



Government
of Canada

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A Discussion Paper on
Canada's Contribution
to Addressing **Climate Change**



Following the conclusion of the Kyoto Protocol in December 1997, Canada's First Ministers met to discuss ways Canada could contribute to addressing climate change. They agreed that climate change is an important global issue and Canada must do its part to address it.

In determining how to meet its climate change commitments, the Government of Canada established two important conditions. First, there must be a workable plan. And second, such a plan must be developed in full consultation with provinces, territories, stakeholders and Canadians.

This Discussion Paper is a step towards meeting those objectives. It explains what we know about climate change and what we have concluded. It presents four options for addressing Canada's climate change commitments and the analytical results that are currently available and seeks input on a number of key issues.

Some have expressed reservations about Canada's ability to achieve its target without U.S. participation in the Kyoto Protocol. Canada's challenge is to see whether there is a workable plan for achieving our Kyoto target — a plan that is affordable, a plan where no region of the country is asked to bear an unreasonable burden, a plan that promotes innovation and addresses issues related to the competitiveness of Canadian industry and a plan that takes into account the complexity and long-term nature of climate change.

This Discussion Paper will be considered in depth by federal, provincial and territorial energy and environment ministers at their meeting on May 21, 2002. There will be consultations with some 900 stakeholders in mid-June, with day-long sessions planned in every jurisdiction in Canada — 14 meetings in all. The views of Canadians everywhere are welcome.

Following consultations based on this document, a preferred approach will be identified and a draft plan developed in greater detail and analyzed over the summer. Consultations on that plan will take place in the fall.


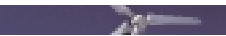


This Paper draws on the ideas and proposals that have already come forward from provinces and territories, business, environmental groups and other experts. The options it contains are not exclusive and other options may be suggested. The Government of Canada welcomes further input over the months ahead, such as: the paper under preparation by the Government of Alberta with its views on what Alberta can contribute to addressing climate change; the evolving action plan of Eastern Canadian Premiers in the context of their regional agreement on climate change with the New England Governors; the steps being taken by the Government of Quebec, including its recent framework agreement with its aluminium sector; and the Federation of Canadian Municipalities' *Plan to Achieve 20 Per Cent of the Kyoto Target*.

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Ce document est également offert en français sous le titre:
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à la lutte contre les changements climatiques*

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Climate change is the ultimate sustainable development issue. Canada must chart a path where our economy can continue to flourish and grow while at the same time improving its greenhouse gas (GHG) intensity, that is, becoming more efficient at producing each unit of gross domestic product (GDP) with fewer GHG emissions.

Climate change is not only a challenge to be overcome but an opportunity to be seized in areas such as innovation, energy efficiency, transportation, agriculture and forestry. Meeting our commitments will contribute to a better quality of life for Canadians.

Over the longer term, addressing climate change means moving to fundamentally different ways of producing and using energy. It means using new and innovative technologies that already exist, such as fuel cells, and others, such as zero-emissions coal combustion technologies, that are only just being imagined in the laboratory.

Reducing the emissions intensity of our economy requires a workable plan that promotes the use of best technologies and practices, both in the short and longer term.

Canada's emissions of greenhouse gases continue to increase and are now 19.6 per cent higher than they were in 1990. However, in developing a workable plan there is reason for optimism. Significant progress is being made in some sectors. Over the past decade, emissions from Canada's manufacturing and industrial processing sector have remained stable at 1990 levels while output has increased by more than 30 per cent. There are a number of low emissions-intensive technologies waiting to be brought to market in all sectors of the economy. Energy efficiency will help all companies to be more productive and to lower costs.

Canadian companies are making energy efficiency and GHG emission reductions a key component of their strategic thinking. For example, Alcan's new 400,000 tonne smelter in Alma, Quebec, incorporates the latest energy efficiency technologies. DaimlerChrysler Canada has reduced the GHG emissions per vehicle manufactured by 42 per cent over the past decade. DuPont Canada has achieved its ten-year goal of a 25 per cent reduction in per unit energy use six years ahead of schedule. Syncrude Canada has reduced GHG emissions per barrel of production by 26 per cent since 1988. Weyerhaeuser Canada's Prince Albert, Saskatchewan, plant is energy self-sufficient, dramatically reducing GHG emissions. Dofasco has reduced GHG emissions by 24 per cent since 1990 through its commitment to energy reduction and sustainable development. Nexfor Inc. has reduced its emissions by more than 23 per cent through energy efficiency projects and by replacing fossil fuels with biomass. TransAlta is using offsets and emission trading to reduce emissions from its facilities.

Across Canada, nearly 800 organizations from all sectors of the Canadian economy have developed voluntary action plans to reduce their GHG emissions and registered these plans with the Voluntary Challenge and Registry Inc. (VCR Inc.) and EcoGESTe, two non-profit partnerships between industry and governments. Of these organizations, more than 360 have produced progress reports to document their successes in reducing GHG emissions. The success of VCR Inc. and EcoGESTe is just one indication of the willingness of Canadian companies to join in the national effort to reduce GHG emissions.

Thirty of the largest multinationals in the world, including DuPont, Toyota, British Petroleum, IBM, Kodak, Alcoa, Royal Dutch Shell and Rio Tinto, are also reducing their emissions and profiting by doing so. British Petroleum, for example, has reduced its worldwide emissions to ten per cent below 1990 levels seven years ahead of schedule at a net saving to the company. And IBM has saved approximately \$50 million per year through its energy efficiency initiatives.

Recently, the Government of Canada announced its Innovation Strategy. This policy framework, supporting investment and technology development and adoption, is critical to addressing Canada's climate change commitments. It includes policies to stimulate technology development, promote the adoption and use of incentives and provide investment stability. Innovation policies must also be supported by measures to encourage behavioural change.

Consumers play an important role in creating new markets and stimulating behavioural change in industry. Informed choices by consumers can help pull new climate-friendly technology and products into the marketplace.

The Government of Canada is working with Canadians in their communities to raise awareness of these choices by providing information and tools to encourage the reduction of GHG emissions at home, at work and on the road.

Individual behavioural change is a long-term proposition, but there is solid evidence that it can be successful, based on initiatives such as the blue-box recycling program and anti-smoking and anti-drinking and driving campaigns.

A workable Canadian plan must help accelerate the widespread application of best

technologies and best practices. It must also harness the power of the marketplace and encourage further technological innovation so that Canada — and Canadian companies — stay ahead of the curve.

The Kyoto Protocol poses a real challenge for Canada. The emissions reductions implied by our target are significant and require changes in behaviour and practices by Canadian citizens, businesses and governments. This is why Canada worked hard on the international negotiations on rules relating to sinks and the Kyoto Mechanisms. We were successful and the international rules for Kyoto implementation allow real reductions in global GHG emissions to be achieved in the most cost-effective manner.

That said, the decision by the United States not to ratify the Protocol creates a unique situation for Canada. The emissions reduction targets that Canada and the United States respectively took on during the 1997 negotiations in Kyoto were within one percentage point of each other, requiring comparable levels of effort by our two countries. However, the recent plan put forward by the United States is expected to have a much smaller impact on U.S. emissions over the next ten years than would have been implied by their Kyoto target. This imbalance raises competitiveness issues for Canada and Canadian industry that need to be addressed in a workable climate change plan.

That is why Canada has renewed its insistence that the international community recognize the global environmental benefits created by Canada's large exports of cleaner energy to the United States. Our exports of natural gas and hydro-electricity displace some 70 megatonnes (MT) of GHG emissions. Crediting Canada with these

reductions would recognize that this is a cost-effective way to address climate change from a global perspective.

Recent estimates place the impact of reaching our Kyoto target at between 0 and -2 per cent of GDP in 2012*. Current economic projections indicate Canada's GDP could be about 31 per cent larger in 2012 than in 2000. In a Kyoto world, our economy would be 29 to 31 per cent larger. Just where in that range the impact will fall will be largely determined by the policy approach we take.

Some approaches to achieving our climate change objectives could result in some regions of our country bearing differential burdens. However, First Ministers have agreed that no region of the country should be asked to bear an unreasonable burden and any workable plan must respect that condition.

Federal, provincial and territorial governments have been co-operating on the climate change issue for more than a decade. In April 1998, environment and energy ministers established the National Climate Change Process (NCCP).

In October 2000, a major milestone was reached with the completion of Canada's First National Climate Change Business Plan. Canada's National Climate Change Business Plan 2002, the second national business plan, contains further action to reduce emissions, adapt to a changing climate and encourage action by all Canadians. This plan also reflects the many climate change-related activities planned and underway by the Canadian private sector, municipalities and other public organizations.

In addition to efforts under the NCCP, we also have the advantage of considering the proposals put forward by the Canadian Council of Chief Executives and other industry and environmental groups. These studies and reports have been helpful in developing this Discussion Paper.

At the municipal level, the Federation of Canadian Municipalities (FCM) has played an active role on climate change and is committed to taking concrete actions. The FCM firmly believes that GHG emissions reductions can lead to enhanced community benefits and quality of life. More than 100 Canadian communities have adopted emissions reduction targets as part of the Partners for Climate Protection program.

Existing policies and programs are giving us a good start towards achieving our climate commitments. For example, GHG emissions reductions have already been — or will be — achieved through Budget 2000, Action Plan 2000 on Climate Change, Budget 2001, Canada's investment in the World Bank Prototype Carbon Fund, Technology Early Action Measures and the Sustainable Development Technology Fund.

Canada must decide on a workable plan for addressing its climate change commitments, while taking into account its partnerships and progress, the strong international framework for action and existing programs and policies, including those that are indirectly helping to reduce our emissions.

We are seeking the input of provinces and territories on how best to accomplish Canada's climate change goals. Other orders of government hold many useful and effective

*The most recent estimates are set out in Table 1, Appendix 1. The estimated impacts on GDP in 2012 range from plus 0.4 per cent to minus 1.7 per cent.

policy levers for reducing GHG emissions and we want to collaborate with them in the development of a workable plan. Governments working in partnership will be more successful in this endeavour than any of us can be by working alone.

We are also seeking the views of business and other stakeholders, as well as individual Canadians. This is where climate change action will actually occur and their vision, commitment and entrepreneurial spirit are needed to drive any workable plan to its goal.

Examples of Government of Canada Actions Underway to Achieve GHG Reductions

Action Plan 2000 on Climate Change is a \$500 million, five-year program that is the centerpiece for action on climate change in Canada. The Action Plan contains 45 initiatives that target key sectors that account for 90 per cent of Canada's GHG emissions. It lays the groundwork for long-term behavioural, technological and economic change and gives individual Canadians the tools that they need to do their part.

Budget 2001 includes more action addressing climate change, including: a doubling of the Green Municipal Funds, which have been effective in stimulating more than 150 community-based projects across Canada, a majority of which reduce GHGs; a new production incentive for electricity from wind energy; and a broadening of eligibility for income tax incentives for renewable energy and certain energy efficiency projects.

The World Bank's **Prototype Carbon Fund** is designed to help all countries effectively meet emissions reduction targets and their sustainable development goals. Canada joined four other countries and 12 private sector partners in the World Bank's first fund offering. The Fund invests in emissions reduction projects in developing countries, Eastern Europe and the former Soviet Union, with the emissions reduction credits being returned to investors.

Technology Early Action Measures (TEAM) is a Government of Canada Climate Change Action Fund initiative that brings together partners in the private and public sectors to demonstrate new technological products and processes that reduce GHGs.

The **Sustainable Development Technology Fund (SDTF)** is administered by a third-party foundation and is designed to stimulate the development and demonstration of environmental technologies, particularly those aimed at reducing GHG emissions, such as fuel cells and new process technologies, as well as those designed to improve air quality, such as clean coal technologies.

The **Clean Development Mechanism (CDM)/Joint Implementation (JI) Office** facilitates participation by Canadian companies in emissions reduction projects in other industrialized countries as well as in developing countries. The projects can create export opportunities for leading-edge Canadian companies and the international emission permits generated can help Canada achieve its climate change commitments.

Federal, provincial and territorial co-operation on climate change was clearly articulated in the December 1997 statement by First Ministers following the conclusion of the Kyoto Protocol. In that statement First Ministers agreed that:

- Climate change is an important global issue and Canada must do its part to address it;
- We must do so in such a way that no region is asked to bear an unreasonable burden;
- It is important to achieve a thorough understanding of the impact, cost and benefits of implementing the Protocol and of the various options for doing so; and
- Provision should be made for the full participation of provincial and territorial governments, along with the federal government, in any implementation of the Protocol.

First Ministers directed their Ministers of the Environment and Energy to work together to examine the consequences of Kyoto. The work that has been undertaken to date represents a major collaborative effort by governments to construct an approach for managing climate change risks that reflects the complex nature of the issue, the evolving science, Canada's role in the international community and the Canadian constitutional framework.

