.8%), Newfoundland and Labrador (-20.9%) and Saskatchewan (-14.8%). For Alberta, this scenario is almost as costly as the first one in terms of provincial GDP while some other provinces like Quebec, Prince Edward Island and New Brunswick are almost unaffected. They, respectively, suffer GDP loss of 0.4, 0.1 and 0.5%

As with GDP, employment under this scenario is most negatively affected in energy-producing provinces, especially Alberta. The model provides a drop of 246,000 in the number of jobs in Alberta, 135,700 of them coming from the *mining, quarrying, and oil and gas extraction* industry alone (see **table 4.5**). Ontario and British Columbia also see their total employment rates drop significantly. In British Columbia, most of the jobs are lost in the *mining, quarrying, and oil and gas extraction* industry. In Ontario, most of the jobs are lost in the service industry. As an example, the *finance and insurance*; *professional, scientific and technical services* and *business, building and other support services* lose 6 000, 9 600, and 10 200 jobs respectively.

The other non-oil-producing provinces are only mildly affected (Manitoba, New Brunswick, Nova Scotia, and Prince Edward Island). Economic sectors such as *agriculture and forestry*; *real estate and rental and leasing*; *educational services*; *health care and social*

assistance, and *public administration* see only a slight decrease in their overall number of jobs. These sectors lose fewer than 3 000 jobs each on a national scale.

Table 4.5. Employment losses under scenario 2 (in thousands of jobs)

	AB	**BC**	**MB**	**NB**	**NL**	**NS**	**ON**	**PE**	**QC**	**SK**	**Tot.**
Agriculture and forestry	0.3	0.2	0.1	0.0	0.0	0.0	0.2	0.0	0.1	0.1	**1**
Mining, quarrying, and oil and gas extraction	135.7	11.7	2.8	0.5	8.0	2.0	0.6	0.1	0.2	15.5	**177**
Utilities	3.4	0.4	0.1	0.0	0.1	0.0	0.3	0.0	0.1	0.4	**5**
Construction	3.1	1.2	0.0	0.0	0.0	0.0	0.4	0.0	0.1	0.5	**5**
Manufacturing	10.0	1.8	0.5	0.1	0.1	0.2	4.6	0.0	2.3	1.2	**21**
Wholesale trade	7.9	1.8	0.3	0.1	0.2	0.1	2.6	0.0	0.7	1.0	**15**
Retail trade	6.0	2.3	0.3	0.1	0.2	0.1	3.1	0.0	1.1	0.7	**14**
Transportation and warehousing	9.0	2.4	0.5	0.1	0.3	0.1	4.4	0.0	0.9	0.9	**19**
Finance and insurance	7.6	1.5	0.4	0.1	0.3	0.1	6.0	0.0	1.3	1.1	**18**
Real estate and rental and leasing	1.2	0.2	0.0	0.0	0.0	0.0	0.3	0.0	0.1	0.1	**2**
Professional, scientific and technical services	28.9	5.5	0.5	0.2	0.5	0.4	9.6	0.0	3.5	2.2	**51**
Business, building and other support services	16.0	3.6	0.7	0.7	0.6	0.4	10.2	0.0	3.4	1.5	**37**
Educational services	0.6	0.2	0.0	0.0	0.0	0.0	0.3	0.0	0.1	0.1	**1**
Health care and social assistance	0.7	0.3	0.1	0.1	0.1	0.0	0.2	0.0	0.1	0.2	**2**
Information, culture and recreation	4.2	1.1	0.2	0.1	0.1	0.1	3.1	0.0	0.9	0.4	**10**
Accommodation and food services	3.2	1.3	0.2	0.1	0.1	0.1	1.3	0.0	0.4	0.4	**7**
Other services (except public administration)	7.3	1.0	0.1	0.0	0.3	0.0	1.0	0.0	0.4	0.6	**11**
Public administration	0.9	0.3	0.1	0.0	0.0	0.0	0.3	0.0	0.1	0.2	**2**
Total (rounded)	**246**	**37**	**7**	**2**	**11**	**4**	**48**	**0**	**16**	**27**	**398**

4.3 Policy scenario 3

This scenario is a mix of the two previous ones. It targets the most polluting sectors, but distributes the burden to more than just one industry. This emulates a sector-specific environmental policy or a policy where small emitters are spared by taxation or regulation rules. It calls for a 22.5% direct output value reduction for the following sectors: *crop and animal production*; *oil and gas extraction*; *electric power generation, transmission and distribution*; *pulp, paper and paperboard mills*; *petroleum and coal product manufacturing*; *cement and concrete product manufacturing*; *primary metal manufacturing*; *wholesale trade*; *air*

transportation, and *truck transportation*. Theses sectors, pooled together, represent 75% of the total national GHG emissions (**table 4.6**).

Table 4.6. 2020 sectorial shares of GHG emissions prior to shock

	GHG emissions (Kt.)	**National share**
Crop and animal production	83,576	12.4%
Oil and gas extraction	173,895	25.7%
Electric power generation, transmission and distribution	97,744	14.5%
Pulp, paper and paperboard mills	31,983	4.7%
Petroleum and coal product manufacturing	25,120	3.7%
Cement and concrete product manufacturing	11,552	1.7%
Primary metal manufacturing	25,226	3.7%
Wholesale trade	13,894	2.1%
Air transportation	18,629	2.8%
Truck transportation	27,151	4.0%
Total	-	75.3%

4.3.1 Industrial production impact under scenario 3

The negative effect from the backward linkages to other industrial sectors is smaller in this scenario. Most industries, around 80% of them if the territories are excluded, are not significantly affected, losing less than 5% of their worth. Indeed, the targeted carry a larger part of the GHG reduction than the other sectors. The *crop and animal production* output value is reduced by an average of 28% in the Prairies, *electric power generation, transmission and distribution* output value is cut by approximately 28% in Ontario, British Columbia and Quebec, and in the Maritimes, the *truck transportation* industry suffers a decrease in output value of 30% (**table 4.7** and **appendix C3**).

The *oil and gas extraction* industry is one of the most impacted by this policy. It faces a 46.6% output value decrease in Ontario and a 41.3% reduction in New Brunswick. Moreover, this industry is in the top 5 most negatively affected industries in every province but Quebec. In comparison, in the first policy scenario, the same industry is only in Ontario's top 10 most

affected industries. Nevertheless, from **table 4.8,** the decrease in *oil and gas extraction* output has little to no implications on this sector's employment data in provinces other than the western provinces plus Ontario.

Non-targeted industries are much less impacted than the others, but still suffer some output reduction due to their economic interconnections. Most of the industries that were affected the most under scenario 1 are not included in the top 5 most affected industries under this scenario. The majority of these low-carbon industries suffer decreases below 10% (**appendix C3**).

Table 4.7. The five most affected industries in each province under scenario 3 in 2020

Industry (% value loss)				
AB	**BC**	**MB**	**NB**	**NL**
Truck transportation (34.1)	*Oil and gas extraction* (33.5)	*Oil and gas extraction* (36.6)	*Oil and gas extraction* (41.3)	*Oil and gas extraction* (29.8)
Electric power generation, transmission and distribution (33.7)	*Truck transportation* (29.7)	*Truck transportation* (33.7)	*Truck transportation* (32.1)	*Truck transportation* (27.4)
Petroleum and coal product manufacturing (33.0)	*Petroleum and coal product manufacturing* (28.6)	*Crop and animal production* (27.8)	*Primary metal manufacturing* (30.8)	*Petroleum and coal product manufacturing* (26.8)
Oil and gas extraction (31.1)	*Cement and concrete product manufacturing* (28.3)	*Petroleum and coal product manufacturing* (26.7)	*Electric power generation, transmission and distribution* (26.7)	*Wholesale trade* (25.8)
Crop and animal production (30.1)	*Electric power generation, transmission and distribution* (26.9)	*Wholesale trade* (26.5)	*Crop and animal production* (26.5)	*Electric power generation, transmission and distribution* (25.6)
NS	**ON**	**PE**	**QC**	**SK**
Oil and gas extraction (36.3)	*Oil and gas extraction* (46.6)	*Primary metal manufacturing* (38.4)	*Truck transportation* (29.6)	*Primary metal manufacturing* (33.9)
Truck transportation (29.1)	*Truck transportation* (30.7)	*Petroleum and coal product manufacturing* (28.8)	*Crop and animal production* (29.3)	*Truck transportation* (33.1)
Primary metal manufacturing (28.1)	*Petroleum and coal product manufacturing* (30.3)	*Truck transportation* (27.2)	*Petroleum and coal product manufacturing* (28.8)	*Petroleum and coal product manufacturing* (32.7)
Crop and animal production (26.9)	*Crop and animal production* (28.6)	*Crop and animal production* (27.1)	*Primary metal manufacturing* (28.5)	*Oil and gas extraction* (32.2)
Cement and concrete product manufacturing (26.7)	*Electric power generation, transmission and distribution* (26.9)	*Electric power generation, transmission and distribution* (27.1)	*Cement and concrete product manufacturing* (28.1)	*Electric power generation, transmission and distribution* (30.9)

4.3.2 GDP and employment impact under scenario 3

In terms of GDP decrease, **table 4.2** (page 42) shows that the third scenario features much more inequality between provinces than the first one, but less than the second one.

Provincial GDP reductions go from 3.2% in Nova Scotia to 12.4% in Saskatchewan. Even if the overall GDP reduction is greater than under the previous scenario, it is still well below the first one (6.5% vs 20.1%).

As in the first policy simulation, Ontario and Quebec lose more jobs than the other less populous provinces (see **table 4.8**). The difference this time is that Alberta also suffers a significantly high job loss. In comparison with the first scenario, the overall job loss is much less within each province and on a national level. Targeting specific industries instead of distributing the ecological burden equally across sectors saves approximately 3,000,000 jobs nationally. Compared to the second policy scenario, this scenario places less of a burden on Alberta, there are 2.5 times more jobs lost in the oil industry under scenario 2 than scenario 3, but much more difficult on Ontario's job market, which loses 329,000 jobs instead of 48,000.

Table 4.8. Employment losses under scenario 3 (in thousands of jobs)

	AB	**BC**	**MB**	**NB**	**NL**	**NS**	**ON**	**PE**	**QC**	**SK**	**Tot.**
Agriculture and forestry	19.5	6.0	7.3	2.0	0.5	1.8	25.1	1.4	17.5	12.3	**94**
Mining, quarrying, and oil and gas extraction	52.9	4.8	1.8	0.5	3.4	1.0	4.7	0.0	2.2	6.3	**78**
Utilities	5.5	2.8	1.9	1.0	0.8	1.2	13.3	0.1	8.5	1.6	**37**
Construction	2.0	1.6	0.2	0.3	0.0	0.2	4.1	0.0	1.6	0.5	**10**
Manufacturing	21.4	13.5	4.0	6.0	2.4	3.1	57.2	0.1	52.1	5.3	**165**
Wholesale trade	27.1	23.8	5.9	3.4	1.7	3.5	66.8	0.3	40.2	7.3	**180**
Retail trade	4.7	3.3	1.1	0.5	0.3	0.5	10.5	0.1	5.7	1.4	**28**
Transportation and warehousing	27.5	21.9	9.5	5.2	1.7	3.6	66.6	0.4	36.7	6.2	**179**
Finance and insurance	4.7	2.2	1.0	0.5	0.2	0.3	12.3	0.0	5.0	1.3	**28**
Real estate and rental and leasing	0.9	0.4	0.1	0.0	0.0	0.0	1.5	0.0	0.5	0.1	**4**
Professional, scientific and technical services	15.9	6.4	1.4	0.6	0.3	0.9	25.8	0.1	12.5	2.2	**66**
Business, building and other support services	9.0	4.0	1.2	1.2	0.4	0.8	16.9	0.1	7.5	1.3	**42**
Educational services	0.4	0.3	0.1	0.1	0.0	0.0	0.9	0.0	0.4	0.1	**2**
Health care and social assistance	0.5	0.3	0.1	0.1	0.1	0.1	0.8	0.0	0.7	0.2	**3**
Information, culture and recreation	3.4	2.3	0.7	0.3	0.1	0.4	10.7	0.1	4.5	0.7	**23**
Accommodation and food services	2.6	2.3	0.5	0.2	0.2	0.3	6.7	0.1	2.7	0.5	**16**
Other services (except public administration)	5.0	1.4	0.5	0.4	0.3	0.2	3.6	0.0	2.5	0.8	**15**
Public administration	0.8	0.5	0.1	0.1	0.0	0.1	1.3	0.0	1.0	0.3	**4**
Total (rounded)	**204**	**98**	**38**	**23**	**13**	**18**	**329**	**3**	**202**	**48**	**974**

4.4 The 2013 simulations

The three policy simulations were also conducted with the 2013 economy, prior to the projection exercise. The first, second and third policies limit industrial output by 8.2%, 48.6% and 25.7% respectively (**table 4.9**). The 2013 and 2020 models feature similar results in terms of the cost distribution amongst provinces, total GHG emission shares and sectorial impacts for each policy simulated. The only significant difference being the scale of the changes. As one would expect, the 2013 model calls for smaller output reductions.

Table 4.9. Impact on GDP in basic price in 2013

	GDP reduction (%)		
	Policy 1	**Policy 2**	**Policy 3**
Direct reduction of industrial output	8.2% on every industry	48.6% on the largest emitter	25.7% on top 10 emitters
Alberta	13.6	13.5	7.6
British Columbia	12.4	1.5	2.7
Manitoba	12.7	1.6	4.5
New Brunswick	12.3	0.3	3.4
Newfoundland and Labrador	11.6	13.4	6.7
Nova Scotia	11.8	0.5	2.0
Ontario	13.0	0.4	3.0
Prince Edward Island	11.7	0.1	2.2
Quebec	12.6	0.2	3.2
Saskatchewan	12.8	9.5	8.0
Northwest Territories	12.0	4.2	4.1
Nunavut	12.5	0.3	3.0
Yukon	11.0	0.2	1.4
Enclaves Abroad	8.2	0.0	0.0
Canada (total)	12.9	3.6	4.2

4.5 The technological shocks

The technological shock, adding to or substituting for the original output reduction, has a significant impact. First thing, if the GHG emission target is still the same for 2020 (514,539 kt. of CO^2 equivalent) under each scenario, the starting point changes depending on which EICs are

used. For the previous simulations, the 2013 coefficients were used in the model (**table 3.6**, page 36). However, if the updated 2020 EICs resulting from the forecasting exercise replace the original ones, the overall 2020 GHG emission associated with the 2020 total industrial output is substantially lower.

Depending on the starting point of the EICs projection, the GHG emissions in 2020 are expected to be either 392,887 or 596,478 Kt. Using data from 1997 to set the trend used to project coefficients to 2020, the modelled economy hit its target at no cost. It is not the case if the trend is set in 2007. Due to the fact that the 1997 trend seems to significantly underestimate future GHG emissions when compared to the predictions from Environment Canada (2014), the 2007 trend is used for the rest of the analysis. As displayed in **table 4.10**, total GHG emission is also lower than before if the BP EICs are used.

Table 4.10. Total 2020 industrial GHG emissions before shock (Kt. of CO_2 equivalent)

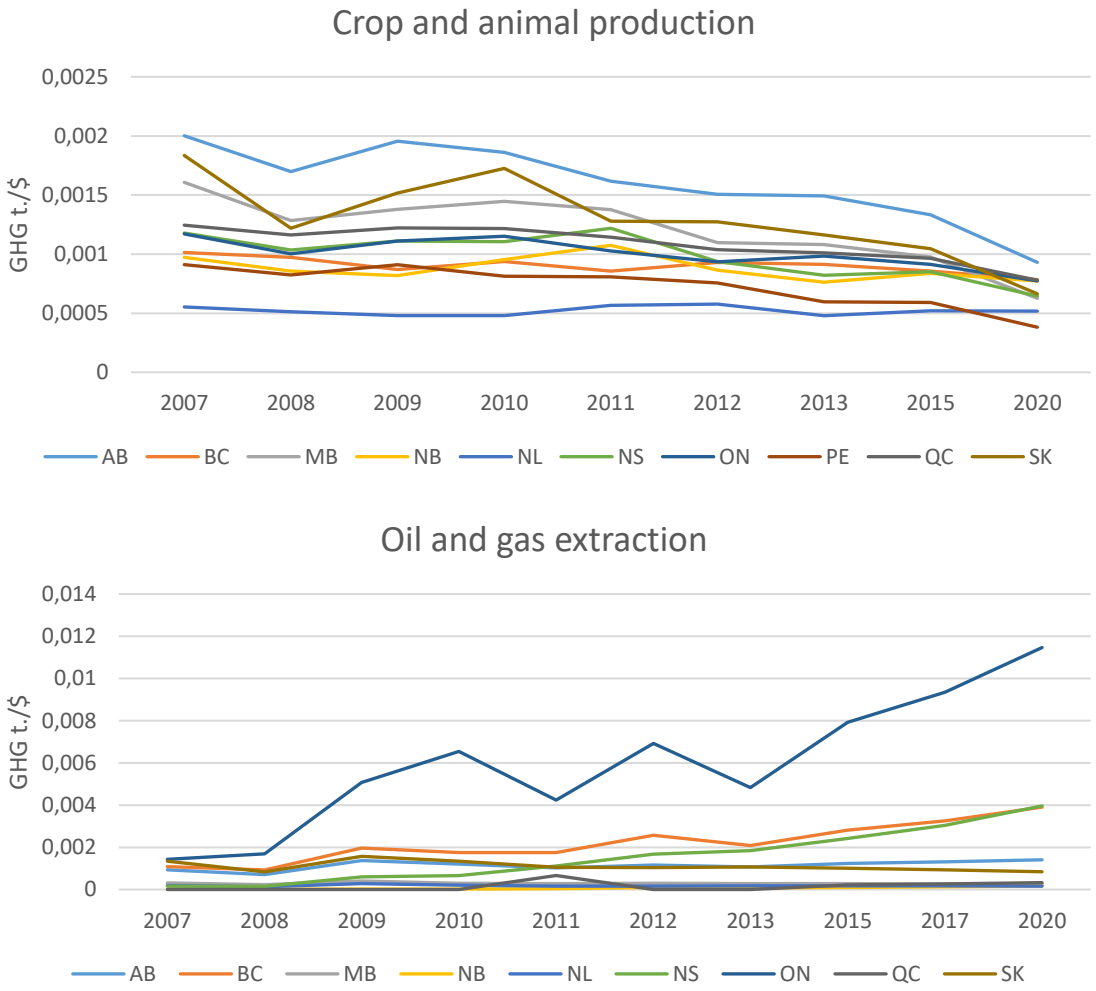
	Best practice coefficients	Projected 2020 coefficients	2013 coefficients
Policy scenario 1	501,647	596,478 (from 2007) 392,887 (from 1997)	671,066
Policy scenario 2	662,332		
Policy scenario 3	542,600		
Industrial share of 2020 Paris agreement target: 514,539			

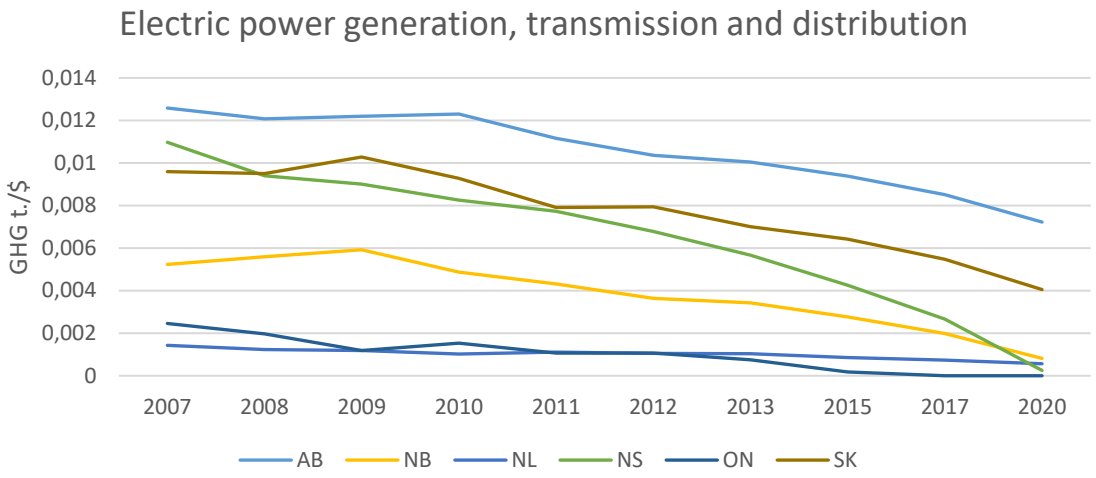
4.5.1 The updated 2020 emission intensity coefficients

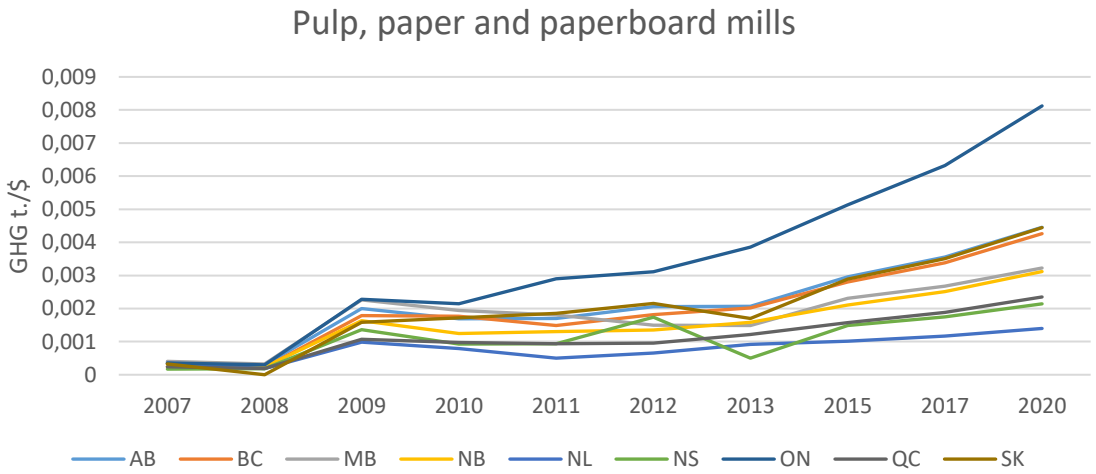
The trend projections for the 10 most GHG emitting industrial sectors in 2013 are displayed in **figure 4.1**. Values from 2013 to 2020 were projected, and provinces without any production or an EIC near zero are omitted in the graphs for clarity. In the analysis, every emission intensity coefficient is projected up to 2020, and their updated value is displayed in **appendix G**. Two originally highly polluting sectors do not figure in the top 10 largest emitters at the end of the trend projection, and are thus replaced under the third policy scenario. These are

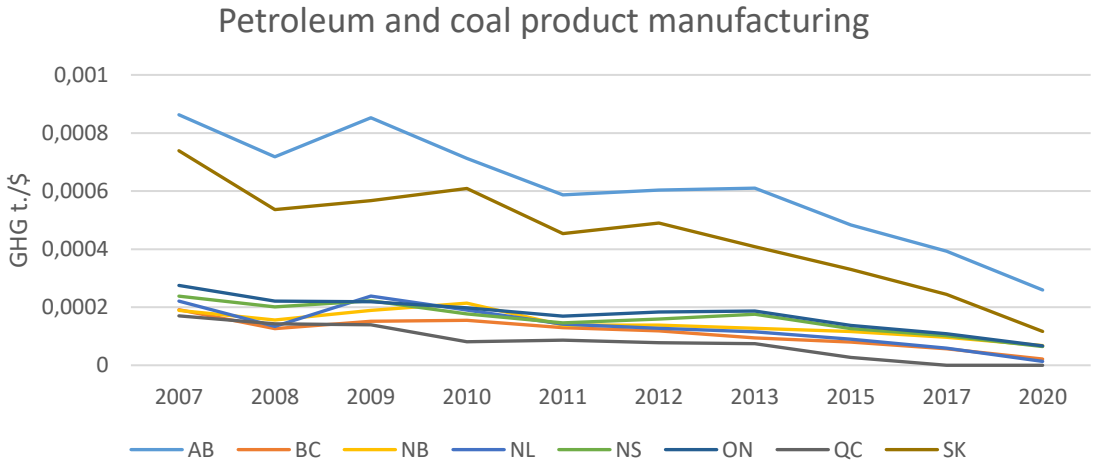
cement and concrete product manufacturing and *wholesale trade*, and they are replaced by *forestry and logging* and *wood product manufacturing*.

