The Cost of Bill C-288 to Canadian Families and Business

Canada

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Minister's Message

Canadians want balanced solutions to environmental protection and economic growth. Balance means making sure that economic decisions are environmentally responsible. But balance also requires that environmental decisions be economically responsible.

The passage in the House of Commons of Bill C-288 – *An Act to ensure Canada meets its global climate change obligations under the Kyoto Protocol* – requires that the Bill be assessed on how well it balances environmental protection and economic growth.

This report demonstrates that the implementation of Bill C-288 represents an unbalanced approach – an unbalanced approach that would plunge the Canadian economy into recession and dramatically lower the living standards of workers and families.

Bill C-288 requires that the Government of Canada reduce greenhouse gas emissions to 6% below 1990 levels beginning in 2008, through to 2012. This requires dramatic action, because the latest Canadian data submitted to the United Nations shows we are 35% above this level.

To meet this target through the 2008 to 2012 period, the report's economic model found that the necessary changes to the Canadian economy would result in a decline in GDP by over 6.5% from expected levels in 2008. This would result in a recession comparable to the one in 1981–1982, which stands as the largest recession to date in Canada since World War II.

The impacts of such a contraction would be severe:

- The unemployment rate would rise by 25% with about 275,000 Canadians losing their jobs by 2009;
- The cost of electricity would increase by 50% after 2010;
- The price of gasoline would rise by 60%;
- The cost of natural gas would more than double; and,
- Real disposable income for a family of four would fall by $4,000.

Even assuming a highly optimistic level of access to international credits, the report suggests that a large carbon tax represents the only feasible way for Canada to meet the requirements of Bill C-288. Many businesses would have no choice but to cut production and lay off workers, leading to a major recession and increased unemployment.

The Government of Canada believes that C-288 represents an unbalanced approach that would hurt workers, families and businesses.

The Honourable John Baird, P.C., M.P.
Minister of the Environment

April 2007

A. Introduction

On February 14, 2007, the House of Commons passed Bill C-288 – *An Act to ensure that Canada meets its global obligations under the Kyoto Protocol*. Section 3 of the Bill states that, "The purpose of this Act is to ensure that Canada takes effective and timely action to meet its obligations under the Kyoto Protocol and help address the problem of global climate change." If Bill C-288 is approved by the Senate, Section 7.1 requires that "Within 180 days after this Act comes into force, the Governor in Council shall ensure that Canada fully meets its obligations under Article 3, paragraph 1, of the Kyoto Protocol by making, amending or repealing the necessary regulations under this or any other Act."

The purpose of this paper is to examine the economic implications for Canada of full implementation of Bill C-288. It assumes that the objective of the Act is to require that Canada meet its Kyoto obligations over the first commitment period from 2008 to 2012 by achieving greenhouse gas reductions that are real and creditable under the terms of the Kyoto Protocol.

Kyoto Protocol Article 3

1. The Parties included in Annex I shall, individually or jointly, ensure that their aggregate anthropogenic carbon dioxide equivalent emissions of the greenhouse gases listed in Annex A do not exceed their assigned amounts … with a view to reducing their overall emissions of such gases by at least 5 per cent below 1990 levels in the commitment period 2008 to 2012.

The Kyoto Protocol

In December 1997, Canada and 160 other members of the United Nations Framework Convention on Climate Change (UNFCCC) met in Kyoto, Japan to conclude a protocol to the Convention to limit emissions of greenhouse gases (GHGs).[1] The resulting agreement, called the Kyoto Protocol, was signed by Canada on April 29, 1998, and ratified in 2002. The Kyoto Protocol entered into force on February 16, 2005.

Under the terms of the Kyoto Protocol, 38 industrialised countries (Annex I countries) committed to cut their emissions of greenhouse gases between 2008 and 2012 to levels that are at least 5% below 1990 levels. In terms of individual country targets, Canada is required to reduce emissions to a level of 6% below 1990 levels in 2008–2012.[2] As a group, the European Union has a target of an 8% reduction from 1990 levels, the United States (which did not ratify the Protocol) had a target of a 7% reduction from 1990 levels, while several other countries, including Australia (which also has not ratified), are permitted to let their emissions continue to rise above 1990 levels, but at a reduced rate of growth (see Annex I).

China and India, two of the largest and fastest growing economies in the world, and who have both ratified the Kyoto Protocol, are not required to reduce their emissions under the current agreement.

1 GHGs are the atmospheric gases responsible for causing global warming and climate change. The major GHGs are carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_20). Less prevalent – but very powerful – greenhouse gases are hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6).

2 In accordance with Article 3, paragraphs 7 and 8 of the Kyoto Protocol, Canada's allowable emissions for the period 2008 to 2012 is 2,815 Mt (i.e. 94% of the 1990 level multiplied by five). This means that, on average, Canada's emissions cannot exceed 563 Mt for each year of the Kyoto period.

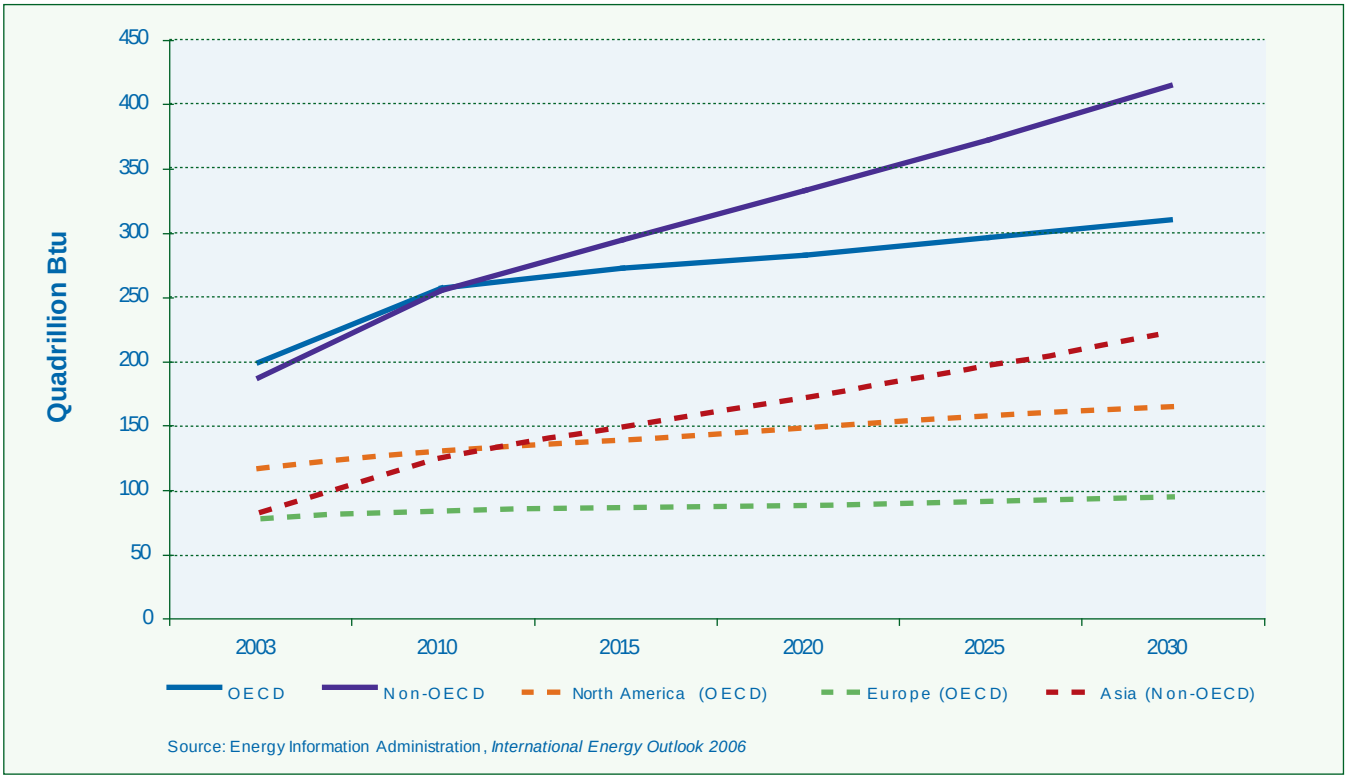
B. Global Context

The science underlying climate change tells us that human-caused emissions of GHGs, resulting primarily from the combustion of fossil fuels for energy, is a significant driver of global warming. Global energy-use trends are therefore at the centre of the issue of climate change, and are tied to global economic growth projections.

According to the *World Energy Outlook 2006* (WEO2006) of the International Energy Agency (IEA), world energy demand will increase by 53% over 2004 levels by 2030, with 70% of the increase coming from developing countries. Similar energy and emissions growth projections are made in the *International Energy Outlook 2006* (IEO2006) by the Energy Information Administration (EIA) in the US (Chart 1). According to the EIA, fossil fuels will remain the dominant source of world energy, accounting for 83% of the overall increase in energy demand between 2004 and 2030. Power generation accounts for 47% of this increase. According to both the IEA and EIA, the world's remaining economically exploitable energy resources are adequate to meet the projected increases in demand through to 2030.