The options under consideration in this Discussion Paper draw heavily from the ideas that have emerged from the NCCP. Many of the measures that could be implemented would be the responsibility of provincial, territorial and municipal governments. Many others could be most effectively done through partnerships between governments and the

private sector and other stakeholders. Canada's climate change commitments can be met most efficiently and cost-effectively through collaboration.

Provinces and territories have many cost-effective tools to make a significant contribution to achieving Canada's target, such as building codes, improved transportation and land use policies, attaching energy efficiency requirements to project permits, renewable energy production requirements and ensuring grid access for co-generation and small electricity producers and regulatory structures for both natural gas and electricity distributors that include incentives for demand management activities.

Provinces and territories are beginning to take action. For example, in October 2000, Quebec announced its action plan on climate change. In January 2001, Manitoba announced its initial response to climate change. Others are also taking steps to address the issue.

The provinces are also taking action with their United States neighbours. In August 2001, for example, the New England Governors and Eastern Canadian Premiers announced a joint Climate Change Action Plan which aims to reduce regional GHG emissions to their 1990 levels by 2010. The implementation plan for this initiative will make an important contribution to meeting Canada's climate change commitments.

The Government of Canada wants to work with provinces and territories in implementing GHG emissions reduction measures and welcomes the statements of provincial Premiers and territorial Leaders on their concern about climate change and their agreement on the need for action.

For Canada, the separate path being pursued by the United States creates unique challenges for our participation in the Protocol. There is a considerable gap between Canada's target of -6 per cent under the Kyoto Protocol and the goal for the U.S., recently announced by the Administration, of reducing the GHG intensity of the U.S. economy by 18 per cent over the next ten years. This will result in about a 30 per cent increase in emissions above 1990 levels instead of the U.S.'s Kyoto target of -7 per cent. This difference is of serious concern given the high level of integration of our two economies.

In light of the important competitiveness issues facing Canada and the technological opportunities that lie ahead, a co-operative working relationship with the U.S. on climate change will be important. The Government of Canada builds on a strong partnership with the U.S. in this regard.

In February 2002, President Bush released the American plan for addressing climate change. While the U.S. has decided not to ratify the Kyoto Protocol, the Administration has proposed large investments to spur research, development and uptake of clean energy technologies, the creation of domestic and international partnerships to reduce emissions and improved reporting methods to better track the progress being made under voluntary initiatives.

Canada has an interest in these U.S. efforts and, in March 2002, Canada and the U.S. issued a joint statement on expanding and intensifying climate change co-operation in a number of areas, including science and research, technology development and emissions measurement and accounting.

Working with the U.S. on climate change will allow Canada to make important gains on two fronts. First, Canada will be able to promote some of its leading edge GHG-reduction technologies in the U.S. market. For example, with the recent legislative developments in California calling for significantly more GHG-friendly vehicles by 2005, Canadian fuel cell technology will become even more attractive to North American car and bus manufacturers.

Second, increased co-operation with the U.S. will give Canada an insider's advantage as new technologies are developed. It will also enable Canada to reap some of the economic spin-offs from large climate change research and development investments. For example, Canada is already host to a collaborative project involving the U.S. as well as other partners to test and further develop better carbon dioxide (CO₂) capture, storage and sequestration technologies. Co-operative actions with U.S. researchers to lower the costs of these technologies would be of great benefit to large Canadian CO₂ emitters, such as natural gas and oil sands producers, in the highly integrated North American energy market.

Increased co-operation to establish common methods of emissions measurement, monitoring and reporting could make it easier for companies in both countries to operate in the emerging domestic and international emissions trading markets.

In formulating an appropriate policy on climate change, it is important to take note of what is known and what is not. What follows is a brief overview of what is known about the science of climate change, its expected impacts on our country, our economy and our ways of life, and an assessment of the framework provided by the Kyoto Protocol for how we might address these issues.

Science

The international community has concluded that there is compelling scientific evidence of climate change. More than a decade ago, the United Nations Environment Program and the World Meteorological Organization established the Intergovernmental Panel on Climate Change (IPCC) to assess scientific research on climate change, including its impacts and response measures.

The IPCC has recently completed its Third Assessment. This involved more than 1,000 scientists and scholars from a wide range of disciplines and countries. The major conclusions have been endorsed by 17 national scientific academies around the world and in a letter signed by more than 100 Nobel laureates. There are three key findings:

The first is that human activities are changing the composition of the atmosphere. Data collected from polar ice cores, for example, show that concentrations of CO₂ had been stable at about 280 parts per million by volume for the 10,000 years between the last ice age and the start of the 19th century. The present concentration has not been exceeded during the past 420,000 years and likely not during the past 20 million years.

However, CO₂ concentrations have now increased by about 30 per cent. If this trend continues, by the end of the century the concentration of CO₂ in our atmosphere will be at least double what it had been prior to the industrial revolution.

Second, these changes in the concentration of CO₂ in our atmosphere are affecting, and will continue to affect, the global climate. Indeed, the IPCC concluded that most of the warming observed over the past 50 years is attributable to human activities.

While uncertainties exist about the timing and rate of future changes, the IPCC has suggested that the average global surface temperature is likely to increase by between 1.4 and 5.8 degrees Celsius by 2100. And temperatures in the North are expected to increase considerably more.

While this may appear to be a fairly modest increase, even small changes in global average temperature have a dramatic impact on our climate. During the last ice age, for example, the average global temperature was only five degrees cooler than it is today.

Changes in the earth's climate also create the possibility — though remote — of “surprises” such as the collapse of the Gulf Stream. Such large and rapid changes in the climate system have occurred in the past but are, by their nature, difficult to predict.

The third major conclusion reached by the IPCC is that changes consistent with global warming are already occurring in some parts of the world. Mountain glaciers are retreating, the global sea level is rising and climate zones are shifting. The growing season in the Northern hemisphere has lengthened by between one and four days per

decade during the last 40 years and there has been a northward migration of plants, insects and animals.

Moreover, the 20th century was the warmest century of the last millennium. The 1990s were the warmest decade of the last century. The years 1999 and 2001 were the warmest years yet. And the first three months of 2002 were the warmest since records began.

In fact, in Canada we have just completed the 19th consecutive season of above normal temperatures. This is well beyond the range of natural climate variability.

Impacts

Climate change could have a profound impact on the Canadian way of life. Warmer temperatures may bring some benefits to Canada, including lower costs for winter snow removal, less hazardous shipping in ice-congested waters, lower heating costs and longer, warmer growing seasons, as well as a northward expansion of zones suitable for agriculture. Over the longer term, however, we can also expect some much less appealing consequences. No region of the globe can expect to be a net beneficiary of global climate change.

Increasing temperatures will move the treeline significantly northward during this century. Because forests respond slowly to change, they may become mismatched with their changed environment. This could affect the economics of the forest industry, which may have to contend with increases in the number of harmful insects which damage the forests, such as the mountain pine beetle. Also, drier summer conditions will increase the number and severity of forest fires.

Our fisheries — both freshwater and marine — could also be affected. Changing water temperatures and circulation patterns will

affect the abundance of fish species. Since fish size is affected by water temperature, variation in the growth rates of some species can also be expected. It is expected that the range for spawning rivers and the suitable ocean habitat for the Pacific salmon could shift many hundreds of kilometres northward, greatly affecting the west coast fishery and traditional way of life.

In the North, melting permafrost will put buildings, pipelines and other infrastructure at risk. Winter roads, which are used for shipping heavy goods such as fuel, building materials, heavy machinery for economic development and food to communities and industry, are already becoming less reliable. Inuit elders and scientists are reporting consequences such as declining food supplies for the polar bear population.

Rising temperatures in the North mean that the Northwest Passage will eventually open to shipping. This could bring economic opportunities, but also raise concerns for ecosystems and the traditional lifestyles of Northern people and sovereignty issues.

Water levels in the Great Lakes are forecast to drop by more than one metre. In shallow lakes such as Lake St. Clair and Lake Erie, the existing shoreline would move up to six kilometres offshore. Flows of water in the St. Lawrence River at Montreal would be reduced by 40 per cent with significant implications for shipping. Freighters are already running at less than full loads through the St. Lawrence Seaway.

Reductions in water levels in reservoirs are expected, which will reduce hydro-electricity generation potential — a particular concern in British Columbia, Manitoba and Quebec, which rely heavily on hydro-electricity.

The Prairies will likely see increased droughts, with the grasslands areas of southern Alberta and southern Saskatchewan becoming semi-arid. The Canadian Wheat Board estimated that, last year, Prairie droughts cost the Canadian economy about \$5 billion, largely felt by the local and regional economies.

Heat waves are expected to become more frequent and more intense. The frequency and intensity of some severe weather events, such as heavy rainfall, are also expected to increase.

The global atmospheric circulation will change so that air pollutants will not be dispersed so rapidly. As a result, there will be more days of poor air quality and smog, increasing the risks to health in many of our cities.

On a global level, climate change will have serious implications for those regions least able to help themselves, including Africa, parts of Asia, and small island states that are vulnerable to rising sea levels.

Kyoto Protocol

Over the past ten years, as the evidence of climate change has become clearer and the impacts of climate change better understood, a strong international impetus for action has emerged.

In 1992, more than 180 countries, including Canada, signed the United Nations Framework Convention on Climate Change (UNFCCC), which set out the principles and framework for a global response to climate change, including the need to reduce GHG emissions. The UNFCCC came into force in March 1994. Despite good intentions, however, little action was taken around the world.

In response, the Kyoto Protocol of 1997 set legally-binding targets for industrialized nations. Canada's target is to lower our GHG emissions so that the yearly average between 2008-2012 will be six per cent below what it was in 1990. If no action were taken to address climate change, it is estimated that Canada's emissions in 2010 will be about 33 per cent greater than they were in 1990.

Last fall, international negotiations were completed on how to achieve the Kyoto targets. Cost-effectiveness was a key consideration. Among the tools developed are the use of carbon sinks and the obtaining of international permits through the Kyoto Mechanisms.

The Kyoto Mechanisms can serve to reduce the total costs of achieving Canada's GHG emissions reduction target. Strategic investments in the Kyoto Mechanisms may also contribute to the achievement of Canada's international development objectives. At the same time, a domestic focus for emission reduction efforts may lead to co-benefits, such as improved air quality within Canada, as well as provide an additional stimulus for investment in the domestic capital stock.

What is a carbon sink? A carbon sink is an ecosystem, such as the oceans, forests or soils, that removes and stores carbon from the air. Trees, for example, can serve as carbon sinks because they are able to convert CO₂ from the air into plant sugars through the process of photosynthesis. Credits can be obtained for sinks just as from any other GHG reduction.

What is a Kyoto Mechanism? There are three Mechanisms under the Protocol that allow countries and companies to buy or generate permits from emissions reductions abroad. They are International Emissions Trading — buying permits from other industrialized countries; Joint Implementation — investing in emissions reduction projects in other industrialized countries; and the Clean Development Mechanism — investing in emissions reduction projects in developing countries. The Mechanisms are a fundamental part of the Protocol to help mobilize the energy, creativity and resources of the private sector in the global fight against climate change. Canadian companies have already demonstrated their interest in the Kyoto Mechanisms by investing in emissions reduction projects in developing countries.

The Kyoto Mechanisms are effective, flexible and market-based instruments for addressing climate change. The atmosphere does not care where in the world a reduction of greenhouse gases takes place. Studies show that the use of these economically efficient and business-friendly mechanisms can significantly reduce the cost of meeting our Kyoto target and promote the export of Canadian climate change technology.

The Protocol allows any Party that emits less than its target to sell the difference as emissions permits on the international market. Permits may also be generated through investments in emissions reduction projects. As with other commodities such as coffee or soybeans, the use of the Kyoto Mechanisms will result in an international market for carbon, the price of which will be determined by the supply of, and demand for, emissions permits on the international market. Several Canadian firms have made the use of the Kyoto Mechanisms a central component of their strategies for addressing GHG emissions.

The industrialized countries of the world have agreed that, having contributed most to the problem to date and having the resources to act, they should take the lead with respect to addressing it. To this end, the Kyoto Protocol comes into force when it has been ratified by 55 nations representing at least 55 per cent of industrial countries' 1990 CO₂ emissions.

Canada is responsible for only about two per cent of global GHG emissions but we are still the ninth largest emitter nation and among the highest emitters per capita.

Many fear that, should the Kyoto Protocol not come into force, it will take years to negotiate a new international agreement. While the Kyoto Protocol, on its own, does not constitute the full and final answer to climate change, it is seen as an important step along a road that will require ongoing negotiations and sustained effort for much of

this century. For example, while industrialized countries must act first, the major developing country emitters, whose emissions are expected to grow dramatically in the coming years, should take on targets by 2013. It remains to be seen whether this will be achieved in ongoing negotiations. It is, nonetheless, encouraging that some developing countries are making headway even though not formally bound by the Kyoto Protocol.