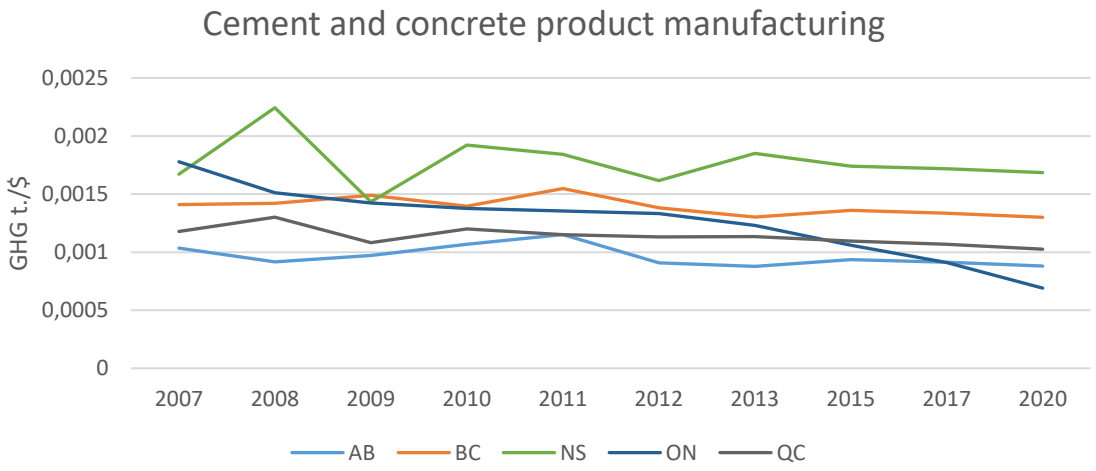
Figure 4.1. Emission intensity coefficient trend projections

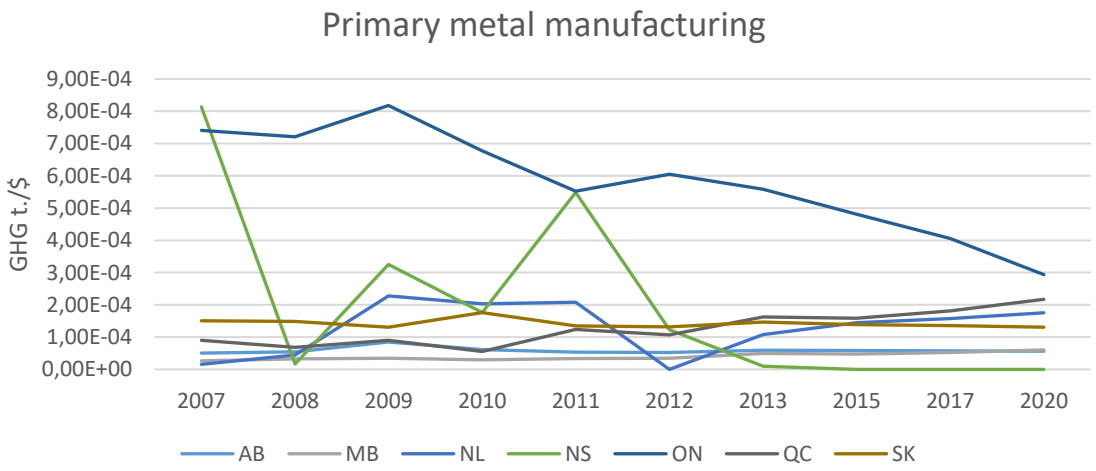



Electric power generation, transmission and distribution
GHG t./$
0,014
0,012
0,01
0,008
0,006
0,004
0,002
0
2007
2008
2009
2010
2011
2012
2013
2015
2017
2020
AB
NB
NL
NS
ON
SK

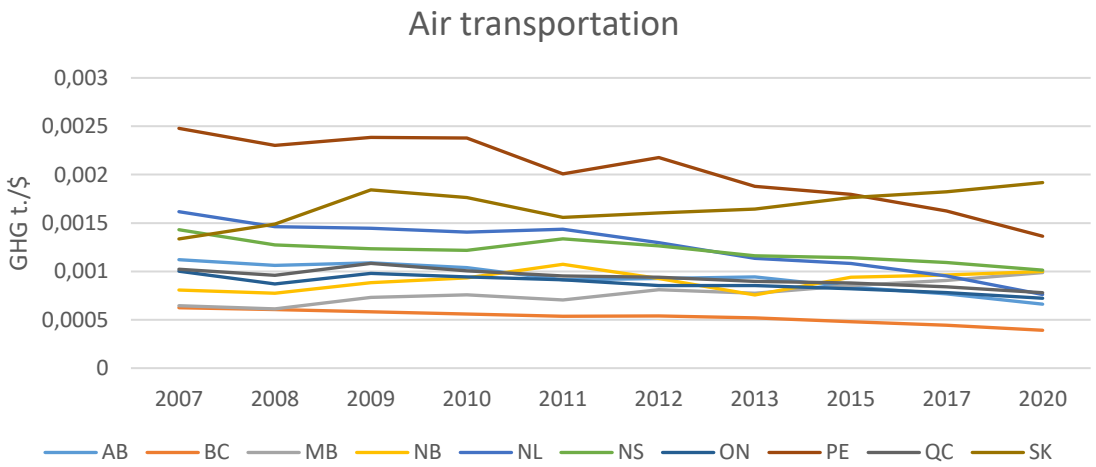

Pulp, paper and paperboard mills
GHG t./$
0,009
0,008
0,007
0,006
0,005
0,004
0,003
0,002
0,001
0
2007
2008
2009
2010
2011
2012
2013
2015
2017
2020
AB
BC
MB
NB
NL
NS
ON
QC
SK

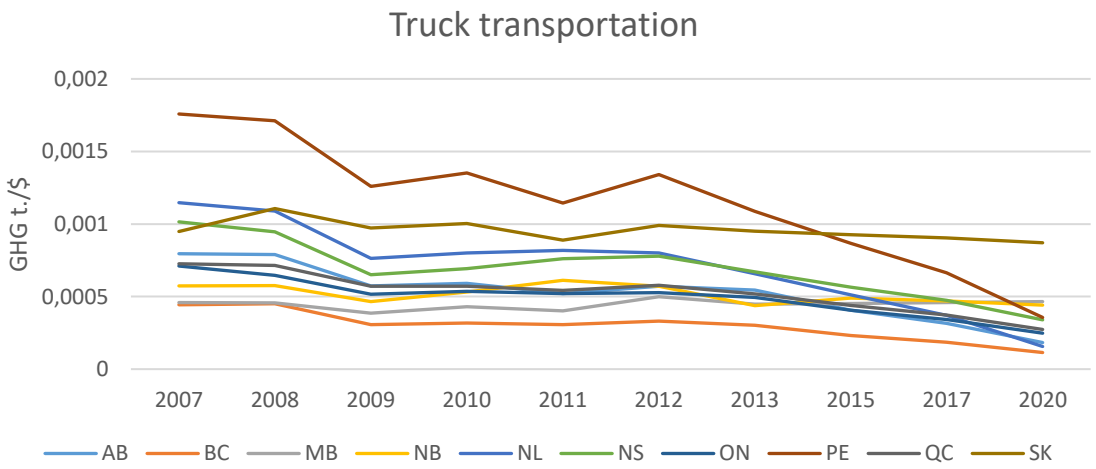

Petroleum and coal product manufacturing
GHG t./$
0,001
0,0008
0,0006
0,0004
0,0002
0
2007
2008
2009
2010
2011
2012
2013
2015
2017
2020
AB
BC
NB
NL
NS
ON
QC
SK


Cement and concrete product manufacturing
GHG t./$
0,0025
0,002
0,0015
0,001
0,0005
0
2007
2008
2009
2010
2011
2012
2013
2015
2017
2020
AB
BC
NS
ON
QC


Primary metal manufacturing
GHG t./$
9,00E-04
8,00E-04
7,00E-04
6,00E-04
5,00E-04
4,00E-04
3,00E-04
2,00E-04
1,00E-04
0,00E+00
2007
2008
2009
2010
2011
2012
2013
2015
2017
2020
AB
MB
NL
NS
ON
QC
SK


Wholesale trade
GHG t./$
0,00012
0,0001
0,00008
0,00006
0,00004
0,00002
0
2007
2008
2009
2010
2011
2012
2013
2015
2017
2020
Canada





Replacing the EICs derived directly from 2013 data by the projected ones, the negative economic impacts of all modelled environmental policies were decreased. Under each scenario, both provincial and national GDP decreases were below their previous estimations. In comparison to the base scenarios (**table 4.1**), the impact on national GDP of the three different environmental burden allocations is cut by close to half (**table 4.11**). The national GDP drop goes from 20.1% to 12.1% under the first policy scenario, from 5.6% to 2.4% under the second scenario, and from 6.5% to 2.7% for the third scenario.

The distribution of the negative impact on provincial GDPs is similarly to before. Under policy 1, each province still sees their GDP drop in similar proportions. Under policy 2, most provinces, excluding the oil-producing ones, are mildly affected. The third policy penalizes the western provinces to a greater extent, but manages to allocate some costs to other regions.

Table 4.11. Impact on GDP in basic price in 2020 with projected EIC

	GDP reduction (%)		
	Policy 1	**Policy 2**	**Policy 3**
Direct reduction of industrial output	7.7% on every industry	32.3% on the largest emitter	12.4% on top 10 emitters
Alberta	12.7	8.8	5.7
British Columbia	11.6	1.0	2.1
Manitoba	11.9	1.1	3.0
New Brunswick	11.5	0.2	2.6
Newfoundland and Labrador	10.9	8.9	5.4
Nova Scotia	11.0	0.4	1.2
Ontario	12.2	0.3	1.4
Prince Edward Island	10.9	0.1	1.4
Quebec	11.8	0.1	1.9
Saskatchewan	11.9	6.3	6.0
Northwest Territories	11.3	2.8	3.1
Nunavut	11.7	0.2	2.4
Yukon	10.3	0.2	1.0
Enclaves Abroad	7.7	0.0	0.0
Canada (total)	12.1	2.4	2.7

In terms of job losses, the different policy scenarios with updated EICs compare to each other and have a similar distribution as the base simulations. **Table 4.12** provides the allocation of the three policy scenarios. Allocating the environmental burden evenly across sectors is the most negative policy in terms the job market, and one can expect the job loss to be minimized when the *oil and gas extraction* industry is the only one targeted. As before, the first policy impacts the central provinces to a greater extent, and the second one mostly penalizes Alberta. More details on which sector are affected within each province are available in **appendix F**.

Table 4.12. Employment losses with projected EIC (in thousands)

Gross job loss (rounded)	AB	BC	MB	NB	NL	NS	ON	PE	QC	SK	Tot.
Policy 1	311	298	82	46	30	58	938	9	543	74	**2389**
Policy 2	104	15	3	1	5	2	21	0	7	11	**169**
Policy 3	97	51	17	11	6	8	118	1	86	22	**417**

4.5.2 Policy scenarios under best practices

If BP coefficients are used to run the policy scenarios instead of the 2013 ones, the negative economic impacts are also significantly lower. The first policy scenario uses BP coefficients for every industry, and this alone is enough for Canada to meet the 2020 Paris Agreement target. In other words, if every sector adapts their technology to match the one used by the lowest GHG emitters, Canada could fulfill its commitment at no cost, or at least without needing to limit its industrial output.

The same is not true if only the *oil and gas extraction* sector adopts the best practices. This is because the provinces featuring heavy activity in this sector are already the ones having the best practices. As displayed in **table 3.1** at page 28, Saskatchewan and Alberta are the best practitioners for this specific industry. So, in the end, there is not much change if this industry adopts BP or not. As seen in **table 4.13**, the impact on the national GDP does not vary much (5.6% reduction vs. 5.5%) from the base policy scenario. It is the same for the provinces, where Alberta and Saskatchewan manage to save a small 0.2% of their GDP (on some 20.6% and 14.6% drops respectively).

Nevertheless, under policy scenario 3, where the top 10 largest emitters' EICs are replaced by the BP coefficients, there are important improvements. Of all simulations calling for industrial reduction, this sub-scenario is the least costly. It calls for a 1.6% drop in the national

2020 GDP and provincial GDP drops vary from 3.0% for Saskatchewan to less than 1% for Nova Scotia and Prince Edward Island.

Table 4.13. Impact on GDP in basic price in 2020 with BP EIC

	GDP reduction (%)	
	Policy 2	**Policy 3**
Direct reduction of industrial output	75.5% on the largest emitter	5.4% on top 10 emitters
Alberta	20.6	2.8
British Columbia	2.3	1.0
Manitoba	2.5	1.7
New Brunswick	0.5	1.3
Newfoundland and Labrador	20.7	2.5
Nova Scotia	0.8	0.8
Ontario	0.7	1.1
Prince Edward Island	0.1	0.8
Quebec	0.3	1.2
Saskatchewan	14.6	3.0
Northwest Territories	6.4	1.6
Nunavut	0.5	1.1
Yukon	0.4	0.5
Enclaves Abroad	0.0	0.0
Canada (total)	5.5	1.6

Under the BP policy scenario 1, there is no need for an industrial output reduction and thus there is no impact on employment either. For the second BP policy scenario, the effect on employment is similar to the one under the base simulation. However, when it comes to the third policy, the job loss is much smaller if the top ten emitters adopt the best practitioners' technology. Instead of the 974,000 job losses across Canada, 234,000 jobs are now lost (see **table 4.14**). The central provinces and Alberta are still hit harder, but to a lesser extent. Details on sector specific job losses are given in **appendix F**.

Table 4.14. Employment losses with BP EIC (in thousands)

Gross job loss (rounded)	AB	BC	MB	NB	NL	NS	ON	PE	QC	SK	Tot.
Policy 2	244	36	7	2	11	4	48	0	16	27	**394**
Policy 3	49	23	9	5	3	4	79	1	49	12	**234**

When it comes to the distribution of the negative impacts amongst the different industries, for both the simulations with the BP and projected EICs, the portrait is very similar to the simulations with the 2013 EICs. The targeted industries suffer the greatest decrease under policy scenarios 2 and 3, and low-emitting industries are the most negatively impacted under policy scenario 1. Detailed results are displayed in **appendix D** and **E**.

4.5.3 Research and development

To reach the targeted GHG emission cap: the first scenario calls for a 15.0% decrease in each industry's EIC, the second one requires a drop of 58.2% of the oil and gas extraction's EICs (regardless of the region), and the 10 largest emitters have to bring down their EIC by 19.2% under scenario 3.

Chapter 5

DISCUSSION

5.1 Main scenarios comparison

The first policy scenario, even if it performs best in terms of cost distribution amongst provinces, would be unbearable for both the Canadian and provincial economies. Evenly sharing the cost comes at a price that is too high for this scenario to be reasonably considered. The 20% drop in national GDP and the 18% to 21% drops in provincial GDPs would have catastrophic consequences across the country, both in terms of industrial production and employment. Moreover, a lot of low carbon emitting industries are negatively impacted under this scenario. In fact, they suffer the largest decrease of output value while none of the top 10 largest GHG emitters are the top most affected industries. This is true for every province and territory in both the 2013 and 2020 models. This policy would thus be in total opposition to the polluter-pay principle and would make little political and economic sense in a real-life scenario. Even if this policy distributes the environmental burden the most evenly, the backlash would be overwhelming and most of the non-problematic industries and provinces would not be spared. As in Lixon et al. (2008), distributing the cost as evenly as possible comes at a greater cost.

The second scenario presented is the cheapest in terms of GDP reduction, targeting the largest emitter is thus a way to minimize overall costs as the literature suggests (de Souza et al. 2016, San Cristobal 2010). However, it calls for a high level of cost concentration, allocating them to very few provinces and industries. The *oil and gas extraction* industry is heavily affected in every province, yet this specific sector concentrates most of its activity in the western provinces of Alberta and Saskatchewan. This means that the share of total provincial GDP this

sector is providing is greater in these regions than elsewhere. In the short run, a cut in its output would have little direct impact for a province like Quebec or New Brunswick, but would have serious consequences for the oil powered economy of Alberta.

In light of these results, the third policy scenario is the most balanced and workable since the economic burden is not entirely allocated to a single industry nor a small group of provinces and its overall cost is not excessive. Under this scenario, the most polluting industries and provinces absorb the greatest cost.

5.2 The technological shock scenarios

The first two technological shocks on EICs lead to significantly lower negative impacts on the Canadian economy. Although the specific distribution pattern of the first simulations are preserved, those with the modified EICs (projected and BP) show that complying with the Paris Agreement might not be as difficult as first presented.

By projecting emission coefficients from 2007 to 2020, one can see that the sacrifices needed in 2020 might not be extreme. With these EICs, the first policy scenario, where every sector has to decrease their industrial output evenly, still makes little sense compared to the two other scenarios. The second scenario shows the same distributional issue as before, allocating most of the environmental burden to oil producing provinces, and it remains the cheapest one at the national level. The third policy, the one targeting the 10 largest emitters, distributes the burden more evenly, but this time, Saskatchewan is worse off than under the second scenario. With the third policy scenario, a lot of the cost is taken off of Alberta, which is otherwise the hardest hit region under a policy exclusively targeting the oil industry. Nevertheless, updating the EICs yields more optimistic results. One could expect that, from 2013 to 2020, many

industries should tend, to a certain extent, toward less GHG-intensive coefficients. This means that the results from the first set of simulations probably overestimate the actual costs the Canadian economy will have to face in 2020 even if there is no major shift in environmental regulations.

If the BP EICs replace the original ones, the negative economic impacts on jobs and GDP are also less gloomy. In fact, even if adopting best practices does not change much under the second policy scenario, both the first and the third one would be easier on the Canadian economy. There is no need for any industrial output reduction if every sector in every province complies with the best practices and if the 10 most emitting industries switch to best practices the overall costs of an output reduction are at their lowest. So, in the end, if many industries or at least the largest emitters end up adopting the 2013 best practices in 2020, the economic toll from the Paris Agreement will be small in the face of Canada's environmental commitment.

The third and last technological shock is different in many ways to all the other ones. It is the only one not coupled with an industrial output reduction. It acts as a way to estimate in which proportions technology has to improve if Canada only relies on innovation to comply with its Paris Agreement commitment, but does not give any insights on how to reach that level of technological advancement. Still, the simulation remains relevant, as it will be explained in the next section, since most provinces do plan to invest in R&D to transition to a low-carbon economy. One province, Saskatchewan, even advocates that it is the best way for Canada to mitigate its GHG emissions, discarding a price on carbon.

5.3 The provincial initiatives

Even though the Canadian commitment to the Paris Agreement is a national one and thus calls for a national carbon policy, the federal government could, and probably will to a certain degree, rely on the initiatives coming from the provinces. As it is exposed in this section, many provinces have already set climate change or energy-related policies. Some of those policies echo the technological scenarios simulated by this analysis and will most likely serve as incentives for private and public agents to limit their GHG emissions into the atmosphere.

Alberta's Climate Leadership Plan is part of the Pan-Canadian Framework on Clean Growth and Climate Change (Government of Canada 2017) and it puts the emphasis on clean energy and Alberta's oil sand industry. More specifically, Alberta plans to phase out its coal power plants by 2030 and, by 2025, to bring down by 45% methane emissions coming from its domestic oil and gas operation. Also, Alberta already has set an emission cap on oil sands production and a carbon pricing policy on fossil fuels. The province intends to power its move to a greener future by stimulating innovation, by promoting energy efficiency and by implementing green infrastructure plans (Government of Alberta 2017).

British Columbia has its own GHG emissions reduction plan too. It seeks to reduce the province's emissions by 80% below 2007 levels, and aims to do so by 2050 without harming their job market. This plan consists of a revenue-neutral carbon tax and sectorial goals and regulations. British Columbia's action revolves around setting standards in natural gas exploitation and utilization, in transportation, in urban planning and the public sector, and in their industrial complexes and power grid. The most contributing sectors in British Columbia's plan are the agriculture and forestry ones. They are supposed to reduce their annual emissions by

12 million kilotons by 2050. To do so, the provincial government aims to review how British Columbia's forests are managed (by avoiding burning slash and seeking productivity increases) and to "recycle" wood waste (Government of British Columbia 2016).

Even if Manitoba does not take part in the Pan-Canadian Framework on Clean Growth and Climate Change as most of the other provinces and territories do, it still has a plan (Government of Manitoba 2015). Its provincial GHG emission reduction targets mirror the Canadian one up to 2030, then Manitoba wants to cut its emission in half in comparison to its 2005 levels, and ultimately aims to be totally carbon neutral by 2080. The climate change policy of this province includes a cap and trade scheme (to be implemented) and it limits the industrial GHG output from its largest emitters. In 2013, most of Manitoba's GHG emissions were produced by the agricultural sector (31%) and the transportation sector (39%). To address the emissions coming from the transportation industry, Manitoba plans to push its public fleet toward the use of more fuel-efficient vehicles. Manitoba's plan also promotes biodiesel and other biofuels for heavy-duty transportation and trucking. When it comes to agriculture, Manitoba has worked with stakeholders to develop more efficient and less GHG intensive farming. For the years to come, it developed an 11 point plan that promotes more sustainable agricultural practices. Even if Manitoba's plan is ambitious, it does not offer a lot of concrete and tangible initiatives other than its 5 years 5-million-dollar Climate Change Action Fund and its carbon pricing system.

In the Maritimes, New Brunswick's Climate Change Action Plan (Government of Canada 2017) places the emphasis on low-carbon energy and renewables, carbon pricing, and climate change adaptation. Nova Scotia's plan is focused on GHG regulations and pricing. By implementing a cap on GHG emissions from their electricity-producing industry, they started

their transition from coal powered energy to renewables and less GHG intensive fuels. Additionally, they plan to develop a cap and trade system including most of their industrial sectors. Prince Edward Island's key actions to date focus on energy efficiency, transportation, and on transitioning to low-carbon agricultural practices (Government of Prince Edward Island 2015). *Turn back the tide* (Government of Newfoundland and Labrador 2016) is Newfoundland and Labrador's climate change action plan. This plan leads the province toward energy efficiency, green technology development, and clean energy development backed by hydroelectricity projects.

Ontario's *Climate Change Action Plan* (Government of Ontario 2016) notably includes a cap and trade system for greenhouse gas and the province has already taken a significant action against coal power plants. In 2015, Ontario set long-term emission reduction targets and implemented, later in 2016, the legal basis of a carbon pricing system that will be integrated into the Western Climate Initiative (Government of Canada 2017). This plan, like many others in the Canadian provinces, insists on the importance of research and development. On this matter, Ontario plans to support the commercialization of greener technologies, to tax and regulate the private sectors to support "low-carbon investment", and to develop institutions conducting low-carbon oriented research. According to Ontario's plan, action will also be taken on transportation, energy efficiency, and agriculture and forestry to reduce the province's impact on the global climate.

Even if Quebec is one of the least problematic Canadian province when it comes to GHG emissions, its government still intends to take action to reduce provincial atmospheric pollution. Quebec is one of the founders of the Western Climate Initiative with California and has set a cap and trade mitigation goal for both the years 2020 and 2030. This carbon market allowed the

province to plan investments going over 3 billion dollars in its *Plan d'action 2013-2020 sur les changements climatiques* (Gouvernement du Québec 2012). Quebec's goals revolve around the electrification of its transportation, the promotion of green innovation, and putting forward a transition to renewable energy and low-carbon practices in the public and private sectors.

Like Manitoba, Saskatchewan does not take part in the Pan-Canadian Framework on Clean Growth and Climate Change. This province is also one of the most hesitant when it comes to carbon pricing, expressing doubt about a national tax (Radio-Canada 2016). Nevertheless, the province did propose a white paper on climate change (Government of Saskatchewan 2016). The white paper does not include any carbon pricing system, saying that it would put a disproportionate cost on Saskatchewan, but puts forth some alternative solutions to the province's GHG emission problem. Among these, the white paper recommends refocusing the Canadian effort against climate change on the development and funding of new low-carbon technologies. Saskatchewan also intends to shift its energy mix toward renewables and nuclear.

As the technological shocks illustrate in this analysis, these province specific initiatives, even if they are not all currently implemented, will most likely decrease the environmental burden that Canada will eventually have to face. This is why this study tries to account for the greening of the economy. If the provinces go through with most of the previously mentioned actions, or at least some of them, one can expect the negative impact of a carbon policy on industrial output, GDP and employment to be substantially less important than under the first set of scenarios presented. Nevertheless, as the simulations show, the distribution of the costs of an environmental policy amongst provinces and industrial sectors under each scenario remains more or less unchanged, even when the greening of the economy is considered. This means that, in any case, the workability of an environmental solution is still a relevant issue for Canada.

5.4 Model limitations

5.4.1 The 2020 economy

In addition to the standard IO analysis assumption (Ghanem 2010, Miller and Blair 2009), this research carries arguably heavy assumptions about the future of the Canadian economy. Sector differentiated growth projections do take into account industrial sector changes over time, however, any growth projections are vulnerable to uncertainties. This study relies on the accuracy of these projection scenarios' own assumptions. Additionally, this research assumes a constant GHG emissions to output value ratio and, in the years to come, these ratios will probably change due to technology. This problem is accounted for in the technological shocks, but the design of these shocks is still rather unsophisticated in comparison to what a proper analysis of the Canadian future would be asking for. Much work could be done to improve the accuracy of this research's portrait of the 2020 Canadian economy. Notably by allowing for uncertainties by developing various projection scenarios that could account for different GDP growth rates, technologies or trade-related changes, and energy prices. Despite these necessary shortcomings, the putty-clay theory of technology and capital formation (Gilchrist and Williams 2000, Johansen 1959) would suggest that it is still reasonable to assume that the structure of the economy and the industrial processes will not change drastically from 2013 to 2020. If they do, the actual economic impacts should lie somewhere between the ones depicted under the first set of scenarios, and the ones depicted under the technological shocks sub-scenarios.

Even if the projection exercise comes with its flaws, taking the economy up to 2020 allows this analysis to not only account for what Canada has to forsake now if it wants to reduce its GHG emissions to a targeted level, but also to account for the missed opportunities that a

business as usual scenario would otherwise grant. In other words, by forcing the shocks on the projected 2020 economy instead of the 2013 one, this research includes what the Canadian economy loses in comparison to a hypothetical scenario where it would have the ability to grow without any additional environmental regulations.

5.4.2 The Newfoundland and Labrador oil crisis and GHG data

The available data precedes the Newfoundland oil crisis, so any conclusion on the consequences of an environmental policy over this specific province should be made with caution. Nonetheless, an educated guess would be that having more accurate or recent data on this province while running the model would mostly result in putting a slightly greater stress on Saskatchewan and Alberta oil industries in the third and possibly second policy scenarios.

The results of this research would have been more precise if region and industry specific GHG data were available in Canada. Even if the most important GHG data is provincially differentiated using the NIR, most of the industries share the same EICs across the country. Desegregated GHG emissions data geographically would have allowed this analysis to be truer to the specificities of each regions' pollution patterns.