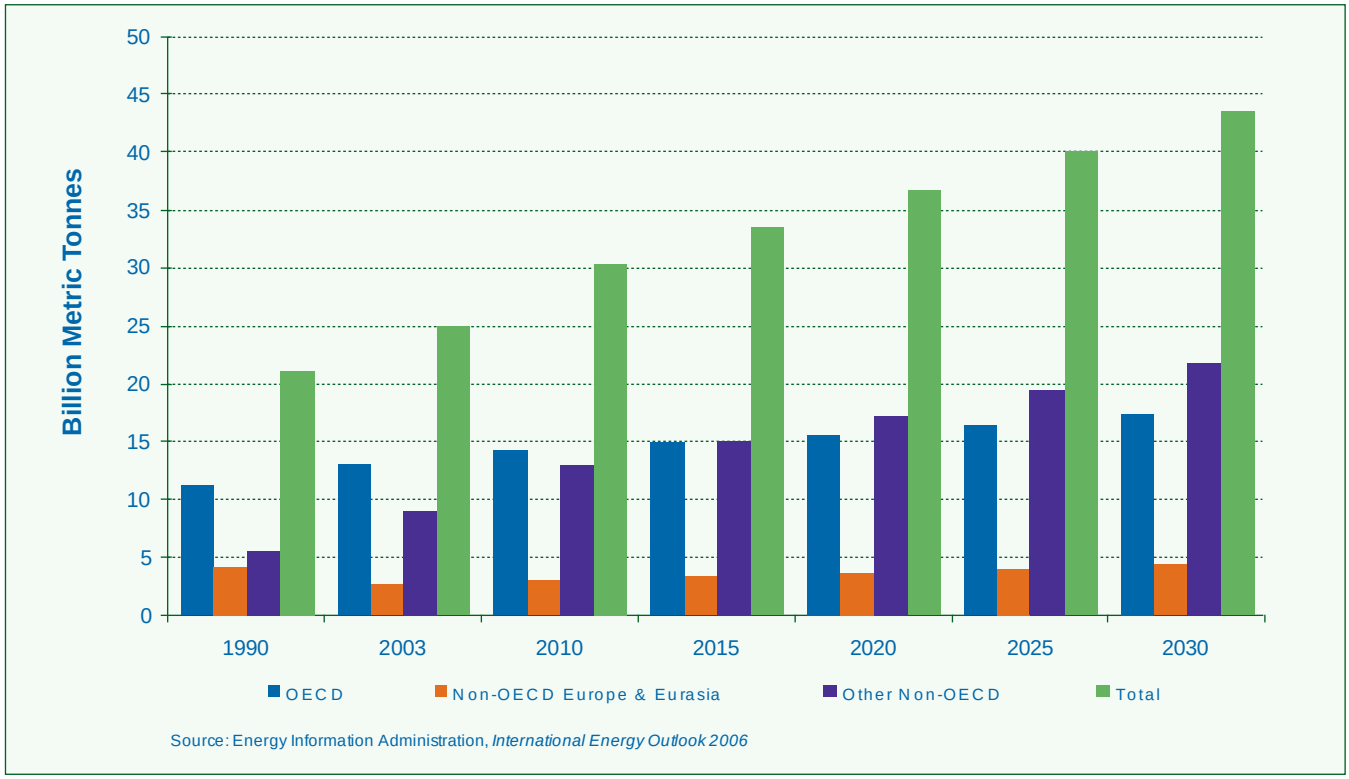
In the absence of new government action, global energy-related carbon dioxide (CO_2) emissions will increase by 55% from 1990 to 2030, with developing countries (primarily China and India) being responsible for over three-quarters of the increase. Developing countries' share of global emissions overtakes that of OECD countries soon after 2010 (Chart 2). China will become the world's largest emitter prior to 2010.

Chart 1: World Energy Consumption, 2003–2030



Source: Energy Information Administration, *International Energy Outlook 2006*

Chart 2: World Carbon Dioxide Emissions by Region, 1990–2030



Source: Energy Information Administration, *International Energy Outlook 2006*

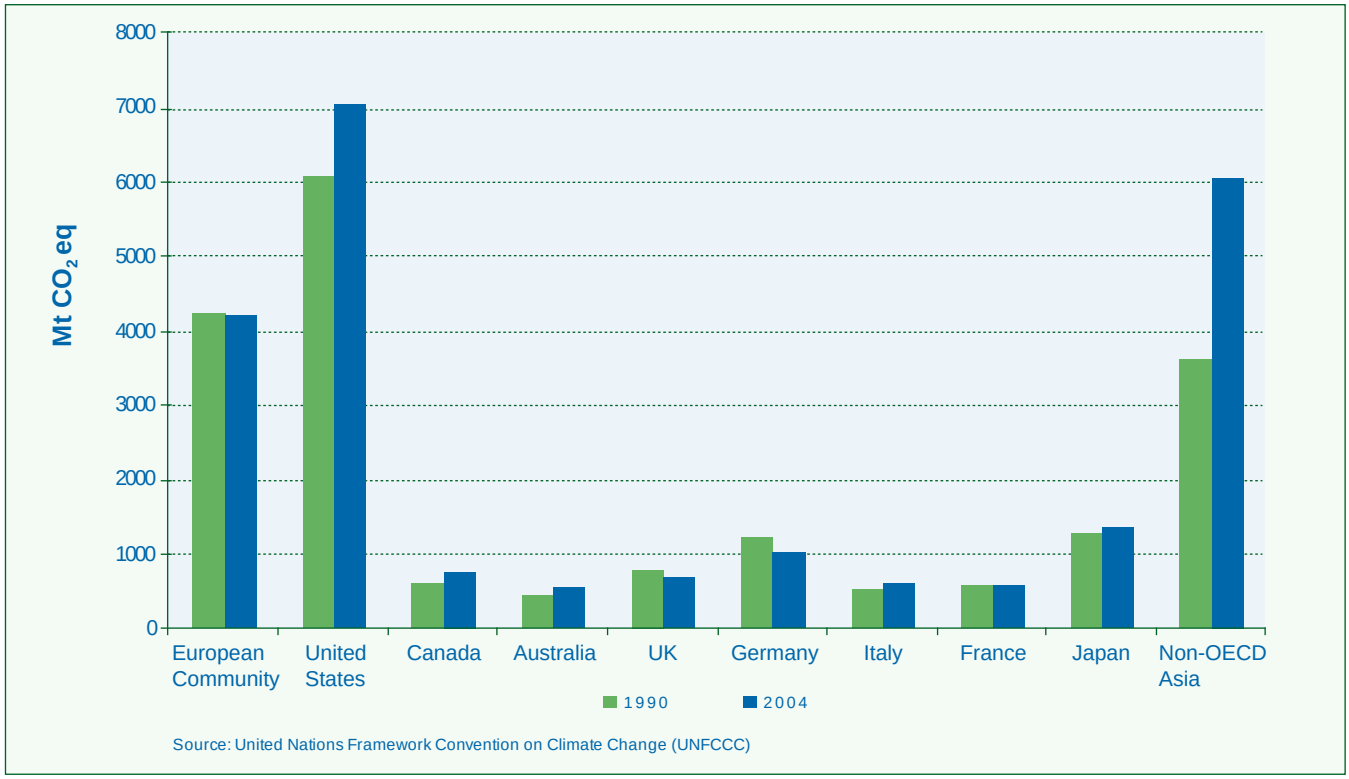
GHG Emissions of Kyoto Signatories

There are significant differences in various countries' progress toward reducing greenhouse gas emissions. Overall, the EU has kept its emissions stable at around 1990 levels. Within the EU, Germany and the UK are among the most advanced in terms of actually reducing their emissions since 1990. In the case of Germany, this resulted in part from the major economic changes following reunification, which saw closure and replacement of economically non-viable industrial facilities of the former East Germany, as well as proactive government policies such as introduction of a carbon tax. For the UK, success in reducing emissions arose from a combination of government policies introduced since the late 1990s, and benefited as well from a longer-term trend away from coal as a primary source of domestic industrial and household energy.

More generally, the fact that the EU has assumed a collective target, and the evolution of the organization since 1990, has worked to its advantage in terms of its ability to meet, and even expand upon, its Kyoto targets. Under Article 4 of the Kyoto Protocol, the 15 member states of the EU (before it expanded in 2004) are to collectively meet a GHG reduction target of –8% of 1990 levels by 2012. In effect, this allows those EU countries that surpass their GHG reductions (e.g. Germany and the UK) to compensate for member states that are not achieving their targets (e.g. Denmark, Ireland, Italy and Spain). In particular, reunification with the former East Germany allowed Germany (the largest European economy) to take on a deep reduction target.

In addition, some of the new "economies in transition" (EIT) countries that are within the now 27-member state EU still remain well below their Kyoto targets. While some of these EIT countries (e.g. Czech Republic, Hungary, Poland and Slovenia) are now experiencing rapid economic growth that has resulted in a GHG emissions increase of 4.1% over the period 2000–2004, overall the presence and economic situation of EIT countries within the EU will contribute greatly to its collective ability to meet both its Kyoto objectives and its recent commitment of reducing emissions by 20% of 1990 levels by 2020.

Chart 3: GHG Emissions by Region and Selected Countries, 1990 and 2004



In other developed countries, including Canada, the United States, Australia and Japan, emissions have increased, in some cases significantly. However, the most dramatic emissions increases have come in the developing Asian economies of China and India, where economic growth and energy demand has begun to take off (Chart 3).

Despite progress by some Annex I countries, the WEO2006 projects total emissions of Annex I OECD countries in 2010 to be 29% above the target set out in the Protocol.

C. Canadian Context

Canadian Geography and Economy

Canada is the second-largest country in the world. Average and seasonal temperatures vary widely, depending on the region – most of the country experiences short, hot summers and long, extremely cold winters. Canada's population in 2005 was 32.8 million, with 80% living within 160 kilometres of the 6,400 kilometre long border with the United States – a distribution that illustrates Canada's high level of economic integration with the US and our low population density. Heating, cooling and transportation associated with the Canadian geographic context contribute to high energy demand and per capita greenhouse gas emissions.

The Canadian economy is export-oriented and resource-based – more than 40% of Canada's economic output is exported – and 40% of the exports are energy-intensive, resource-based commodities. Canada is one of only a few industrialized countries that are net exporters of coal, oil and natural gas, with large reserves of each.