There is one area in particular where Canada would like to see the Protocol improved. Canada is very concerned that the Protocol does not yet provide explicit recognition for the global environmental benefits created by the export of cleaner energy, which displaces the use of dirtier energy in the importing country. Canada is asking that this issue be resolved now so that credits are recognized

right from the start of the operation of the Protocol. We have been working hard within the UNFCCC to explain this concept internationally and gain its recognition and acceptance. We held an informal session last fall attended by some 34 countries from around the world. We hosted a formal UNFCCC workshop in May 2002 at which 34 countries also participated and Canada provided its analysis and methodology for the determination that the estimated global environmental benefits created by our export of cleaner energy are 70 MT. The next step is consideration of the results of that workshop at the international negotiating session in June 2002, with a view to recommending whether the issue moves forward to the Eighth Conference of the Parties (CoP8) in October 2002.

Canadian exports of cleaner energy, namely natural gas and hydro-electricity, displace the use of dirtier fuels, such as coal and oil, in the United States. This causes global GHG emissions to be lower than would otherwise be the case and Canada is seeking credit for this within ongoing international negotiations. This benefit, calculated as the emissions displaced in the United States minus the emissions occurring in Canada in order to produce and transport the cleaner energy to export markets, is calculated to be 70 MT per year.

Another critical issue for Canada and for the Protocol is the decision of the U.S. not to ratify. The Protocol can still come into force and, given the steps being taken toward ratification by many other countries, probably will. With the United States not participating, the Protocol will cover about two-thirds of the emissions of industrialized countries, which provides a solid basis on which to get started.

If Canada chooses to ratify the Kyoto Protocol, we would be the only North American Free Trade Agreement (NAFTA) country and, indeed, the only country in the Americas, to establish a mandatory emissions reduction target. Under these conditions, competitiveness issues must be given very careful consideration. For example, most of the Canadian commodity-based industries trade in global markets where prices are set outside Canada. It is important that approaches to reducing emissions take account of such economic realities.

Recognizing these challenges, the Kyoto Protocol nevertheless remains of tremendous importance, not only for its scope and breadth and for the measures it proposes, but also for the signals it sends and the consensus it represents. It constitutes the only global instrument available to move the process of addressing climate change forward. Canada must now look at whether there is a workable, affordable plan that would enable us to achieve our climate change goals, maintain a strong and vibrant economy and enhance our overall quality of life.

This section outlines what can be concluded with respect to the size of the challenge, the potential economic impacts and co-benefits of action, the basic policy instruments available to governments and the risks that surround any policy approach.

Size of the Challenge

Business-as-usual projections would see Canada's GHG emissions rise to approximately 809 MT by 2010. Canada's Kyoto target is 571 MT by 2010, creating a "gap" of about 240 MT that must be addressed.

These projections assume a strong, growing economy and, in particular, strong growth in the oil, gas and electricity sectors — major contributors to GHG emissions. Should growth in these sectors turn out to be greater than assumed, more GHG emissions would be produced, the gap would be larger and we would have to do more to achieve our target. Of course, the reverse is also true.

It is estimated that some 74 MT of the gap could be closed as a result of actions and credits from current policies and programs.

These include the measures in Action Plan 2000, Budget 2001 and estimated sinks credits.

This estimate does not include the potential reductions from other government programs such as the large investment being made by the federal, provincial, territorial and municipal governments in green infrastructure. It also does not attempt to account for the climate change benefits from the many initiatives that have been put in place by provincial and territorial governments.

Accounting for this 74 MT leaves a gap on the order of 166 MT. In addition, for planning purposes we need to consider how the 70 MT of credits we are requesting as recognition of the global environmental benefits from our export of cleaner energy to the United States could change the assessment of the workability of alternative approaches.

If we take into account all of these factors, the remaining gap to be filled would be about 96 MT. We need an approach to achieve these additional reductions and manage the risks around achieving that goal.

The 74 MT includes an estimated 50 MT for Action Plan 2000 and Budget 2001 and 24 MT for sinks. Previous government estimates have shown 65 MT for Action Plan 2000. This figure needs two adjustments. First, it contains an estimated 20 MT of private sector purchases of international permits under the Clean Development Mechanism (CDM) and Joint Implementation (JI) and that would be assisted by the Action Plan 2000 investments in the CDM/JI Office and its activities at home and abroad. These private sector purchases will only be achieved if a domestic emissions trading system is put in place and therefore are included as appropriate under the New Actions header in the assessments shown later in this Paper of how any policy option enables Canada to fill the gap. Second, 5 MT needs to be added for the new initiatives from Budget 2001. In total, Action Plan 2000 and Budget 2001 are estimated to contribute 50 MT. Previous government estimates have shown 30 MT for sinks; this is reduced by 6 MT, the amount of sinks included in the Action Plan 2000 estimate, resulting in 24 MT.

Economic Impacts and Co-benefits of Taking Action

One of the key considerations in developing a climate change strategy is the impact it will have on the Canadian economy. Estimates have varied considerably. Estimates by the Analysis and Modelling Group (AMG) in 2000 placed the impact at between 0 and -3 per cent of GDP. Other studies put the impact at less than one per cent of GDP.

Recent estimates of the impact, based on possible policy approaches, by the AMG narrow the range of forecasts by reducing the upper end and place the impact of reaching our target at between 0 and -2 per cent of GDP by 2012. These results mean that while Canada's GDP in 2012 would be about 31 per cent greater than in 2000 without actions to reduce GHG emissions, it would instead be between 29 and 31 per cent greater depending on the approach employed to achieve our climate change goal. Factors beyond Canada's control, in particular the international price of carbon, would also play a role. Further detail on the AMG results may be found in Appendix I.

The AMG estimates indicate that, unless policies are well designed, the impact could be uneven across provinces and territories. This is particularly true for the provinces of Alberta, Saskatchewan and Newfoundland. Any workable plan must take account of the First Ministers' commitment to meet Canada's target in a way that does not unreasonably burden any region of the country.

Any discussion of economic impacts must also recognize that, just as climate change presents challenges, so too it accelerates innovation and offers new opportunities — to develop new technologies, win new markets and create new jobs. It also provides broader benefits including cleaner air, reduced health costs and other environmental improvements. Economic models have difficulty capturing

these aspects of the equation but the potential economic and social benefits of these opportunities cannot be overlooked and should not be underestimated. Other work by the AMG estimated the environmental and health co-benefits of taking action on climate change to be on the order of \$300 to \$500 million per year.

Analysis and Modelling Group

(AMG): *The AMG is one of the federal-provincial-territorial working groups created as part of the NCCP to focus on analytic priorities. The focus of their recent work has been on modelling exercises to develop estimates of the economic impact of possible approaches to meeting our Kyoto target.*

The modelling was carried out using two models — an energy-technology model and a macro-economic model. The energy-technology model estimates changes in energy use, energy prices, GHG emissions, investment costs and cost savings resulting from potential policies. The macro-economic model uses these and other inputs to estimate impacts on economic activity, competitiveness, trade and government fiscal position.

The models provide indicative estimates only; actual impacts will certainly be different. Their great value is in providing insights into how the impacts of specific policies work their way through the economy. The AMG's analysis of Options 1 and 3 below provided useful information and guidance for the design of proposals included in Option 4.

A carefully designed approach to achieving Canada's climate change commitments can help to advance a number of important public policy objectives, including the quality of life Canadians enjoy.

Many of the actions to reduce CO₂ in the transportation sector, for example, will also

help improve the air quality in our cities, reduce traffic congestion and improve the quality of our lives. The development and use of new technologies such as fuel cell buses and bio-diesel fuel will open markets for world-class Canadian innovators.

Greater use of biomass ethanol in our gasoline not only means less CO₂ in our atmosphere, but a new source of income for farmers. Better building standards will mean

buildings and homes that are more energy efficient, healthier and less expensive to maintain.

Indeed, while there is no doubt that addressing climate change presents many challenges, for an innovative economy it also offers many opportunities — to take the lead and set the pace, to become the standard by which others measure themselves.

Competitiveness

The impact on the competitiveness of Canadian industry is a key consideration in developing Canada's approach to climate change. Canada is a trading nation, with exports accounting for about 37 per cent of our GDP; 87 per cent of our exports go to the U.S. With the United States' decision not to ratify the Kyoto Protocol, it is clearly imperative that Canada's approach to climate change be responsive to the needs of our trading sectors.

Competitiveness considerations were carefully studied by the AMG in the National Climate Change Process. In October 2000, federal, provincial and territorial Ministers of Energy and Environment requested further analysis to strengthen understanding in this area. The AMG, in partnership with Industry Canada, undertook a series of consultations with nine energy- and/or trade-sensitive industries with a view to determining their trade and investment vulnerabilities to competition from countries not ratifying the Kyoto Protocol. It also examined sectors that would benefit from climate change policies.

A key dimension of the AMG's work was to ensure that the modelling appropriately captured each sector's unique market situation and, therefore, that the results reported in this Discussion Paper reflect the input received on competitiveness issues.

The nine industries that were studied are primary aluminium, cement, industrial chemicals and fertilizers, metal mining, upstream oil and gas, refined petroleum products, pulp and paper, iron and steel and vehicle manufacturing. They account for about 60 per cent of Canadian exports, more than 50 per cent of industrial GDP and about 20 per cent of total GDP. On average, they export almost 70 per cent of their output, and 90 per cent of their exports go to the U.S. Generally they trade in global markets where their prices are set outside Canada, thereby limiting their ability to recover mitigation costs.

Some parts of the Canadian electricity industry could also face competitiveness pressures, particularly in western Canada, due to electricity imports from the U.S. These pressures are expected to increase with increased integration of the North American electricity market and wholesale competition.

The AMG competitiveness review also examined the issue of investment "leakage" (the relocation of capital as a direct result of climate change costs). It observed that an increase in costs could induce investment outflows from Canada due to changes in relative rates of return or even curtail new investment that would otherwise flow into Canada. At the same time, it is recognized that investment flows are governed by a wide range of factors such as: labour skills, productivity and costs; capacity to innovate; taxation levels; investment incentives; liveable cities; and the regulatory climate.



The AMG competitiveness consultations also examined industries for which climate change policies may provide opportunities. Such industries include renewable energy, energy efficiency, alternative transportation fuels, urban transit and environmental services. For example, the renewable energy industry could experience annual growth rates of 10 to 40 per cent. The extent of the benefit to the Canadian economy will depend in large part on our capacity to supply the technology and equipment associated with growth in these sectors.

The Government is committed to addressing competitiveness issues in the design of Canada's climate change policy. Options will be assessed for their impacts on sectoral and overall competitiveness. Option 4, for example, specifically attempts to address competitiveness concerns through the design of the domestic emissions trading (DET) system and through the suggestion that the Government of Canada could consider measures that might facilitate the transition to low emissions-intensive technologies. In addition, Canada's success in achieving unrestricted access to the Kyoto Mechanisms provides our industry with the opportunity to meet emissions reduction targets on the international market at least cost.

The Government of Canada invites comments on the extent to which the options set out in this Discussion Paper address competitiveness concerns.

Policy Instruments

There are three main policy instruments that Canada could use to achieve its target: 1) domestic emissions trading; 2) targeted measures; and 3) government purchases of international permits.

1. Domestic Emissions Trading

The goal of a DET system is to encourage greater energy efficiency through the innovation and creativity that comes from utilizing the market. Under DET, companies would be allocated emission permits and required to hold a permit for each tonne of GHGs they emit. Firms that can reduce emissions at low cost will do so, and sell their excess permits. On the other hand, those facing higher costs to reduce their emissions will find it more economical to buy excess permits from others.

There is some useful experience with such trading systems and a number of other countries are moving in this direction. The U.S., for example, addressed the acid rain problem through an emissions trading system and the United Kingdom has a voluntary

emissions trading system that has recently gotten up and running, while Europe has proposed moving to a mandatory system by 2005 and has issued a directive laying out the key elements of the proposed system design. In Canada, Ontario has already introduced a similar system to reduce NOx emissions.

A DET system can be broad or narrow, in terms of the percentage of total emissions covered by the system. A "broad as practical" system could cover up to 80 per cent of Canada's total GHG emissions.

A decision needs to be taken with respect to the overall number of permits to make available in the DET system. There are also options with respect to how permits are allocated. They could be auctioned to the highest bidder or distributed free to participating firms. If distributed free, a decision would have to be made as to how many permits to allocate to specific firms and sectors.

The two main options for determining allocation are: distributing permits on the basis of historical emissions (sometimes called grandfathering); and allocating on the basis of output and emissions intensity.

Emissions trading systems are acknowledged to be among the most cost-effective approaches to reducing emissions. This is because, once the overall target has been set, market forces have free rein to find the lowest-cost means of meeting it. It also provides the link for the private sector to the international market for emissions permits, which could be an important factor for keeping overall costs down.