5.4.3 Flexibility issues

An industrial output reduction can only represent an upper bound cost approximation of a carbon pricing policy (Lixon et al. 2008). If a tax on carbon is established as it is supposed to, one could expect the tax revenue to be redistributed and thus allow for compensation payments (Metcalf 2007). This could lead to potentially a decrease in the negative impacts on some region or industries, depending on how the revenue recycling is designed (Beugin et al. 2016, Dower and Zimmerman 1992). Under a cap and trade system, the least costly abaters would be able to

trade their emissions stock with high cost emitters, granting the economy much more flexibility (Harris and Roach 2013) than the model actually allows.

Furthermore, under a real-life scenario, one could expect a mix of different policies to be implemented to limit Canadian GHG emissions into the atmosphere. It is actually what the Canadian government wants to do at this point: coupling a tax on carbon with a cap on methane emissions from the oil and gas industry (Environment Canada 2017b, 2017c). The impact of such a combination of policies is beyond the scope of this research, but more precise simulations can be conducted to better emulate the planned governmental actions against climate change. Sophisticated studies allowing for more analytical flexibility were notably produced under the Kyoto Protocol context (Snoddon and Wigle 2007, Wigle 2004) and beyond (Arif and Dissou 2016) using Computable General Equilibrium analysis. Such an exercise could be renewed under the scope of the Canadian commitment to the Paris Agreement.

Chapter 6

CONCLUSION

Walking in the footsteps of Victor (1972), Smith (1991) and Lixon et al. (1998), this research is linking the Canadian IO data with an environmental commodity. More precisely, it addresses the problem Canada is now facing in terms of GHG mitigation under its Paris Agreement's commitment. The novelty of the present study is to assess for distribution issues in addition to economic efficiency ones. Seeking workability as it is defined by J.R. Commons, this research includes the trade-offs between overall national costs and regional ones in terms of industrial output, GDP and employment. To do so, its simulates diverse policy scenarios and the allocation burden through targeted industrial output reductions.

6.1 Research highlights

Limiting industrial output evenly across sectors, as in the first policy scenario, is costly. Likewise, it is highly unlikely that the second policy would be implemented under the Canadian political context due to the fact it requires Alberta and Saskatchewan to absorb the economic consequences of compliance to the Paris Agreement. If Canada wants to tackle its climate change problem through a national policy, it would need the participation of every province, or at least the ones that are responsible for most of its emissions. Knowing this, allocating the abatement costs only to Alberta and Saskatchewan would be the equivalent of asking them to "take one for the team" and it would most certainly not be accepted. Moreover, Canada cannot completely turn its back on oil production without endangering its future economic growth. Taxing only the oil industry at an excessive rate (which is the case in the second scenario) would be a risky move that could have lasting negative effects all over the country.

The technological shocks decrease the negative effects of all the allocation burdens simulated. Nevertheless, when it comes to distributional issues, the portrait is still the same. In other words, the impacts are smaller under the technological shocks, but they follow the same distributional patterns as the original ones.

6.2 Policy recommendation

For these reasons, this paper advocates for a middle ground solution, one where the costs are distributed to a certain extent amongst the agents, but still targets the most polluting sectors. Of course, amid these sectors, there are some industries that could be problematic to legislate. For example, agriculture in the Prairies or electricity in Ontario, the political context makes taxing these sectors a very sensitive issue. Nevertheless, when it comes to designing a national carbon pricing policy, policy makers must keep in mind that looking for compromises between overall economic costs and their geographical and sectorial distribution could be an appropriate way to address the many specificities of the Canadian economy and political system.

As it is shown by the simulations under the BP EICs, when the environmental burden is distributed to the largest emitters while they adopt low-carbon technologies, the Canadian environmental goal can be reached at low costs without putting too much pressure on a single province. A carbon pricing policy targeting those GHG intensive sectors will grant them the incentives to innovate and perfect their technology, setting the stage for one of the "best case scenarios" presented here. Moreover, the simulation lowering the EICs directly through research and development hints that the major polluters, pooled together, would have to reduce their emission to production ratio by 19.2%. The research to develop a technology that could reduce the emission to production ratio by this amount would be substantial. However, the investment

in research and development to decrease the emission in these sectors is probably a better policy alternative than the other scenarios. Taxing the top polluters would not only give them incentives to improve their technology, but could also raise the funds the government would need to implement a subsidy program for GHG emissions-related research and development.

6.3 Further research

This thesis proposes a way in which the Canadian government could tackle its climate change commitment, but much more work is needed on the economic and political implications of carbon pricing. Using input-output framework, the analysis of the ecological-economical relationship could be further developed by expanding the number of ecological commodities, for example water, and by accounting for structural changes or price fluctuations.

The development of an input-output price model would enable a further investigation of how a carbon price would be translated through commodity prices in the economy. This would provide information on how costs would change, which has implications for the competitiveness of some industrial sectors. In addition, the price changes would provide insight into the distributional impact on the household sector.

Additional research could be undertaken on technological and structural change to address the climate change issue. This could include technology to reduce emissions, but could also include changes in inputs to existing industrial sectors or the expansion of new industrial sectors. For example, what would be the economic implications for the development of a renewable energy sector that includes solar, wind and other renewable energy sources.

Greater attention could also be paid to the institutional context concerning how a tax or carbon price is implemented. The institutional rules concerning a tax or carbon price mechanism;

e.g. carbon trading, will have different incentives for behaviour. How these are implemented will have an impact on industrial development. The environmental policy that is adopted will have a different impact on every province in terms of its industrial structure, industrial growth and GDP growth. This has particularly important implications for Canada because of the transfer mechanism used to redistribute wealth between provinces. Additional research could address the complicated relationship between the provinces by shedding light on how the environmental policy concerning climate change would impact equalization payments and, more broadly, other federal social transfers.

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APPENDIX A

Table A1. Industrial sector aggregation

nbr	Aggregated industry name [IIOC code]	IIOC code	Unaggregated industry name
1	*Crop and animal production [BS11A00]*	BS111A00	*Crop production (except greenhouse, nursery and floriculture production)*
		BS111400	*Greenhouse, nursery and floriculture production*
		BS112A00	*Animal production (except aquaculture)*
		BS112500	*Aquaculture*
2	*Forestry and logging [BS11300]*	BS113000	*Forestry and logging*
3	*Fishing, hunting and trapping [BS11400]*	BS114000	*Fishing, hunting and trapping*
4	*Support activities for agriculture and forestry [BS11500]*	BS115A00	*Support activities for crop and animal production*
		BS115300	*Support activities for forestry*
5	*Oil and gas extraction [BS21100]*	BS211113	*Conventional oil and gas extraction*
		BS211114	*Non-conventional oil extraction*
6	*Coal mining [BS21210]*	BS212100	*Coal mining*
7	*Metal ore mining [BS21220]*	BS212210	*Iron ore mining*
		BS212220	*Gold and silver ore mining*
		BS212230	*Copper, nickel, lead and zinc ore mining*
		BS212290	*Other metal ore mining*
8	*Non-metallic mineral mining and quarrying [BS21230]*	BS212310	*Stone mining and quarrying*
		BS212320	*Sand, gravel, clay, and ceramic and refractory minerals mining and quarrying*
		BS212392	*Diamond mining*
		BS21239A	*Other non-metallic mineral mining and quarrying (except diamond and potash)*
		BS212396	*Potash mining*
9	*Support activities for mining and oil and gas extraction [BS21300]*	BS21311A	*Support activities for oil and gas extraction*
		BS21311B	*Support activities for mining*
10	*Electric power generation, transmission and distribution [BS22110]*	BS221100	*Electric power generation, transmission and distribution*
11	*Natural gas distribution, water, sewage and other systems [BS221A0]*	BS221200	*Natural gas distribution*
		BS221300	*Water, sewage and other systems*
12	*Residential building construction [BS23A00]*	BS23A000	*Residential building construction*
13	*Non-residential building construction [BS23B00]*	BS23B000	*Non-residential building construction*
14	*Transportation engineering construction [BS23C10]*	BS23C100	*Transportation engineering construction*
15	*Oil and gas engineering construction [BS23C20]*	BS23C200	*Oil and gas engineering construction*
16	*Electric power engineering construction [BS23C30]*	BS23C300	*Electric power engineering construction*
17	*Communication engineering construction [BS23C40]*	BS23C400	*Communication engineering construction*
18	*Other engineering construction [BS23C50]*	BS23C500	*Other engineering construction*
19	*Repair construction [BS23D00]*	BS23D000	*Repair construction*
20	*Other activities of the construction industry [BS23E00]*	BS23E000	*Other activities of the construction industry*

21	*Animal food manufacturing [BS31110]*	BS311100	*Animal food manufacturing*
22	*Sugar and confectionery product manufacturing [BS31130]*	BS311300	*Sugar and confectionery product manufacturing*
23	*Fruit and vegetable preserving and specialty food manufacturing [BS31140]*	BS311400	*Fruit and vegetable preserving and specialty food manufacturing*
24	*Dairy product manufacturing [BS31150]*	BS311500	*Dairy product manufacturing*
25	*Meat product manufacturing [BS31160]*	BS311600	*Meat product manufacturing*
26	*Seafood product preparation and packaging [BS31170]*	BS311700	*Seafood product preparation and packaging*
27	*Miscellaneous food manufacturing [BS311A0]*	BS311200 BS311800 BS311900	*Grain and oilseed milling* *Bakeries and tortilla manufacturing* *Other food manufacturing*
28	*Soft drink and ice manufacturing [BS31211]*	BS312110	*Soft drink and ice manufacturing*
29	*Breweries [BS31212]*	BS312120	*Breweries*
30	*Wineries and distilleries [BS3121A]*	BS3121A0	*Wineries and distilleries*
31	*Tobacco manufacturing [BS31220]*	BS312200	*Tobacco manufacturing*
32	*Textile and textile product mills [BS31A00]*	BS31A000	*Textile and textile product mills*
33	*Clothing and leather and allied product manufacturing [BS31B00]*	BS31B000	*Clothing and leather and allied product manufacturing*
34	*Wood product manufacturing [BS32100]*	BS321100 BS321200 BS321900	*Sawmills and wood preservation* *Veneer, plywood and engineered wood product manufacturing* *Other wood product manufacturing*
35	*Pulp, paper and paperboard mills [BS32210]*	BS322100	*Pulp, paper and paperboard mills*
36	*Converted paper product manufacturing [BS32220]*	BS322200	*Converted paper product manufacturing*
37	*Printing and related support activities [BS32300]*	BS323000	*Printing and related support activities*
38	*Petroleum and coal product manufacturing [BS32400]*	BS324110 BS3241A0	*Petroleum refineries* *Petroleum and coal product manufacturing (except petroleum refineries)*
39	*Basic chemical manufacturing [BS32510]*	BS325100	*Basic chemical manufacturing*
40	*Pesticide, fertilizer and other agricultural chemical manufacturing [BS32530]*	BS325300	*Pesticide, fertilizer and other agricultural chemical manufacturing*
41	*Pharmaceutical and medicine manufacturing [BS32540]*	BS325400	*Pharmaceutical and medicine manufacturing*
42	*Miscellaneous chemical product manufacturing [BS325C0]*	BS325200 BS325500 BS325600 BS325900	*Resin, synthetic rubber, and artificial and synthetic fibres and filaments manufacturing* *Paint, coating and adhesive manufacturing* *Soap, cleaning compound and toilet preparation manufacturing* *Other chemical product manufacturing*
43	*Plastic product manufacturing [BS32610]*	BS326100	*Plastic product manufacturing*
44	*Rubber product manufacturing [BS32620]*	BS326200	*Rubber product manufacturing*
45	*Non-metallic mineral product manufacturing (except cement and concrete products) [BS327A0]*	BS327A00	*Non-metallic mineral product manufacturing (except cement and concrete products)*
46	*Cement and concrete product manufacturing [BS32730]*	BS327300	*Cement and concrete product manufacturing*
47	*Primary metal manufacturing [BS33100]*	BS331100	*Iron and steel mills and ferro-alloy manufacturing*

		BS331200	*Steel product manufacturing from purchased steel*
		BS331300	*Alumina and aluminum production and processing*
		BS331400	*Non-ferrous metal (except aluminum) production and processing*
		BS331500	*Foundries*
48	*Fabricated metal product manufacturing [BS33200]*	BS332100	*Forging and stamping*
		BS332A00	*Cutlery, hand tools and other fabricated metal product manufacturing*
		BS332300	*Architectural and structural metals manufacturing*
		BS332400	*Boiler, tank and shipping container manufacturing*
		BS332500	*Hardware manufacturing*
		BS332600	*Spring and wire product manufacturing*
		BS332700	*Machine shops, turned product, and screw, nut and bolt manufacturing*
		BS332800	*Coating, engraving, heat treating and allied activities*
49	*Machinery manufacturing [BS33300]*	BS333100	*Agricultural, construction and mining machinery manufacturing*
		BS333200	*Industrial machinery manufacturing*
		BS333300	*Commercial and service industry machinery manufacturing*
		BS333400	*Ventilation, heating, air-conditioning and commercial refrigeration equipment manufacturing*
		BS333500	*Metalworking machinery manufacturing*
		BS333600	*Engine, turbine and power transmission equipment manufacturing*
		BS333900	*Other general-purpose machinery manufacturing*
50	*Computer and peripheral equipment manufacturing [BS33410]*	BS334100	*Computer and peripheral equipment manufacturing*
51	*Electronic product manufacturing [BS334B0]*	BS334200	*Communications equipment manufacturing*
		BS334A00	*Other electronic product manufacturing*
		BS334400	*Semiconductor and other electronic component manufacturing*
52	*Electrical equipment and component manufacturing [BS335A0]*	BS335100	*Electric lighting equipment manufacturing*
		BS335300	*Electrical equipment manufacturing*
		BS335900	*Other electrical equipment and component manufacturing*
53	*Household appliance manufacturing [BS33520]*	BS335200	*Household appliance manufacturing*
54	*Motor vehicle manufacturing [BS33610]*	BS336110	*Automobile and light-duty motor vehicle manufacturing*
		BS336120	*Heavy-duty truck manufacturing*

55	*Motor vehicle body and trailer manufacturing [BS33620]*	BS336200	*Motor vehicle body and trailer manufacturing*
56	*Motor vehicle parts manufacturing [BS33630]*	BS336310	*Motor vehicle gasoline engine and engine parts manufacturing*
		BS336320	*Motor vehicle electrical and electronic equipment manufacturing*
		BS336330	*Motor vehicle steering and suspension components (except spring) manufacturing*
		BS336340	*Motor vehicle brake system manufacturing*
		BS336350	*Motor vehicle transmission and power train parts manufacturing*
		BS336360	*Motor vehicle seating and interior trim manufacturing*
		BS336370	*Motor vehicle metal stamping*
		BS336390	*Other motor vehicle parts manufacturing*
57	*Aerospace product and parts manufacturing [BS33640]*	BS336400	*Aerospace product and parts manufacturing*
58	*Railroad rolling stock manufacturing [BS33650]*	BS336500	*Railroad rolling stock manufacturing*
59	*Ship and boat building [BS33660]*	BS336600	*Ship and boat building*
60	*Other transportation equipment manufacturing [BS33690]*	BS336900	*Other transportation equipment manufacturing*
61	*Furniture and related product manufacturing [BS33700]*	BS337100	*Household and institutional furniture and kitchen cabinet manufacturing*
		BS337200	*Office furniture (including fixtures) manufacturing*
		BS337900	*Other furniture-related product manufacturing*
62	*Miscellaneous manufacturing [BS33900]*	BS339100	*Medical equipment and supplies manufacturing*
		BS339900	*Other miscellaneous manufacturing*
63	*Wholesale trade [BS41000]*	BS411000	*Farm product wholesaler-distributors*
		BS412000	*Petroleum product wholesaler-distributors*
		BS413000	*Food, beverage and tobacco wholesaler-distributors*
		BS414000	*Personal and household goods wholesaler-distributors*
		BS415000	*Motor vehicle and parts wholesaler-distributors*
		BS416000	*Building material and supplies wholesaler-distributors*
		BS417000	*Machinery, equipment and supplies wholesaler-distributors*
		BS418000	*Miscellaneous wholesaler-distributors*
		BS419000	*Wholesale electronic markets, and agents and brokers*
64	*Retail trade [BS4A000]*	BS441000	*Motor vehicle and parts dealers*
		BS442000	*Furniture and home furnishings stores*
		BS443000	*Electronics and appliance stores*
		BS444000	*Building material and garden equipment and supplies dealers*
		BS445000	*Food and beverage stores*
		BS446000	*Health and personal care stores*

		BS447000	*Gasoline stations*
		BS448000	*Clothing and clothing accessories stores*
		BS451000	*Sporting goods, hobby, book and music stores*
		BS452000	*General merchandise stores*
		BS453000	*Miscellaneous store retailers*
		BS454000	*Non-store retailers*
65	*Air transportation [BS48100]*	BS481000	*Air transportation*
66	*Rail transportation [BS48200]*	BS482000	*Rail transportation*
67	*Water transportation [BS48300]*	BS483000	*Water transportation*
68	*Truck transportation [BS48400]*	BS484000	*Truck transportation*
69	*Transit, ground passenger and scenic and sightseeing transportation, taxi and limousine service and support activities for transportation [BS48B00]*	BS485100	*Urban transit systems*
		BS48A000	*Other transit and ground passenger transportation and scenic and sightseeing transportation*
		BS485300	*Taxi and limousine service*
		BS488000	*Support activities for transportation*
70	*Pipeline transportation [BS48600]*	BS486A00	*Crude oil and other pipeline transportation*
		BS486200	*Pipeline transportation of natural gas*
71	*Postal service and couriers and messengers [BS49A00]*	BS491000	*Postal service*
		BS492000	*Couriers and messengers*
72	*Warehousing and storage [BS49300]*	BS493000	*Warehousing and storage*
73	*Motion picture and sound recording industries [BS51200]*	BS512130	*Motion picture and video exhibition*
		BS512200	*Sound recording industries*
		BS5121A0	*Motion picture and video industries (except exhibition)*
74	*Radio and television broadcasting [BS51510]*	BS515100	*Radio and television broadcasting*
75	*Publishing, pay/specialty services, telecommunications and other information services [BS51B00]*	BS511110	*Newspaper publishers*
		BS5111A0	*Periodical, book and directory publishers*
		BS511200	*Software publishers*
		BS515200	*Pay and specialty television*
		BS517000	*Telecommunications*
		BS518000	*Data processing, hosting, and related services*
		BS519000	*Other information services*
76	*Depository credit intermediation and monetary authorities [BS52B00]*	BS521000	*Monetary authorities - central bank*
		BS5221A0	*Banking and other depository credit intermediation*
		BS522130	*Local credit unions*
		BS522200	*Non-depository credit intermediation*
		BS522300	*Activities related to credit intermediation*
		BS52A000	*Financial investment services, funds and other financial vehicles*
77	*Insurance carriers [BS52410]*	BS524100	*Insurance carriers*

78	*Lessors of real estate [BS53110]*	BS531100	*Lessors of real estate*
79	*Owner-occupied dwellings [BS5311A]*	BS5311A0	*Owner-occupied dwellings*
80	*Rental and leasing services and lessors of non-financial intangible assets (except copyrighted works) [BS53B00]*	BS532100	*Automotive equipment rental and leasing*
		BS532A00	*Rental and leasing services (except automotive equipment)*
		BS533000	*Lessors of non-financial intangible assets (except copyrighted works)*
81	*Other finance, insurance and real estate services and management of companies and enterprises [BS5A000]*	BS524200	*Agencies, brokerages and other insurance related activities*
		BS531A00	*Offices of real estate agents and brokers and activities related to real estate*
		BS551113	*Holding companies*
82	*Legal, accounting and architectural, engineering and related services [BS541C0]*	BS541100	*Legal services*
		BS541200	*Accounting, tax preparation, bookkeeping and payroll services*
		BS541300	*Architectural, engineering and related services*
		BS541400	*Specialized design services*
83	*Computer systems design and other professional, scientific and technical services [BS541D0]*	BS541500	*Computer systems design and related services*
		BS541600	*Management, scientific and technical consulting services*
		BS541700	*Scientific research and development services*
		BS541900	*Other professional, scientific and technical services*
84	*Advertising, public relations and related services [BS54180]*	BS541800	*Advertising, public relations, and related services*
85	*Administrative and support services [BS56100]*	BS561100	*Office administrative services*
		BS561A00	*Facilities and other support services*
		BS561300	*Employment services*
		BS561400	*Business support services*
		BS561500	*Travel arrangement and reservation services*
		BS561600	*Investigation and security services*
		BS561700	*Services to buildings and dwellings*
86	*Waste management and remediation services [BS56200]*	BS562000	*Waste management and remediation services*
87	*Educational services [BS61000]*	BS610000	*Educational services*
88	*Health care and social assistance [BS62000]*	BS621100	*Offices of physicians*
		BS621200	*Offices of dentists*
		BS621A00	*Miscellaneous ambulatory health care services*
		BS623000	*Nursing and residential care facilities*
		BS624000	*Social assistance*
89	*Arts, entertainment and recreation [BS71000]*	BS71A000	*Performing arts, spectator sports and related industries, and heritage institutions*
		BS713A00	*Amusement and recreation industries*
		BS713200	*Gambling industries*
90	*Accommodation and food services [BS72000]*	BS721100	*Traveller accommodation*

		BS721A00	*RV (recreational vehicle) parks, recreational camps, and rooming and boarding houses*
		BS722000	*Food services and drinking places*
91	*Repair and maintenance [BS81100]*	BS811100	*Automotive repair and maintenance*
		BS811A00	*Repair and maintenance (except automotive)*
92	*Personal services and private households [BS81A00]*	BS812A00	*Personal care services and other personal services*
		BS812200	*Funeral services*
		BS812300	*Dry cleaning and laundry services*
		BS814000	*Private households*
93	*Professional and similar organisations [BS81300] (13)*	BS813000	*Professional and similar organizations*
94	*Repair and maintenance [FC11000]*	FC110000	*Repair and maintenance*
95	*Operating supplies [FC12000]*	FC120000	*Operating supplies*
96	*Office supplies [FC13000]*	FC130000	*Office supplies*
97	*Advertising, promotion, meals, entertainment, and travel [FC20000]*	FC210000	*Advertising, promotion, meals and entertainment*
		FC220000	*Travel, meetings and conventions*
98	*Transportation margins [FC30000]*	FC300000	*Transportation margins*
99	*Non-profit education services [NP61000]*	NP610000	*Educational services*
100	*Non-profit social assistance [NP62400]*	NP624000	*Social assistance*
101	*Non-profit arts, entertainment and recreation [NP71000]*	NP710000	*Arts, entertainment and recreation*
102	*Religious organizations [NP81310]*	NP813100	*Religious organizations*
103	*Miscellaneous non-profit institutions serving households [NPA0000]*	NP813A00	*Grant-making, civic, and professional and similar organizations*
		NP621000	*Ambulatory health care services*
		NP999999	*Other non-profit institutions serving households*
104	*Educational services (except universities) [GS611B0]*	GS611100	*Elementary and secondary schools*
		GS611200	*Community colleges and C.E.G.E.P.s*
		GS611A00	*Other educational services*
105	*Universities [GS61130]*	GS611300	*Universities*
106	*Hospitals [GS62200]*	GS622000	*Hospitals*
107	*Nursing and residential care facilities [GS62300]*	GS623000	*Nursing and residential care facilities*
108	*Other federal government services [GS91100]*	GS911100	*Defence services*
		GS911A00	*Other federal government services (except defence)*
109	*Other provincial and territorial government services [GS91200]*	GS912000	*Other provincial and territorial government services*
110	*Other municipal government services [GS91300]*	GS913000	*Other municipal government services*
111	*Other aboriginal government services [GS91400]*	GS914000	*Other aboriginal government services*

APPENDIX B

Table B1. Industry correspondence GDP - IIOC

GDP classification	**Table A1 industry number**
Crop, forestry, fishing and trapping, and support	1 to 4
Mining	5 to 9
Utilities	10 and 11
Construction	12 to 20
Manufacturing	21 to 62
Wholesale trade and retail	63 and 64
Transportation and warehousing	65 to 72
Information and cultural services	73 to 75
Finance, insurance, real estate, and rental and leasing	76 to 80
Professional, scientific, and technical services	82 to 84
Management of companies and enterprises	81
Administrative and support services	85
Waste management and remediation services	86
Arts, entertainment, and recreation	89 to 101
Accomodation and food services	90
Other services	91 to 93, 102 and 103
Educational services	87, 99, 104 and 105
Health care and social assistance and hospital	88, 100, 106 and 107
Public Administration	108 to 111

Table B2. Industry correspondence Employment - IIOC

Employment classification	**Table A1 industry number**
Agriculture and forestry	1 to 4
Mining, quarrying, and oil and gas extraction	5 to 9
Utilities	10 and 11
Construction	12 to 20
Manufacturing	21 to 62
Wholesale trade	63
Retail trade	64
Transportation and warehousing	65 to 72
Finance and insurance	76 to 77
Real estate and rental and leasing	78 to 80
Professional, scientific and technical services	82 to 84
Business, building and other support services	81, 85 and 86
Educational services	87, 99, 104 and 105
Health care and social assistance	88, 100, 106 and 107
Information, culture and recreation	73 to 75, 89 and 101
Accommodation and food services	90
Other services (except public administration)	91 to 93, 102 and 103
Public administration	108 to 111