More than half of the oil and natural gas produced in Canada is exported for US consumption. Between 1990 and 2002, net oil exports grew by 449% while natural gas exports grew by 138%. Other G7 countries, with the exception of the UK, increased their imports of oil and gas over the same period, thereby effectively exporting that portion of the emissions associated with the production of the fossil fuels they consume.

Fossil Fuel

As a net energy exporter, Canada bears part of the GHG emissions burden for fossil fuel consumption in other countries. In 2004, Canada's fossil fuel production sector emitted 4 tonnes per capita. If our trading partners were allocated the emissions associated with producing the fossil fuels they import from us, Canada's per capita GHG emissions from fossil fuel production would fall to just 2 tonnes per capita.

Canada's national circumstances and emissions profile are not expected to dramatically shift in the near term. Population growth is expected to continue for the next 15 years, while the Canadian economy is forecast to continue to prosper – growth is forecast at 2.4% annually for the next 15 years.

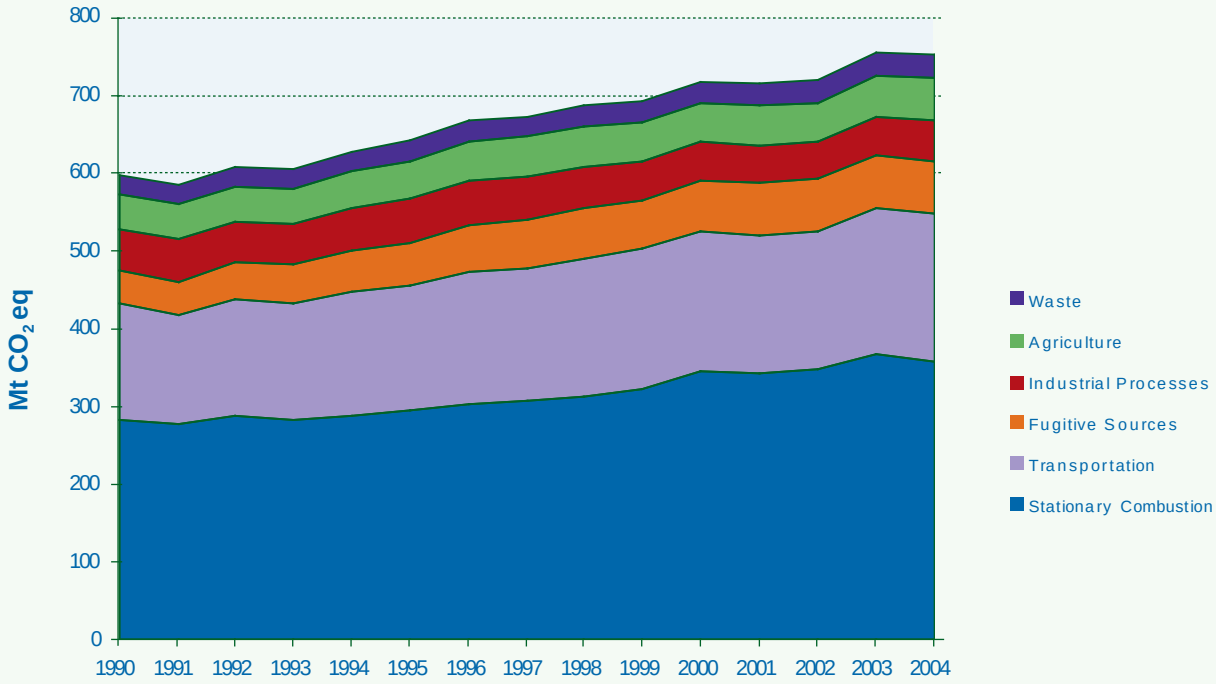
While net exports of natural gas are expected to decrease by 2020 from current levels (production of natural gas is expected to decline due to depletion of conventional gas resources, while domestic demand is projected to increase), net oil exports are forecast to increase by some 200% by 2020 over 2004 levels.

Canadian GHG Emissions Trends

Canada's Kyoto target for the 2008–2012 commitment period is a 6% reduction in GHG emissions relative to 1990 levels. In 1990, Canada's GHG emissions were about 599 Mt CO_2 eq, putting Canada's target level of GHG emissions at 563 Mt CO_2 eq.[3] Canada's GHG emissions have grown steadily since 1990.

3 Carbon dioxide equivalent (CO_2 eq) is a metric measure used to compare the emissions from various greenhouse gases based upon their global warming potential (GWP). The carbon dioxide equivalent for a gas is derived by multiplying the tonnes of the gas by the associated GWP. For example, the GWP for methane is 21, which means that emissions of 1 million metric tonnes of methane are equivalent to emissions of 21 million metric tonnes of carbon dioxide.

Chart 4: Canada's GHG Emissions by Source, 1990–2004



Source: Environment Canada, *Trends in GHG Sources and Sinks in Canada, 1990-2004*

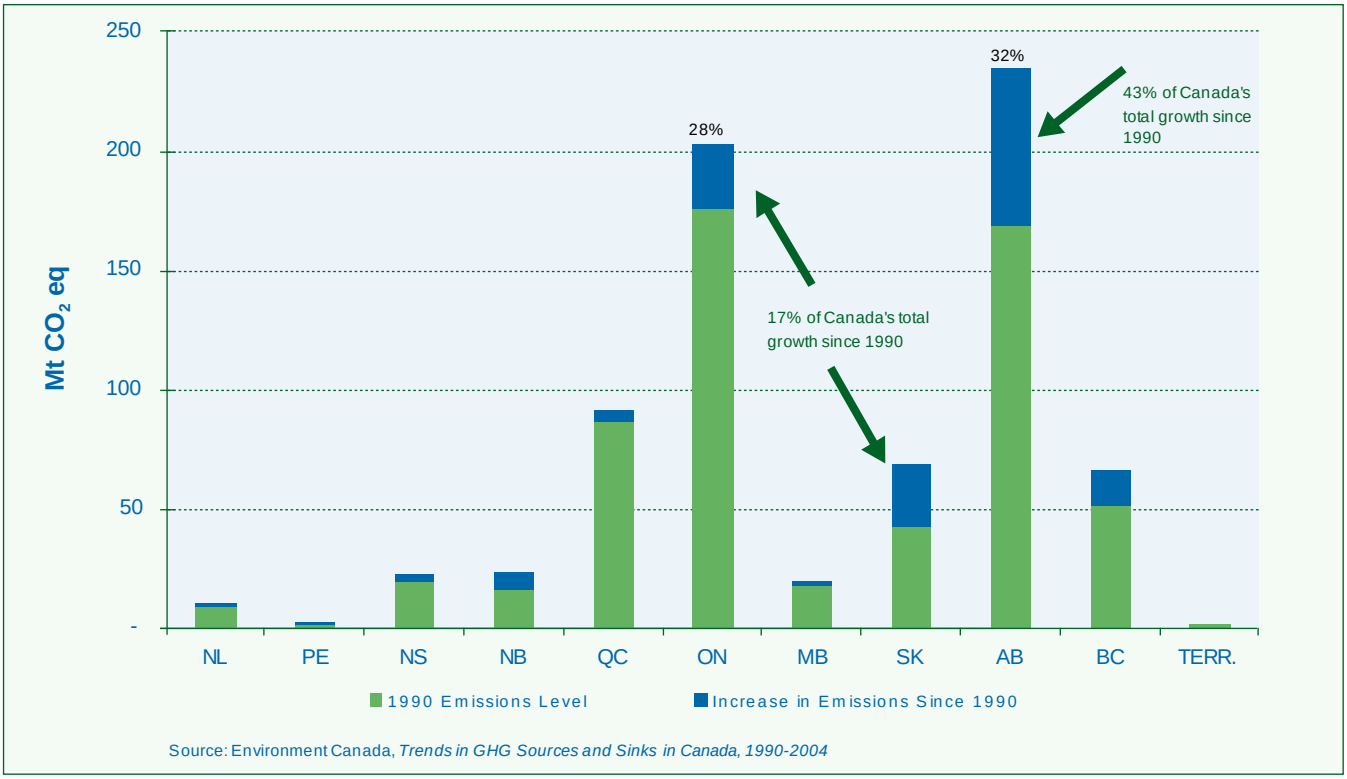
Over 80% of Canada's GHG emissions come from the production and use of energy, mostly from stationary fossil fuel combustion (47%) and transportation (25%). Industrial process emissions and agriculture each account for about 7% of Canada's total GHG emissions (Chart 4).

GHG emissions are not distributed evenly across Canada. Differences in factors such as climate, energy resources, industrial structure and travel patterns contribute to different levels and trends of emissions. In 2004, Alberta was the largest contributor, with 31% of Canada's total emissions (235 Mt). Ontario followed closely with about 27% of the national total (203 Mt). Quebec, Saskatchewan and British Columbia contributed 12%, 9.2% and 8.9% respectively.

Alberta accounted for 43% of total growth in emissions over the period from 1990 to 2004. Ontario and Saskatchewan each accounted for 17% (Chart 5).

With the signing of the Kyoto Protocol in 1998 and its subsequent ratification in 2002, the Government of Canada assumed an enormous challenge on behalf of Canadians. In 2000 the Government launched *Action Plan 2000 on Climate Change*, designed to reduce emissions of GHGs by 49 Mt CO_2 eq by 2010. In 2002, following an extensive process of public consultation, the Government released the *Climate Change Plan for Canada*, which was intended to reduce GHG emissions by an additional 100 Mt CO_2 eq by 2010. And in 2005, the Government announced *Project Green*, which was intended to ensure Canada's compliance with its Kyoto commitments. These initiatives included a mix of policy approaches, with a heavy reliance on voluntary measures. Despite these plans, Canada today is faced with the fact that its GHG emissions have continued to rise steadily for the past decade.