2. Targeted Measures

The second policy tool available to us involves the use of measures that target consumers or particular sectors to encourage them to employ the best technologies and utilize best practices. Such an approach is generally understood to be more expensive than DET. It would involve a broad range of policy instruments, including incentives, regulations or, possibly, fiscal measures. Some elements of this approach would appear to be part of the solution for all countries addressing climate change and would be a greater or lesser part of any approach for Canada.

3. Government Purchases of International Permits

Third, and finally, governments could purchase emissions permits on the international market under the Kyoto Mechanisms, primarily by investing in projects that reduce GHG emissions. There are two reasons why such purchases might be needed under a workable plan: either to help meet the overall climate change goal and ease the requirements sought under the previous two policy instruments or to help manage the risks in any plan, as is described below. Ensuring clear and pragmatic rules for the operation of the Kyoto Mechanisms was part of Canada's success in negotiating the details of the Protocol in Bonn and Marrakech last year.

There are trade-offs to consider in the use of the international market for emission permits. While it provides a cost-effective way to meet our climate change goals, it also means that there are fewer emissions reductions made in Canada, with the loss of co-benefits such as cleaner air and domestic investment in state-of-the-art technologies. For these reasons the Government of Canada would want to ensure it maximizes other policy goals should it make significant investments in the Kyoto Mechanisms. In particular, in acquiring these permits, the Government of Canada could be guided by the following principles:

- Use will be made of all the Kyoto Mechanisms, with a particular focus on the Clean Development Mechanism and Joint Implementation, consistent with Canada's overseas development goals as well as the sustainable development objectives of the host country.
- Links will be made to trade promotion and innovation. For example, when Canada invests in CDM projects, lower emissions could be achieved through the use of better technology provided by Canadian companies. Canadian firms, in turn, could be encouraged to develop leading-edge technology that can be used in such projects.
- Canada may need to consider the purchase of surplus carbon permits from other countries and how those surplus permits could be made environmentally friendly or "greened".

What are "greened" surplus permits? *Since establishing their Kyoto targets, countries such as Russia and Ukraine have seen their economies contract to such an extent that they find themselves with excess permits for sale on the international market. These permits become "greened" if the country selling them agrees to spend the proceeds on new emission reduction projects.*



Managing Risks

Developing policy options to address an issue as complex as climate change requires that a number of assumptions be made. While these are necessary for planning purposes, any “surprises” will affect outcomes and should therefore be identified at the outset.

There are three major risks facing the options discussed in this paper. The first is that the size of the “gap” identified earlier could become greater if the economy grows faster than expected, thus producing more GHG emissions. The gap could also increase if new projects, not included in the assumptions, were to come into operation.

Second, the current and proposed measures to reduce GHG emissions might not work as well as planned, requiring additional action to achieve the target.

Third, while the weight of evidence suggests that the international price of carbon permits will be at the low end of the \$10 to \$50 per tonne range, should the experts be proved wrong and the price end up being higher, the costs of addressing climate change will also increase.

Each of these three risks must be addressed by governments and by the private sector if we are to have a workable plan for achieving Canada's climate change commitments.

With respect to the first two, the issue is one of quantity — how much emissions reduction is required or achieved. Starting early is one way to address this issue. Actual operating experience with new or enhanced policies or programs will enable governments to make timely, phased-in adjustments to policy design if necessary. For example, regulations could be gradually strengthened

*The **international price of carbon** is the price that would be set in the international market for emissions permits that will be created by the Kyoto Mechanisms. Since it is impossible to know now what the international carbon price will be in 2008-2012, it is important that an approach to meeting our Kyoto targets work under a possible range of international carbon prices.*

Canada is generally expected to be a net purchaser of international permits, so the international carbon price is an important factor in determining our overall costs. In the analysis reported in Appendices I and II, the AMG estimated the economic impacts under two price scenarios — \$10/tonne and \$50/tonne in Canadian dollars (Cdn\$). There is good reason to believe that the \$10/tonne scenario is the more likely one. For example, in 29 recent international studies of the price of carbon only four showed estimates as high as Cdn\$50. Of 12 estimates used by other countries only one was as high as Cdn\$50. The average price expectation of experts from 34 international companies is under US\$11. International permits are currently trading at a price of less than US\$8/tonne, although it is still a very young and thin market. The World Bank has estimated that there are available emissions reduction projects in developing countries that would generate credits amounting to many times Canada's total emissions gap at a price of US\$3 to \$4.

For planning purposes, therefore, it is reasonable to assume an international carbon price in the area of Cdn\$10/tonne. However, the estimates that have been produced using a price assumption of Cdn\$50 are useful in indicating potential impacts in a worst-case scenario. Moreover, it is important for the government and the private sector to manage the risk that the carbon price could be higher than Cdn\$10/tonne through hedging strategies. Accordingly, the AMG estimates based on both Cdn\$10 and Cdn\$50 are included in Appendix I.



or incentives and grant programs expanded or increased. Funds can be shifted from programs that are less successful to others that are achieving more than expected. As a final backstop, the Government of Canada could purchase carbon permits in the international marketplace. A purchase in the order of 30 MT per year would provide more than a 10 per cent margin of error on the estimated gap of 240 MT.

These purchases could be made late in the Kyoto commitment period (2011-12) or shortly after it is over and would be purchased at the best available price at the time they are needed.

Alternatively, the Government could enter the international market much earlier and build up a contingency reserve that could be sold at a later date if not needed. This approach would enable the strategic pursuit of CDM and JI investments in support of international development and export promotion policies.

To manage price risk, the Government of Canada would like to develop a hedging strategy in consultation with provinces,

territories and the private sector. This strategy could include the purchase of options, the use of forward contracts or other means.

Such a strategy will involve a variety of instruments that provide international carbon permits at a range of prices consistent with the possible risks. To the extent practical, the Government of Canada would prefer that these international permits come from CDM and JI projects.

It should also be noted that all of the countries that are working to reach their Kyoto commitment will face these same issues of quantity and price. Very few are close to their target and some are expected to make considerable use of the international market. This suggests that Canada could expect to find common cause with other countries to launch an international dialogue to address the incompatibility of high prices and reasonable short-term action to address climate change should such a situation emerge.



An appropriate policy addressing climate change would balance a number of policy objectives. These include:

- Achieving Canada's climate change goal under the Kyoto Protocol, with the majority of our effort through domestic actions and initiatives;
- Helping Canadian industry make a successful transition to a less carbon-intensive economy while remaining competitive in the global marketplace, especially vis-à-vis the United States;
- Seeking an equitable sharing of benefits and burdens, with no region asked to bear an unreasonable burden;
- Ensuring cost effectiveness;
- Applying the principle that "the polluter pays", to the extent practical; and
- Ensuring consistency with other national policy goals and objectives, including promoting cleaner air, fostering innovation and developing a competitive advantage in the knowledge economy.

Meeting all of these objectives to an acceptable level will require a balanced, careful approach. In some cases, trade-offs will have to be made among these objectives to develop a workable plan for achieving Canada's climate change goals. Input from provinces and territories and the views of stakeholders and Canadians on how these trade-offs should be made will be important.

The Government of Canada has considered four options and evaluated how each could be employed. Two of the options, Options 1 and 3, are hypothetical policy options that are the only two which have been modelled by

the AMG so far. The options and results are included even though the impacts suggest that these approaches would likely need some design changes to meet the policy objectives laid out above. Some suggestions as to how this could be achieved are provided.

In addition, the modelling was based on assumptions that would overstate the impacts overall. In particular the AMG work did not take account of:

- emissions reductions that will be achieved from government programs outside of Action Plan 2000 and Budget 2001. These include Canada's investment in the World Bank Prototype Carbon Fund, Technology Early Action Measures Program, Technology Partnerships Canada, the Sustainable Development Technology Fund and the Infrastructure Programs.
- emissions reductions achieved through the efforts of provinces, territories and municipalities. There is a wide range of initiatives described in the First National Business Plan and other orders of government are continuing to build on this effort to fight climate change. In addition, 100 municipalities are members of Partners for Climate Protection and are committed to significant emission reduction goals; and
- the 70 MT of credit for cleaner energy exports that Canada is requesting in the international negotiations.

As noted in the descriptions of Options 1, 2 and 3, it would be possible to take the 70 MT of credit for cleaner energy exports into account and adjust any of those policy designs in the future.

The AMG work provides informative insight into how alternative policy instruments could work and where future policy design efforts might wish to focus attention. Option 4 suggests a mixed approach that takes account of the learnings from the AMG analysis done to date as well as explicitly factoring in the 70 MT of additional credits described above. It is an option that could be modelled over the summer months if the input and advice from consultations confirm that it is an approach that holds promise as the basis of developing a workable plan.

OPTION 1: BROAD AS PRACTICAL DOMESTIC EMISSIONS TRADING

The first option would involve the use of a “broad as practical” DET system.

Such a system would require fossil fuel suppliers, such as refiners, natural gas distributors, coal mines and fossil fuel importers, to hold permits equivalent to the CO₂ emissions resulting from the combustion of the fossil fuels they sell.

As well as applying to fossil fuels, the permit system would also cover non-combustion process emissions (e.g., from cement production).

Because the permit requirement would be applied “upstream” in the production chain, it would “catch” a large percentage of Canada’s GHG emissions — in the order of 80 per cent. For example, emissions from personal transportation and home heating would be included. Approximately 100 to 500 firms would participate directly in the system.

The broad coverage means this approach to emissions trading provides the most certainty with respect to meeting emission targets. As with other variants of emissions trading, however, the price of permits is uncertain.

Because the permits would have value in either the domestic or international market, this type of DET system would drive the price of fuel up in the domestic market. Equity considerations would, therefore, likely require that permits in a “broad as practical” approach be auctioned by the government rather than distributed for free. Otherwise, fossil fuel suppliers would experience a large gain in revenues and profits (as economists predict that prices will go up more than supply goes down).

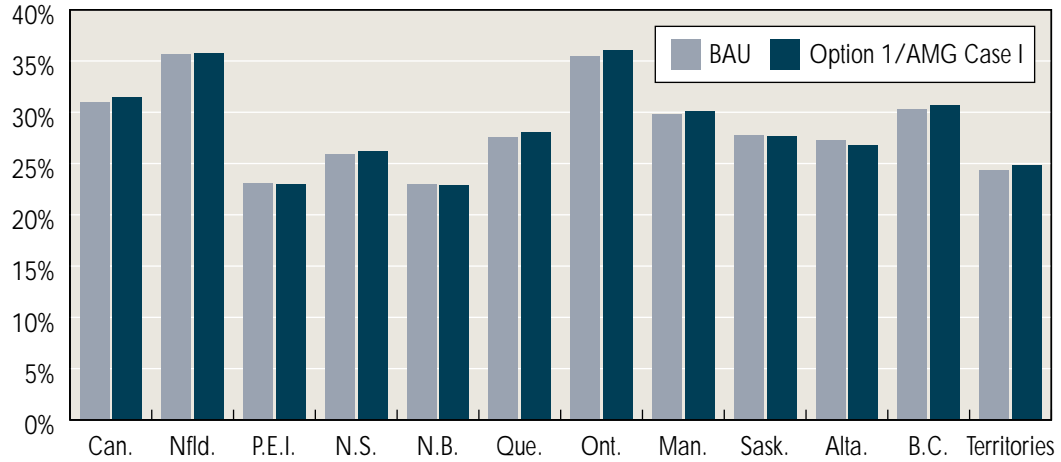
Auctioning the permits would result in increased revenues for government. The revenues involved would be large — about \$4.5 billion annually if the permit price is \$10/tonne. These revenues could be returned into the economy in any number of ways.

Higher consumer prices are an inevitable consequence of a “broad as practical” approach; it is these increases in prices which generate the desired emissions reductions.

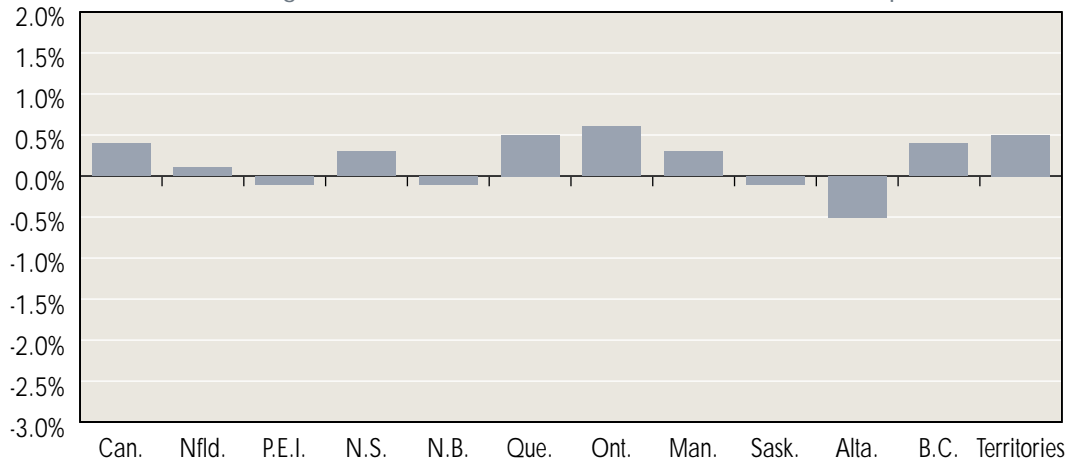
This is one of the hypothetical policy approaches modelled by the AMG. The results from the most recent analysis are shown in Chart 1 below and summarized in terms of the sources of emissions reductions in the table which follows.