Table B3. Industry correspondence NIR - IIOC

NIR classification	IIOC (table A1 industry number)
Agriculture	*Crop and animal production (1)*
Natural Gas Production and Processing Conventional Oil Production Oil Sands – Mining and Extraction Oil Sands – In-situ	*Oil and gas extraction (5)*
Waste & Other – Coal Production	*Coal Mining (6)*
Emissions Intensive & Trade Exposed Industries – Mining	*Metal ore mining (7)* *Non-metallic mineral mining and quarrying (8)* *support activities for mining and oil and gas extraction (9)*
Electricity	*Electric power generation, transmission and distribution (10)*
Downstream Oil and Gas – Natural gas distribution	*Natural gas distribution, water, sewage and other systems (11)*
Emissions Intensive & Trade Exposed Industries – Pulp and Paper	*Pulp, paper and paperboard mills (35)*
Oil Sands – Upgrading Downstream Oil and Gas – Petroleum Refining	*Petroleum and coal product manufacturing (38)*
Emissions Intensive & Trade Exposed Industries –Chemicals & Fertilizers	*Basic chemical manufacturing and pesticide, fertilizer and other agricultural chemical manufacturing (40)*
Emissions Intensive & Trade Exposed Industries – Smelting and Refining (Non Ferrous Metals) Emissions Intensive & Trade Exposed Industries – Lime & Gypsum	*Non-metallic mineral product manufacturing (except cement and concrete products) (45)*
Emissions Intensive & Trade Exposed Industries – Cement	*Cement and concrete product manufacturing (46)*
Emissions Intensive & Trade Exposed Industries – Iron and Steel	*Primary metal manufacturing (47)*
Transportation	*Transportation (air, rail, water, truck, transit) (65-69)*
Oil and Natural Gas Transmission	*Pipeline transportation (70)*
Buildings	*Owner-occupied dwellings (79)*
Waste & Others – Waste	*Waste management and remediation services (86)*

APPENDIX C

Table C1. Industrial output reduction in 2020 under policy scenario 1

	Industry output reduction (%)									
	AB	**BC**	**MB**	**NB**	**NL**	**NS**	**ON**	**PE**	**QC**	**SK**
Crop and animal production	25.6	24.2	24.9	25.9	25.9	26.2	29.0	26.6	31.3	20.9
Forestry and logging	37.6	30.6	34.9	32.7	30.0	36.3	34.3	30.4	35.9	33.6
Fishing, hunting and trapping	17.9	16.2	19.4	18.8	24.7	20.8	17.6	25.6	18.6	15.9
Support activities for agriculture and forestry	38.6	40.6	37.7	44.4	38.2	42.1	39.8	38.7	43.2	34.1
Oil and gas extraction	21.1	24.9	24.8	29.8	18.5	27.4	35.2	0.0	12.8	20.7
Coal mining	22.4	14.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.4
Metal ore mining	29.6	16.4	29.8	20.3	19.5	0.0	31.6	0.0	22.6	20.3
Non-metallic mineral mining and quarrying	29.2	29.8	30.6	20.9	27.8	25.9	24.8	26.9	30.7	16.9
Support activities for mining and oil and gas extraction	28.8	22.2	26.3	27.7	28.5	32.2	23.0	28.4	24.4	26.4
Electric power generation, transmission and distribution	29.6	23.9	22.2	23.4	21.1	23.7	25.0	24.3	22.7	28.4
Natural gas distribution, water, sewage and other systems	23.6	22.2	20.3	30.3	25.2	33.6	26.1	29.6	28.9	23.9
Residential building construction	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8
Non-residential building construction	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8
Transportation engineering construction	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8
Oil and gas engineering construction	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8
Electric power engineering construction	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8
Communication engineering construction	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8
Other engineering construction	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8
Repair construction	35.1	33.5	31.6	33.8	30.8	31.7	35.2	30.7	34.0	34.8
Other activities of the construction industry	34.0	34.2	34.5	34.3	31.7	30.2	32.3	35.3	33.5	33.9
Animal food manufacturing	27.3	32.3	34.6	34.9	35.6	34.3	28.3	36.1	36.8	32.0
Sugar and confectionery product manufacturing	26.5	19.9	13.4	17.2	21.7	23.8	15.9	0.0	18.5	13.6
Fruit and vegetable preserving and specialty food manufacturing	15.7	15.4	14.4	18.5	14.7	16.4	16.4	14.1	16.0	15.8
Dairy product manufacturing	18.1	18.9	18.4	19.6	17.8	18.3	18.7	17.0	18.8	17.7
Meat product manufacturing	19.5	21.4	18.8	19.7	16.4	21.5	20.4	22.5	17.5	21.5
Seafood product preparation and packaging	18.5	15.9	19.9	15.1	16.9	17.2	15.8	17.7	15.9	0.0
Miscellaneous food manufacturing	18.3	17.2	20.7	16.4	15.8	18.2	18.1	19.8	17.7	20.3
Soft drink and ice manufacturing	20.3	19.6	21.0	20.4	18.1	20.0	19.8	18.7	19.8	19.7
Breweries	19.6	19.5	19.7	22.0	19.2	19.1	22.4	20.1	18.4	19.3
Wineries and distilleries	14.3	16.4	18.8	16.1	20.5	16.8	16.1	22.0	16.5	0.0
Tobacco manufacturing	0.0	14.4	0.0	0.0	0.0	0.0	21.3	0.0	13.2	0.0
Textile and textile product mills	22.3	20.2	18.9	24.1	25.4	18.6	17.2	19.1	19.1	19.5
Clothing and leather and allied product manufacturing	15.9	14.0	13.9	14.6	15.5	14.0	14.1	13.5	13.7	13.6
Wood product manufacturing	24.6	18.7	23.5	22.0	25.6	24.2	23.6	25.1	23.9	20.0
Pulp, paper and paperboard mills	16.3	15.0	16.2	18.8	17.5	15.6	22.4	0.0	18.7	13.6
Converted paper product manufacturing	29.4	22.6	29.3	17.4	30.0	29.1	24.6	30.3	22.3	32.2
Printing and related support activities	32.1	28.8	25.3	29.2	28.4	29.1	30.8	30.1	29.2	28.5
Petroleum and coal product manufacturing	28.2	25.2	23.8	17.7	19.2	19.4	26.0	33.5	24.7	26.9
Basic chemical manufacturing	26.8	20.0	21.4	22.1	29.0	19.9	24.7	0.0	25.0	29.8
Pesticide, fertilizer and other agricultural chemical manufacturing	24.4	26.3	29.6	31.1	0.0	16.6	28.3	40.2	36.6	30.6
Pharmaceutical and medicine manufacturing	14.7	18.3	16.1	16.3	13.7	18.5	17.1	18.2	18.6	15.9
Miscellaneous chemical product manufacturing	20.8	24.3	28.5	26.9	30.8	21.5	22.7	25.8	24.2	27.7
Plastic product manufacturing	28.0	25.0	24.0	25.9	27.5	23.1	23.7	0.0	24.7	25.5
Rubber product manufacturing	28.6	26.6	25.9	26.9	25.6	18.7	16.6	0.0	18.1	29.3

Non-metallic mineral product manufacturing (except cement and concrete products)	27.7	27.0	27.2	23.7	29.7	24.8	24.0	26.0	25.3	25.1
Cement and concrete product manufacturing	27.5	28.1	25.4	27.0	26.1	27.8	26.8	26.3	28.2	26.8
Primary metal manufacturing	25.3	17.3	19.0	19.9	24.5	29.0	20.0	36.6	20.1	30.9
Fabricated metal product manufacturing	27.5	25.5	25.4	27.5	27.2	27.9	24.9	28.2	25.6	27.0
Machinery manufacturing	22.1	17.6	17.4	19.8	22.3	16.0	17.3	17.5	17.2	18.4
Computer and peripheral equipment manufacturing	17.5	13.4	13.4	13.0	0.0	13.5	14.3	0.0	14.0	24.2
Electronic product manufacturing	18.3	16.2	14.5	18.9	18.2	17.0	15.0	31.4	15.4	22.5
Electrical equipment and component manufacturing	21.2	20.7	20.8	24.1	21.1	19.4	19.9	28.4	23.4	25.4
Household appliance manufacturing	16.5	16.0	0.0	0.0	0.0	0.0	14.6	15.6	14.5	0.0
Motor vehicle manufacturing	12.9	13.6	15.1	0.0	0.0	13.5	12.8	0.0	12.9	13.8
Motor vehicle body and trailer manufacturing	14.4	14.5	14.0	13.2	0.0	14.1	15.1	13.3	14.1	15.0
Motor vehicle parts manufacturing	16.7	16.6	19.4	21.7	18.7	17.1	19.2	0.0	17.8	22.8
Aerospace product and parts manufacturing	22.3	20.8	19.3	22.7	31.5	21.7	14.5	17.0	15.6	15.6
Railroad rolling stock manufacturing	30.1	30.4	0.0	0.0	0.0	0.0	17.8	30.0	15.9	0.0
Ship and boat building	13.5	19.8	13.2	25.2	14.0	13.0	14.6	14.8	15.4	15.8
Other transportation equipment manufacturing	18.7	19.1	19.5	21.8	23.9	29.0	18.2	0.0	19.6	22.7
Furniture and related product manufacturing	17.4	17.6	18.7	22.0	24.3	21.6	15.4	21.2	16.9	21.5
Miscellaneous manufacturing	22.8	20.5	15.9	20.6	24.6	23.0	17.3	23.4	17.8	25.6
Wholesale trade	23.6	20.9	22.4	21.5	22.1	20.8	21.3	20.0	20.8	22.6
Retail trade	18.5	18.1	18.3	17.8	17.7	17.3	18.8	18.0	18.1	17.8
Air transportation	21.6	21.1	21.8	18.7	21.1	19.6	20.0	17.6	20.2	23.1
Rail transportation	23.2	20.8	21.6	22.5	24.7	25.7	24.7	0.0	21.8	21.6
Water transportation	26.7	22.2	24.3	22.0	21.8	26.0	27.8	20.5	25.9	24.2
Truck transportation	27.7	24.8	26.8	24.0	23.5	25.0	27.5	21.7	25.7	25.6
Transit, ground passenger and scenic and sightseeing transportation, taxi and limousine service and support activities for transportation	26.2	25.2	27.8	27.4	26.5	26.3	26.0	21.5	25.0	27.0
Pipeline transportation	19.3	23.0	29.3	22.6	0.0	19.3	28.2	0.0	25.4	23.9
Postal service and couriers and messengers	31.1	29.9	29.9	28.1	27.9	25.3	30.3	18.8	28.5	29.2
Warehousing and storage	29.8	30.7	23.4	31.0	29.2	30.9	30.6	29.2	29.4	20.4
Motion picture and sound recording industries	19.5	22.4	16.7	17.4	20.4	21.5	31.4	15.2	26.7	20.7
Radio and television broadcasting	37.2	36.4	36.3	36.3	36.0	36.3	33.0	36.4	35.7	36.7
Publishing, pay/specialty services, telecommunications and other information services	25.3	23.8	25.5	24.4	19.6	23.4	26.7	23.1	25.0	24.5
Depository credit intermediation and monetary authorities	24.6	22.5	24.2	23.4	22.5	21.8	22.9	22.5	22.8	24.0
Insurance carriers	25.7	22.5	23.0	22.9	22.6	22.0	22.4	23.0	21.5	23.8
Lessors of real estate	22.6	19.9	19.9	19.9	19.7	20.4	21.5	18.1	20.2	20.7
Owner-occupied dwellings	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8
Rental and leasing services and lessors of non-financial intangible assets (except copyrighted works)	28.8	27.4	27.4	27.4	27.4	28.0	25.5	26.9	25.0	28.3
Other finance, insurance and real estate services and management of companies and enterprises	28.8	26.0	28.5	30.8	28.8	28.6	28.5	29.7	28.8	28.7
Legal, accounting and architectural, engineering and related services	27.2	26.3	26.6	27.1	25.9	27.0	27.3	28.3	26.2	27.6
Computer systems design and other professional, scientific and technical services	30.3	25.1	29.6	27.7	25.9	26.6	27.9	27.1	26.9	31.0
Advertising, public relations and related services	33.1	31.0	28.3	30.4	30.2	29.8	31.6	21.0	32.7	30.1
Administrative and support services	34.0	30.3	31.0	32.8	30.3	29.6	30.8	30.9	31.2	32.3
Waste management and remediation services	30.4	28.2	30.3	24.6	26.9	25.4	28.5	25.1	29.0	30.6
Educational services	20.6	18.7	26.1	22.7	20.6	20.9	23.4	18.8	22.0	23.8

Health care and social assistance	21.3	21.1	21.3	20.4	21.8	20.9	20.7	20.0	21.0	21.8
Arts, entertainment and recreation	16.6	16.1	16.3	15.5	16.2	17.8	16.3	16.5	16.4	15.4
Accommodation and food services	17.0	16.5	17.1	17.2	16.3	16.8	17.2	16.9	16.7	16.4
Repair and maintenance	27.2	25.1	23.1	25.0	25.2	23.3	26.2	22.1	24.5	24.7
Personal services and private households	15.9	15.4	15.1	14.7	13.7	14.7	15.1	14.4	14.8	15.5
Professional and similar organisations	34.1	33.5	29.7	33.1	32.8	31.5	34.3	32.8	33.1	34.1
Repair and maintenance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Operating supplies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Office supplies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advertising, promotion, meals, entertainment, and travel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transportation margins	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-profit education services	13.6	14.4	13.8	15.5	14.5	14.0	13.9	13.6	16.2	13.6
Non-profit social assistance	15.9	13.6	16.9	14.8	13.6	14.5	15.5	17.5	14.5	16.4
Non-profit arts, entertainment and recreation	14.7	14.5	14.4	14.6	15.0	14.9	14.6	14.5	14.9	13.9
Religious organizations	13.8	13.9	13.7	13.7	13.6	13.6	13.9	13.6	14.0	13.6
Miscellaneous non-profit institutions serving households	14.3	14.2	15.4	15.3	13.5	14.1	14.4	13.6	14.2	15.1
Educational services (except universities)	13.0	13.2	13.0	13.4	13.0	13.1	13.2	13.3	13.4	13.0
Universities	14.1	14.0	14.0	13.8	14.6	13.8	13.7	14.1	13.6	14.4
Hospitals	13.4	14.1	13.7	14.0	14.7	14.4	13.8	13.7	13.9	13.8
Nursing and residential care facilities	13.9	13.5	12.8	12.8	12.8	12.9	13.7	13.5	13.0	12.8
Other federal government services	14.7	14.8	14.3	14.3	14.2	13.6	14.2	13.7	14.5	14.7
Other provincial and territorial government services	14.5	14.5	13.8	13.5	13.3	14.2	13.6	14.1	14.2	14.6
Other municipal government services	15.5	17.6	16.0	15.3	15.5	15.6	15.3	15.3	16.1	16.6
Other aboriginal government services	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8

Table C2. Industrial output reduction in 2020 under policy scenario 2

	Industry output reduction (%)									
	AB	**BC**	**MB**	**NB**	**NL**	**NS**	**ON**	**PE**	**QC**	**SK**
Crop and animal production	0.4	0.2	0.2	0.1	0.2	0.1	0.2	0.1	0.2	0.2
Forestry and logging	1.3	0.6	0.3	0.6	0.4	0.1	0.3	0.1	0.2	0.6
Fishing, hunting and trapping	0.1	0.1	0.1	0.0	0.2	0.1	0.1	0.0	0.2	0.1
Support activities for agriculture and forestry	0.8	0.6	0.2	0.5	0.2	0.3	0.2	0.1	0.2	0.3
Oil and gas extraction	80.0	85.7	76.6	76.6	76.3	77.2	77.0	0.0	76.2	83.1
Coal mining	5.9	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.8
Metal ore mining	0.7	2.2	0.6	0.1	0.4	0.0	1.0	0.0	0.4	0.8
Non-metallic mineral mining and quarrying	7.6	3.7	1.4	0.1	2.0	1.3	1.0	0.5	0.9	1.7
Support activities for mining and oil and gas extraction	38.1	9.6	5.9	24.9	40.4	46.9	3.9	45.6	3.1	20.1
Electric power generation, transmission and distribution	18.7	3.3	0.8	0.5	1.8	0.9	0.6	0.1	0.2	8.1
Natural gas distribution, water, sewage and other systems	10.6	0.9	0.2	0.4	1.7	0.7	0.4	0.1	0.3	2.7
Residential building construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-residential building construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transportation engineering construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oil and gas engineering construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Electric power engineering construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Communication engineering construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other engineering construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Repair construction	17.4	4.6	0.3	0.2	0.9	0.3	0.5	0.1	0.2	11.7
Other activities of the construction industry	11.3	2.0	2.3	0.6	2.0	0.5	1.2	0.4	0.4	4.2

Animal food manufacturing	0.4	0.2	0.3	0.2	0.2	0.1	0.3	0.1	0.2	0.3
Sugar and confectionery product manufacturing	0.4	0.2	0.0	0.1	0.5	0.1	0.1	0.0	0.2	0.1
Fruit and vegetable preserving and specialty food manufacturing	0.3	0.1	0.1	1.0	0.1	0.1	0.2	0.0	0.1	0.4
Dairy product manufacturing	0.4	0.2	0.4	0.1	0.2	0.2	0.2	0.1	0.2	0.2
Meat product manufacturing	0.5	0.7	0.3	0.1	0.2	0.3	0.3	0.1	0.1	0.5
Seafood product preparation and packaging	1.0	0.1	0.2	0.0	0.4	0.1	0.1	0.0	0.1	0.0
Miscellaneous food manufacturing	0.3	0.2	0.2	0.1	0.2	0.1	0.1	0.1	0.1	0.4
Soft drink and ice manufacturing	1.3	0.7	0.9	1.0	0.7	0.3	0.7	0.2	0.6	1.4
Breweries	1.3	0.7	0.8	1.7	1.1	0.4	1.5	0.2	0.2	2.2
Wineries and distilleries	0.2	0.3	0.2	0.1	0.5	0.1	0.1	0.2	0.1	0.0
Tobacco manufacturing	0.0	0.4	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0
Textile and textile product mills	2.0	1.4	0.3	0.3	0.5	0.1	0.1	0.0	0.1	0.7
Clothing and leather and allied product manufacturing	0.7	0.1	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.2
Wood product manufacturing	1.4	0.5	0.3	0.1	0.2	0.1	0.2	0.1	0.1	0.4
Pulp, paper and paperboard mills	0.7	0.3	0.5	0.1	0.2	0.1	0.4	0.0	0.3	0.2
Converted paper product manufacturing	4.2	0.7	1.3	0.1	0.7	1.3	0.8	0.3	0.3	2.5
Printing and related support activities	7.0	1.8	1.0	0.8	2.1	1.0	1.2	0.4	0.7	4.4
Petroleum and coal product manufacturing	8.0	1.8	0.2	0.3	0.7	0.7	0.9	0.0	0.6	5.3
Basic chemical manufacturing	5.5	3.5	3.0	1.3	12.1	0.1	1.2	0.0	0.6	7.4
Pesticide, fertilizer and other agricultural chemical manufacturing	3.7	3.8	0.5	0.5	0.0	0.3	0.4	0.4	0.5	0.5
Pharmaceutical and medicine manufacturing	0.4	0.1	0.1	0.0	0.0	0.3	0.2	0.0	0.1	0.2
Miscellaneous chemical product manufacturing	5.4	2.9	2.9	1.2	16.4	0.6	1.0	0.1	0.9	9.8
Plastic product manufacturing	5.9	2.3	1.3	0.4	2.8	0.7	0.7	0.0	0.8	3.2
Rubber product manufacturing	8.7	3.1	2.9	0.5	5.3	0.8	0.2	0.0	0.2	6.2
Non-metallic mineral product manufacturing (except cement and concrete products)	4.7	4.3	1.9	0.5	8.3	3.2	0.9	0.3	1.1	2.3
Cement and concrete product manufacturing	4.5	2.6	0.4	0.1	0.4	1.0	0.4	0.0	0.1	1.8
Primary metal manufacturing	14.6	0.6	0.6	0.1	0.8	8.7	1.1	0.1	0.3	13.6
Fabricated metal product manufacturing	7.1	2.0	1.7	0.9	4.2	1.1	1.1	0.4	1.5	4.1
Machinery manufacturing	14.6	2.5	2.0	1.5	6.1	0.3	1.0	0.2	0.3	3.5
Computer and peripheral equipment manufacturing	2.6	0.1	0.0	0.0	0.0	0.0	0.2	0.0	0.1	6.2
Electronic product manufacturing	4.5	0.8	0.2	1.3	0.9	0.6	0.4	0.1	0.2	1.0
Electrical equipment and component manufacturing	4.6	2.4	3.6	0.8	1.3	0.6	1.2	0.3	1.1	3.6
Household appliance manufacturing	0.8	0.7	0.0	0.0	0.0	0.0	0.2	0.0	0.1	0.0
Motor vehicle manufacturing	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Motor vehicle body and trailer manufacturing	0.9	0.3	0.1	0.0	0.0	0.1	0.2	0.0	0.0	0.9
Motor vehicle parts manufacturing	4.1	3.1	3.1	1.1	1.6	0.3	0.2	0.0	0.2	4.8
Aerospace product and parts manufacturing	1.7	0.3	0.1	0.5	7.8	0.2	0.0	0.1	0.2	1.0
Railroad rolling stock manufacturing	16.0	1.3	0.0	0.0	0.0	0.0	0.1	0.3	0.1	0.0
Ship and boat building	0.7	0.5	0.1	0.3	0.2	0.0	0.1	0.3	0.2	1.5
Other transportation equipment manufacturing	3.3	1.7	1.2	0.8	1.3	1.0	0.3	0.0	1.3	6.1
Furniture and related product manufacturing	0.3	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.4
Miscellaneous manufacturing	3.9	0.8	0.4	0.7	2.2	0.4	0.2	0.3	0.1	3.3
Wholesale trade	8.3	1.8	1.3	0.8	3.7	0.8	1.0	0.5	0.4	3.7
Retail trade	2.1	0.7	0.3	0.1	0.6	0.1	0.3	0.1	0.2	0.9
Air transportation	3.1	0.9	1.1	0.7	2.1	0.7	0.8	0.4	0.7	2.9
Rail transportation	4.3	0.6	0.4	0.2	3.8	0.6	0.7	0.0	0.2	1.0
Water transportation	4.8	0.9	0.5	0.6	0.8	0.3	0.5	0.3	0.3	1.9
Truck transportation	8.8	1.2	1.4	0.3	4.9	0.7	0.6	0.4	0.3	3.2

Transit, ground passenger and scenic and sightseeing transportation, taxi and limousine service and support activities for transportation	6.1	2.2	1.4	0.5	1.9	0.6	1.8	0.2	0.5	2.7
Pipeline transportation	4.1	4.1	0.5	0.2	0.0	0.2	0.5	0.0	0.3	2.8
Postal service and couriers and messengers	8.2	1.8	1.3	1.9	1.6	0.4	1.3	0.1	0.5	3.0
Warehousing and storage	9.2	2.7	1.2	0.7	2.4	0.8	0.9	0.5	0.5	2.6
Motion picture and sound recording industries	2.3	0.5	0.2	0.2	0.9	0.3	1.2	0.0	0.5	1.3
Radio and television broadcasting	6.9	2.3	2.3	1.5	3.7	1.8	1.6	0.8	1.4	4.3
Publishing, pay/specialty services, telecommunications and other information services	6.7	1.3	1.0	0.8	1.1	0.8	1.1	0.4	0.6	2.6
Depository credit intermediation and monetary authorities	9.2	1.4	1.7	0.6	5.2	0.7	1.3	0.3	0.5	4.8
Insurance carriers	9.1	1.0	1.0	0.4	2.8	0.8	1.3	0.2	1.1	3.7
Lessors of real estate	3.7	0.5	0.3	0.2	0.9	0.2	0.3	0.1	0.2	1.7
Owner-occupied dwellings	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rental and leasing services and lessors of non-financial intangible assets (except copyrighted works)	10.4	2.0	1.0	0.7	1.8	0.7	0.8	0.4	0.5	3.3
Other finance, insurance and real estate services and management of companies and enterprises	18.9	3.0	3.3	2.6	9.4	1.8	3.7	1.2	3.1	9.2
Legal, accounting and architectural, engineering and related services	13.4	3.1	1.6	1.1	3.0	1.2	1.3	0.2	0.7	6.1
Computer systems design and other professional, scientific and technical services	16.1	2.4	1.8	1.2	8.9	1.9	1.8	0.7	1.3	8.9
Advertising, public relations and related services	10.1	1.7	1.2	0.7	2.9	1.0	1.2	0.1	0.6	5.8
Administrative and support services	17.8	3.6	2.9	4.0	7.4	1.6	2.1	0.8	1.2	9.5
Waste management and remediation services	14.0	1.5	1.2	0.2	10.0	0.3	0.6	0.1	0.3	9.7
Educational services	3.4	0.3	0.3	0.2	0.8	0.1	0.5	0.0	0.2	1.3
Health care and social assistance	0.4	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.3
Arts, entertainment and recreation	1.5	0.3	0.2	0.2	0.5	0.3	0.2	0.1	0.1	0.5
Accommodation and food services	1.9	0.6	0.3	0.2	0.8	0.2	0.2	0.2	0.1	1.0
Repair and maintenance	9.3	2.0	0.5	0.4	5.0	0.5	0.6	0.2	0.3	4.5
Personal services and private households	1.2	0.4	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.4
Professional and similar organisations	13.9	2.2	1.6	0.8	4.8	0.7	2.0	0.6	1.3	5.0
Repair and maintenance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Operating supplies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Office supplies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advertising, promotion, meals, entertainment, and travel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transportation margins	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-profit education services	0.3	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1
Non-profit social assistance	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Non-profit arts, entertainment and recreation	0.5	0.1	0.1	0.1	0.3	0.1	0.1	0.0	0.1	0.1
Religious organizations	0.4	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.2
Miscellaneous non-profit institutions serving households	0.4	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.2
Educational services (except universities)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Universities	0.8	0.2	0.1	0.1	0.5	0.1	0.1	0.0	0.0	0.6
Hospitals	0.2	0.1	0.1	0.1	0.3	0.0	0.0	0.0	0.0	0.2
Nursing and residential care facilities	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other federal government services	1.1	0.2	0.2	0.2	0.3	0.0	0.1	0.0	0.1	0.4
Other provincial and territorial government services	0.9	0.2	0.2	0.1	0.2	0.1	0.0	0.0	0.0	0.5
Other municipal government services	1.1	0.4	0.2	0.1	0.3	0.1	0.1	0.0	0.1	0.8
Other aboriginal government services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table C3. Industrial output reduction in 2020 under policy scenario 3