Chart 5: Provincial GHG Emission Levels, 2004

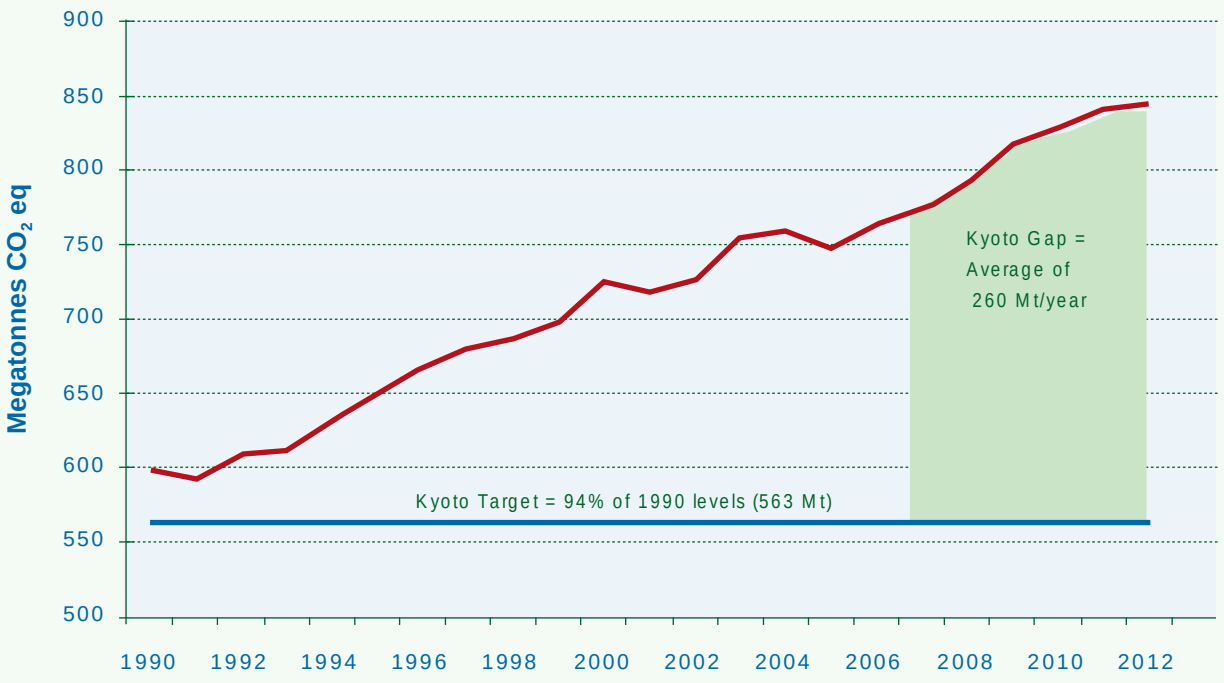


Source: Environment Canada, *Trends in GHG Sources and Sinks in Canada, 1990-2004*

According to Natural Resources Canada's report *Canada's Energy Outlook: The Reference Case 2006*, emissions stood about 27% higher than 1990 levels as of 2004. In 2010, it is projected that Canada's GHG emissions will be in the neighborhood of 830 Mt CO_2 eq (Chart 6).

This means Canada's Kyoto "gap" – the level of emissions reductions required to meet our Kyoto target – will be about 260 Mt CO_2 eq on average for each and every year from 2008 to 2012. This will require about a 33% annual reduction from business-as-usual levels for each of the five years of the Kyoto Protocol's first commitment period.

Chart 6: Canada's GHG Emissions, Projected to 2012



Source: Natural Resources Canada, *Canada's Energy Outlook: The Reference Case 2006*

D. Considerations for Meeting Canada's Kyoto Target

The first commitment period under the Kyoto Protocol is 2008–2012, and requires Canada to reduce emissions by an average of 260 Mt CO_2 eq for each of those years. This means that Canada has only one year to begin bringing about GHG emission cuts that are about one-third less than forecasted levels over this period.

Cutting emissions by this amount in such a compressed period of time is unprecedented in the absence of a dramatic decline in economic output (for example, as occurred in several Eastern European countries after the collapse of the USSR).

While Annex 1 Parties to the Kyoto Protocol are expected to take domestic policy measures to meet their commitments, the Protocol provides three "flexibility mechanisms" to lower the overall costs for Annex 1 Parties in achieving their emission reduction targets. The three Kyoto mechanisms are:

- The Clean Development Mechanism (CDM) which provides for Annex 1 Parties to implement projects that reduce emissions in developing countries;
- Joint Implementation (JI) which provides for Annex 1 Parties to implement an emission-reducing project or a project that enhances removals by sinks in the territory of another Annex I Party; and
- Emissions trading which provides for Annex I Parties to acquire assigned amount units (AAUs) from other Annex I Parties that have excess units.

Under the terms of the Kyoto Protocol, signatory countries that have not met their first compliance period targets will be required to make up the difference in the second commitment period, plus a penalty of 30%. They must also develop a compliance action plan, and their eligibility to "sell" under emissions trading will be suspended.

Cutting emissions by this amount in such a compressed period of time is unprecedented in the absence of a dramatic decline in economic output (for example, as occurred in several Eastern European countries after the collapse of the USSR).

There are several potential policy options for Canada to meet its Kyoto targets starting in 2008, beginning with significant domestic action to reduce emissions levels. It is likely, however, that an exclusive domestic focus would not be possible to maintain, given the magnitude of adjustment for Canada's economy, at this late date, that will be required to yield the required emissions reductions. Canada also has recourse to the Kyoto mechanisms to achieve compliance, which are intended to provide for lower-cost emissions reductions than achievable domestically; but these come with their own economic and environmental risks and uncertainties.

At this time, project-based credits generated from the CDM (known as CERs) represent the main option for environmentally credible international purchases.[4] Under the CDM, various processes are in place to ensure projects generate emissions reductions that are additional to those that would have been achieved without financial support. The issuance of CERs to CDM projects is only made after the use of approved methodologies, third-party certification, and approval by the executive board of the CDM. The growth of the CDM market over the past two years, primarily from European and Japanese investment, as well as support from environmental NGOs, provides further indication that CDM has strong environmental credibility.

4 Certified Emission Reductions (CERs) are issued for emission reductions from CDM project activities and are equal to 1 metric tonne of CO_2 equivalent. Based on information from the UNEP Risoe Centre on Energy, Climate and Sustainable Development, the number of CERs represents roughly 93% of the total project-based credits forecast to 2012 (credits from Joint Implementation – ERUs – account for only 7%).

There is, however, considerable uncertainty about the volume of project-based credits available for purchase. Based on preliminary information from the UNEP Risoe Centre on Energy, Climate and Sustainable Development, about 85 million CERs and other project-based credits (from Joint Implementation) will potentially be available per year for purchase between 2008 and 2012.[5] This equates to less than one-third of Canada's annual reduction target.

An alternative compliance option to purchasing project-based credits would be to purchase AAUs from countries with excess units, such as Russia or Ukraine. Some Annex I countries, including Canada, have expressed a reluctance to purchase these excess AAUs for compliance, as the excess is frequently due to economic collapse or falling production and not for reasons directly related to efforts to curb emissions (so-called "hot air").

Assigned Amount Units (AAUs)

Assigned amount units (AAUs) are emission allowance units granted to each Annex I country according to their respective target level of GHG emissions in the Kyoto agreement.

There is additional uncertainty with respect to Canada's ability to rely heavily on international emissions reductions. For its part, the Kyoto Protocol stipulates that domestic action must constitute a "significant element" of a country's effort to meet its targets.[6] There is no specific limit on the share of international credit purchases that can be counted towards any country's individual target, but Kyoto does not envision that countries would rely primarily on international credits to meet their commitments. Overall, the latest projections from the European Environment Agency indicate that for 10 of the countries making up the EU15, about one-third of projected emissions reductions are planned to come from the use of Kyoto's flexibility mechanisms.[7]

Also uncertain is Japan's level of reliance on international emission reductions. Japan's 2005 Kyoto Achievement Plan indicated that about 13% of its 150 million tonne per year Kyoto gap would be filled through international purchase of credits (about 20 million CERs per year). Japan is already a large buyer of CERs, accounting for about 35% of CERs issued to date.

CoP7 in 2001

At the CoP7 meeting in 2001 (the Marrakesh Accords), the principle of "supplementarity" with respect to the rules for meeting the targets set out in the Kyoto Protocol stated:

"the use of the [Kyoto "flexibility"] mechanisms shall be *supplemental* to domestic action and … domestic action shall thus constitute a significant effort made by each party …"

5 Credits for which no buyer is currently identified or known to the United Nations.

6 The Marrakesh Accords, Decision 15/CP.7, Article 1.

7 European Environment Agency: *Projections of greenhouse gas emissions and removals (CSI 011) – Assessment published February 2007*

E. Policy Options for Canada to Meet Its Kyoto Target

For Canada to meet its Kyoto target – an average 33% reduction from the projected business-as-usual level over the five-year period 2008–2012 – the government would need to introduce measures that are forceful and that would result in deep emission cuts starting next year.

To be effective, these measures would need to send strong price signals quickly and widely throughout the economy, impacting on both large industrial emitters of GHGs and individual consumers.[8]

Given these requirements, a broad carbon tax would likely have to play a key role in any policy tool kit designed to meet Kyoto targets beginning next year, as it is the only economy-wide policy instrument that could conceivably be up and running in such a short time. Such a tax would need to apply to all purchases of fossil-fuel energy by business and individuals in order to have maximum effect.