It should be noted that the overall impact of this approach would be reduced by taking into account the 70 MT in credits that Canada is requesting for cleaner energy exports.

Total Increase in GDP (2000-2012) Relative to Business-as-Usual



Per Cent Change in GDP in 2012 between Business-as-Usual and Option 1



Summary of Option 1 – Broad as Practical DET System

Meeting Canada's Climate Change Goal		
The Gap		240 MT
Current Actions and Credits		74 MT
<i>AP 2000/Budget 2001</i>	<i>50 MT</i>	
<i>Sinks</i>	<i>24 MT</i>	
New Actions		166 MT
<i>DET</i>	<i>144 MT</i>	
New reductions	16 MT	
Private sector purchases of international permits	128 MT	
<i>Targeted Measures: Technology, Strategic Investments and Best Practices</i>	<i>22 MT</i>	
Managing Risk:		
Incremental government purchases of international permits		0-30 MT

Note 1: The modelling work did not distinguish between current actions and credits and new actions. However, this table breaks out the 50 MT from Action Plan 2000 and Budget 2001 as a separate item, with 80 per cent of those emissions reductions assumed to have occurred in the DET sector.

The modelling suggests that an approach to emission reductions focused on a “broad as practical” DET system would lead to the least overall economic impacts of any approach — or even lead to an increase in economic activity because of the recycling of revenues to consumers.

However, there are three important drawbacks.

First, the results indicate that there could be significant negative economic impacts on some provinces. This is largely because of the increased cost of fuel inputs to emissions-intensive industries such as oil sands and coal-fired electricity generation. The uneven impact needs to be considered in view of First Ministers’ commitment that no region would bear an unreasonable burden.

The manner in which the revenues from auctioning permits are recycled plays a critically important role in determining the overall level and distribution of impacts. The AMG modelling recycled the revenues by reducing personal income taxes. Governments could elect to recycle these revenues back into the economy through cuts

in personal or corporate income taxes or to help in the adjustment to cleaner energy, and do this in a way that is tailored to favour those provinces or sectors which would be hardest hit by the option.

Second, this option will generally have the greatest impacts on consumer prices of energy (see Chart 3 in description of Option 3 for energy price impacts). The modelling results indicate that the average price of electricity could increase by about six per cent, while the price of natural gas and gasoline could each increase by about two per cent. The impacts on individual Canadians, particularly those with low incomes or living in rural areas, and on energy-consuming businesses are of concern.

Third, looking at the sources of emission reductions, of note is the large use that the private sector would make of the international market for emission permits. At \$10/tonne these purchases constitute an annual \$1.28 billion investment overseas. The private sector would make these purchases because it is cheaper than finding additional emissions reductions at home.

This option therefore raises the question of whether international purchases of this magnitude are the best strategy for Canada because it is the least costly or whether we would not be better off spending somewhat more at home to upgrade our capital stock and thereby also reap the associated environmental, health and other co-benefits.

The “broad as practical” DET system is described in this Paper because the AMG work indicates it could be the lowest-cost approach.

OPTION 2: ALL TARGETED MEASURES

The second option is to achieve our climate change commitments entirely through a broad range of policy instruments, including incentives, covenants, regulations and, possibly, fiscal measures. It would employ the best available technology, make strategic investments and utilize best practices. The hallmarks of any successful approach to addressing climate change in Canada will be extensive federal-provincial-territorial co-operation and collaboration and many public-private partnerships. However, this is particularly the case in an “all targeted measures” approach. Rather than being driven by market forces, it is built around government programs or initiatives, many of which would be the responsibility of provincial governments.

The menu outlined below — and described in more detail in Appendix II — contains measures that are estimated to result in about 155 MT in domestic emissions reductions, including the effect of Action Plan 2000 and Budget 2001. Allowing for our potential sinks credits and credits for cleaner energy

exports, there are more measures than are needed to achieve our Kyoto target, so choices will have to be made about the most appropriate measures to implement.

The Government would like advice from provinces, territories and stakeholders on what those choices should be and invites provinces and territories to indicate those measures that they would propose to implement as a contribution to achieving the overall goal. For each sector, we would welcome suggestions from those involved as to how each could contribute and what choices would make the best policy sense for their particular sector. We will also want to consider whether any measure could achieve more than suggested, or if the goal set out is unreasonably burdensome. The measures and estimates set out in Appendix II draw heavily on the work of the 16 NCCP Issue Tables and subsequent analysis and studies by AMG and others.

Some of the possible measures could be quite expensive relative to opportunities for reductions in other areas or the possible range of international permit prices. But these measures can often achieve a number of public policy goals at the same time, such as cleaner air or more liveable (and, therefore, competitive) cities. Indeed, it could often be the case that it would make sense to implement a measure regardless of our climate change objectives and precisely for the other benefits it provides. In this sense, cost-benefit analysis may be more favourable than climate change consideration alone would suggest. Moreover, encouraging innovative solutions in these sectors would contribute to Canada's overall innovation agenda and enhance our competitive position in the knowledge economy.

The following sectors would be covered:

- Electricity;
- Oil and gas;
- Transportation;
- Buildings;
- Industry;
- Municipalities;
- Aboriginal and Northern communities; and
- Agriculture and forestry.

What follows is a brief overview of the key potential measures in each sector.

Electricity

In the electricity sector, the strategy would focus on: zero- or low-emission technologies for new generating capacity, reducing emissions from existing generating stations, expanding east-west transmission systems, increasing hydraulic generation and developing and commercializing technologies for clean coal combustion and CO₂ capture and storage, particularly from coal-fired generation. Provincial governments play a large role in setting these types of policies and will want to indicate the steps they think should be taken and the results that could be achieved through a targeted measures approach. Communities can benefit from cleaner air.

Oil & Gas

In the oil and gas sector, the strategy would focus on reducing leaks from natural gas production, processing, transmission and distribution, as well as CO₂ capture and storage from oil sands production and upgrading.

Industry

In the industry sector, the strategy would focus on maximizing the take-up of the most efficient equipment (pumps, motors, conveyors, etc.) throughout industry and accelerating the turnover of large capital stock to more efficient state-of-the-art technologies.

Transportation

Overall, the objective in this sector would be to improve the fuel efficiency of vehicles, develop more GHG-efficient fuels and improve both passenger and goods transportation. The measures listed below will also contribute to cleaner air, making our cities healthier and more liveable. Some of the best tools to implement these measures rest with the provinces and municipalities and their views on priorities and where they would like to act are being sought.

Key measures could include:

- Improving new vehicle fuel efficiency;
- Requiring a greater portion of gasoline in Canada to contain ten per cent ethanol;
- Encouraging production of bio-diesel fuel;
- Increasing parking fees in major urban centres, introducing tolls on major highways and enforcing current speed limits;
- Investing in public transit infrastructure;
- Expanding urban showcase renewal;
- Encouraging take-up of best practices, alternative fuels, anti-idling technology and replacement of older vehicles in the goods transport industry;
- Providing energy efficiency rebates for light-duty vehicles; and
- Linking rail and road systems.

Buildings

Buildings — both residential and commercial — contribute approximately ten per cent of the total GHG emissions in Canada by burning fossil fuels to generate heat and by consuming electricity for light and power.

The greatest immediate potential to reduce GHG emissions is through improving the energy efficiency of existing houses and buildings. Over the long term, however, the most cost-effective approach lies in new construction, by building to the most energy-efficient level possible.

In addition to GHG reductions, actions in these areas would result in substantial benefits to Canadians, including greater home comfort, buildings and homes that are healthier for our families and dollar savings.

Key measures in this sector could include:

- Requiring that all new homes meet R2000 standards by 2010;
- Requiring that all new buildings exceed the Model National Energy Code by 2010;
- Providing incentives to accelerate retrofits on existing buildings so that one-fifth of the entire housing and building stock is upgraded by 2010; and
- Requiring that all space and water heaters using fossil fuels attain technically feasible performance levels by 2010.

As with transportation, some of the best tools to implement the measures in this sector rest with the provinces and municipalities and their proposals for action are invited.

Municipalities

Municipalities have the potential to be both partners in our national efforts and leaders in community activities. As the level of government closest to Canadians, they are directly involved with many of the daily activities that contribute to GHG emissions. More than 100 municipal governments in Canada have already assumed reduction targets as members of the Partners for Climate Protection program. The Green Municipal Enabling Fund and Green Municipal Investment Fund, managed by the FCM, have already put in place projects that address waste diversion, energy and water use, urban transit and renewable energy.

In addition, municipalities have an important role to play in urban development and planning. Municipal governments recognize that their facilities, infrastructure, lands and resources are at considerable risk from the effects of climate change. At the same time, they recognize that taking action on climate change supports many of their objectives for sustainable community development, cleaner air and economic development.

By taking action now, municipalities can preserve the quality of life in their communities, remain economically competitive and protect the health of their citizens.

Key targeted measures involving municipalities could include:

- Using waste heat for community energy systems;
- Capturing and utilizing landfill gas emissions; and
- Improving the planning capability of municipalities with respect to environmental issues.

Aboriginal and Northern Communities

In Aboriginal and Northern communities, the focus could be on providing incentives for greater energy efficiency and promoting renewable energy initiatives.

Reducing GHG emissions can benefit Northern and Aboriginal communities through improvements to their environment, health and economy. Climate change is already having an impact on the fragile northern environment and those communities, primarily Aboriginal, that depend on traditional lifestyles. Special attention needs to be directed to Northern and Aboriginal communities to develop mitigation and adaptation strategies that reflect their unique challenges.

Agriculture and Forestry

Agriculture and forestry are unique sectors in that both have the potential to remove CO₂ from the atmosphere. Sustainable agricultural practices improve the capacity of soils to retain or absorb CO₂, while forests remove and store large amounts of CO₂.

Agriculture and forestry account for about 10 per cent of Canada's GHG emissions but, unlike other sectors, these emissions are almost completely from non-energy sources. Nitrous oxides from fertilizers and manure and methane from livestock account for 96 per cent of agriculture's GHG emissions.

Targeted measures in the agricultural sector could include:

- Providing rebates on soil testing and one-time payments to change fertilizer application;
- Encouraging conservation tillage through incentive payments;

- Improving grazing management by providing incentives to bring more land under improved management regimes; and
- Reducing nitrous oxide emissions from livestock by providing some reimbursement of the cost of feed analysis.

In the forestry sector, the primary objective is afforestation in rural areas using fast-growing species. Key targeted measures in the forestry sector include:

- Investing in fast-growing species; and
- Developing an expanded forest carbon measurement and monitoring system to meet international reporting standards.

These measures encourage the adoption of best management practices that reduce GHG emissions and that also have economic benefits. For example, producers can lower crop production costs and reduce GHG emissions by improving the efficiency of fertilizer use. Such measures can be an important step towards the goal of making Canada first in the world for environmentally responsible agriculture, agri-food and forestry production. They can also contribute to improving the forest and agricultural sectors' international competitiveness, through new sustainable fibre supply, and could diversify rural economies by providing new opportunities for farmers.

Summary

The table below summarizes the potential contribution from targeted measures. In using a targeted measures approach, choices would have to be made about the emissions reduction target for each sector and the measures best suited for achieving that target, while putting Canada on the long-term path required in that sector. As noted above, this list of possible targeted measures is estimated to result in domestic emissions reductions of

about 155 MT. Factoring in 24 MT from sinks leaves a residual gap of about 62 MT, which could be closed through government purchases of international permits.

As noted at the beginning of this section, this option does not make allowance for the 70 MT in credits that Canada is requesting for cleaner energy exports. To do so would allow a more selective, less costly approach to implementing targeted measures.

This all targeted measures option is consistent with proposals made by several business organizations and allows for a great deal of flexibility to address concerns over regional impacts and competitiveness.

However, this option is the most expensive both in terms of overall economic impact and in costs to governments. There are a number of reasons for this. First, this approach requires many initiatives, likely by three different orders of government, with the associated administrative costs. And because it does not use market forces to find the

lowest-cost emissions reduction opportunities, it is inevitably a higher-cost approach than those based on emissions trading.