	Industry output reduction (%)									
	AB	**BC**	**MB**	**NB**	**NL**	**NS**	**ON**	**PE**	**QC**	**SK**
Crop and animal production	30.1	26.0	27.8	26.5	24.7	26.9	28.6	27.1	29.3	26.6
Forestry and logging	5.4	2.8	6.6	10.9	15.0	5.7	9.1	15.1	6.6	4.5
Fishing, hunting and trapping	0.4	0.3	0.5	0.5	0.9	0.6	0.4	0.8	0.4	0.4
Support activities for agriculture and forestry	15.9	7.6	23.3	12.3	21.1	13.0	15.0	24.8	13.4	20.1
Oil and gas extraction	31.1	33.5	36.6	41.3	29.8	36.3	46.6	0.0	22.5	32.2
Coal mining	10.7	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.3
Metal ore mining	16.2	2.1	22.4	11.1	8.2	0.0	21.2	0.0	11.4	7.6
Non-metallic mineral mining and quarrying	9.5	8.6	9.5	4.4	3.9	4.2	5.5	0.9	7.3	3.3
Support activities for mining and oil and gas extraction	14.9	4.5	7.2	11.3	16.3	20.5	4.3	17.8	3.9	8.3
Electric power generation, transmission and distribution	33.7	26.9	26.1	26.7	25.6	26.2	26.9	25.1	27.4	30.9
Natural gas distribution, water, sewage and other systems	6.6	3.4	1.2	18.4	2.2	19.0	5.9	1.3	6.7	3.7
Residential building construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-residential building construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transportation engineering construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oil and gas engineering construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Electric power engineering construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Communication engineering construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other engineering construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Repair construction	10.7	5.6	3.1	6.1	1.8	2.8	5.5	1.5	3.7	12.1
Other activities of the construction industry	9.2	5.8	9.3	10.7	4.8	5.6	6.4	5.5	6.9	8.7
Animal food manufacturing	15.7	18.3	23.4	21.0	20.1	20.0	12.9	23.5	20.0	20.2
Sugar and confectionery product manufacturing	3.5	0.7	0.1	0.4	0.8	1.1	0.3	0.0	0.7	0.1
Fruit and vegetable preserving and specialty food manufacturing	0.4	0.3	0.2	1.7	0.2	0.3	0.5	0.1	0.3	0.7
Dairy product manufacturing	0.5	0.4	0.5	0.5	0.3	0.5	0.6	0.2	0.7	0.4
Meat product manufacturing	0.7	1.5	0.9	0.4	0.3	1.7	1.1	0.7	0.6	1.6
Seafood product preparation and packaging	0.8	0.6	0.6	0.2	0.5	0.6	0.3	0.4	0.2	0.0
Miscellaneous food manufacturing	2.0	0.5	2.6	0.3	0.2	1.0	1.2	1.6	1.2	3.6
Soft drink and ice manufacturing	2.3	2.0	2.5	2.2	0.9	1.6	2.0	0.9	2.0	2.2
Breweries	1.8	1.3	1.5	2.6	1.2	1.1	3.3	1.1	1.0	1.8
Wineries and distilleries	0.4	0.5	0.7	0.4	2.1	0.5	0.5	1.4	0.6	0.0
Tobacco manufacturing	0.0	0.5	0.0	0.0	0.0	0.0	4.2	0.0	0.1	0.0
Textile and textile product mills	2.9	2.5	1.1	2.1	1.6	0.7	0.4	0.8	0.6	2.1
Clothing and leather and allied product manufacturing	0.7	0.4	0.2	0.2	0.2	0.1	0.3	0.1	0.1	0.2
Wood product manufacturing	2.2	2.0	3.5	3.3	3.2	3.0	2.3	1.5	2.8	1.4
Pulp, paper and paperboard mills	23.3	23.6	23.3	25.6	23.1	24.1	25.1	0.0	23.8	23.2
Converted paper product manufacturing	6.2	2.7	5.1	0.9	3.3	3.7	3.5	3.8	2.4	8.2
Printing and related support activities	5.7	3.2	2.6	3.0	2.3	3.1	4.1	2.6	3.4	4.9
Petroleum and coal product manufacturing	33.0	28.6	26.7	26.0	26.8	25.7	30.3	28.8	28.8	32.7
Basic chemical manufacturing	5.5	5.7	5.3	7.4	5.7	1.3	4.9	0.0	4.4	8.6
Pesticide, fertilizer and other agricultural chemical manufacturing	12.3	11.7	17.3	14.7	0.0	1.1	11.7	20.4	17.0	19.4
Pharmaceutical and medicine manufacturing	0.3	0.3	0.2	0.4	0.0	1.2	0.5	0.6	0.4	0.3
Miscellaneous chemical product manufacturing	3.4	3.0	3.3	5.3	13.5	1.7	2.1	3.0	2.3	8.4
Plastic product manufacturing	4.8	2.5	2.9	2.3	3.0	2.1	1.8	0.0	2.1	4.4
Rubber product manufacturing	7.9	4.1	4.6	5.9	5.3	2.2	0.8	0.0	1.1	9.1

Non-metallic mineral product manufacturing (except cement and concrete products)	5.4	4.7	3.5	1.6	7.0	2.7	3.3	5.1	3.3	2.7
Cement and concrete product manufacturing	27.2	28.3	23.9	24.2	23.1	26.7	26.8	23.6	28.1	25.1
Primary metal manufacturing	29.8	24.3	25.9	30.8	23.4	28.1	26.2	38.4	28.5	33.9
Fabricated metal product manufacturing	4.6	2.2	2.6	2.2	2.8	1.8	2.2	4.1	2.2	4.5
Machinery manufacturing	6.4	1.6	1.6	1.6	4.2	0.6	1.1	1.0	1.0	2.1
Computer and peripheral equipment manufacturing	1.3	0.1	0.2	0.1	0.0	0.1	0.5	0.0	0.2	4.8
Electronic product manufacturing	2.3	0.7	0.4	1.6	1.2	0.6	0.5	1.1	0.5	3.0
Electrical equipment and component manufacturing	3.3	2.2	2.9	3.6	1.7	1.2	1.5	3.7	2.0	4.3
Household appliance manufacturing	0.8	0.6	0.0	0.0	0.0	0.0	0.4	0.5	0.3	0.0
Motor vehicle manufacturing	0.1	0.2	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Motor vehicle body and trailer manufacturing	0.6	0.4	0.2	0.0	0.0	0.2	0.6	0.0	0.3	1.0
Motor vehicle parts manufacturing	2.7	2.2	3.9	3.6	3.4	1.4	0.5	0.0	1.2	6.2
Aerospace product and parts manufacturing	4.6	5.1	1.4	6.7	12.9	1.6	0.4	1.3	0.7	1.5
Railroad rolling stock manufacturing	9.8	3.4	0.0	0.0	0.0	0.0	0.5	4.2	0.4	0.0
Ship and boat building	0.5	2.4	0.2	5.3	0.2	0.1	0.6	0.5	0.4	2.0
Other transportation equipment manufacturing	2.5	1.7	2.0	1.9	3.0	3.1	1.2	0.0	1.9	5.7
Furniture and related product manufacturing	0.2	0.2	0.2	0.5	0.2	0.2	0.1	0.5	0.2	0.4
Miscellaneous manufacturing	2.9	1.4	0.7	2.2	2.0	1.8	1.1	1.3	0.8	4.0
Wholesale trade	28.5	24.8	26.5	25.9	25.8	24.6	24.8	24.6	24.6	28.1
Retail trade	1.6	1.0	1.3	1.0	0.8	0.7	1.1	0.8	1.0	1.8
Air transportation	25.8	25.2	25.1	24.3	24.9	24.3	24.5	24.0	24.3	26.1
Rail transportation	6.1	3.8	4.7	6.6	4.6	7.7	5.5	0.0	4.7	5.0
Water transportation	10.6	3.7	6.8	3.9	3.0	5.1	8.2	2.1	6.1	6.7
Truck transportation	34.1	29.7	33.7	32.1	27.4	29.1	30.7	27.2	29.6	33.1
Transit, ground passenger and scenic and sightseeing transportation, taxi and limousine service and support activities for transportation	9.5	7.2	11.0	11.4	8.2	6.3	8.5	4.7	6.3	9.5
Pipeline transportation	5.5	6.6	13.9	10.0	0.0	4.9	9.8	0.0	8.4	10.4
Postal service and couriers and messengers	8.3	4.2	5.0	4.2	3.3	2.4	5.3	1.0	4.0	6.8
Warehousing and storage	12.6	11.1	6.0	11.1	8.3	10.2	11.0	7.8	10.1	4.5
Motion picture and sound recording industries	2.0	1.5	0.8	0.8	1.0	1.4	3.4	0.3	2.2	2.0
Radio and television broadcasting	9.7	8.2	7.8	6.4	7.3	8.1	8.3	4.9	7.9	9.3
Publishing, pay/specialty services, telecommunications and other information services	5.2	2.5	3.5	3.0	1.5	2.1	3.7	2.0	2.8	4.5
Depository credit intermediation and monetary authorities	5.5	1.9	3.5	3.2	3.5	1.7	2.4	1.8	2.2	5.1
Insurance carriers	6.9	2.5	4.0	4.1	2.9	2.2	3.6	2.7	3.2	6.1
Lessors of real estate	3.2	1.1	1.5	1.3	1.2	1.1	1.7	0.6	1.3	2.4
Owner-occupied dwellings	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rental and leasing services and lessors of non-financial intangible assets (except copyrighted works)	7.7	4.4	5.7	5.4	3.7	3.7	3.8	4.6	3.3	8.3
Other finance, insurance and real estate services and management of companies and enterprises	9.4	2.8	5.0	5.9	5.8	2.8	4.3	3.2	4.4	7.1
Legal, accounting and architectural, engineering and related services	7.0	3.2	4.2	3.6	2.3	2.5	3.9	3.9	3.1	6.2
Computer systems design and other professional, scientific and technical services	9.4	3.0	5.2	3.5	5.2	3.1	3.9	3.2	3.6	8.7
Advertising, public relations and related services	8.0	4.6	3.6	3.2	3.1	4.2	7.7	0.9	6.0	6.4
Administrative and support services	10.9	4.4	5.5	6.2	5.7	3.3	4.8	3.1	4.3	9.5
Waste management and remediation services	9.1	2.9	5.3	4.0	6.2	1.7	3.8	1.0	4.0	9.9
Educational services	2.2	0.6	1.5	1.2	0.8	0.5	1.5	0.3	1.2	1.5

Health care and social assistance	0.3	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.4
Arts, entertainment and recreation	1.2	0.8	0.7	0.6	0.6	0.9	1.2	0.7	0.9	0.7
Accommodation and food services	1.5	1.1	1.1	0.9	0.9	0.9	1.3	0.8	0.9	1.2
Repair and maintenance	6.5	2.9	3.7	5.5	4.7	2.0	2.8	2.1	3.0	6.0
Personal services and private households	0.9	0.5	0.3	0.2	0.1	0.2	0.3	0.2	0.3	0.5
Professional and similar organisations	7.8	3.0	3.9	5.7	3.4	2.2	3.3	2.6	2.9	5.6
Repair and maintenance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Operating supplies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Office supplies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advertising, promotion, meals, entertainment, and travel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transportation margins	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-profit education services	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1
Non-profit social assistance	0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.2
Non-profit arts, entertainment and recreation	0.4	0.4	0.2	0.3	0.3	0.4	0.5	0.2	0.4	0.2
Religious organizations	0.3	0.2	0.2	0.2	0.1	0.1	0.2	0.1	0.2	0.2
Miscellaneous non-profit institutions serving households	0.3	0.2	0.2	0.2	0.1	0.1	0.2	0.1	0.2	0.3
Educational services (except universities)	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0
Universities	0.5	0.2	0.2	0.2	0.3	0.1	0.2	0.2	0.1	0.5
Hospitals	0.1	0.1	0.1	0.2	0.3	0.1	0.1	0.1	0.1	0.2
Nursing and residential care facilities	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other federal government services	0.7	0.3	0.3	0.3	0.3	0.1	0.3	0.1	0.4	0.4
Other provincial and territorial government services	0.6	0.3	0.3	0.2	0.1	0.2	0.2	0.2	0.2	0.9
Other municipal government services	1.1	0.9	0.7	0.7	0.4	0.5	0.6	0.3	0.8	1.4
Other aboriginal government services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

APPENDIX D

Table D1. Industrial output reduction in 2020 under policy scenario 1 with projected EIC

	Industry output reduction (%)									
	AB	**BC**	**MB**	**NB**	**NL**	**NS**	**ON**	**PE**	**QC**	**SK**
Crop and animal production	15.4	14.6	15.0	15.6	15.6	15.8	17.4	16.0	18.8	12.6
Forestry and logging	22.6	18.4	21.0	19.6	18.1	21.8	20.7	18.3	21.6	20.2
Fishing, hunting and trapping	10.8	9.7	11.7	11.3	14.9	12.5	10.6	15.4	11.2	9.6
Support activities for agriculture and forestry	23.2	24.4	22.7	26.7	23.0	25.3	24.0	23.3	26.0	20.5
Oil and gas extraction	12.7	15.0	14.9	17.9	11.1	16.5	21.2	0.0	7.7	12.4
Coal mining	13.5	8.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.3
Metal ore mining	17.8	9.8	18.0	12.2	11.7	0.0	19.0	0.0	13.6	12.2
Non-metallic mineral mining and quarrying	17.6	17.9	18.4	12.6	16.7	15.6	14.9	16.2	18.5	10.2
Support activities for mining and oil and gas extraction	17.3	13.3	15.8	16.6	17.1	19.4	13.8	17.1	14.7	15.9
Electric power generation, transmission and distribution	17.8	14.4	13.3	14.1	12.7	14.2	15.1	14.6	13.6	17.1
Natural gas distribution, water, sewage and other systems	14.2	13.4	12.2	18.2	15.1	20.2	15.7	17.8	17.4	14.4
Residential building construction	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7
Non-residential building construction	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7
Transportation engineering construction	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7
Oil and gas engineering construction	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7
Electric power engineering construction	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7
Communication engineering construction	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7
Other engineering construction	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7
Repair construction	21.1	20.2	19.0	20.3	18.5	19.1	21.2	18.5	20.5	20.9
Other activities of the construction industry	20.5	20.6	20.7	20.6	19.0	18.2	19.4	21.2	20.2	20.4
Animal food manufacturing	16.5	19.4	20.8	21.0	21.4	20.6	17.0	21.7	22.2	19.2
Sugar and confectionery product manufacturing	16.0	12.0	8.1	10.3	13.1	14.3	9.6	0.0	11.2	8.2
Fruit and vegetable preserving and specialty food manufacturing	9.5	9.3	8.7	11.1	8.9	9.9	9.9	8.5	9.6	9.5
Dairy product manufacturing	10.9	11.4	11.1	11.8	10.7	11.0	11.2	10.2	11.3	10.7
Meat product manufacturing	11.7	12.9	11.3	11.8	9.8	12.9	12.2	13.5	10.5	12.9
Seafood product preparation and packaging	11.1	9.6	12.0	9.1	10.2	10.4	9.5	10.7	9.6	0.0
Miscellaneous food manufacturing	11.0	10.3	12.5	9.9	9.5	10.9	10.9	11.9	10.6	12.2
Soft drink and ice manufacturing	12.2	11.8	12.6	12.2	10.9	12.0	11.9	11.2	11.9	11.9
Breweries	11.8	11.8	11.9	13.2	11.6	11.5	13.5	12.1	11.1	11.6
Wineries and distilleries	8.6	9.9	11.3	9.7	12.4	10.1	9.7	13.2	9.9	0.0
Tobacco manufacturing	0.0	8.7	0.0	0.0	0.0	0.0	12.8	0.0	7.9	0.0
Textile and textile product mills	13.4	12.1	11.4	14.5	15.3	11.2	10.3	11.5	11.5	11.7
Clothing and leather and allied product manufacturing	9.6	8.4	8.4	8.8	9.3	8.4	8.5	8.1	8.2	8.2
Wood product manufacturing	14.8	11.3	14.1	13.2	15.4	14.6	14.2	15.1	14.4	12.0
Pulp, paper and paperboard mills	9.8	9.0	9.8	11.3	10.5	9.4	13.5	0	11.3	8.2
Converted paper product manufacturing	17.7	13.6	17.6	10.4	18.0	17.5	14.8	18.2	13.4	19.4
Printing and related support activities	19.3	17.3	15.2	17.6	17.1	17.5	18.6	18.1	17.6	17.1
Petroleum and coal product manufacturing	16.9	15.1	14.3	10.7	11.5	11.7	15.6	20.2	14.8	16.2
Basic chemical manufacturing	16.1	12.0	12.9	13.3	17.4	12.0	14.9	0.0	15.0	17.9
Pesticide, fertilizer and other agricultural chemical manufacturing	14.7	15.8	17.8	18.7	0.0	10.0	17.0	24.2	22.0	18.4
Pharmaceutical and medicine manufacturing	8.8	11.0	9.7	9.8	8.2	11.1	10.3	10.9	11.2	9.6
Miscellaneous chemical product manufacturing	12.5	14.6	17.2	16.2	18.5	12.9	13.7	15.5	14.5	16.7
Plastic product manufacturing	16.9	15.0	14.4	15.6	16.5	13.9	14.3	0.0	14.8	15.4
Rubber product manufacturing	17.2	16.0	15.6	16.2	15.4	11.3	10.0	0.0	10.9	17.6

Non-metallic mineral product manufacturing (except cement and concrete products)	16.7	16.2	16.4	14.2	17.9	14.9	14.4	15.6	15.2	15.1
Cement and concrete product manufacturing	16.5	16.9	15.3	16.2	15.7	16.7	16.1	15.8	16.9	16.1
Primary metal manufacturing	15.2	10.4	11.4	12.0	14.7	17.5	12.0	22.0	12.1	18.6
Fabricated metal product manufacturing	16.6	15.3	15.3	16.5	16.3	16.8	15.0	16.9	15.4	16.3
Machinery manufacturing	13.3	10.6	10.5	11.9	13.4	9.6	10.4	10.5	10.4	11.1
Computer and peripheral equipment manufacturing	10.5	8.1	8.0	7.8	0.0	8.1	8.6	0.0	8.4	14.6
Electronic product manufacturing	11.0	9.7	8.7	11.4	10.9	10.2	9.0	18.9	9.2	13.5
Electrical equipment and component manufacturing	12.8	12.4	12.5	14.5	12.7	11.7	11.9	17.1	14.1	15.3
Household appliance manufacturing	9.9	9.6	0.0	0.0	0.0	0.0	8.8	9.4	8.7	0.0
Motor vehicle manufacturing	7.8	8.2	9.1	0.0	0.0	8.1	7.7	0.0	7.7	8.3
Motor vehicle body and trailer manufacturing	8.7	8.7	8.4	8.0	0.0	8.5	9.1	8.0	8.5	9.0
Motor vehicle parts manufacturing	10.0	10.0	11.6	13.1	11.2	10.3	11.6	0.0	10.7	13.7
Aerospace product and parts manufacturing	13.4	12.5	11.6	13.6	19.0	13.0	8.7	10.2	9.4	9.4
Railroad rolling stock manufacturing	18.1	18.3	0.0	0.0	0.0	0.0	10.7	18.0	9.6	0.0
Ship and boat building	8.1	11.9	7.9	15.2	8.4	7.8	8.8	8.9	9.3	9.5
Other transportation equipment manufacturing	11.2	11.5	11.7	13.1	14.4	17.5	10.9	0.0	11.8	13.6
Furniture and related product manufacturing	10.4	10.6	11.2	13.2	14.6	13.0	9.3	12.7	10.2	12.9
Miscellaneous manufacturing	13.7	12.3	9.6	12.4	14.8	13.8	10.4	14.1	10.7	15.4
Wholesale trade	14.2	12.5	13.5	13.0	13.3	12.5	12.8	12.0	12.5	13.6
Retail trade	11.1	10.9	11.0	10.7	10.6	10.4	11.3	10.8	10.9	10.7
Air transportation	13.0	12.7	13.1	11.2	12.7	11.8	12.1	10.6	12.1	13.9
Rail transportation	14.0	12.5	13.0	13.5	14.8	15.5	14.8	0.0	13.1	13.0
Water transportation	16.1	13.3	14.6	13.2	13.1	15.7	16.7	12.3	15.6	14.5
Truck transportation	16.7	14.9	16.1	14.4	14.1	15.0	16.5	13.1	15.5	15.4
Transit, ground passenger and scenic and sightseeing transportation, taxi and limousine service and support activities for transportation	15.8	15.2	16.7	16.5	15.9	15.8	15.7	12.9	15.0	16.2
Pipeline transportation	11.6	13.8	17.7	13.6	0	11.6	17.0	0	15.3	14.4
Postal service and couriers and messengers	18.7	18.0	18.0	16.9	16.8	15.2	18.2	11.3	17.1	17.6
Warehousing and storage	17.9	18.5	14.1	18.7	17.5	18.6	18.4	17.5	17.7	12.3
Motion picture and sound recording industries	11.7	13.5	10.0	10.5	12.3	12.9	18.9	9.1	16.1	12.4
Radio and television broadcasting	22.4	21.9	21.8	21.9	21.7	21.8	19.8	21.9	21.5	22.1
Publishing, pay/specialty services, telecommunications and other information services	15.2	14.3	15.4	14.7	11.8	14.1	16.1	13.9	15.0	14.7
Depository credit intermediation and monetary authorities	14.8	13.5	14.6	14.1	13.6	13.1	13.8	13.5	13.7	14.5
Insurance carriers	15.5	13.5	13.8	13.8	13.6	13.2	13.5	13.8	13.0	14.3
Lessors of real estate	13.6	12.0	12.0	12.0	11.8	12.2	13.0	10.9	12.2	12.5
Owner-occupied dwellings	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7
Rental and leasing services and lessors of non-financial intangible assets (except copyrighted works)	17.3	16.5	16.5	16.5	16.5	16.8	15.3	16.2	15.1	17.0
Other finance, insurance and real estate services and management of companies and enterprises	17.3	15.7	17.1	18.5	17.3	17.2	17.1	17.8	17.4	17.3
Legal, accounting and architectural, engineering and related services	16.4	15.8	16.0	16.3	15.6	16.3	16.4	17.0	15.7	16.6
Computer systems design and other professional, scientific and technical services	18.2	15.1	17.8	16.6	15.6	16.0	16.8	16.3	16.2	18.6
Advertising, public relations and related services	19.9	18.7	17.0	18.3	18.2	17.9	19.0	12.6	19.7	18.1
Administrative and support services	20.4	18.2	18.7	19.7	18.2	17.8	18.5	18.6	18.7	19.4
Waste management and remediation services	18.3	17.0	18.2	14.8	16.2	15.3	17.1	15.1	17.4	18.4
Educational services	12.4	11.2	15.7	13.7	12.4	12.6	14.1	11.3	13.3	14.3

Health care and social assistance	12.8	12.7	12.8	12.3	13.1	12.5	12.5	12.0	12.6	13.1
Arts, entertainment and recreation	10.0	9.7	9.8	9.3	9.7	10.7	9.8	9.9	9.8	9.3
Accommodation and food services	10.2	9.9	10.3	10.3	9.8	10.1	10.3	10.2	10.0	9.9
Repair and maintenance	16.3	15.1	13.9	15.0	15.2	14.0	15.7	13.3	14.7	14.8
Personal services and private households	9.6	9.2	9.1	8.9	8.2	8.9	9.1	8.7	8.9	9.3
Professional and similar organisations	20.5	20.2	17.9	19.9	19.7	18.9	20.6	19.7	19.9	20.5
Repair and maintenance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Operating supplies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Office supplies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advertising, promotion, meals, entertainment, and travel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transportation margins	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-profit education services	8.2	8.7	8.3	9.3	8.7	8.4	8.3	8.2	9.7	8.2
Non-profit social assistance	9.6	8.2	10.2	8.9	8.2	8.7	9.3	10.5	8.7	9.9
Non-profit arts, entertainment and recreation	8.8	8.7	8.6	8.8	9.0	9.0	8.8	8.7	9.0	8.4
Religious organizations	8.3	8.4	8.2	8.3	8.2	8.2	8.4	8.2	8.4	8.2
Miscellaneous non-profit institutions serving households	8.6	8.5	9.2	9.2	8.1	8.5	8.7	8.2	8.5	9.1
Educational services (except universities)	7.8	7.9	7.8	8.1	7.8	7.9	8.0	8.0	8.1	7.8
Universities	8.5	8.4	8.4	8.3	8.8	8.3	8.3	8.5	8.2	8.6
Hospitals	8.1	8.5	8.2	8.4	8.9	8.7	8.3	8.2	8.4	8.3
Nursing and residential care facilities	8.4	8.1	7.7	7.7	7.7	7.7	8.2	8.1	7.8	7.7
Other federal government services	8.8	8.9	8.6	8.6	8.6	8.2	8.5	8.3	8.7	8.9
Other provincial and territorial government services	8.7	8.7	8.3	8.1	8.0	8.5	8.2	8.5	8.6	8.8
Other municipal government services	9.3	10.6	9.6	9.2	9.3	9.4	9.2	9.2	9.7	10.0
Other aboriginal government services	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7	7.7

Table D2. Industrial output reduction in 2020 under policy scenario 2 with projected EIC