Revenue received from a broad carbon tax could be recycled back through the economy through changes to other tax rates, although at the same time it would be essential to ensure that the government's overall fiscal situation be kept whole in order to avoid returning to a deficit.

The government could, in theory, supplement a carbon tax with a strong regulatory component on Canada's largest GHG emitters, consistent with the polluter-pays principle. This would also make it possible to establish a domestic emissions trading system among regulated sectors and businesses to help mitigate some of the costs for regulated industries. International trading, despite the uncertainties with respect to the supply of credits identified above, could also mitigate some of the domestic costs and reduce Canada's overall burden.

The principal constraint around implementing these measures beginning in 2008 is a practical one. Design and implementation of a carbon tax, along with development of a coherent system of GHG regulation and domestic trading, as well as engagement in the international carbon market, would be an extremely complex initiative for any government to undertake in such a short period of time. For example, regulating the largest GHG emitters alone will require in the range of two years for design, target setting, verification, legally required public and stakeholder consultations, and regulatory drafting.

For Canada to meet its Kyoto target – an average 33% reduction from the projected business-as-usual level over the five-year period 2008–2012 – the government would need to introduce measures that are forceful and that would result in deep emission cuts starting next year.

For all intents and purposes it is therefore not realistic to contemplate that all three key elements of a comprehensive policy package to meet Kyoto – carbon tax, regulatory system, domestic and international trading – could be up and running within one year. It is nevertheless useful to put aside administrative practicalities and focus for a moment on the broader question of the implications for Canada's economy of attempting to meet the Kyoto targets for the 2008–2012 period beginning next year, assuming that appropriate initiatives could be put in place as rapidly as would be required. The following analysis examines this question in some detail.

8 Independent evaluations of previous Government of Canada sponsored subsidy and information programs have demonstrated that these "voluntary" programs have slowed the pace at which GHG emissions have grown, but have not stopped their overall growth, and would not be sufficient to achieve the deep reductions required under the Kyoto Protocol. For example, "Burning Our Money to Warm the Planet", M. Jaccard et al., CD Howe Institute, May 2006.

F. Scenario Overview

This section describes the core scenario evaluated as part of this analysis. A description of the economic model used to evaluate this scenario is presented in Annex II.[9]

As described above, a strong policy would be required for Canada to meet its Kyoto target in such a short time frame. In theory, the approach could involve a number of elements, including taxes, regulations and trading. Practically, however, introducing new direct GHG regulations would not be possible as new regulations generally require several years to develop and implement. While existing regulations (e.g. Energy Efficiency Regulations) could be made more stringent, they would have minimal effect in the short term.

It is likely that Canada would have to rely to some extent on international trading of credits for Kyoto compliance (e.g. CERs, or AAUs). However, international trading has its own constraints that would need to be addressed in the overall policy. For one, there is widespread hesitancy to purchase excess AAUs given the "hot air" risk (EU countries are expected to generate very few, if any, excess AAUs for sale internationally that would represent real GHG reductions). Furthermore, as noted above, it seems that at best there will be approximately 85 Mt of project-based credits available worldwide in each year of the Kyoto first commitment period which could conceivably be purchased by Canadian business.[10] In theory, this could equal roughly 30% of the annual emissions reductions Canada would need to make. In reality, it is unlikely that Canada would be able to purchase all available credits, as Japan and several EU states will also be in the CDM/JI marketplace.

Based on these considerations, the following scenario has been assumed to be the most reasonable and administratively practical way for Canada to meet its Kyoto targets. An economic modeling analysis was conducted to generate an overview of the major implications for Canada's economy:

- Introduction of a carbon tax, at a nominal rate of approximately $195 for each tonne of GHGs emitted, that would apply to all GHG-producing activities by the industrial, commercial and household sectors.[11] The tax would be payable by businesses and individuals at the point of sale for consumption of fossil fuel energy, as well as on emissions generated by industrial sectors from activities not directly related to fuel consumption (e.g. petroleum refining).

  Electricity producers would see the charge applied to the coal, oil or natural gas consumed in their facilities, while consumers would see the charge applied to the gasoline they buy at the pumps, as well as to their heating fuel bills.

- Such a carbon tax would generate a great deal of revenue for the government. These revenues are first used to ensure that the total government balance remains unchanged from projected values. The remaining revenues are recycled into the economy through reductions in other taxes for households and businesses.

9 The modeling structure includes a detailed energy-technology model that interacts with a macroeconomic model of the Canadian economy.

10 CDM Pipeline, United Nations Environment Programme (UNEP) Risoe Centre on Energy, Climate and Sustainable Development.

11 The carbon tax rate is set at a level that will raise the cost of consumption of fossil fuels to a point high enough to induce accelerated adoption of available energy efficiency technologies, to the limited degree possible in the short term, and changes in economic output such that 75% of Canada's Kyoto target emissions reductions over the Kyoto period are met through domestic action. The other 25% is assumed to be made through international credit purchases.

Electricity producers would see the charge applied to the coal, oil or natural gas consumed in their facilities, while consumers would see the charge applied to the gasoline they buy at the pumps, as well as to their heating fuel bills.

- In recognition of the very high environmental risks associated with a reliance on non-CDM/JI credits, Canadian business is assumed to purchase only CDM/JI credits. It is further assumed that Canadian businesses would be able to acquire about 75% of the total global supply of these credits (about 65 Mt out of 85 Mt) that is currently forecast to be available for each year of the Kyoto period. This would be equal to about 25% of Canada's total required reductions, with the remainder to be realized through domestic action in response to the carbon tax.
- The cost of CDM/JI credits is assumed to be $25 per tonne. This cost is derived from the latest available information on the CDM credit price, which is about $20 Canadian per tonne.[12] It was further assumed that Canada's entry into this market would increase the demand for permits significantly and drive the price up to $25 per tonne, implying a Canadian entry premium of 25%. The figure of $25 per tonne could, of course, be higher or lower over the Kyoto period, but for the purposes of this analysis any reasonable divergence from this price would have a relatively marginal impact on results due to the implied ceiling on the volume of credits that could be purchased abroad (no more than 25% or so of Canada's Kyoto target).

12 Point Carbon, *CDM & JI Monitor*, March 21, 2007.

G. Analytical Findings

The analytical findings present the general cost of the policy change to the economy as a whole and its key players (major economic sectors, including consumers). The analysis also captures some of the benefits of taking action. For instance, one benefit that results from the policy is the energy savings that result from investments in energy efficiency. However, there are benefits of taking action that are not included in this analysis, such as the environmental improvements (e.g. cleaner air) and associated health benefits, or the benefits of technological innovation, which are however unlikely to materialize in this short period. Therefore, this analysis provides a partial view of the consequences of the core scenario considered to meet Canada's Kyoto target.

This analysis is based on an integrated energy-technology and macroeconomic model. While a very sophisticated analytical tool, no modeling structure can fully capture the complicated interactions between and within markets, and between firms and consumers associated with a given policy shock. However, this and other models can provide directional guidance with respect to the broad economic consequences likely to arise from a policy change, based on the best information available, and within the constraints of the assumptions applied. Several variations of models exist, and have different strengths and weaknesses.

The specific modeling framework used for this analysis has several known limitations. Its strength is in modeling impacts at the national level. Sectoral and regional distributions of these impacts require careful refinement and interpretation. Furthermore, results are generated at the industry level – there is no capacity to assess impacts on individual firms.

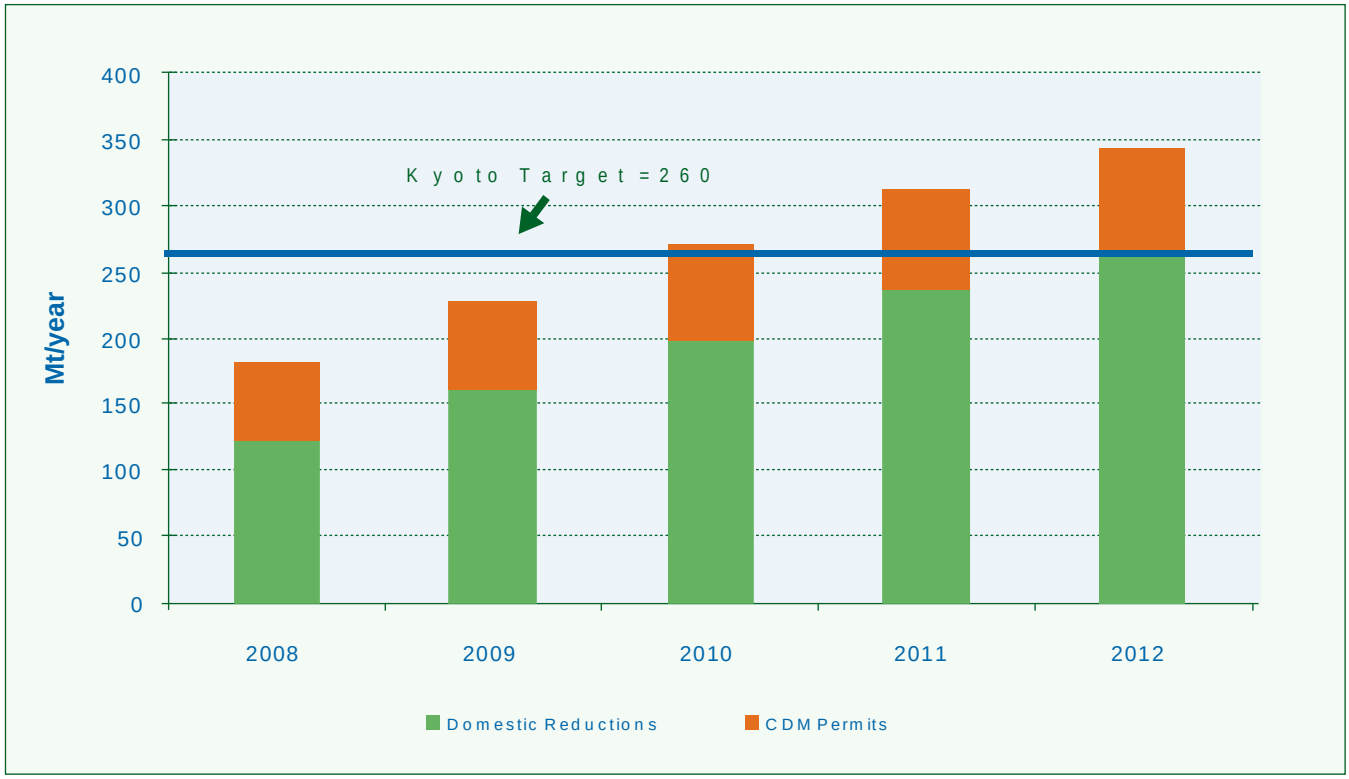
A further limitation derives from the fact that the modeling framework used in this analysis was not calibrated to simulate the effects of a monetary policy and exchange rate response to the economic impacts of the policy. Such a response – particularly the exchange rate – would be expected to help temper the shock and facilitate economic recovery over time. This means that the economic impacts presented may be somewhat overstated, particularly after 2009, assuming that a monetary policy and exchange rate response could accelerate economic recovery without at the same time increasing Canadian emissions in excess of the Kyoto target. The results presented here should therefore be interpreted as how the economy would initially be affected by a full-blown implementation of Kyoto over the short term, not how and when the economy would eventually recover from the shock.