Second, compared to some other options, this approach likely involves less use of Kyoto Mechanisms, since it is difficult to design targeted measures that can accommodate private sector purchases of international permits. As a result, domestic reductions are being pushed to levels where the cost is significantly above the price at which permits are trading in the international marketplace. Canada worked hard in the international negotiations to ensure workable, effective Kyoto Mechanisms and this all targeted measures approach does not take advantage of the cost savings the international market can provide.

This option likely also provides the least certainty for meeting a target. The Government is interested in views about ways to reduce the costs (direct and administrative) and risks associated with this option while still achieving Canada's Kyoto target.

Summary of Option 2 – All Targeted Measures

Meeting Canada's Climate Change Goal:		
The Gap		240 MT
Current Actions and Credits		74 MT
<i>AP 2000/Budget 2001</i>	50 MT	
<i>Sinks</i>	24 MT	
New Actions		166 MT
<i>DET</i>	0 MT	
<i>Targeted Measures: Technology, Strategic Investments and Best Practices</i>	104 MT	
<i>Government purchases of international permits</i>	62 MT	
Managing Risk:		
Incremental government purchases of international permits		0-30 MT

OPTION 3: MIXED APPROACH – LARGE FINAL EMITTER DOMESTIC EMISSIONS TRADING

The third policy approach is a mix of DET, targeted measures and the government purchase of international permits.

Under this mixed approach, a different sort of emissions trading system would be introduced. In this case, permits would be allocated to so-called “Large Final Emitters” and the permit requirement would be applied directly to emissions, rather than to the fossil fuels whose combustion leads to emissions.

Because the permits would be directly applied to emissions, it would not be feasible for the system’s coverage to be as broad as in the “broad as practical” approach. For example, it would not be administratively feasible to apply the emissions requirement to cars and trucks. Therefore, only major industrial emitters would be included. The following sectors would be part of the system:

- Electricity (coal, oil and gas);
- Oil and gas production, including oil sands;
- Petroleum refining;
- Pipelines;
- Pulp and paper;
- Cement;
- Chemicals;
- Iron and steel, smelting; and
- Other industries.

The AMG examined a particular model for such a mixed approach. Under their model, the coverage of the emissions trading system was set at about 40 per cent of total emissions;

it is estimated that about 400 to 500 firms would be covered by such a system. The AMG modelled an approach to an output-based allocation system, whereby the allocation was related to emissions intensity and output. The target for the DET sector was set at a six per cent reduction from 1990 levels.

For those sectors not covered by a DET system, the AMG assumed the introduction of targeted measures that are cost effective up to \$50/tonne. This approach begins to address the issue of the high cost of some of the targeted measures noted under Option 2. Government purchases of international permits were used to fill the remaining emissions gap.

The AMG’s estimated economic impacts for Option 3 are summarized below in Chart 2. Compared to the results for Option 1, the results indicate a larger impact on GDP, both nationally and for vulnerable provinces. Also, compared to the results for Option 1, all provinces — not just those most affected — face a reduction in their GDP relative to business-as-usual levels. This raises the question of the consistency of the specific design of this option as examined by AMG with First Ministers’ commitment to ensuring no unreasonable regional burden.

Under this option, consumer fuel prices rise much less significantly than under Option 1, as shown below in Chart 3. This is because permits are not being placed on fossil fuel supply.

As noted at the beginning of this section, the modelling results make no allowance for the 70 MT in credits that Canada is requesting for cleaner energy exports.

CHART 2 Option 3: Mixed Approach GDP Impacts for Canada, the Provinces and Territories at \$10/tonne

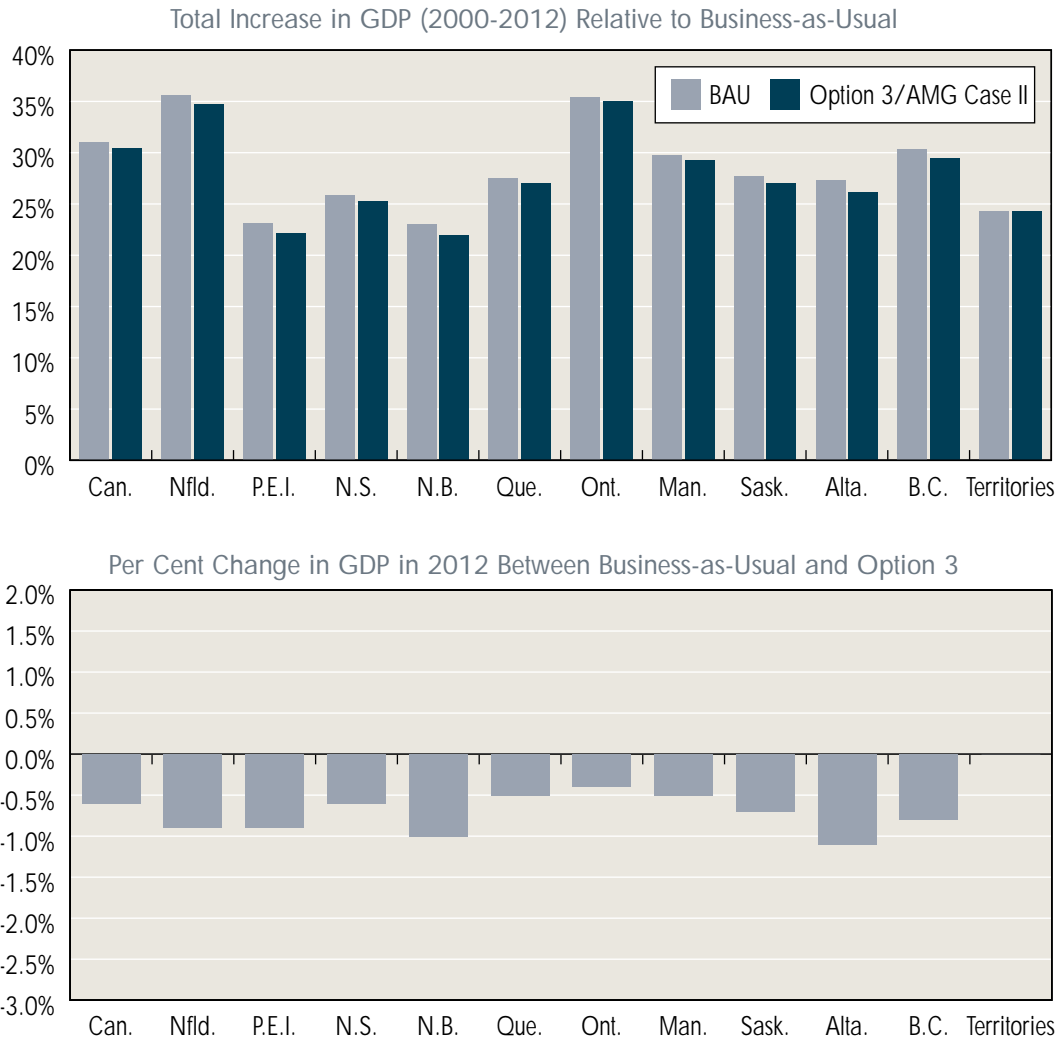
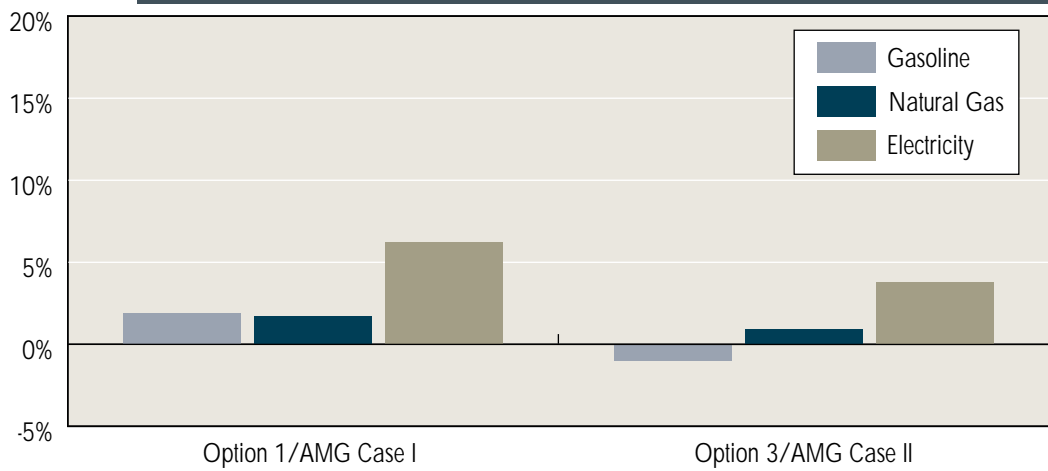


CHART 3 Per Cent Change in Consumer Energy Prices in 2010 Relative to Business-as-Usual at \$10/tonne



Summary of Option 3 - Mixed Approach
Large Final Emitter Domestic Emissions Trading System

Meeting Canada's Climate Change Goal:		
The Gap		240 MT
Current Actions and Credits		74 MT
<i>AP 2000/Budget 2001</i>	50 MT	
<i>Sinks</i>	24 MT	
New Actions		166 MT
<i>DET</i>	99 MT	
New reductions	23 MT	
Private sector purchases of international permits	76 MT	
<i>Targeted Measures: Technology, Strategic Investments and Best Practices</i>	25 MT	
<i>Government purchases of international permits</i>	42 MT	
Managing Risk:		
Incremental government purchases of international permits		0-30 MT

Note 1: The modelling work did not distinguish between current actions and credits and new actions. However, this table breaks out the 50 MT from Action Plan 2000 and Budget 2001 as a separate item, with 50 per cent of those emission reductions assumed to have occurred in the DET sector.

The above table summarizes the results of the AMG analysis of this option in terms of the sources of emissions reductions.

OPTION 4: ADJUSTED MIXED APPROACH

The fourth option would see a mixed approach similar to Option 3, but with some important differences.

First, and most importantly, the method for allocating permits would be specifically designed to ease competitiveness concerns for companies experiencing significant growth. As in Option 3, permits would be offered without charge in order to minimize the cost burden on participating firms and allocation would be linked to emissions intensity and output. However, the allocation approach would be different from that in Option 3, by involving consideration of a sector's capacity to reduce emissions at reasonable cost, and by ensuring that growing firms would see their permit allocation also grow. It should be noted that permit allocation would still be below business-as-usual (BAU) emissions —

perhaps equalling about 75 per cent of BAU emissions for the DET-covered sectors overall.

Second, firms participating in the emissions trading system would have the opportunity to purchase emission reductions or “offsets” from firms outside the trading system. This reduces the need for costly targeted measures in those “offsetting” sectors, and allows the power of the market to find the least-costly emissions reductions, both within the emissions trading system and outside of it.

What is an Offset? When a new technology is introduced or activity undertaken that reduces emissions, a credit, or “offset”, is created. The company can sell that offset in the emissions market, even if the company itself is not normally part of the trading system. For example, the mass planting of trees, which act as sinks, is an offset that could be traded to a company such as an oil refinery. An offset system will require the development of a system of measurement, monitoring, reporting and verification of reductions achieved.

This option would involve a somewhat broader coverage for the emissions trading system — covering about 42 per cent of Canada's GHG emissions — by including somewhat smaller firms. This broader coverage, while modest, would nonetheless help to improve the overall cost-effectiveness of the approach.

Third, while the choice of targeted measures would be based on cost considerations as in Option 3, Option 4 would also deliberately take into account the extent to which such measures could help achieve other economic, social and environmental goals (e.g., sustainable development in the agricultural and forestry sectors, cleaner and more livable cities and cleaner air). Achieving a multiplicity of public policy goals would be the driving force behind the measures selected.

Targeted measures may also be necessary where there is little or no interest in trading offsets or where there are other environmental

or economic reasons for governmental actions. In this instance, targeted measures would be used primarily to address gaps, if any, remaining after the offset market has had an opportunity to develop.

Finally, as has been suggested as an adjustment for all the options considered so far, it is proposed that this option be assessed under the planning assumption that Canada is successful in its request for the 70 MT that we are seeking in credits for cleaner energy exports.

Designed in this way, governments may need to purchase some international permits to meet Canada's climate change goals. In addition, some purchases could perhaps be important, as in all options, as part of the strategy for managing risks.

The following table summarizes this option in terms of the sources of emissions reductions.

Summary of Option 4 - Adjusted Mixed Approach		
Meeting Canada's Climate Change Goal:		
The Gap		240 MT
Current Actions and Credits		74 MT
<i>AP 2000/Budget 2001</i>	50 MT	
<i>Sinks</i>	24 MT	
Cleaner Energy Exports		70 MT
New Actions		96 MT
<i>DET</i>	55 MT	
New reductions	25 MT	
Offsets	20 MT	
Private sector purchases of international permits	10 MT	
<i>Targeted Measures: Technology, Strategic Investments and Best Practices</i>	25 MT	
<i>Government purchases of international permits</i>	16 MT	
Managing Risk:		
Incremental government purchases of international permits		0-30 MT

Note: The 50 MT from Action Plan 2000 and Budget 2001 are listed separately, with 50 per cent of those emission reductions assumed to occur in the DET sector.