	Industry output reduction (%)									
	AB	**BC**	**MB**	**NB**	**NL**	**NS**	**ON**	**PE**	**QC**	**SK**
Crop and animal production	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1
Forestry and logging	0.6	0.2	0.1	0.3	0.2	0.1	0.1	0.0	0.1	0.3
Fishing, hunting and trapping	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.0
Support activities for agriculture and forestry	0.4	0.2	0.1	0.2	0.1	0.1	0.1	0.0	0.1	0.1
Oil and gas extraction	33.9	36.3	32.5	32.4	32.4	32.7	32.6	0	32.3	35.2
Coal mining	2.5	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9
Metal ore mining	0.3	0.9	0.2	0.0	0.2	0	0.4	0.0	0.2	0.3
Non-metallic mineral mining and quarrying	3.2	1.6	0.6	0.0	0.9	0.6	0.4	0.2	0.4	0.7
Support activities for mining and oil and gas extraction	16.1	4.1	2.5	10.6	17.1	19.9	1.6	19.3	1.3	8.5
Electric power generation, transmission and distribution	7.9	1.4	0.3	0.2	0.7	0.4	0.2	0.1	0.1	3.5
Natural gas distribution, water, sewage and other systems	4.5	0.4	0.1	0.2	0.7	0.3	0.2	0.0	0.1	1.1
Residential building construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-residential building construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transportation engineering construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oil and gas engineering construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Electric power engineering construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Communication engineering construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other engineering construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Repair construction	7.4	1.9	0.1	0.1	0.4	0.1	0.2	0.0	0.1	4.9
Other activities of the construction industry	4.8	0.8	1.0	0.3	0.8	0.2	0.5	0.2	0.2	1.8

Animal food manufacturing	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1
Sugar and confectionery product manufacturing	0.2	0.1	0.0	0.0	0.2	0.1	0.0	0.0	0.1	0.0
Fruit and vegetable preserving and specialty food manufacturing	0.1	0.1	0.0	0.4	0.0	0.0	0.1	0.0	0.0	0.2
Dairy product manufacturing	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1
Meat product manufacturing	0.2	0.3	0.1	0.0	0.1	0.1	0.1	0.1	0.0	0.2
Seafood product preparation and packaging	0.4	0.1	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.0
Miscellaneous food manufacturing	0.1	0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.0	0.2
Soft drink and ice manufacturing	0.5	0.3	0.4	0.4	0.3	0.1	0.3	0.1	0.3	0.6
Breweries	0.5	0.3	0.3	0.7	0.5	0.1	0.6	0.1	0.1	0.9
Wineries and distilleries	0.1	0.1	0.1	0.0	0.2	0.1	0.1	0.1	0.0	0.0
Tobacco manufacturing	0.0	0.2	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0
Textile and textile product mills	0.9	0.6	0.1	0.1	0.2	0.1	0.1	0.0	0.1	0.3
Clothing and leather and allied product manufacturing	0.3	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1
Wood product manufacturing	0.6	0.2	0.1	0.0	0.1	0.1	0.1	0.0	0.1	0.2
Pulp, paper and paperboard mills	0.3	0.1	0.2	0.1	0.1	0.0	0.2	0	0.1	0.1
Converted paper product manufacturing	1.8	0.3	0.6	0.1	0.3	0.6	0.3	0.1	0.1	1.0
Printing and related support activities	3.0	0.8	0.4	0.3	0.9	0.4	0.5	0.2	0.3	1.8
Petroleum and coal product manufacturing	3.4	0.8	0.1	0.1	0.3	0.3	0.4	0.0	0.2	2.3
Basic chemical manufacturing	2.4	1.5	1.3	0.6	5.1	0.1	0.5	0	0.2	3.2
Pesticide, fertilizer and other agricultural chemical manufacturing	1.6	1.6	0.2	0.2	0	0.1	0.2	0.2	0.2	0.2
Pharmaceutical and medicine manufacturing	0.2	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1
Miscellaneous chemical product manufacturing	2.3	1.2	1.2	0.5	6.9	0.2	0.4	0.0	0.4	4.2
Plastic product manufacturing	2.5	1.0	0.5	0.2	1.2	0.3	0.3	0.0	0.3	1.4
Rubber product manufacturing	3.7	1.3	1.2	0.2	2.3	0.4	0.1	0.0	0.1	2.6
Non-metallic mineral product manufacturing (except cement and concrete products)	2.0	1.8	0.8	0.2	3.5	1.4	0.4	0.1	0.5	1.0
Cement and concrete product manufacturing	1.9	1.1	0.2	0.0	0.2	0.4	0.2	0.0	0.1	0.8
Primary metal manufacturing	6.2	0.3	0.3	0.1	0.4	3.7	0.4	0.0	0.1	5.7
Fabricated metal product manufacturing	3.0	0.9	0.7	0.4	1.8	0.5	0.5	0.2	0.6	1.7
Machinery manufacturing	6.2	1.1	0.9	0.6	2.6	0.1	0.4	0.1	0.1	1.5
Computer and peripheral equipment manufacturing	1.1	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	2.6
Electronic product manufacturing	1.9	0.3	0.1	0.5	0.4	0.3	0.2	0.0	0.1	0.4
Electrical equipment and component manufacturing	1.9	1.0	1.5	0.3	0.5	0.2	0.5	0.1	0.4	1.5
Household appliance manufacturing	0.3	0.3	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Motor vehicle manufacturing	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Motor vehicle body and trailer manufacturing	0.4	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.4
Motor vehicle parts manufacturing	1.7	1.3	1.3	0.5	0.7	0.1	0.1	0	0.1	2.0
Aerospace product and parts manufacturing	0.7	0.1	0.1	0.2	3.3	0.1	0.0	0.0	0.1	0.4
Railroad rolling stock manufacturing	6.8	0.5	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
Ship and boat building	0.3	0.2	0.0	0.1	0.1	0.0	0.0	0.1	0.1	0.6
Other transportation equipment manufacturing	1.4	0.7	0.5	0.3	0.5	0.4	0.1	0.0	0.6	2.6
Furniture and related product manufacturing	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Miscellaneous manufacturing	1.6	0.3	0.2	0.3	0.9	0.2	0.1	0.1	0.1	1.4
Wholesale trade	3.5	0.8	0.6	0.4	1.6	0.4	0.4	0.2	0.2	1.6
Retail trade	0.9	0.3	0.1	0.0	0.2	0.1	0.1	0.0	0.1	0.4
Air transportation	1.3	0.4	0.5	0.3	0.9	0.3	0.3	0.2	0.3	1.2
Rail transportation	1.8	0.3	0.2	0.1	1.6	0.2	0.3	0.0	0.1	0.4
Water transportation	2.0	0.4	0.2	0.3	0.4	0.1	0.2	0.1	0.1	0.8
Truck transportation	3.7	0.5	0.6	0.1	2.1	0.3	0.3	0.2	0.1	1.4

Transit, ground passenger and scenic and sightseeing transportation, taxi and limousine service and support activities for transportation	2.6	0.9	0.6	0.2	0.8	0.3	0.8	0.1	0.2	1.1
Pipeline transportation	1.7	1.7	0.2	0.1	0	0.1	0.2	0.0	0.1	1.2
Postal service and couriers and messengers	3.5	0.8	0.5	0.8	0.7	0.2	0.6	0.1	0.2	1.3
Warehousing and storage	3.9	1.2	0.5	0.3	1.0	0.3	0.4	0.2	0.2	1.1
Motion picture and sound recording industries	1.0	0.2	0.1	0.1	0.4	0.1	0.5	0.0	0.2	0.6
Radio and television broadcasting	2.9	1.0	1.0	0.6	1.6	0.7	0.7	0.3	0.6	1.8
Publishing, pay/specialty services, telecommunications and other information services	2.9	0.5	0.4	0.4	0.5	0.3	0.5	0.2	0.2	1.1
Depository credit intermediation and monetary authorities	3.9	0.6	0.7	0.2	2.2	0.3	0.5	0.1	0.2	2.0
Insurance carriers	3.9	0.4	0.4	0.2	1.2	0.3	0.6	0.1	0.5	1.6
Lessors of real estate	1.6	0.2	0.1	0.1	0.4	0.1	0.1	0.0	0.1	0.7
Owner-occupied dwellings	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rental and leasing services and lessors of non-financial intangible assets (except copyrighted works)	4.4	0.8	0.4	0.3	0.8	0.3	0.3	0.2	0.2	1.4
Other finance, insurance and real estate services and management of companies and enterprises	8.0	1.3	1.4	1.1	4.0	0.7	1.6	0.5	1.3	3.9
Legal, accounting and architectural, engineering and related services	5.7	1.3	0.7	0.5	1.3	0.5	0.5	0.1	0.3	2.6
Computer systems design and other professional, scientific and technical services	6.8	1.0	0.7	0.5	3.8	0.8	0.7	0.3	0.6	3.8
Advertising, public relations and related services	4.3	0.7	0.5	0.3	1.2	0.4	0.5	0.0	0.3	2.5
Administrative and support services	7.5	1.5	1.2	1.7	3.1	0.7	0.9	0.3	0.5	4.0
Waste management and remediation services	5.9	0.6	0.5	0.1	4.2	0.1	0.2	0.0	0.1	4.1
Educational services	1.4	0.1	0.1	0.1	0.3	0.1	0.2	0.0	0.1	0.6
Health care and social assistance	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1
Arts, entertainment and recreation	0.6	0.1	0.1	0.1	0.2	0.1	0.1	0.0	0.0	0.2
Accommodation and food services	0.8	0.3	0.1	0.1	0.3	0.1	0.1	0.1	0.1	0.4
Repair and maintenance	3.9	0.8	0.2	0.2	2.1	0.2	0.2	0.1	0.1	1.9
Personal services and private households	0.5	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Professional and similar organisations	5.9	0.9	0.7	0.3	2.0	0.3	0.8	0.3	0.5	2.1
Repair and maintenance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Operating supplies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Office supplies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advertising, promotion, meals, entertainment, and travel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transportation margins	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-profit education services	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-profit social assistance	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-profit arts, entertainment and recreation	0.2	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1
Religious organizations	0.2	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1
Miscellaneous non-profit institutions serving households	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Educational services (except universities)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Universities	0.3	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.2
Hospitals	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1
Nursing and residential care facilities	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other federal government services	0.5	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.2

Other provincial and territorial government services	0.4	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.2
Other municipal government services	0.5	0.2	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.4
Other aboriginal government services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table D3. Industrial output reduction in 2020 under policy scenario 3 with projected EIC

	Industry output reduction (%)									
	AB	**BC**	**MB**	**NB**	**NL**	**NS**	**ON**	**PE**	**QC**	**SK**
Crop and animal production	16.6	14.3	15.3	14.5	13.6	14.8	15.6	14.9	16.1	14.6
Forestry and logging	28.7	26.1	26.5	25.5	24.2	27.6	25.9	23.5	27.9	27.0
Fishing, hunting and trapping	0.2	0.1	0.2	0.3	0.4	0.3	0.2	0.4	0.2	0.2
Support activities for agriculture and forestry	15.4	21.2	16.1	22.9	15.2	19.7	15.2	15.3	20.1	15.1
Oil and gas extraction	16.9	18.4	19.9	22.6	16.4	19.7	25.1	0.0	12.4	17.6
Coal mining	5.8	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.1
Metal ore mining	8.8	1.0	12.3	6.1	4.5	0.0	11.5	0.0	6.3	4.1
Non-metallic mineral mining and quarrying	3.1	2.8	2.4	2.2	1.8	2.0	1.3	0.5	2.6	1.7
Support activities for mining and oil and gas extraction	8.1	2.4	3.8	6.0	8.9	11.1	2.2	9.8	2.1	4.5
Electric power generation, transmission and distribution	18.3	15.1	14.2	14.7	13.9	14.2	14.3	13.7	15.0	16.6
Natural gas distribution, water, sewage and other systems	3.3	1.8	0.4	10.0	0.7	10.1	2.7	0.5	2.9	1.7
Residential building construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-residential building construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transportation engineering construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oil and gas engineering construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Electric power engineering construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Communication engineering construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other engineering construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Repair construction	5.5	2.9	1.4	4.3	0.9	1.3	2.4	0.7	1.6	6.2
Other activities of the construction industry	3.9	2.5	2.4	4.2	1.7	2.1	1.4	2.5	2.2	3.8
Animal food manufacturing	8.6	10.1	12.9	11.5	11.1	11.0	7.1	12.9	11.0	11.1
Sugar and confectionery product manufacturing	1.6	0.2	0.0	0.1	0.3	0.3	0.1	0.0	0.3	0.0
Fruit and vegetable preserving and specialty food manufacturing	0.1	0.1	0.1	0.6	0.1	0.1	0.2	0.0	0.1	0.2
Dairy product manufacturing	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.1	0.3	0.1
Meat product manufacturing	0.3	0.7	0.4	0.2	0.1	0.8	0.4	0.2	0.3	0.8
Seafood product preparation and packaging	0.4	0.4	0.2	0.1	0.2	0.3	0.1	0.2	0.1	0.0
Miscellaneous food manufacturing	1.0	0.3	1.4	0.1	0.1	0.5	0.6	0.8	0.6	1.9
Soft drink and ice manufacturing	0.5	0.4	0.5	0.5	0.3	0.4	0.4	0.4	0.4	0.7
Breweries	0.5	0.4	0.5	0.8	0.4	0.4	1.0	0.5	0.2	0.7
Wineries and distilleries	0.2	0.2	0.3	0.1	1.1	0.1	0.2	0.4	0.2	0.0
Tobacco manufacturing	0.0	0.3	0.0	0.0	0.0	0.0	1.4	0.0	0.0	0.0
Textile and textile product mills	1.5	1.3	0.6	1.1	0.9	0.4	0.2	0.4	0.3	1.1
Clothing and leather and allied product manufacturing	0.4	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1
Wood product manufacturing	15.5	14.4	15.1	15.9	14.5	15.3	14.3	14.4	15.4	13.7
Pulp, paper and paperboard mills	12.8	13.0	12.8	14.0	12.6	13.2	13.5	0.0	12.9	12.7
Converted paper product manufacturing	2.1	1.2	1.7	0.4	1.3	1.3	1.2	1.3	0.9	2.4
Printing and related support activities	2.2	1.2	0.7	1.3	0.9	0.8	0.9	1.1	0.8	1.8
Petroleum and coal product manufacturing	18.1	16.4	14.7	14.4	14.6	14.1	16.1	15.8	15.6	17.7
Basic chemical manufacturing	2.8	3.0	2.8	3.6	2.8	0.4	2.2	0.0	2.2	4.0

Pesticide, fertilizer and other agricultural chemical manufacturing	6.6	6.4	9.4	8.1	0.0	0.6	6.3	11.2	9.2	10.6
Pharmaceutical and medicine manufacturing	0.1	0.1	0.1	0.2	0.0	0.5	0.2	0.3	0.2	0.1
Miscellaneous chemical product manufacturing	1.8	1.7	1.8	2.6	7.3	0.9	0.9	0.3	1.2	4.2
Plastic product manufacturing	2.4	1.6	1.2	1.1	1.6	1.0	0.7	0.0	1.0	2.3
Rubber product manufacturing	4.2	2.8	2.5	3.3	2.8	1.1	0.3	0.0	0.5	4.9
Non-metallic mineral product manufacturing (except cement and concrete products)	2.4	1.9	1.9	1.0	2.7	1.3	1.4	3.0	1.6	1.3
Cement and concrete product manufacturing	1.3	0.9	0.3	0.7	0.2	0.5	0.5	0.3	0.4	0.8
Primary metal manufacturing	16.4	13.4	14.2	17.0	12.9	15.6	14.4	23.0	15.6	18.6
Fabricated metal product manufacturing	2.4	1.4	1.4	1.3	1.5	0.9	1.0	2.2	1.1	2.4
Machinery manufacturing	3.4	1.0	0.8	0.9	2.2	0.3	0.5	0.5	0.5	1.1
Computer and peripheral equipment manufacturing	0.7	0.1	0.1	0.0	0.0	0.0	0.2	0.0	0.1	2.6
Electronic product manufacturing	1.2	0.4	0.2	0.8	0.6	0.3	0.2	0.6	0.2	1.6
Electrical equipment and component manufacturing	1.7	1.3	1.5	2.0	1.1	0.6	0.7	1.7	1.0	2.2
Household appliance manufacturing	0.4	0.5	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.0
Motor vehicle manufacturing	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Motor vehicle body and trailer manufacturing	0.3	0.3	0.1	0.0	0.0	0.1	0.2	0.0	0.1	0.5
Motor vehicle parts manufacturing	1.5	1.2	2.1	2.0	1.8	0.7	0.2	0.0	0.6	3.0
Aerospace product and parts manufacturing	2.4	2.8	0.8	3.7	6.2	0.8	0.2	0.7	0.3	0.7
Railroad rolling stock manufacturing	4.2	1.9	0.0	0.0	0.0	0.0	0.2	2.0	0.2	0.0
Ship and boat building	0.2	2.9	0.1	3.5	0.1	0.0	0.2	0.2	0.2	1.0
Other transportation equipment manufacturing	1.3	1.2	0.9	1.2	1.6	1.7	0.5	0.0	0.9	3.0
Furniture and related product manufacturing	0.1	0.1	0.1	0.4	0.1	0.2	0.0	0.8	0.1	0.2
Miscellaneous manufacturing	1.3	0.5	0.3	0.7	0.9	0.4	0.3	0.5	0.2	1.6
Wholesale trade	3.0	1.2	1.9	1.8	1.7	1.0	1.0	1.0	1.0	2.8
Retail trade	0.8	0.6	0.6	0.6	0.4	0.3	0.4	0.4	0.5	0.9
Air transportation	13.9	13.7	13.5	13.4	13.6	13.2	13.3	13.1	13.2	14.0
Rail transportation	2.9	2.0	1.9	3.5	2.0	3.9	2.3	0.0	2.3	2.2
Water transportation	3.8	2.8	2.3	2.4	1.6	3.4	2.6	0.9	4.3	1.6
Truck transportation	18.5	17.3	18.2	17.9	14.9	15.9	16.2	14.8	16.4	17.7
Transit, ground passenger and scenic and sightseeing transportation, taxi and limousine service and support activities for transportation	4.7	4.6	5.5	6.3	4.1	3.2	3.6	2.5	2.9	4.6
Pipeline transportation	2.9	3.6	7.1	5.4	0.0	2.5	4.7	0.0	4.2	5.4
Postal service and couriers and messengers	2.6	1.3	1.4	1.3	0.9	0.6	1.1	0.3	0.8	1.9
Warehousing and storage	4.0	3.5	1.7	3.1	2.0	2.7	2.1	1.6	2.1	1.4
Motion picture and sound recording industries	0.7	0.3	0.2	0.3	0.4	0.3	0.7	0.1	0.4	0.6
Radio and television broadcasting	2.5	1.6	1.6	1.7	1.7	1.3	1.2	1.1	1.3	2.2
Publishing, pay/specialty services, telecommunications and other information services	2.1	0.9	1.1	1.2	0.6	0.7	0.8	0.7	0.7	1.6
Depository credit intermediation and monetary authorities	2.6	1.0	1.5	1.5	1.7	0.7	0.8	0.7	0.8	2.3
Insurance carriers	3.1	1.2	1.6	2.0	1.3	0.9	1.2	1.1	1.2	2.7
Lessors of real estate	1.2	0.4	0.4	0.4	0.4	0.3	0.3	0.2	0.3	0.8
Owner-occupied dwellings	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rental and leasing services and lessors of non-financial intangible assets (except copyrighted works)	3.9	2.5	2.7	2.7	1.8	1.7	1.3	2.3	1.5	4.1
Other finance, insurance and real estate services and management of companies and enterprises	4.7	1.5	2.3	2.8	2.8	1.1	1.6	1.3	1.8	3.3

Legal, accounting and architectural, engineering and related services	3.3	1.5	1.6	1.5	1.0	1.0	1.0	1.6	1.0	2.7
Computer systems design and other professional, scientific and technical services	4.2	1.2	1.6	1.2	2.5	1.1	1.1	1.2	1.2	3.3
Advertising, public relations and related services	2.9	1.1	1.0	1.2	1.2	0.8	1.0	0.3	0.9	2.3
Administrative and support services	4.9	1.9	2.0	2.2	2.5	1.2	1.4	0.9	1.3	3.5
Waste management and remediation services	3.9	1.1	1.5	1.7	2.9	0.5	0.8	0.3	1.1	3.4
Educational services	0.9	0.2	0.5	0.5	0.3	0.2	0.4	0.1	0.3	0.6
Health care and social assistance	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Arts, entertainment and recreation	0.5	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Accommodation and food services	0.7	0.5	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.5
Repair and maintenance	3.4	2.2	1.8	3.2	2.5	1.1	1.2	1.1	1.5	3.1
Personal services and private households	0.4	0.2	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.2
Professional and similar organisations	4.1	1.7	1.9	3.0	1.8	1.0	1.4	1.3	1.3	2.7
Repair and maintenance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Operating supplies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Office supplies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advertising, promotion, meals, entertainment, and travel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transportation margins	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-profit education services	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Non-profit social assistance	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Non-profit arts, entertainment and recreation	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1
Religious organizations	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.1	0.1
Miscellaneous non-profit institutions serving households	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1
Educational services (except universities)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Universities	0.2	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.2
Hospitals	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1
Nursing and residential care facilities	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other federal government services	0.3	0.2	0.1	0.1	0.1	0.0	0.1	0.0	0.1	0.2
Other provincial and territorial government services	0.3	0.2	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.4
Other municipal government services	0.4	0.4	0.2	0.3	0.2	0.2	0.1	0.1	0.2	0.5
Other aboriginal government services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

APPENDIX E

Table E1. Industrial output reduction in 2020 under policy scenario 2 with BP EIC

	Industry output reduction (%)									
	AB	**BC**	**MB**	**NB**	**NL**	**NS**	**ON**	**PE**	**QC**	**SK**
Crop and animal production	0.4	0.2	0.2	0.1	0.2	0.1	0.2	0.1	0.1	0.2
Forestry and logging	1.3	0.5	0.3	0.6	0.4	0.1	0.3	0.1	0.2	0.6
Fishing, hunting and trapping	0.1	0.1	0.1	0.0	0.2	0.1	0.1	0.0	0.2	0.1
Support activities for agriculture and forestry	0.8	0.6	0.2	0.5	0.2	0.3	0.2	0.1	0.2	0.3
Oil and gas extraction	79.3	84.9	75.9	75.9	75.6	76.5	76.3	0.0	75.5	82.3
Coal mining	5.8	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.7
Metal ore mining	0.7	2.2	0.5	0.1	0.4	0.0	1.0	0.0	0.4	0.8
Non-metallic mineral mining and quarrying	7.5	3.7	1.4	0.1	2.0	1.3	1.0	0.5	0.9	1.6
Support activities for mining and oil and gas extraction	37.7	9.5	5.8	24.7	40.1	46.5	3.8	45.2	3.0	19.9
Electric power generation, transmission and distribution	18.6	3.3	0.8	0.5	1.7	0.9	0.6	0.1	0.2	8.1
Natural gas distribution, water, sewage and other systems	10.5	0.9	0.2	0.4	1.7	0.7	0.4	0.1	0.3	2.7
Residential building construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-residential building construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transportation engineering construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oil and gas engineering construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Electric power engineering construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Communication engineering construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other engineering construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Repair construction	17.3	4.5	0.3	0.2	0.9	0.3	0.4	0.1	0.2	11.5
Other activities of the construction industry	11.2	2.0	2.3	0.6	2.0	0.5	1.2	0.4	0.4	4.2
Animal food manufacturing	0.4	0.2	0.3	0.2	0.2	0.1	0.3	0.1	0.2	0.3
Sugar and confectionery product manufacturing	0.4	0.2	0.0	0.1	0.5	0.1	0.1	0.0	0.2	0.1
Fruit and vegetable preserving and specialty food manufacturing	0.3	0.1	0.1	1.0	0.1	0.1	0.2	0.0	0.1	0.4
Dairy product manufacturing	0.4	0.2	0.3	0.1	0.2	0.2	0.2	0.1	0.2	0.2
Meat product manufacturing	0.5	0.6	0.3	0.1	0.2	0.3	0.3	0.1	0.1	0.5
Seafood product preparation and packaging	1.0	0.1	0.2	0.0	0.4	0.1	0.1	0.0	0.1	0.0
Miscellaneous food manufacturing	0.3	0.2	0.2	0.1	0.2	0.1	0.1	0.1	0.1	0.4
Soft drink and ice manufacturing	1.3	0.7	0.9	1.0	0.7	0.3	0.7	0.2	0.6	1.4
Breweries	1.3	0.7	0.8	1.6	1.1	0.3	1.4	0.2	0.2	2.2
Wineries and distilleries	0.2	0.3	0.2	0.1	0.5	0.1	0.1	0.2	0.1	0.0
Tobacco manufacturing	0.0	0.4	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0
Textile and textile product mills	2.0	1.4	0.3	0.3	0.5	0.1	0.1	0.0	0.1	0.7
Clothing and leather and allied product manufacturing	0.6	0.1	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.2
Wood product manufacturing	1.3	0.5	0.3	0.1	0.2	0.1	0.2	0.1	0.1	0.4
Pulp, paper and paperboard mills	0.7	0.3	0.5	0.1	0.2	0.1	0.4	0.0	0.3	0.2
Converted paper product manufacturing	4.1	0.7	1.3	0.1	0.7	1.3	0.8	0.3	0.3	2.4
Printing and related support activities	6.9	1.8	1.0	0.8	2.1	1.0	1.2	0.4	0.7	4.3
Petroleum and coal product manufacturing	7.9	1.8	0.2	0.3	0.7	0.7	0.9	0.0	0.5	5.3
Basic chemical manufacturing	5.5	3.5	3.0	1.3	12.0	0.1	1.2	0.0	0.6	7.4
Pesticide, fertilizer and other agricultural chemical manufacturing	3.7	3.7	0.5	0.5	0.0	0.2	0.4	0.4	0.5	0.5
Pharmaceutical and medicine manufacturing	0.4	0.1	0.1	0.0	0.0	0.3	0.2	0.0	0.1	0.1
Miscellaneous chemical product manufacturing	5.4	2.9	2.8	1.1	16.2	0.6	1.0	0.1	0.9	9.8
Plastic product manufacturing	5.9	2.3	1.3	0.4	2.8	0.7	0.7	0.0	0.8	3.2
Rubber product manufacturing	8.6	3.1	2.9	0.5	5.3	0.8	0.2	0.0	0.2	6.2