Unless otherwise noted, the impact of the policy on key economic indicators is presented in per cent deviation from the business-as-usual scenario. Business-as-usual (BAU) refers to the scenario associated with continuing current population, economic and technology trends and in the absence of government policy to reduce GHG emissions.

Emission Reductions

Chart 7 illustrates the mix of domestic and international credit contributions to Canada's emissions reductions over the Kyoto period under the policy scenario. About 25% (65 Mt) of Canada's annual target of 260 Mt is accounted for by international purchases each year. Domestic reductions would increase over the period as businesses and individuals react to higher energy prices. In this period, some small domestic reductions would come from carbon sequestration, landfill gas and enhanced agricultural methods, but as will be demonstrated below, a significant share of domestic reductions would come from reductions in sector outputs associated with the carbon tax shock.

Chart 7: Emissions Reductions



While credit purchases would decline as a share of total reductions over time, they amount to about $1.8 billion in yearly expenditure for reducing emissions in other countries.

The domestic carbon tax would generate on average $105 billion per year in revenue, most of which is assumed to be recycled in the form of reduced business and personal tax burdens.[13] The tax reductions mitigate the impact of the carbon tax on domestic demand in the short term. They also increase economic efficiency over the long term by stimulating, for example, capital accumulation; however, these effects are not materially important for the short run.

13 The government keeps some of the revenues to ensure that the total government balance remains in line with projected values in the baseline scenario.

Economic Impacts

The gross domestic product (GDP) is the best available indicator of the overall health of Canada's economy, as it measures the market value of all the goods and services produced in the Canadian economy (or the total value added by all sectors of the economy).

The analysis indicates that GDP would decline by more than 6.5% relative to current projections in 2008 as a result of the policy, falling to a level about 4.2% below that of 2007 (Table 1). This would imply a deep recession in 2008, with a one-year net loss of national economic activity in the range of $51 billion relative to 2007 levels. By way of comparison, the most severe recession in the post World War II period for Canada, as measured by the fall in real GDP, was in 1981–1982. Real GDP fell 4.9% between the second quarter of 1981 and the fourth quarter of 1982.

Following 2008, GDP would resume growth, but under this simulation would not recover to 2007 levels until about 2010. However, as previously noted, this analysis does not account for a monetary policy and nominal exchange rate response that would be expected to mitigate some of this loss, particularly after 2009. Indeed, after a one-time spike in the price level in 2008 (an increase of about 6%), the results indicate a significant fall in the inflation rate below BAU levels in the following years, as well as a substantial deterioration of Canada's trade balance. Independent of any monetary policy reaction, this would likely trigger a depreciation of the Canadian dollar, helping restore Canada's competitiveness over time. Furthermore, while the monetary policy response in 2008 would be complicated by the presence of a one-time spike in the price level and a depreciating currency, the recession, together with the expectation of inflation returning to levels below the BAU, would in all likelihood lead to a more accommodative monetary policy. The size of the GDP loss, relative to BAU, that could be at least partially offset as a result of such a response is represented by the dashed line in Chart 8. It should be further noted, however, that the need to ensure that Kyoto's emissions targets continue to be met throughout this period would likely require further increases of the carbon tax rate to ensure that the recovering economy does not exceed the Kyoto GHG ceiling.

All provinces and sectors would experience significant declines in economic activities under this scenario. Alberta, because of its high dependence on energy-intensive oil and gas production, would likely be particularly impacted.

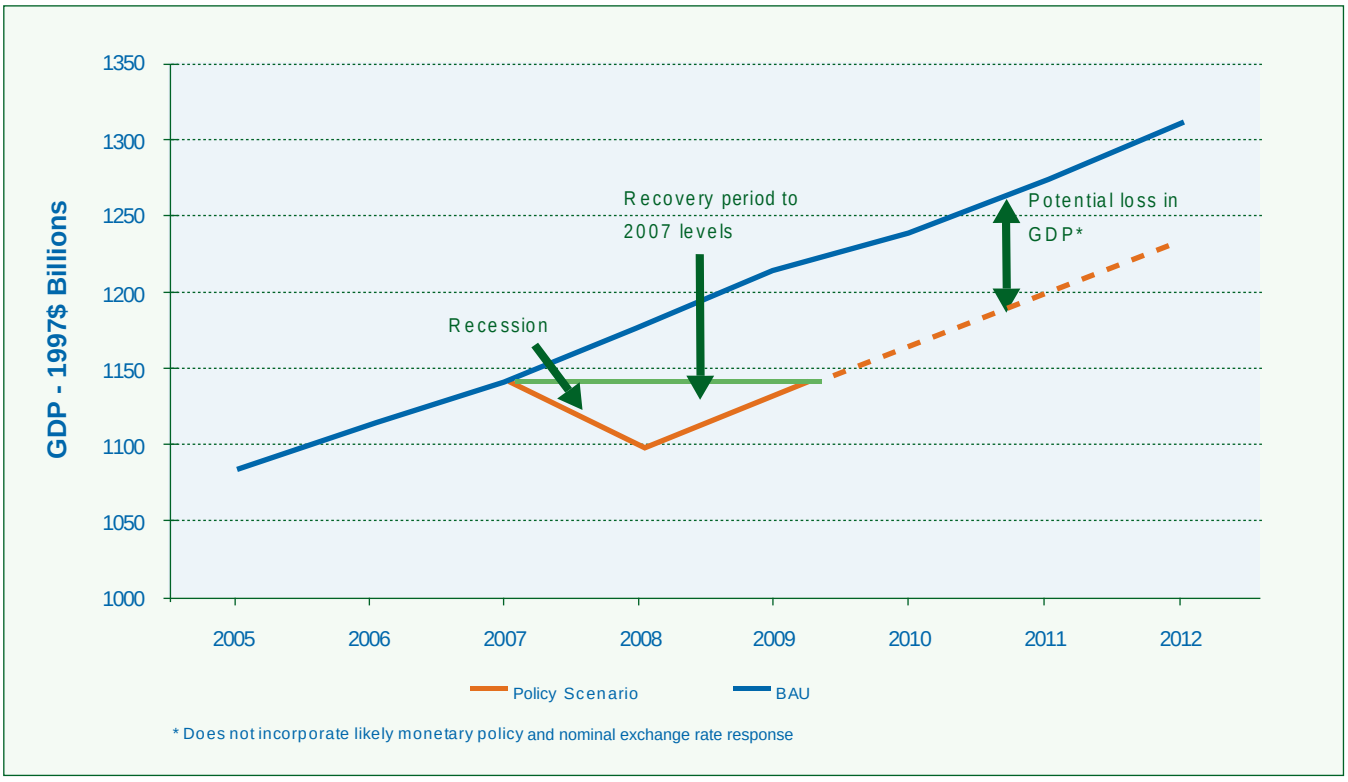
Table 1: Near-Term Impact on Real GDP and Employment

	2008	2009
	Difference from BAU, per cent	
Real GDP	–6.7	–7.2
Employment	–2.5	–4.1
	2008	**2009**
	Estimated Rate of Growth, per cent	
Real GDP	–4.2	2.2
Employment	–1.4	–0.3

These negative GDP impacts, despite the recycling of carbon tax revenues, are explained by a number of key factors. First, there would be a significant time lag between recycling of tax revenues and any associated economic rebound effect, as businesses realign capital investments in light of the sudden reality of a carbon-constrained economy, and consumers save, over the short term, a portion of the recycled revenues they receive. Second, there would be "leakage" of the recycled carbon tax out of the Canadian economy associated with the rise in domestic production costs – imports of foreign-produced goods and services would increase, and in conjunction with a significant decline in overall exports, Canada's balance of trade position would deteriorate. Finally, about 30% of carbon tax revenues are retained by federal and provincial governments to offset pressures on their respective fiscal positions arising from the policy shock – this amounts to a net increase in the overall tax burden, with attendant economic costs.