Option 4 in Practice

What follows is a brief overview of how the fourth option might work in practice.

Element 1 - Domestic Emissions Trading

As noted, under the proposed DET system, permits would be distributed without charge to firms. Within the context of a set total allocation of permits to the DET system, the number of permits a firm receives would reflect several considerations, including: the emissions-intensity of the sector in question (more emissions-intensive sectors would receive more permits); growth in the firm's output (rapidly growing firms would receive more permits); and the cost of reducing emissions (sectors facing higher costs would receive more permits). For every tonne of GHG firms emit, they would hold one permit. An overview of the formula for allocating permits is contained in Appendix III.

A DET system with these features has the advantage of accommodating growth. It also recognizes the unique challenges facing emissions-intensive sectors, while taking into account the technological capacity of various sectors to reduce emissions. These advantages come at the price of complexity in design and the need to make what could be difficult decisions respecting the setting of the various parameters in the allocation formula.

It is expected that this option would provide a better result for rapidly growing, emissions-intensive industries than what has been modelled under Option 3 to date.

Companies participating in the DET system could also purchase offsets from sectors that are not part of the system. The sectors that are most likely to become involved in offsets include agriculture (through credits received for best practices in the management of soil, livestock and fertilizer), forestry (for

afforestation using fast-growing species) and municipalities (for the capture of landfill gases).

Offsets for the DET system are assumed to be in the order of 20 MT. In particular, the offset approach achieves the 15 MT that it has been estimated could be generated under targeted measures in these sectors and it is likely that a market-driven approach through offsets would be able to find at least five more MT in these areas.

To help moderate the costs for firms that are part of the DET system and to facilitate their purchase of offsets, the Government of Canada could consider measures that might facilitate the transition to low emissions-intensive technologies. The possibility of additional government purchases of international permits could also be considered. These would be additional adjustments to this approach in comparison to Option 3.

Element 2 - Targeted Measures

The second element in this option would be a selective approach to targeted measures so as to maximize the benefits for other public policy objectives. This might, for example, place an emphasis on deploying best available technology, on making strategic investments that better position Canada for large emissions reductions in the long term or on utilizing best practices that could create the market demand needed to enable green technology firms to grow. This approach would also place a priority on sustainable development objectives and, in particular, on achieving health and environment co-benefits and improving the overall quality of life. As in Option 3, such an approach would involve a broad range of policy instruments, including incentives, regulations and, possibly, fiscal measures.

The menu outlined in the description of Option 2 above — and described in more

detail in Appendix II — contains more measures than are needed to achieve the 25 MT of new reductions required under Option 4. Choices would have to be made about which measures to implement. The views of the provinces and territories on policy priorities and working together to identify and support the most strategic approaches will be critical. Municipal governments also are active in these areas and should contribute their suggestions, including how this approach could be integrated with the Green Municipal Funds. This approach is about the search for overall excellence, so the unique perspectives and potential contributions of business, environmental groups and others are also invited.

The following sectors would be covered:

- Transportation;
- Buildings;
- Industry not covered by the DET system (e.g., small and medium enterprises, consumer products); and
- Aboriginal and Northern communities.

There could also be targeted measures for municipalities, agriculture and forestry, if appropriate, to facilitate or complement developments under the DET offsets.

Option 4 Implications

This option has not been modelled to estimate its economic impacts. However, the design features of this option are specifically suggested so as to try to bring the overall impact on GDP below that estimated by AMG under Option 3. In addition, it is expected that the impact on the provinces would be more balanced than under Option 3.

This option would appear to have the potential to reduce Canada's GHG emissions in a reasonably cost-effective way and provides the flexibility to capture the ideas and contributions from the provinces, territories and stakeholders. It will be somewhat higher cost than it could otherwise be because of the particular approach of striving for multiple policy objectives for the targeted measures, and it would be important to attempt to assess qualitatively and quantitatively to the extent possible the overall benefits gained by Canada and Canadians as a result. Moreover, it would encourage action by industry and consumers, build partnerships and complement measures already undertaken by the provinces and territories to address issues of regional interest.

Finally, it would lay the foundation for long-term behavioural, technological and economic change, positioning Canada to develop a significant competitive advantage in the economy of tomorrow.

The Government is interested in receiving input on whether this option provides the basis for a workable approach to meeting Canada's Kyoto target.

This Discussion Paper will be considered in depth by federal, provincial and territorial energy and environment ministers at their meeting on May 21, 2002. There will be consultations with some 900 stakeholders in mid-June with day-long sessions planned in every jurisdiction in Canada — 14 meetings in all. The views of Canadians everywhere are welcome.

Following consultations, a preferred approach will be identified and a draft plan developed and analyzed over the summer.

Consultations on that plan will take place in the fall.

WE WANT YOUR VIEWS

WE INVITE YOUR COMMENTS ON THIS DISCUSSION PAPER. PLEASE SEND ALL CORRESPONDENCE TO:

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Ottawa, ON K1N 5M3*

*fax: 613-943-5811
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AMG Modelling Process and Results

The economic impacts of climate change policy were assessed by linking together a detailed energy-technology model (Energy 2020) and a macro-economic model (The Informetrica Model).

The Energy 2020 Model

Energy 2020 is a multi-sector analysis system that simulates the price, supply and demand for all fuels in the North American energy market — Canadian provinces and territories, U.S. states and, to a lesser extent, Mexico. It represents the economic decision-making involved in the production, conversion and consumption of energy products. Because Energy 2020 simulates how participants in an energy system make decisions, it can simulate how energy producers and consumers will respond to a wide variety of assumptions and policies.

Energy 2020 can determine energy output and prices for each sector, both in regulated and deregulated markets. In simulating business and consumer decision-making about energy and GHG reduction, this model takes account of both price and non-price considerations.

In short, Energy 2020 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 also considers the implications of combining multiple GHG reducing measures.

The model simulates the impact of changes in policy or market conditions against a reference case. The 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 macro-economic analysis, which assesses the impact of these investments as well as monetary flows on the whole economy.

The Informetrica Model

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 is a dynamic econometric model which demonstrates the interaction among demand, industrial performance, cost of production and price formation. It represents the spending of households, business and non-business. GHG reduction policies impact directly on business investment, consumption and other sources of demand. In turn, changes in the demand for materials and services by these businesses indirectly affect all other businesses. The consequent changes to the income of labour and business along this supply chain encourages further spending and results in a multiplier effect.

There are other factors influencing spending such as changes to the unit costs of production and climate change policies such as emissions trading. The prices charged by producers are detailed for various industries which, in turn, determine the prices of final demand.

TIM uses input-output tables to link final demands to industrial output, thereby

representing the interdependence of industries, and to determine the selling prices that are used in the calculation of final demand. The results from the energy-technology model are used to reflect changes in fuel-using technology.

TIM shows these effects as an “adjustment” over time and, as such, the system is not always in equilibrium. There may be periods of under/over-capacity, higher unemployment and imbalances in the Government’s current account. The AMG decided to use an econometric model that reflects the frictions and rigidities of the economy in order to provide insights to the adjustment path.

TIM has 750 categories of final demand and 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.

For this analysis, TIM uses the results from Energy 2020, in particular capital investment, energy savings and emission permit prices, as input to calculate the impacts on economic activity, competitiveness, trade and government fiscal position. Other information (e.g., cost to government, increased operating expenses) is also used.

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.

The Regional Informetrica Model (RIM) allocates the national results by province and territory. In the case of industrial goods and services, the provincial/territorial impact is determined by re-allocating the national estimate of final demand based on the share of industrial activity within a given province/territory.

In the case of non-industrial goods and services produced within a province/territory, the impact is based on local economic activity (income), demographics or other regional measures. In this analysis, the regional differences in electricity generation and other energy production are captured by detailed analysis from the energy-technology model.

Model Enhancement

As part of the AMG industry competitiveness consultations, the two models were reviewed and modified to incorporate the insights from industry representatives on industry dynamics and market behaviour. Modifications made to the AMG modelling framework include:

- Use of an integrated North American energy-technology model.
- The upstream oil and natural gas industry, the refined petroleum products industry, iron and steel and other commodity producers were assumed to be price-takers. This means that industry is assumed to be unable to pass on additional costs associated with climate change policies.
- For oil sands and frontier oil and gas production, supply varies in response to costs of production. In the case of oil sands, for example, a one per cent increase in costs leads to a three per cent decrease in production.
- Following the advice of the Canadian Petroleum Products Institute, reduced domestic demand for refined petroleum products is borne by domestic producers rather than by foreign suppliers.
- Following the advice of the Canadian Vehicle Manufacturers Association, it was assumed that an initiative to improve vehicle fuel efficiency without a similar initiative in the U.S. would come at a very high marginal cost.

**TABLE 1: Per Cent Change in Aggregate Indicators for Canada in 2012
Relative to Business-as-Usual**

	BAU Growth (2000-12)	Option 1/AMG Case I Broad as Practical		Option 3/AMG Case II Mixed Approach	
		\$10/tonne	\$50/tonne	\$10/tonne	\$50/tonne
Gross Domestic Product	31	0.4	0.1	-0.6	-1.7
Employment ('000)	13	0.5	0.5	-0.2	-0.9
Real Personal Disposable Income	67	1.3	3.3	-0.9	-2.4
Real Business Investment		1.5	2.2	0	0.2
Consumer Price Index		1.0	3.4	0.1	0.2
Energy Price Increase					
Gasoline		1.9	9.5	-1.0	-0.7
Natural Gas		1.7	7.1	0.9	1.9
Electricity		6.2	16.7	3.8	6.3

Note: Business-as-Usual (BAU) reflects the growth in economic indicators underlying the AMG reference case.

Note: The AMG estimated the economic impacts of climate change policy options under two scenarios for the international price of CO₂ - Cdn\$10/tonne and Cdn\$50/tonne. The \$10/tonne scenario is considered to be much more likely. The \$50/tonne scenario is included here for the purposes of risk analysis only.

**TABLE 2: Per Cent Change in Gross Domestic Product by Province and Territory in 2012
Relative to Business-as-Usual**

	BAU Growth (2000-12)	Option 1/AMG Case I Broad as Practical		Option 3/AMG Case II Mixed Approach	
		\$10/tonne	\$50/tonne	\$10/tonne	\$50/tonne
Newfoundland	35.6	0.1	-1.0	-0.9	-4.1
Prince Edward Island	23.1	-0.1	0.4	-0.9	-2.0
Nova Scotia	25.9	0.3	0.6	-0.6	-1.3
New Brunswick	23.0	-0.1	0.1	-1.0	-1.7
Quebec	27.5	0.5	0.7	-0.5	-1.0
Ontario	35.4	0.6	0.9	-0.4	-1.0
Manitoba	29.8	0.3	0.4	-0.5	-1.3
Saskatchewan	27.7	-0.1	-0.7	-0.7	-1.7
Alberta	27.3	-0.5	-3.7	-1.1	-5.3
British Columbia	30.3	0.4	0.7	-0.8	-1.7
Territories	24.3	0.5	0.5	0	-0.5
Canada	31.0	0.4	0.1	-0.6	-1.7

Note: The AMG estimated the economic impacts of climate change policy options under two scenarios for the international price of CO₂ - Cdn\$10/tonne and Cdn\$50/tonne. The \$10/tonne scenario is considered to be much more likely. The \$50/tonne scenario is included here for the purposes of risk analysis only.

**TABLE 3: Per Cent Change in Gross Domestic Product by Sector in 2012
Relative to Business-as-Usual**

	BAU Growth (2000-12)	Option 1/AMG Case I Broad as Practical		Option 3/AMG Case II Mixed Approach	
		\$10/tonne	\$50/tonne	\$10/tonne	\$50/tonne
Coal Mining	25.0	-5.8	-26.9	-5.5	-26.6
Oil & Gas Production	26.9	-2.3	-10.7	-2.6	-11.9
Refining	12.5	-4.5	-6.4	-7.3	-6.8
Gas Distribution	31.8	-6.2	-9.8	-9.3	-10.4
Pipelines	29.6	-2.2	-6.2	-4.1	-7.7
Electric Utilities	23.2	-7.6	-15.6	-6.7	-14.7
Wood & Paper	22.0	0.6	0.4	-0.2	-0.3
Chemicals & Chemical Products	47.5	0.4	-1.1	0	-0.2
Metallic Minerals & Products	32.1	0.4	-2.0	0.7	0.5
Machinery & Equipment (non-electrical)	62.0	1.5	-2.1	3.7	3.3
Transportation Equipment	27.7	0.2	0	0.6	0.7
Electrical & Electronic Components	48.3	2.2	5.0	-0.5	1.3
Construction & Related Activities	20.0	0.5	-0.4	-1.9	-2.8
Business-related Services	43.1	0.7	1.2	-0.4	-1.2
Consumer Goods & Services	30.5	1.2	2.2	-0.4	-1.3
Government & Social Services	19.5	0.2	0.6	0	-0.1

Note: The AMG estimated the economic impacts of climate change policy options under two scenarios for the international price of CO₂ - Cdn\$10/tonne and Cdn\$50/tonne. The \$10/tonne scenario is considered to be much more likely. The \$50/tonne scenario is included here for the purposes of risk analysis only.