Non-metallic mineral product manufacturing (except cement and concrete products)	4.7	4.3	1.8	0.5	8.2	3.2	0.9	0.3	1.1	2.3
Cement and concrete product manufacturing	4.5	2.6	0.4	0.1	0.4	1.0	0.4	0.0	0.1	1.8
Primary metal manufacturing	14.5	0.6	0.6	0.1	0.8	8.6	1.0	0.1	0.3	13.4
Fabricated metal product manufacturing	7.0	2.0	1.7	0.8	4.2	1.1	1.1	0.4	1.5	4.0
Machinery manufacturing	14.5	2.5	2.0	1.5	6.0	0.2	1.0	0.2	0.3	3.5
Computer and peripheral equipment manufacturing	2.5	0.1	0.0	0.0	0.0	0.0	0.2	0.0	0.1	6.2
Electronic product manufacturing	4.4	0.8	0.2	1.2	0.9	0.6	0.4	0.1	0.2	0.9
Electrical equipment and component manufacturing	4.6	2.4	3.6	0.8	1.3	0.6	1.2	0.3	1.0	3.6
Household appliance manufacturing	0.8	0.6	0.0	0.0	0.0	0.0	0.2	0.0	0.1	0.0
Motor vehicle manufacturing	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0	0.0	0.0
Motor vehicle body and trailer manufacturing	0.9	0.3	0.1	0.0	0.0	0.1	0.2	0.0	0.0	0.9
Motor vehicle parts manufacturing	4.1	3.0	3.0	1.1	1.6	0.3	0.2	0.0	0.2	4.8
Aerospace product and parts manufacturing	1.7	0.3	0.1	0.5	7.7	0.2	0.0	0.1	0.2	1.0
Railroad rolling stock manufacturing	15.8	1.3	0.0	0.0	0.0	0.0	0.1	0.3	0.1	0.0
Ship and boat building	0.7	0.5	0.1	0.3	0.2	0.0	0.1	0.3	0.2	1.5
Other transportation equipment manufacturing	3.2	1.7	1.2	0.8	1.3	1.0	0.3	0.0	1.3	6.0
Furniture and related product manufacturing	0.3	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.4
Miscellaneous manufacturing	3.8	0.8	0.4	0.7	2.2	0.4	0.2	0.3	0.1	3.3
Wholesale trade	8.2	1.8	1.3	0.8	3.7	0.8	0.9	0.5	0.4	3.7
Retail trade	2.1	0.7	0.3	0.1	0.5	0.1	0.3	0.1	0.2	0.9
Air transportation	3.1	0.9	1.1	0.7	2.1	0.7	0.8	0.4	0.7	2.9
Rail transportation	4.2	0.6	0.4	0.2	3.7	0.6	0.7	0	0.2	1.0
Water transportation	4.7	0.9	0.5	0.6	0.8	0.3	0.5	0.3	0.3	1.9
Truck transportation	8.7	1.2	1.4	0.3	4.8	0.7	0.6	0.4	0.3	3.2
Transit, ground passenger and scenic and sightseeing transportation, taxi and limousine service and support activities for transportation	6.0	2.2	1.4	0.5	1.9	0.6	1.8	0.2	0.5	2.7
Pipeline transportation	4.1	4.1	0.5	0.2	0.0	0.2	0.5	0.0	0.3	2.8
Postal service and couriers and messengers	8.1	1.8	1.3	1.8	1.6	0.4	1.3	0.1	0.5	2.9
Warehousing and storage	9.1	2.7	1.2	0.7	2.4	0.8	0.9	0.5	0.5	2.6
Motion picture and sound recording industries	2.2	0.5	0.2	0.2	0.9	0.3	1.1	0.0	0.5	1.3
Radio and television broadcasting	6.8	2.3	2.3	1.5	3.7	1.7	1.6	0.8	1.4	4.3
Publishing, pay/specialty services, telecommunications and other information services	6.7	1.2	1.0	0.8	1.1	0.8	1.1	0.4	0.6	2.5
Depository credit intermediation and monetary authorities	9.1	1.4	1.7	0.6	5.2	0.7	1.3	0.3	0.5	4.8
Insurance carriers	9.1	1.0	1.0	0.4	2.7	0.8	1.3	0.2	1.1	3.6
Lessors of real estate	3.7	0.5	0.3	0.2	0.9	0.2	0.3	0.1	0.2	1.7
Owner-occupied dwellings	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rental and leasing services and lessors of non-financial intangible assets (except copyrighted works)	10.3	2.0	1.0	0.7	1.8	0.7	0.8	0.4	0.5	3.3
Other finance, insurance and real estate services and management of companies and enterprises	18.8	2.9	3.2	2.6	9.3	1.7	3.7	1.2	3.0	9.1
Legal, accounting and architectural, engineering and related services	13.2	3.1	1.5	1.1	3.0	1.2	1.3	0.2	0.7	6.1
Computer systems design and other professional, scientific and technical services	15.9	2.4	1.7	1.2	8.8	1.9	1.7	0.7	1.3	8.8
Advertising, public relations and related services	10.0	1.7	1.2	0.7	2.9	1.0	1.2	0.1	0.6	5.7
Administrative and support services	17.6	3.6	2.8	4.0	7.4	1.6	2.1	0.8	1.1	9.4
Waste management and remediation services	13.9	1.5	1.2	0.2	9.9	0.3	0.5	0.1	0.3	9.6
Educational services	3.3	0.3	0.3	0.2	0.8	0.1	0.5	0.0	0.2	1.3

Health care and social assistance	0.4	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.3
Arts, entertainment and recreation	1.5	0.3	0.2	0.2	0.5	0.3	0.2	0.1	0.1	0.5
Accommodation and food services	1.9	0.6	0.3	0.2	0.8	0.2	0.2	0.2	0.1	1.0
Repair and maintenance	9.2	1.9	0.5	0.4	5.0	0.5	0.6	0.2	0.3	4.5
Personal services and private households	1.2	0.4	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.4
Professional and similar organisations	13.7	2.1	1.6	0.8	4.7	0.7	1.9	0.6	1.2	4.9
Repair and maintenance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Operating supplies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Office supplies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advertising, promotion, meals, entertainment, and travel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transportation margins	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-profit education services	0.3	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1
Non-profit social assistance	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Non-profit arts, entertainment and recreation	0.5	0.1	0.1	0.1	0.3	0.1	0.1	0.0	0.1	0.1
Religious organizations	0.4	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.2
Miscellaneous non-profit institutions serving households	0.4	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.2
Educational services (except universities)	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Universities	0.8	0.2	0.1	0.1	0.4	0.1	0.1	0.0	0.0	0.6
Hospitals	0.2	0.1	0.1	0.1	0.3	0.0	0.0	0.0	0.0	0.2
Nursing and residential care facilities	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other federal government services	1.1	0.2	0.2	0.2	0.3	0.0	0.1	0.0	0.1	0.4
Other provincial and territorial government services	0.9	0.2	0.2	0.1	0.2	0.1	0.0	0.0	0.0	0.5
Other municipal government services	1.1	0.4	0.2	0.1	0.3	0.1	0.1	0.0	0.1	0.8
Other aboriginal government services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table E2. Industrial output reduction in 2020 under policy scenario 3 with BP EIC

	Industry output reduction (%)									
	AB	**BC**	**MB**	**NB**	**NL**	**NS**	**ON**	**PE**	**QC**	**SK**
Crop and animal production	7.2	6.2	6.7	6.4	5.9	6.5	6.9	6.5	7.0	6.4
Forestry and logging	1.3	0.7	1.6	2.6	3.6	1.4	2.2	3.6	1.6	1.1
Fishing, hunting and trapping	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.2	0.1	0.1
Support activities for agriculture and forestry	3.8	1.8	5.6	2.9	5.1	3.1	3.6	5.9	3.2	4.8
Oil and gas extraction	7.5	8.0	8.8	9.9	7.2	8.7	11.2	0.0	5.4	7.7
Coal mining	2.6	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.8
Metal ore mining	3.9	0.5	5.4	2.7	2.0	0.0	5.1	0	2.7	1.8
Non-metallic mineral mining and quarrying	2.3	2.1	2.3	1.1	0.9	1.0	1.3	0.2	1.8	0.8
Support activities for mining and oil and gas extraction	3.6	1.1	1.7	2.7	3.9	4.9	1.0	4.3	0.9	2.0
Electric power generation, transmission and distribution	8.1	6.5	6.3	6.4	6.1	6.3	6.5	6.0	6.6	7.4
Natural gas distribution, water, sewage and other systems	1.6	0.8	0.3	4.4	0.5	4.6	1.4	0.3	1.6	0.9
Residential building construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-residential building construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transportation engineering construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oil and gas engineering construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Electric power engineering construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Communication engineering construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other engineering construction	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Repair construction	2.6	1.4	0.7	1.5	0.4	0.7	1.3	0.4	0.9	2.9
Other activities of the construction industry	2.2	1.4	2.2	2.6	1.2	1.3	1.5	1.3	1.7	2.1

Animal food manufacturing	3.8	4.4	5.6	5.0	4.8	4.8	3.1	5.6	4.8	4.9
Sugar and confectionery product manufacturing	0.8	0.2	0.0	0.1	0.2	0.3	0.1	0.0	0.2	0.0
Fruit and vegetable preserving and specialty food manufacturing	0.1	0.1	0.0	0.4	0.0	0.1	0.1	0.0	0.1	0.2
Dairy product manufacturing	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.2	0.1
Meat product manufacturing	0.2	0.4	0.2	0.1	0.1	0.4	0.3	0.2	0.1	0.4
Seafood product preparation and packaging	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0
Miscellaneous food manufacturing	0.5	0.1	0.6	0.1	0.1	0.2	0.3	0.4	0.3	0.9
Soft drink and ice manufacturing	0.5	0.5	0.6	0.5	0.2	0.4	0.5	0.2	0.5	0.5
Breweries	0.4	0.3	0.3	0.6	0.3	0.3	0.8	0.3	0.2	0.4
Wineries and distilleries	0.1	0.1	0.2	0.1	0.5	0.1	0.1	0.3	0.1	0.0
Tobacco manufacturing	0	0.1	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
Textile and textile product mills	0.7	0.6	0.3	0.5	0.4	0.2	0.1	0.2	0.1	0.5
Clothing and leather and allied product manufacturing	0.2	0.1	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0
Wood product manufacturing	0.5	0.5	0.8	0.8	0.8	0.7	0.6	0.4	0.7	0.3
Pulp, paper and paperboard mills	5.6	5.7	5.6	6.1	5.5	5.8	6.0	0	5.7	5.6
Converted paper product manufacturing	1.5	0.6	1.2	0.2	0.8	0.9	0.8	0.9	0.6	2.0
Printing and related support activities	1.4	0.8	0.6	0.7	0.6	0.7	1.0	0.6	0.8	1.2
Petroleum and coal product manufacturing	7.9	6.9	6.4	6.2	6.4	6.2	7.3	6.9	6.9	7.8
Basic chemical manufacturing	1.3	1.4	1.3	1.8	1.4	0.3	1.2	0.0	1.1	2.1
Pesticide, fertilizer and other agricultural chemical manufacturing	3.0	2.8	4.1	3.5	0.0	0.3	2.8	4.9	4.1	4.7
Pharmaceutical and medicine manufacturing	0.1	0.1	0.1	0.1	0.0	0.3	0.1	0.1	0.1	0.1
Miscellaneous chemical product manufacturing	0.8	0.7	0.8	1.3	3.2	0.4	0.5	0.7	0.5	2.0
Plastic product manufacturing	1.2	0.6	0.7	0.6	0.7	0.5	0.4	0.0	0.5	1.1
Rubber product manufacturing	1.9	1.0	1.1	1.4	1.3	0.5	0.2	0.0	0.3	2.2
Non-metallic mineral product manufacturing (except cement and concrete products)	1.3	1.1	0.8	0.4	1.7	0.6	0.8	1.2	0.8	0.6
Cement and concrete product manufacturing	6.5	6.8	5.7	5.8	5.5	6.4	6.4	5.7	6.8	6.0
Primary metal manufacturing	7.2	5.8	6.2	7.4	5.6	6.7	6.3	9.2	6.8	8.1
Fabricated metal product manufacturing	1.1	0.5	0.6	0.5	0.7	0.4	0.5	1.0	0.5	1.1
Machinery manufacturing	1.5	0.4	0.4	0.4	1.0	0.2	0.3	0.2	0.2	0.5
Computer and peripheral equipment manufacturing	0.3	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.1	1.1
Electronic product manufacturing	0.5	0.2	0.1	0.4	0.3	0.1	0.1	0.3	0.1	0.7
Electrical equipment and component manufacturing	0.8	0.5	0.7	0.9	0.4	0.3	0.4	0.9	0.5	1.0
Household appliance manufacturing	0.2	0.2	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0
Motor vehicle manufacturing	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Motor vehicle body and trailer manufacturing	0.2	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.1	0.2
Motor vehicle parts manufacturing	0.7	0.5	0.9	0.9	0.8	0.3	0.1	0.0	0.3	1.5
Aerospace product and parts manufacturing	1.1	1.2	0.3	1.6	3.1	0.4	0.1	0.3	0.2	0.4
Railroad rolling stock manufacturing	2.4	0.8	0.0	0.0	0.0	0.0	0.1	1.0	0.1	0.0
Ship and boat building	0.1	0.6	0.0	1.3	0.1	0.0	0.1	0.1	0.1	0.5
Other transportation equipment manufacturing	0.6	0.4	0.5	0.5	0.7	0.8	0.3	0.0	0.5	1.4
Furniture and related product manufacturing	0.1	0.0	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.1
Miscellaneous manufacturing	0.7	0.3	0.2	0.5	0.5	0.4	0.3	0.3	0.2	1.0
Wholesale trade	6.8	6.0	6.4	6.2	6.2	5.9	6.0	5.9	5.9	6.8
Retail trade	0.4	0.2	0.3	0.2	0.2	0.2	0.3	0.2	0.2	0.4
Air transportation	6.2	6.0	6.0	5.8	6.0	5.8	5.9	5.8	5.8	6.3
Rail transportation	1.5	0.9	1.1	1.6	1.1	1.9	1.3	0.0	1.1	1.2
Water transportation	2.5	0.9	1.6	0.9	0.7	1.2	2.0	0.5	1.5	1.6
Truck transportation	8.2	7.1	8.1	7.7	6.6	7.0	7.4	6.5	7.1	7.9

Transit, ground passenger and scenic and sightseeing transportation, taxi and limousine service and support activities for transportation	2.3	1.7	2.6	2.7	2.0	1.5	2.0	1.1	1.5	2.3
Pipeline transportation	1.3	1.6	3.3	2.4	0.0	1.2	2.3	0.0	2.0	2.5
Postal service and couriers and messengers	2.0	1.0	1.2	1.0	0.8	0.6	1.3	0.2	1.0	1.6
Warehousing and storage	3.0	2.7	1.4	2.7	2.0	2.5	2.6	1.9	2.4	1.1
Motion picture and sound recording industries	0.5	0.4	0.2	0.2	0.2	0.3	0.8	0.1	0.5	0.5
Radio and television broadcasting	2.3	2.0	1.9	1.5	1.7	2.0	2.0	1.2	1.9	2.2
Publishing, pay/specialty services, telecommunications and other information services	1.2	0.6	0.8	0.7	0.4	0.5	0.9	0.5	0.7	1.1
Depository credit intermediation and monetary authorities	1.3	0.5	0.8	0.8	0.8	0.4	0.6	0.4	0.5	1.2
Insurance carriers	1.7	0.6	1.0	1.0	0.7	0.5	0.9	0.7	0.8	1.5
Lessors of real estate	0.8	0.3	0.4	0.3	0.3	0.3	0.4	0.1	0.3	0.6
Owner-occupied dwellings	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rental and leasing services and lessors of non-financial intangible assets (except copyrighted works)	1.8	1.0	1.4	1.3	0.9	0.9	0.9	1.1	0.8	2.0
Other finance, insurance and real estate services and management of companies and enterprises	2.2	0.7	1.2	1.4	1.4	0.7	1.0	0.8	1.1	1.7
Legal, accounting and architectural, engineering and related services	1.7	0.8	1.0	0.9	0.5	0.6	0.9	0.9	0.8	1.5
Computer systems design and other professional, scientific and technical services	2.3	0.7	1.3	0.8	1.2	0.8	0.9	0.8	0.9	2.1
Advertising, public relations and related services	1.9	1.1	0.9	0.8	0.8	1.0	1.9	0.2	1.4	1.5
Administrative and support services	2.6	1.1	1.3	1.5	1.4	0.8	1.1	0.7	1.0	2.3
Waste management and remediation services	2.2	0.7	1.3	1.0	1.5	0.4	0.9	0.2	1.0	2.4
Educational services	0.5	0.1	0.4	0.3	0.2	0.1	0.4	0.1	0.3	0.4
Health care and social assistance	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Arts, entertainment and recreation	0.3	0.2	0.2	0.1	0.1	0.2	0.3	0.2	0.2	0.2
Accommodation and food services	0.4	0.3	0.3	0.2	0.2	0.2	0.3	0.2	0.2	0.3
Repair and maintenance	1.6	0.7	0.9	1.3	1.1	0.5	0.7	0.5	0.7	1.4
Personal services and private households	0.2	0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.1	0.1
Professional and similar organisations	1.9	0.7	0.9	1.4	0.8	0.5	0.8	0.6	0.7	1.3
Repair and maintenance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Operating supplies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Office supplies	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Advertising, promotion, meals, entertainment, and travel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transportation margins	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-profit education services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-profit social assistance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-profit arts, entertainment and recreation	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0
Religious organizations	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Miscellaneous non-profit institutions serving households	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Educational services (except universities)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Universities	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1
Hospitals	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Nursing and residential care facilities	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other federal government services	0.2	0.1	0.1	0.1	0.1	0.0	0.1	0.0	0.1	0.1
Other provincial and territorial government services	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.2
Other municipal government services	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.3
Other aboriginal government services	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

APPENDIX F

Table F1. Employment losses under scenario 1 with projected EIC

	AB	BC	MB	NB	NL	NS	ON	PE	QC	SK	Tot.
Agriculture and forestry	11.04	8.46	4.03	1.99	0.82	2.13	16.75	1.02	14.28	5.93	**66.46**
Mining, quarrying, and oil and gas extraction	25.39	3.78	1.05	0.86	1.72	0.66	5.48	0.05	2.97	3.39	**45.36**
Utilities	3.46	1.74	1.06	0.56	0.37	0.66	8.60	0.06	4.48	0.99	**21.99**
Construction	20.89	18.89	4.13	2.84	1.87	3.30	44.41	0.51	25.63	4.61	**127.07**
Manufacturing	23.49	20.37	8.43	3.54	1.51	4.10	100.13	0.63	68.68	4.82	**235.70**
Wholesale trade	13.52	12.02	3.00	1.73	0.87	1.77	34.42	0.15	20.44	3.54	**91.47**
Retail trade	31.74	35.35	9.41	5.75	4.01	7.66	104.09	1.25	64.27	8.05	**271.59**
Transportation and warehousing	21.36	21.88	6.93	3.14	1.94	3.48	63.96	0.38	32.59	4.97	**160.64**
Finance and insurance	12.25	14.69	4.11	1.89	0.89	2.36	63.62	0.24	27.23	3.48	**130.75**
Real estate and rental and leasing	5.03	6.14	1.17	0.52	0.35	0.76	16.83	0.09	6.68	0.95	**38.51**
Professional, scientific and technical services	34.52	31.82	5.14	2.83	1.68	4.92	104.31	0.59	56.83	5.24	**247.89**
Business, building and other support services	16.90	19.02	4.06	3.80	1.31	4.51	66.45	0.45	31.56	2.84	**150.92**
Educational services	10.87	14.73	4.01	2.38	1.59	3.00	42.76	0.49	24.72	3.67	**108.22**
Health care and social assistance	26.39	30.63	10.58	6.00	4.48	7.93	91.51	1.16	61.66	8.33	**248.67**
Information, culture and recreation	11.00	14.76	3.52	1.65	0.85	2.59	49.08	0.39	26.35	2.52	**112.71**
Accommodation and food services	17.02	20.77	4.86	2.87	1.73	3.69	53.18	0.66	30.13	3.84	**138.76**
Other services (except public administration)	17.22	12.81	3.58	2.10	1.86	2.31	37.59	0.38	23.13	3.47	**104.47**
Public administration	8.67	9.91	3.19	2.01	1.75	2.53	34.69	0.69	20.94	2.98	**87.36**
Total	**310.79**	**297.77**	**82.29**	**46.45**	**29.60**	**58.36**	**937.85**	**9.22**	**542.58**	**73.63**	**2388.54**

Table F2. Employment losses under scenario 2 with projected EIC

	AB	BC	MB	NB	NL	NS	ON	PE	QC	SK	Tot.
Agriculture and forestry	0.13	0.09	0.02	0.01	0.00	0.01	0.08	0.00	0.05	0.04	**0.44**
Mining, quarrying, and oil and gas extraction	57.53	4.97	1.19	0.21	3.40	0.85	0.27	0.03	0.08	6.56	**75.09**
Utilities	1.45	0.15	0.02	0.01	0.02	0.02	0.13	0.00	0.03	0.19	**2.02**
Construction	1.30	0.51	0.01	0.01	0.01	0.01	0.16	0.00	0.04	0.21	**2.25**
Manufacturing	4.25	0.75	0.23	0.05	0.05	0.07	1.96	0.00	0.96	0.52	**8.83**
Wholesale trade	3.34	0.75	0.13	0.05	0.10	0.05	1.09	0.00	0.30	0.41	**6.22**

Retail trade	2.54	0.98	0.11	0.03	0.09	0.04	1.33	0.00	0.47	0.29	**5.89**
Transportation and warehousing	3.80	1.01	0.21	0.04	0.13	0.06	1.87	0.00	0.40	0.39	**7.91**
Finance and insurance	3.20	0.63	0.19	0.03	0.13	0.05	2.53	0.00	0.57	0.47	**7.80**
Real estate and rental and leasing	0.50	0.07	0.01	0.00	0.00	0.00	0.12	0.00	0.03	0.03	**0.76**
Professional, scientific and technical services	12.24	2.34	0.21	0.08	0.22	0.19	4.06	0.01	1.50	0.92	**21.77**
Business, building and other support services	6.77	1.51	0.29	0.29	0.27	0.18	4.31	0.01	1.42	0.62	**15.66**
Educational services	0.25	0.08	0.01	0.01	0.02	0.01	0.13	0.00	0.03	0.05	**0.58**
Health care and social assistance	0.30	0.11	0.03	0.02	0.04	0.01	0.10	0.00	0.05	0.06	**0.73**
Information, culture and recreation	1.77	0.46	0.08	0.03	0.03	0.06	1.31	0.00	0.39	0.16	**4.30**
Accommodation and food services	1.34	0.55	0.07	0.03	0.06	0.03	0.54	0.01	0.15	0.17	**2.95**
Other services (except public administration)	3.09	0.41	0.04	0.02	0.14	0.02	0.43	0.00	0.18	0.27	**4.60**
Public administration	0.40	0.12	0.03	0.01	0.02	0.01	0.11	0.00	0.05	0.07	**0.82**
Total	**104.19**	**15.48**	**2.88**	**0.92**	**4.74**	**1.66**	**20.54**	**0.08**	**6.70**	**11.43**	**168.61**

Table F3. Employment losses under scenario 3 with projected IEC

	AB	**BC**	**MB**	**NB**	**NL**	**NS**	**ON**	**PE**	**QC**	**SK**	**Tot.**
Agriculture and forestry	11.90	10.02	4.09	1.96	0.35	1.25	15.22	0.81	13.17	6.86	65.63
Mining, quarrying, and oil and gas extraction	28.82	2.62	0.99	0.27	1.89	0.52	2.44	0.02	1.15	3.44	42.16
Utilities	2.97	1.59	1.05	0.57	0.41	0.65	7.03	0.06	4.65	0.87	19.85
Construction	0.98	0.80	0.10	0.23	0.01	0.08	1.69	0.01	0.67	0.27	4.83
Manufacturing	12.16	11.76	2.21	3.52	1.31	1.77	29.80	0.06	30.34	2.88	95.82
Wholesale trade	2.87	1.19	0.43	0.23	0.11	0.15	2.75	0.01	1.62	0.73	10.11
Retail trade	2.39	2.00	0.49	0.32	0.16	0.23	3.82	0.05	2.73	0.69	12.88
Transportation and warehousing	14.48	12.42	5.01	2.84	0.90	1.94	32.65	0.22	19.37	3.22	93.04
Finance and insurance	2.22	1.09	0.45	0.23	0.11	0.14	4.30	0.01	1.87	0.57	10.99
Real estate and rental and leasing	0.41	0.17	0.03	0.02	0.01	0.01	0.36	0.00	0.15	0.04	1.21
Professional, scientific and technical services	7.41	2.69	0.48	0.24	0.16	0.32	6.72	0.05	3.90	0.88	22.86
Business, building and other support services	4.20	1.84	0.48	0.47	0.20	0.29	5.55	0.03	2.63	0.53	16.21
Educational services	0.16	0.11	0.03	0.03	0.01	0.01	0.24	0.00	0.11	0.04	0.74
Health care and social assistance	0.21	0.17	0.04	0.03	0.04	0.02	0.24	0.00	0.20	0.09	1.04

Information, culture and recreation	1.30	0.73	0.21	0.11	0.04	0.11	2.27	0.02	1.07	0.23	6.10
Accommodation and food services	1.12	0.97	0.19	0.10	0.07	0.10	1.53	0.02	0.79	0.18	5.07
Other services (except public administration)	2.59	0.96	0.22	0.22	0.17	0.08	1.40	0.02	1.17	0.41	7.23
Public administration	0.34	0.24	0.05	0.03	0.02	0.02	0.34	0.00	0.30	0.11	1.44
Total	96.54	51.36	16.55	11.43	5.95	7.70	118.34	1.38	85.90	22.06	417.21