The fall in production means that net employment would be down from the BAU level by more than 4% (or 705,000 jobs) in 2009 as businesses scale back or cease production in response to reduced demand and higher costs (Table 1). This would raise the unemployment rate by about 1.5 percentage points in 2009 (about 25% higher than current projections). The absolute level of employment would fall by about 1.7% (or 276,000 jobs) between 2007 and 2009. The expected fall in employment is less than that in real GDP because the most affected industries – carbon-intensive industries – are more intensive in capital and less in labour compared to other sectors.[14] In addition, there would be a reduction of real per capita personal disposable income levels from BAU of around 2.5% in 2009 (or about $1,000 per Canadian in today's dollars).

Chart 8: Impact on GDP



14 As a result, the adverse impact on employment and the unemployment rate is less than experienced in the 1981–1982 recession.

Due to the much higher costs of production associated with the introduction of a major carbon tax on energy inputs, Canadian energy exports would be expected to decline significantly (Chart 9).

Canada's net exports of petroleum products would decline precipitously relative to BAU levels, as higher production prices would render much of our petroleum industry uncompetitive at prevailing world market prices, particularly with respect to energy-intensive oil sands production.

Overall, the analysis indicates that Canada's oil production for both domestic and export markets would be approximately 30% less than in the BAU scenario in 2008.

Chart 9: Energy Trade Impacts

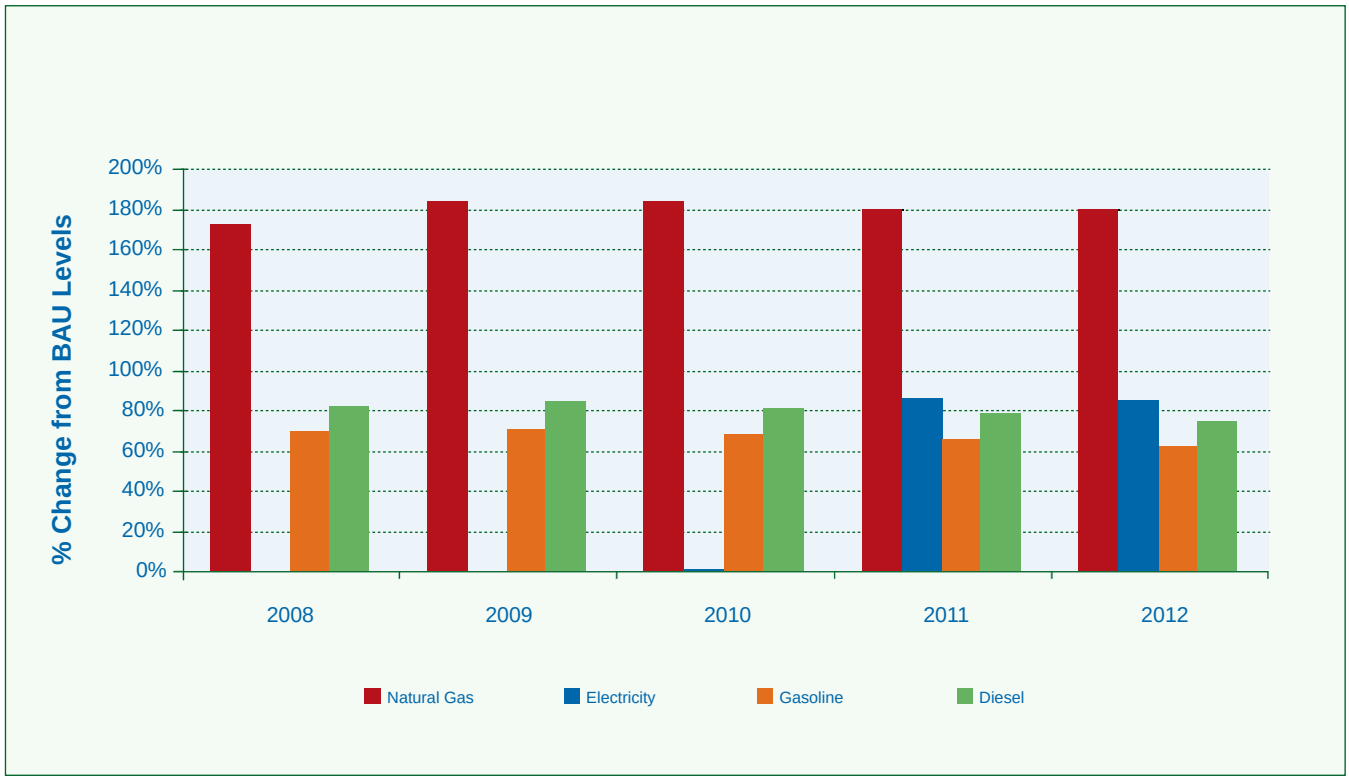
Net exports of natural gas would also fall as a result of cost-driven declines in domestic production of about 15% on average over 2008–2012. Coal imports would be expected to fall by almost 15% on average over the period relative to BAU projections, as the phase-out and closure of existing coal-fired electricity generation facilities is sped up – as a result of relative stability in gross coal exports, net exports of coal would increase slightly.

In terms of net electricity exports, it is likely that they would be somewhat greater as a result of the policy because reduced domestic demand for electricity, associated with broad economic decline, would create an excess supply of "clean" Canadian electricity in hydro-rich provinces (Quebec, Manitoba, B.C.) that could be exported to meet US demand.

The carbon tax would also have implications for energy prices faced by Canadian consumers (Chart 10). Natural gas prices would more than double in the early years, relative to BAU prices, as a result of the carbon tax. In contrast, national electricity prices would be expected to be relatively stable in the early years as total supply remains roughly in line with the baseline scenario as higher exports compensate for reduced domestic demand (there would, however, likely be significant regional variations in electricity price impacts). In later years, decisions would likely be taken to postpone planned expansions of electricity production capacity, or opt for relatively more expensive sources of electricity generation such as renewables and natural gas, and as a result electricity prices would likely rise by about 50% on average after 2010.

Prices for transportation fuels would also rise by a large margin – roughly 60% higher relative to BAU. At today's gasoline prices of approximately $1.00 a litre, this would translate into an average price of over $1.60 per litre as a result of the policy.

Chart 10: Impact on Energy Prices



H. Alternate Scenarios

It does not appear likely that governments could rely exclusively, or even predominantly, on program spending or subsidies to meet Canada's Kyoto target. The impact on government debt levels and/or overall tax burdens would likely be unsustainable, while the ability of initiatives of this type to bring about the emissions reductions required in such a short period of time is doubtful. More credible alternate scenarios for meeting Kyoto starting next year would revolve around different degrees of access to international credits as a complementary compliance option to initiatives such as a carbon tax. A brief discussion of the two "end-points" in terms of access to international credits – no international trading, and unlimited international trading – is presented below to illustrate a number of key considerations and probable limitations.

No International Trading

This alternative would have Canada rely solely on domestic emissions reductions in the Kyoto period, with no purchases of international credits whatsoever. From an economic perspective, this option simply does not seem plausible. To achieve reductions in the order of the Kyoto target under this approach, a comprehensive carbon tax (or similar charge, such as the permit price under a hard cap and trade system) would have to be set so high that, in the Kyoto compliance period, the Canadian economy would experience an average annual loss of well over the 6.5% or so of GDP estimated under the option detailed above (possibly in the 10% range).

Unlimited International Trading

The second alternative would assume unlimited access to any and all international carbon credits as a compliance mechanism for Canadian emitters. This introduces a completely different price dynamic for Canada. The scenario examined in detail above, where about 75% of the reductions on average would have to occur in Canada due to the limited availability of reliable project-based credits, would require a carbon charge for domestic reductions of $195. With unlimited access to international trading (regardless of "hot air" risk), the $25 per tonne international credit price assumed for the purposes of this analysis would effectively become the price ceiling for Canadian emitters, making it unnecessary to consider any domestic reductions at a cost above that price.

It is therefore reasonable to assume that this scenario would see international credits becoming the source of reductions for the vast majority of Canada's Kyoto target (the analysis presented above indicated that only a small portion of Canada's domestic emissions reductions could be achieved at a cost below $25 per tonne over the Kyoto period). This would dramatically lower the overall cost of reductions for Canadian emitters, and as a result would carry a much lower economic cost for Canada than presented above, although some negative impacts would be inevitable.

At the same time, while putting aside the issue of whether or not this heavy use of international credits could be technically acceptable under the Kyoto Protocol, it is evident that this approach would likely not be consistent with the spirit and intent of that agreement, which envisaged that domestic reductions would make up a significant portion of each signatory's target (as previously noted, those Kyoto signatories in the EU that appear to be on track in meeting their respective targets seem likely to rely on international credit purchases for 30% or less of their overall reductions). There are, moreover, a number of environmental and other challenges presented by this scenario.

- Assuming that 80% or so of Canada's Kyoto target would be met through international credits, somewhere in the range of $6 billion annually would be required for these purchases, while at the same time there would be little incentive for domestic investment in energy efficiency and GHG reduction technologies.
- Given the limited volume of available project-based credits, over 60% of Canada's international permit purchases would have to be AAUs.[15] It is expected that most of the AAUs available in the first commitment period will be surplus allowances from economies in transition, countries such as Russia and the Ukraine, where emissions reductions have occurred solely due to economic decline during the 1990s (frequently referred to as "hot air"). Canadian businesses would therefore be expected to send over $3 billion annually to these countries, for which there would be no incremental emissions reductions, and no potential technological or other co-benefits in Canada.

15 As the JI market is still in its infancy, the availability of JI credits will likely be quite limited (only JI credits issued after 2007 are eligible under the European emissions trading scheme).

I. Conclusions

The conclusion of this analysis is that Canada cannot meet its 2008–2012 Kyoto target, as envisaged under Bill C-288, in a manner that would assure the required level of real GHG reductions on both a domestic and global level without experiencing significant economic costs. Like any such analysis, this conclusion depends on a few core assumptions:

1. First and foremost, it is assumed that Canada would not be willing to take advantage of those Kyoto compliance mechanisms, in particular AAUs, that do not represent guaranteed incremental GHG reductions. To the extent that Canadians and their governments chose to diverge from this assumption, the results of this analysis could change, although some economic costs would still likely arise.
2. It is further assumed that Canada will be able to purchase about 75% of the currently estimated available supply of project-based credits (about 65 Mt/year) at a price of $25 per tonne over the Kyoto period. To the extent that more or fewer credits are in fact available to Canada (and to a much lesser degree, the extent to which the price is higher or lower than $25 per tonne), the costs for Canada could vary, up or down, from those presented under this scenario.
3. Finally, it is also assumed that there are no breakthroughs in current energy efficiency and other technologies pertaining to GHG emissions, or any dramatic reductions in the cost of access by Canadians to clean energy sources over the 2008 to 2012 period. Unforeseen developments on either of these fronts in the near future could also dramatically change the economic costs of meeting Canada's Kyoto target.

This last assumption is particularly important because, although it is quite reasonable for the purposes of this analysis, it also underscores the real source of the economic costs associated with Canada significantly reducing GHG emissions within the Kyoto period – a lack of time for business and consumers to smoothly transition to the changes required. Because of the assumed imperative that Canada will need to reduce its GHG emissions by an annual average of 33% beginning next year and for each of the following four years, this analysis cannot, for example:

- Credibly incorporate such long-term transformational technologies as carbon capture and storage, that could, by 2015 or so, allow many sectors of the economy, particularly the oil and gas and electric utility industries, to sequester a significant proportion of their GHG emissions at a relatively low cost;
- Include the emissions impacts of long-term energy infrastructure projects, such as planned new hydro-electric generation capacity in northern Quebec, Manitoba, and Newfoundland and Labrador that, together with development of an east-west electricity grid, could dramatically reduce the dependence of Canadian industry and consumers on high GHG-emitting energy sources;
- Accommodate business capital turnover cycles to allow for relatively low-cost incremental investments in more energy-efficient technologies and processes as existing machinery and equipment reaches the end of its productive life;
- Allow for an evolution in consumer awareness and behaviour that would result in increased use of energy-efficient household and transportation choices, and facilitate a shift to a low-carbon lifestyle without affecting overall standard of living;

- Wait for development and implementation of solid international certification procedures with respect to "greened" AAUs that could transform these currently questionable credits into verifiable and incremental GHG reductions on par with CDM/JI, thereby providing much-needed liquidity and integrity to current international carbon markets; or
- Incorporate any future developments in the US that might facilitate an integrated North American approach to GHG emission reductions. Several US states are moving forward on coordinated climate change plans, and options are being discussed at the US federal level that could create opportunities in the near future to alleviate the competitiveness and economic constraints on Canada acting alone in North America.

These and other potential ways to dramatically reduce Canada's GHG emissions over the long-term suggest that the economic hurdles for Canada to address climate change in a significant manner can be overcome with sufficient time, and on the basis of an effective and consistent policy framework.

ANNEX I

Kyoto Targets for Signatory Countries

Country	Target (1990 – 2008/2012)
EU-15, Bulgaria, Czech Republic, Estonia, Latvia, Liechtenstein, Lithuania, Monaco, Romania, Slovakia, Slovenia, Switzerland	–8%
US*	–7%
Canada, Hungary, Japan, Poland	–6%
Croatia	–5%
New Zealand, Russian Federation, Ukraine	0
Norway	+1%
Australia*	+8%
Iceland	+10%

* have not ratified

ANNEX II

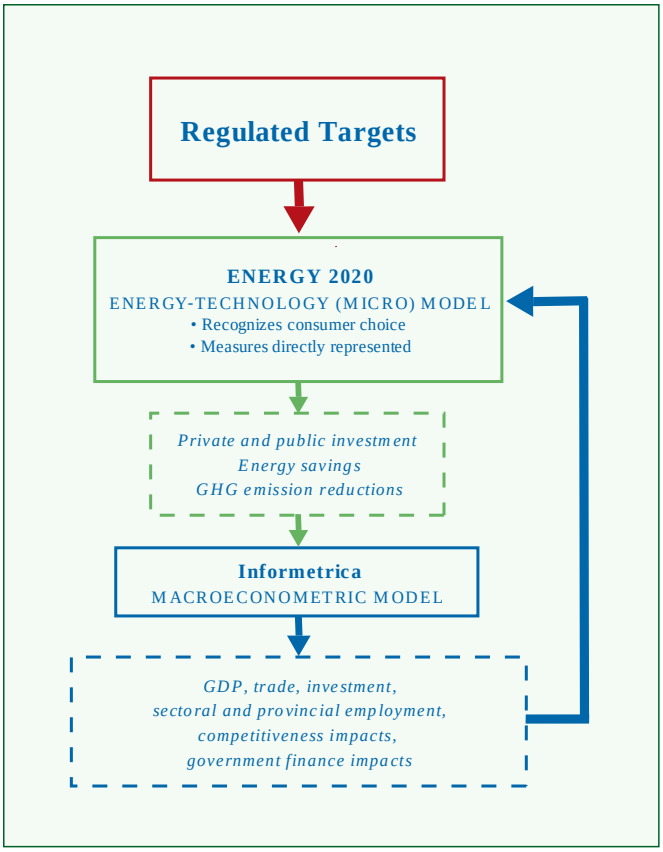
Overview of Economic Modeling Framework Used in This Analysis

The approach used in analyzing the economic consequences of meeting Canada's emissions reductions under the Kyoto Protocol is comprised of three major components:

- Business-as-Usual Scenario – The most important assumption is the "business-as-usual" (BAU) outlook, which projects emissions growth in the absence of additional policy. The BAU reflects the most recent understanding of oil and gas development and prices, additions to electricity generation capacity and improvements in energy intensity. The key assumptions in the modeling structure were aligned with NRCan's *Canada's Energy Outlook: The Reference Case 2006*.
- Policy package and other assumptions – This includes the required greenhouse gas targets by sector, simulated carbon tax levels and international carbon credit trading parameters.
- Modeling Structure – The model structure is comprised of two models: i) ENERGY 2020, a detailed energy-technology model of Canadian energy markets; and ii) The Informetrica Model (TIM), a macroeconometric model of the Canadian economy developed by the Ottawa-based consulting firm Informetrica Ltd.

As illustrated in Chart 1, the analytic process operates by first modeling the policy package in ENERGY 2020. In this phase of the analysis industrial targets and carbon charges are directly evaluated for their emissions and financial impacts (i.e. private and public investments, energy savings/change in energy mix, permit transactions and emissions reductions). The estimates of the incremental investments, energy costs and savings, and implied GHG emissions charges become inputs to the TIM model that estimates the GDP, employment, trade, government finance and other measures of economic performance. The impacts of output, employment and investment changes are

Chart 1: The Analytic Approach



fully diffused across energy markets and the economy via a feedback mechanism between the two models.

E2020 is an integrated multi-region, multi-sector North American model that simulates the supply, price and demand for all fuels. E2020 can determine energy output and prices for each sector, both in regulated and deregulated markets. In short, E2020 examines the choices that consumers and businesses make in the purchase and use of energy, in response to factors such as energy prices and government policies.

The model's main outputs include changes in energy use, energy prices, GHG emissions, investment costs and potential cost savings resulting from the policy

change. These results help to identify the direct effects of GHG reduction policies. The investments and savings, in turn, are inputs to the macroeconomic analysis, which assesses the impact of these investments as well as monetary flows on the whole economy.

The Informetrica Model (TIM) examines consumption, investment, production and trade decisions in the whole economy. This analysis captures not only the interaction among industries, but also the implications for changes in producer prices, relative final prices and income. It also factors in government fiscal balances, monetary flows, interest and exchange rates.

TIM represents 133 industries at a provincial and territorial level. It also has an international component to account for exports and imports, which covers approximately 100 commodities. The TIM model allocates the national results by province and territory.

TIM projects the direct impacts on the economy's final demand, output and employment, price formation, and sectoral income that result from various policy approaches. The projection estimates the effect of climate change policy and related financing assumptions on the national economy.

While very sophisticated analytical tools, no model can fully capture the complicated interactions between and within markets, and between firms and consumers associated with a given policy shock. However, macroeconomic models can provide directional guidance with respect to the broad economic consequences likely to arise from a policy change, based on the best information available, and within the constraints of the assumptions applied. Several variations of macroeconomic models exist, and have different strengths and weaknesses.

The specific modeling framework used for this analysis has several known limitations. Its strength is in modeling impacts at the national level. Sectoral and regional distributions of these impacts are regarded as somewhat less reliable. Furthermore, the model does not generate changes in nominal interest rates and exchange rates, as would occur under a monetary policy response to a major economic event. While this would mean that economic impacts may be somewhat overstated in the middle and later years of the analysis, adjustments associated with a monetary policy response would not dramatically change the overall results for the period under examination. Nevertheless, these results should be interpreted as how the economy would initially be affected by a full-blown implementation of Kyoto over the short to medium term, not how and when the economy would eventually recover from the shock.

Notice to Reader

Environment Canada's analytical report entitled "The Cost of Bill C-288 to Canadian Families and Business" was reviewed by well-respected economic experts from the private sector and academia:

- Don Drummond, Senior Vice-President and Chief Economist at Toronto Dominion Bank Financial Group
- Jean-Thomas Bernard, Professor, Department of Economics, Laval University
- Christopher Green, Professor, Department of Economics, McGill University
- Mark Jaccard, Professor, School of Resource and Environmental Management, Simon Fraser University
- Carl Sonnen, President, Informetrica Limited

The reviewers believe that Environment Canada's report presents a reasonable representation of the cost of meeting Canada's commitments under the Kyoto Protocol.