Table F4. Employment losses under scenario 2 with BP IEC

	AB	**BC**	**MB**	**NB**	**NL**	**NS**	**ON**	**PE**	**QC**	**SK**	**Tot.**
Agriculture and forestry	0.30	0.20	0.05	0.03	0.01	0.01	0.20	0.00	0.11	0.10	**1.02**
Mining, quarrying, and oil and gas extraction	134.46	11.61	2.78	0.49	7.95	2.00	0.64	0.07	0.18	15.33	**175.51**
Utilities	3.39	0.36	0.06	0.02	0.05	0.04	0.31	0.00	0.06	0.44	**4.73**
Construction	3.04	1.19	0.03	0.01	0.01	0.02	0.38	0.00	0.09	0.50	**5.27**
Manufacturing	9.93	1.74	0.54	0.11	0.11	0.17	4.59	0.00	2.24	1.22	**20.65**
Wholesale trade	7.80	1.74	0.30	0.11	0.24	0.12	2.55	0.01	0.71	0.96	**14.53**
Retail trade	5.94	2.29	0.26	0.06	0.21	0.10	3.10	0.01	1.10	0.68	**13.76**
Transportation and warehousing	8.88	2.35	0.50	0.10	0.30	0.14	4.37	0.01	0.94	0.91	**18.49**
Finance and insurance	7.48	1.47	0.44	0.07	0.31	0.13	5.91	0.00	1.33	1.09	**18.22**
Real estate and rental and leasing	1.16	0.16	0.02	0.01	0.01	0.01	0.28	0.00	0.06	0.06	**1.77**
Professional, scientific and technical services	28.61	5.48	0.49	0.19	0.51	0.44	9.49	0.02	3.51	2.16	**50.90**
Business, building and other support services	15.82	3.54	0.68	0.68	0.62	0.41	10.06	0.02	3.32	1.44	**36.60**
Educational services	0.58	0.18	0.03	0.02	0.04	0.01	0.31	0.00	0.07	0.11	**1.36**
Health care and social assistance	0.70	0.26	0.06	0.05	0.10	0.03	0.23	0.00	0.12	0.15	**1.71**
Information, culture and recreation	4.14	1.06	0.19	0.08	0.08	0.13	3.06	0.01	0.91	0.37	**10.04**
Accommodation and food services	3.13	1.29	0.16	0.06	0.14	0.07	1.27	0.02	0.36	0.40	**6.89**
Other services (except public administration)	7.23	0.96	0.09	0.04	0.34	0.04	1.00	0.00	0.43	0.62	**10.75**
Public administration	0.94	0.27	0.06	0.03	0.05	0.02	0.27	0.00	0.12	0.17	**1.93**
Total	**243.54**	**36.18**	**6.72**	**2.16**	**11.07**	**3.89**	**48.02**	**0.18**	**15.66**	**26.71**	**394.13**

Table F5. Employment losses under scenario 3 with BP EIC

	AB	BC	MB	NB	NL	NS	ON	PE	QC	SK	Tot.
Agriculture and forestry	4.69	1.44	1.76	0.49	0.12	0.43	6.02	0.35	4.21	2.96	**22.46**
Mining, quarrying, and oil and gas extraction	12.70	1.16	0.44	0.12	0.82	0.23	1.13	0.01	0.52	1.51	**18.64**
Utilities	1.32	0.68	0.46	0.25	0.18	0.29	3.19	0.03	2.05	0.39	**8.84**
Construction	0.47	0.38	0.05	0.08	0.01	0.04	0.98	0.00	0.38	0.13	**2.51**
Manufacturing	5.13	3.23	0.95	1.44	0.58	0.74	13.73	0.03	12.50	1.26	**39.59**
Wholesale trade	6.51	5.70	1.42	0.83	0.41	0.83	16.04	0.08	9.64	1.76	**43.22**
Retail trade	1.13	0.78	0.27	0.13	0.07	0.12	2.52	0.02	1.37	0.33	**6.74**
Transportation and warehousing	6.61	5.26	2.29	1.24	0.41	0.87	15.99	0.10	8.80	1.49	**43.06**
Finance and insurance	1.13	0.52	0.25	0.11	0.05	0.08	2.95	0.01	1.20	0.31	**6.61**
Real estate and rental and leasing	0.22	0.09	0.02	0.01	0.00	0.01	0.36	0.00	0.12	0.03	**0.86**
Professional, scientific and technical services	3.82	1.54	0.34	0.15	0.08	0.21	6.19	0.03	3.01	0.52	**15.88**
Business, building and other support services	2.16	0.96	0.29	0.29	0.10	0.19	4.05	0.02	1.80	0.31	**10.16**
Educational services	0.09	0.06	0.02	0.02	0.01	0.01	0.22	0.00	0.09	0.02	**0.54**
Health care and social assistance	0.12	0.08	0.03	0.02	0.02	0.02	0.20	0.00	0.16	0.05	**0.70**
Information, culture and recreation	0.81	0.56	0.17	0.07	0.03	0.09	2.57	0.01	1.09	0.16	**5.55**
Accommodation and food services	0.62	0.55	0.13	0.06	0.04	0.08	1.61	0.01	0.66	0.11	**3.86**
Other services (except public administration)	1.20	0.34	0.11	0.09	0.08	0.04	0.85	0.01	0.59	0.20	**3.51**
Public administration	0.19	0.12	0.03	0.02	0.01	0.01	0.32	0.00	0.24	0.07	**1.01**
Total	**48.90**	**23.45**	**9.03**	**5.41**	**3.02**	**4.27**	**78.93**	**0.71**	**48.42**	**11.60**	**233.75**

Appendix G

Table G1. Projected EICs (changes from previous ones) (CO^2 equivalent Mt./$)

	AB	BC	MB	NB	NL	NS	ON	PE	QC	SK
Crop and animal production	930 (-563)	784 (-130)	626 (-455)	773 (11)	519 (39)	645 (-177)	774 (-209)	382 (-215)	779 (-232)	664 (-499)
Forestry and logging	1766 (823)	1766 (823)	1766 (823)	1766 (823)	1766 (823)	1766 (823)	1766 (823)	1766 (823)	1766 (823)	1766 (823)
Fishing, hunting and trapping	8 (-244)	8 (-244)	8 (-244)	8 (-244)	8 (-244)	8 (-244)	8 (-244)	8 (-244)	8 (-244)	8 (-244)
Support activities for agriculture and forestry	19 (-208)	19 (-208)	19 (-208)	19 (-208)	19 (-208)	19 (-208)	19 (-208)	19 (-208)	19 (-208)	19 (-208)
Oil and gas extraction	1408 (342)	3905 (1818)	258 (-17)	165 (90)	164 (-18)	3961 (2115)	11467 (6646)	0 (0)	332 (332)	837 (-225)
Coal mining	1290 (332)	154 (-333)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	119 (9)
Metal ore mining	78 (24)	195 (47)	82 (-105)	680 (454)	325 (53)	0 (0)	302 (134)	0 (0)	232 (-138)	816 (311)
Non-metallic mineral mining and quarrying	38 (-13)	108 (-32)	0 (-177)	510 (296)	0 (-257)	739 (372)	203 (45)	25 (25)	0 (-349)	373 (-103)
Support activities for mining and oil and gas extraction	76 (23)	185 (41)	9 (-173)	751 (531)	264 (0)	983 (606)	301 (139)	31 (31)	102 (-257)	788 (298)
Electric power generation, transmission and distribution	7223 (-2827)	0 (-90)	0 (-67)	814 (-2619)	564 (-463)	249 (-5419)	0 (-749)	80 (30)	30 (-9)	4050 (-2952)
Natural gas distribution, water, sewage and other systems	0 (-188)	0 (-168)	220 (-226)	0 (-285)	0 (0)	168 (2)	0 (-359)	0 (0)	0 (-197)	0 (-1079)
Residential building construction	0 (-11)	0 (-11)	0 (-11)	0 (-11)	0 (-11)	0 (-11)	0 (-11)	0 (-11)	0 (-11)	0 (-11)
Non-residential building construction	0 (-8)	0 (-8)	0 (-8)	0 (-8)	0 (-8)	0 (-8)	0 (-8)	0 (-8)	0 (-8)	0 (-8)
Transportation engineering construction	0 (-45)	0 (-45)	0 (-45)	0 (-45)	0 (-45)	0 (-45)	0 (-45)	0 (-45)	0 (-45)	0 (-45)
Oil and gas engineering construction	0 (-24)	0 (-24)	0 (-24)	0 (-24)	0 (-24)	0 (-24)	0 (-24)	0 (-24)	0 (-24)	0 (-24)
Electric power engineering construction	63 (31)	63 (31)	63 (31)	63 (31)	63 (31)	63 (31)	63 (31)	63 (31)	63 (31)	63 (31)
Communication engineering construction	122 (72)	122 (72)	122 (72)	122 (72)	122 (72)	122 (72)	122 (72)	122 (72)	122 (72)	122 (72)
Other engineering construction	102 (62)	102 (62)	102 (62)	102 (62)	102 (62)	102 (62)	102 (62)	102 (62)	102 (62)	102 (62)
Repair construction	0 (-13)	0 (-13)	0 (-13)	0 (-13)	0 (-13)	0 (-13)	0 (-13)	0 (-13)	0 (-13)	0 (-13)
	424	424	424	424	424	424	424	424	424	424

Other activities of the construction industry	(121)	(121)	(121)	(121)	(121)	(121)	(121)	(121)	(121)	(121)
Animal food manufacturing	24 (-16)	24 (-16)	24 (-16)	24 (-16)	24 (-16)	24 (-16)	24 (-16)	24 (-16)	24 (-16)	24 (-16)
Sugar and confectionery product manufacturing	156 (35)	156 (35)	156 (35)	156 (35)	197 (76)	156 (35)	156 (35)	0 (0)	156 (35)	156 (35)
Fruit and vegetable preserving and specialty food manufacturing	81 (-1)	81 (-1)	81 (-1)	81 (-1)	81 (-1)	81 (-1)	81 (-1)	81 (-1)	81 (-1)	81 (-1)
Dairy product manufacturing	36 (-1)	36 (-1)	36 (-1)	36 (-1)	36 (-1)	36 (-1)	36 (-1)	36 (-1)	36 (-1)	36 (-1)
Meat product manufacturing	60 (16)	60 (16)	60 (16)	60 (16)	60 (16)	60 (16)	60 (16)	60 (16)	60 (16)	60 (16)
Seafood product preparation and packaging	21 (-1)	21 (-1)	21 (-1)	21 (-1)	21 (-1)	21 (-1)	21 (-1)	21 (-1)	21 (-1)	9 (9)
Miscellaneous food manufacturing	49 (-15)	49 (-15)	49 (-15)	49 (-15)	49 (-15)	49 (-15)	49 (-15)	49 (-15)	49 (-15)	49 (-15)
Soft drink and ice manufacturing	20 (-13)	20 (-13)	20 (-13)	20 (-13)	20 (-13)	20 (-13)	20 (-13)	20 (-13)	20 (-13)	20 (-13)
Breweries	36 (-8)	36 (-8)	36 (-8)	36 (-8)	36 (-8)	36 (-8)	36 (-8)	75 (32)	36 (-8)	36 (-8)
Wineries and distilleries	88 (-22)	88 (-22)	88 (-22)	88 (-22)	88 (-22)	88 (-22)	88 (-22)	88 (-22)	88 (-22)	0 (0)
Tobacco manufacturing	0 (0)	19 (12)	0 (0)	0 (0)	0 (0)	0 (0)	4 (-4)	0 (0)	4 (-4)	0 (0)
Textile and textile product mills	73 (-6)	73 (-6)	73 (-6)	73 (-6)	73 (-6)	73 (-6)	73 (-6)	73 (-6)	73 (-6)	73 (-6)
Clothing and leather and allied product manufacturing	29 (5)	29 (5)	29 (5)	29 (5)	29 (5)	29 (5)	29 (5)	29 (5)	29 (5)	29 (5)
Wood product manufacturing	477 (241)	477 (241)	477 (241)	477 (241)	477 (241)	477 (241)	477 (241)	477 (241)	477 (241)	477 (241)
Pulp, paper and paperboard mills	4456 (2390)	4263 (2248)	3226 (1739)	3118 (1535)	1399 (484)	2143 (1640)	8124 (4263)	0 (0)	2350 (1131)	4446 (2748)
Converted paper product manufacturing	39 (-23)	39 (-23)	39 (-23)	39 (-23)	39 (-23)	39 (-23)	39 (-23)	39 (-23)	39 (-23)	39 (-23)
Printing and related support activities	53 (9)	53 (9)	53 (9)	53 (9)	53 (9)	53 (9)	53 (9)	53 (9)	53 (9)	53 (9)
Petroleum and coal product manufacturing	259 (-351)	21 (-73)	10 (8)	68 (-59)	13 (-101)	64 (-111)	67 (-120)	0 (0)	0 (-75)	117 (-292)
Basic chemical manufacturing	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Pesticide, fertilizer and other agricultural chemical manufacturing	1211 (-1010)	159 (-903)	0 (-587)	0 (-107)	0 (0)	445 (-256)	0 (-3117)	51 (7)	0 (-986)	77 (-129)
	25	25	25	32	40	25	25	25	25	0

Pharmaceutical and medicine manufacturing	(6)	(6)	(6)	(13)	(21)	(6)	(6)	(6)	(6)	(-19)
Miscellaneous chemical product manufacturing	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Plastic product manufacturing	43 (9)	43 (9)	43 (9)	43 (9)	43 (9)	43 (9)	43 (9)	0 (0)	43 (9)	43 (9)
Rubber product manufacturing	43 (-19)	43 (-19)	43 (-19)	43 (-19)	151 (89)	43 (-19)	43 (-19)	0 (0)	43 (-19)	43 (-19)
Non-metallic mineral product manufacturing (except cement and concrete products)	268 (-137)	883 (53)	0 (-363)	761 (209)	0 (-6)	0 (-3)	81 (-98)	0 (-26)	1119 (-383)	1 (-14)
Cement and concrete product manufacturing	879 (2)	1300 (-1)	0 (-1)	22 (4)	1 (-2)	1684 (-166)	690 (-539)	0 (0)	1025 (-109)	0 (-1)
Primary metal manufacturing	57 (-3)	11 (-6)	60 (11)	3 (0)	175 (72)	0 (-10)	294 (-264)	15 (10)	217 (55)	131 (-16)
Fabricated metal product manufacturing	43 (-4)	43 (-4)	43 (-4)	43 (-4)	43 (-4)	43 (-4)	43 (-4)	43 (-4)	43 (-4)	43 (-4)
Machinery manufacturing	17 (-6)	17 (-6)	17 (-6)	17 (-6)	17 (-6)	17 (-6)	17 (-6)	17 (-6)	17 (-6)	17 (-6)
Computer and peripheral equipment manufacturing	10 (4)	10 (4)	10 (4)	4 (-2)	0 (0)	10 (4)	10 (4)	0 (0)	10 (4)	4 (-2)
Electronic product manufacturing	13 (3)	13 (3)	13 (3)	13 (3)	13 (3)	13 (3)	13 (3)	13 (3)	13 (3)	13 (3)
Electrical equipment and component manufacturing	11 (-6)	11 (-6)	11 (-6)	11 (-6)	11 (-6)	11 (-6)	11 (-6)	11 (-6)	11 (-6)	11 (-6)
Household appliance manufacturing	16 (-6)	16 (-6)	0 (0)	0 (0)	0 (0)	0 (0)	16 (-6)	0 (-22)	16 (-6)	4 (4)
Motor vehicle manufacturing	6 (-6)	6 (-6)	6 (-6)	0 (0)	0 (0)	6 (-6)	6 (-6)	0 (0)	6 (-6)	6 (-6)
Motor vehicle body and trailer manufacturing	65 (21)	65 (21)	65 (21)	65 (21)	0 (0)	65 (21)	65 (21)	65 (21)	65 (21)	65 (21)
Motor vehicle parts manufacturing	5 (-8)	5 (-8)	5 (-8)	5 (-8)	5 (-8)	5 (-8)	5 (-8)	0 (0)	5 (-8)	5 (-8)
Aerospace product and parts manufacturing	14 (0)	14 (0)	14 (0)	14 (0)	14 (0)	14 (0)	14 (0)	14 (0)	14 (0)	18 (4)
Railroad rolling stock manufacturing	17 (-2)	17 (-2)	0 (0)	0 (0)	0 (0)	0 (0)	17 (-2)	32 (13)	17 (-2)	0 (0)
Ship and boat building	0 (-18)	0 (-18)	0 (-18)	0 (-18)	0 (-18)	0 (-18)	0 (-18)	0 (-18)	0 (-18)	35 (17)
Other transportation	6 (-1)	6 (-1)	6 (-1)	6 (-1)	6 (-1)	10 (3)	6 (-1)	0 (0)	6 (-1)	6 (-1)

equipment manufacturing										
Furniture and related product manufacturing	47 (10)	47 (10)	47 (10)	47 (10)	47 (10)	47 (10)	47 (10)	47 (10)	47 (10)	47 (10)
Miscellaneous manufacturing	21 (-3)	21 (-3)	21 (-3)	21 (-3)	21 (-3)	21 (-3)	21 (-3)	21 (-3)	21 (-3)	21 (-3)
Wholesale trade	49 (-31)	49 (-31)	49 (-31)	49 (-31)	49 (-31)	49 (-31)	49 (-31)	49 (-31)	49 (-31)	49 (-31)
Retail trade	30 (-24)	30 (-24)	30 (-24)	30 (-24)	30 (-24)	30 (-24)	30 (-24)	30 (-24)	30 (-24)	30 (-24)
Air transportation	661 (-281)	391 (-129)	988 (213)	999 (243)	761 (-374)	1013 (-147)	722 (-131)	1363 (-517)	780 (-115)	1918 (274)
Rail transportation	280 (-266)	170 (-131)	531 (82)	523 (85)	295 (-362)	467 (-205)	333 (-161)	0 (0)	364 (-154)	1010 (57)
Water transportation	562 (-464)	339 (-228)	999 (156)	991 (168)	610 (-626)	918 (-345)	655 (-274)	1149 (-898)	709 (-265)	1901 (111)
Truck transportation	183 (-362)	114 (-187)	465 (18)	441 (3)	156 (-501)	340 (-332)	248 (-246)	356 (-732)	273 (-245)	871 (-81)
Transit, ground passenger and scenic and sightseeing transportation, taxi and limousine service and support activities for transportation	32 (-114)	22 (-60)	115 (-6)	106 (-11)	19 (-158)	71 (-110)	52 (-81)	58 (-235)	58 (-82)	212 (-44)
Pipeline transportation	0 (-519)	0 (-815)	0 (-149)	0 (-74)	0 (0)	0 (-185)	0 (-993)	0 (0)	0 (-1010)	0 (-1464)
Postal service and couriers and messengers	267 (97)	267 (97)	267 (97)	267 (97)	267 (97)	267 (97)	267 (97)	267 (97)	267 (97)	267 (97)
Warehousing and storage	29 (-28)	29 (-28)	29 (-28)	29 (-28)	29 (-28)	29 (-28)	29 (-28)	29 (-28)	29 (-28)	29 (-28)
Motion picture and sound recording industries	14 (-25)	14 (-25)	14 (-25)	14 (-25)	14 (-25)	14 (-25)	14 (-25)	14 (-25)	14 (-25)	14 (-25)
Radio and television broadcasting	4 (-4)	4 (-4)	4 (-4)	4 (-4)	4 (-4)	4 (-4)	4 (-4)	4 (-4)	4 (-4)	4 (-4)
Publishing, pay/specialty services, telecommunications and other information services	9 (0)	9 (0)	9 (0)	9 (0)	9 (0)	9 (0)	9 (0)	9 (0)	9 (0)	9 (0)
Depository credit intermediation and monetary authorities	0 (-10)	0 (-10)	0 (-10)	0 (-10)	0 (-10)	0 (-10)	0 (-10)	0 (-10)	0 (-10)	0 (-10)
Insurance carriers	4 (0)	4 (0)	4 (0)	4 (0)	4 (0)	4 (0)	4 (0)	4 (0)	4 (0)	4 (0)
Lessors of real estate	0 (-83)	0 (-83)	0 (-83)	0 (-83)	0 (-83)	0 (-83)	0 (-83)	0 (-83)	0 (-83)	0 (-83)
Owner-occupied dwellings	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Rental and leasing services and lessors of non-financial intangible assets (except copyrighted works)	29 (-83)	29 (-83)	29 (-83)	29 (-83)	29 (-83)	29 (-83)	29 (-83)	29 (-83)	29 (-83)	29 (-83)
Other finance, insurance and real estate services and management of companies and enterprises	15 (-45)	15 (-45)	15 (-45)	15 (-45)	15 (-45)	15 (-45)	15 (-45)	15 (-45)	15 (-45)	15 (-45)
Legal, accounting and architectural, engineering and related services	12 (-2)	12 (-2)	12 (-2)	12 (-2)	12 (-2)	12 (-2)	12 (-2)	12 (-2)	12 (-2)	12 (-2)
Computer systems design and other professional, scientific and technical services	5 (-6)	5 (-6)	5 (-6)	5 (-6)	5 (-6)	5 (-6)	5 (-6)	5 (-6)	5 (-6)	5 (-6)
Advertising, public relations and related services	15 (-4)	15 (-4)	15 (-4)	15 (-4)	15 (-4)	15 (-4)	15 (-4)	15 (-4)	15 (-4)	15 (-4)
Administrative and support services	39 (9)	39 (9)	39 (9)	39 (9)	39 (9)	39 (9)	39 (9)	39 (9)	39 (9)	39 (9)
Waste management and remediation services	115 (-23)	665 (159)	752 (269)	1044 (378)	2075 (710)	800 (339)	435 (174)	1213 (627)	431 (71)	484 (48)
Educational services	0 (-40)	0 (-40)	0 (-40)	0 (-40)	0 (-40)	0 (-40)	0 (-40)	0 (-40)	0 (-40)	0 (-40)
Health care and social assistance	11 (-22)	11 (-22)	11 (-22)	11 (-22)	11 (-22)	11 (-22)	11 (-22)	11 (-22)	11 (-22)	11 (-22)
Arts, entertainment and recreation	3 (-9)	3 (-9)	3 (-9)	3 (-9)	3 (-9)	3 (-9)	3 (-9)	3 (-9)	3 (-9)	3 (-9)
Accommodation and food services	14 (-11)	14 (-11)	14 (-11)	14 (-11)	14 (-11)	14 (-11)	14 (-11)	14 (-11)	14 (-11)	14 (-11)
Repair and maintenance	118 (19)	118 (19)	118 (19)	118 (19)	118 (19)	118 (19)	118 (19)	118 (19)	118 (19)	118 (19)
Personal services and private households	24 (-9)	24 (-9)	24 (-9)	24 (-9)	24 (-9)	24 (-9)	24 (-9)	24 (-9)	24 (-9)	24 (-9)
Professional and similar organisations	5 (1)	5 (1)	5 (1)	5 (1)	5 (1)	5 (1)	5 (1)	5 (1)	5 (1)	5 (1)
Repair and maintenance	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Operating supplies	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Office supplies	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Advertising, promotion, meals, entertainment, and travel	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Transportation margins	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Non-profit education services	163 (54)	163 (54)	163 (54)	163 (54)	163 (54)	163 (54)	163 (54)	163 (54)	163 (54)	163 (54)
Non-profit social assistance	20 (-10)	20 (-10)	20 (-10)	20 (-10)	20 (-10)	20 (-10)	20 (-10)	20 (-10)	20 (-10)	20 (-10)
Non-profit arts, entertainment and recreation	11 (-110)	11 (-110)	11 (-110)	11 (-110)	11 (-110)	11 (-110)	11 (-110)	11 (-110)	11 (-110)	11 (-110)
Religious organizations	4 (-165)	4 (-165)	4 (-165)	4 (-165)	4 (-165)	4 (-165)	4 (-165)	4 (-165)	4 (-165)	4 (-165)
Miscellaneous non-profit institutions serving households	94 (38)	94 (38)	94 (38)	94 (38)	94 (38)	94 (38)	94 (38)	94 (38)	94 (38)	94 (38)
Educational services (except universities)	0 (-32)	0 (-32)	0 (-32)	0 (-32)	0 (-32)	0 (-32)	0 (-32)	0 (-32)	0 (-32)	0 (-32)
Universities	46 (-9)	46 (-9)	46 (-9)	46 (-9)	46 (-9)	46 (-9)	46 (-9)	46 (-9)	46 (-9)	46 (-9)
Hospitals	0 (-14)	0 (-14)	0 (-14)	0 (-14)	0 (-14)	0 (-14)	0 (-14)	0 (-14)	0 (-14)	0 (-14)
Nursing and residential care facilities	4 (-6)	4 (-6)	4 (-6)	4 (-6)	4 (-6)	4 (-6)	4 (-6)	4 (-6)	4 (-6)	4 (-6)
Other federal government services	4 (-26)	4 (-26)	4 (-26)	4 (-26)	4 (-26)	4 (-26)	4 (-26)	4 (-26)	4 (-26)	4 (-26)
Other provincial and territorial government services	8 (-1)	8 (-1)	8 (-1)	8 (-1)	8 (-1)	8 (-1)	8 (-1)	8 (-1)	8 (-1)	8 (-1)
Other municipal government services	107 (6)	107 (6)	107 (6)	107 (6)	107 (6)	107 (6)	107 (6)	107 (6)	107 (6)	107 (6)
Other aboriginal government services	17 (-13)	17 (-13)	17 (-13)	17 (-13)	17 (-13)	17 (-13)	17 (-13)	17 (-13)	17 (-13)	17 (-13)