**TABLE 4: Emissions Reductions by Province and Territory in 2010
Relative to Business-as-Usual — Megatonnes of CO₂ Equivalent**

	BAU Growth (2000-12)	Option 1/AMG Case I Broad as Practical		Option 3/AMG Case II Mixed Approach	
		\$10/tonne	\$50/tonne	\$10/tonne	\$50/tonne
Newfoundland	13.9	0.8	1.7	1.1	1.9
Prince Edward Island	3.0	0.1	0.2	0.2	0.2
Nova Scotia	21.1	1.3	2.2	1.6	2.3
New Brunswick	23.9	2.9	4.8	2.8	4.0
Quebec	95.7	7.6	10.2	10.1	12.3
Ontario	225.6	25.8	41.6	29.4	43.1
Manitoba	22.5	1.7	2.6	2.2	2.9
Saskatchewan	64.0	2.8	7.0	3.6	7.0
Alberta	262.7	20.8	69.9	21.9	70.4
British Columbia	73.8	6.1	10.4	7.7	11.0
Northwest Territories	1.9	0.2	0.3	0.3	0.3
Yukon	0.6	0.1	0.1	0.1	0.1
Nunavut	0.5	0	0.1	0.1	0.1
Sinks		34.1	34.1	34.1	34.1
Canada	809.0	104.2	185.2	115.2	189.8

Note: The AMG estimated the economic impacts of climate change policy options under two scenarios for the international price of CO₂ - Cdn\$10/tonne and Cdn\$50/tonne. The \$10/tonne scenario is considered to be much more likely. The \$50/tonne scenario is included here for the purposes of risk analysis only.

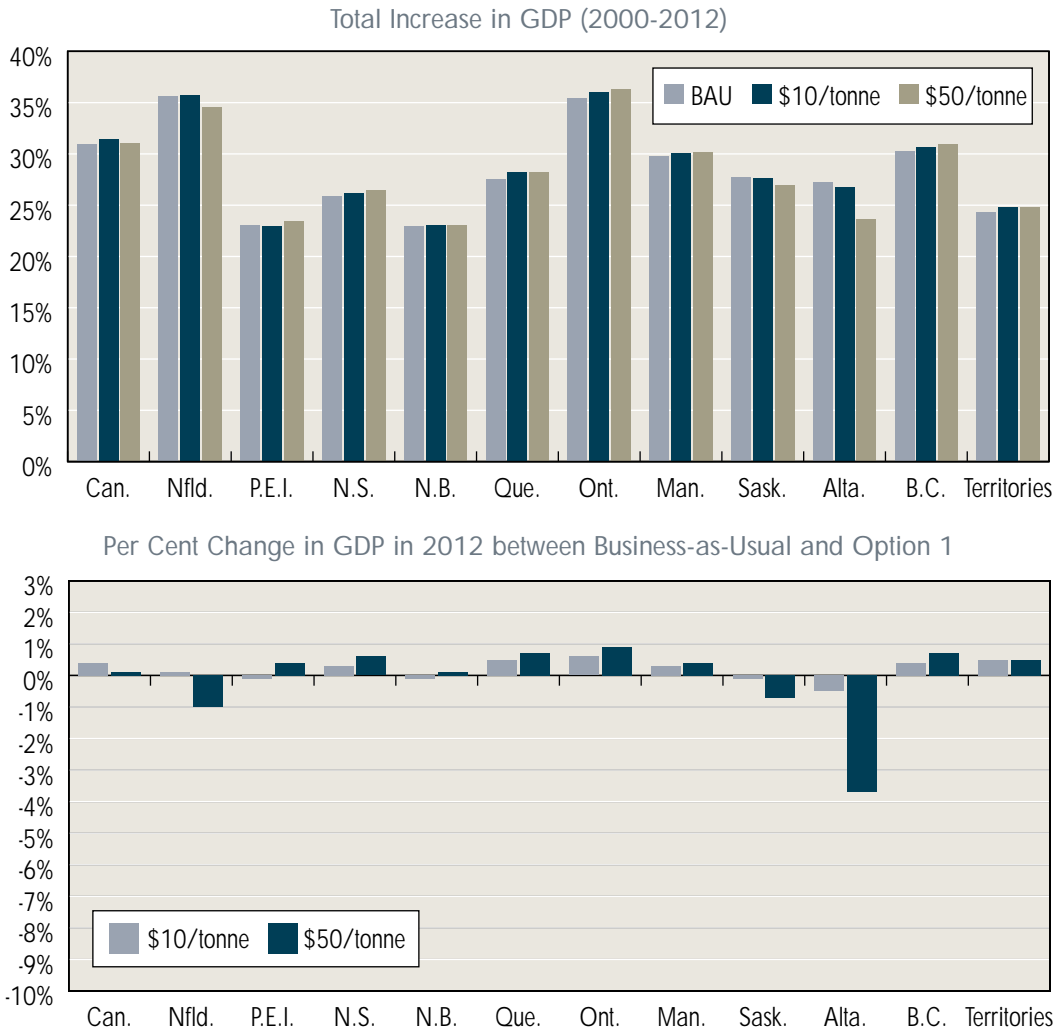
**TABLE 5: Emission Reductions by Sector in 2010
Relative to Business-as-Usual — Megatonnes of CO₂ Equivalent**

	BAU Growth (2000-12)	Option 1/AMG Case I Broad as Practical		Option 3/AMG Case II Mixed Approach	
		\$10/tonne	\$50/tonne	\$10/tonne	\$50/tonne
Residential	49.1	2.1	3.0	4.1	4.1
Commercial	35.4	2.1	4.0	2.1	2.0
Industrial	134.0	10.3	18.1	9.3	15.3
Transportation	205.0	10.3	14.1	26.9	30.6
Electricity	130.6	29.8	69.6	23.8	64.2
Fossil Fuels	142.4	12.3	34.3	11.4	32.6
Agro-ecosystems	69.9				
Landfill	24.0				
Others	18.7				
CO ₂ Capture and Storage		3.5	7.9	3.5	7.9
Sinks		34.1	34.1	34.1	34.1
Total	809.0	104.5	185.2	115.3	190.9

Note: The AMG estimated the economic impacts of climate change policy options under two scenarios for the international price of CO₂ - Cdn\$10/tonne and Cdn\$50/tonne. The \$10/tonne scenario is considered to be much more likely. The \$50/tonne scenario is included here for the purposes of risk analysis only.

CHART A.1

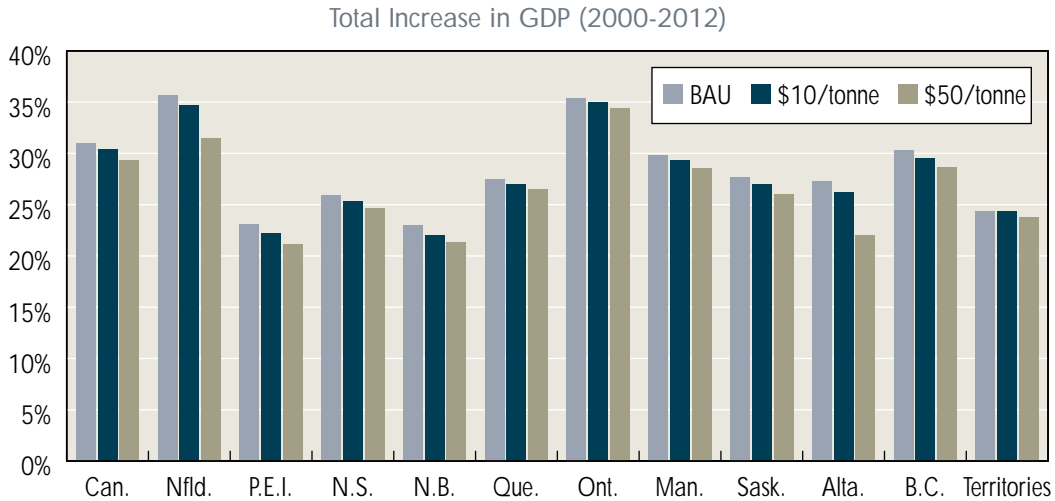
GDP Impacts for Canada and the Provinces and Territories for Option 1



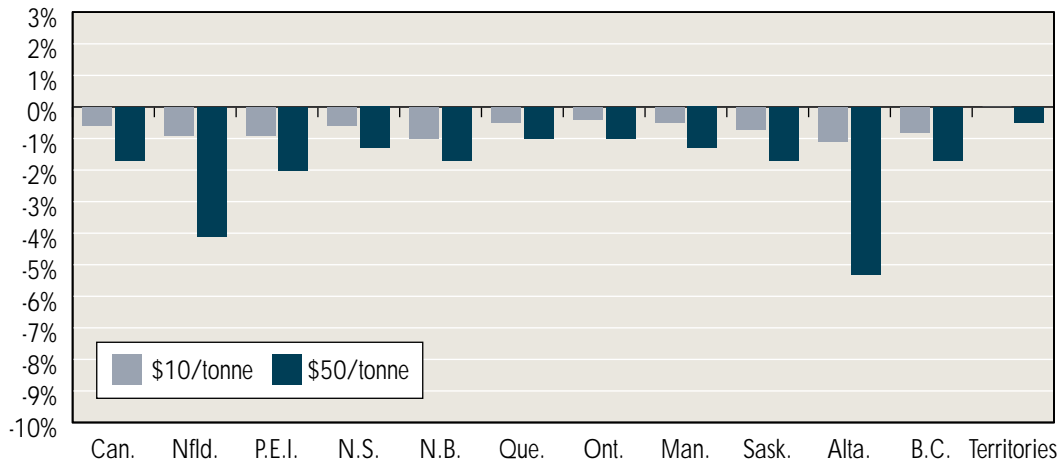
Note: The AMG estimated the economic impacts of climate change policy options under two scenarios for the international price of CO₂ - Cdn\$10/tonne and Cdn\$50/tonne. The \$10/tonne scenario is considered to be much more likely. The \$50/tonne scenario is included here for the purposes of risk analysis only.

CHART A.2

GDP Impacts for Canada and the Provinces and Territories for Option 3



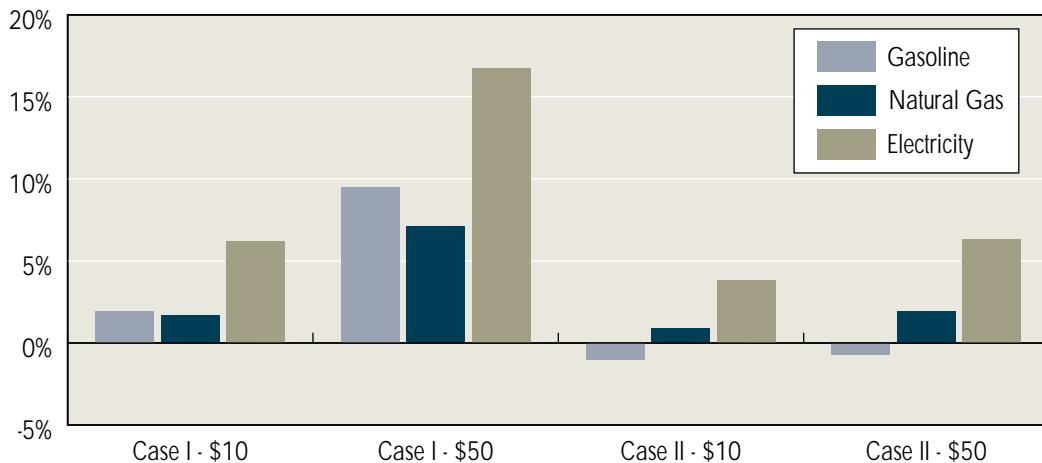
Per Cent Change in GDP in 2012 between Business-as-Usual and Option 3



Note: The AMG estimated the economic impacts of climate change policy options under two scenarios for the international price of CO₂ - Cdn\$10/tonne and Cdn\$50/tonne. The \$10/tonne scenario is considered to be much more likely. The \$50/tonne scenario is included here for the purposes of risk analysis only.

CHART A.3

Per Cent Change in Consumer Energy Prices in 2010 Relative to Business-as-Usual



Note: The AMG estimated the economic impacts of climate change policy options under two scenarios for the international price of CO₂ - Cdn\$10/tonne and Cdn\$50/tonne. The \$10/tonne scenario is considered to be much more likely. The \$50/tonne scenario is included here for the purposes of risk analysis only.

Description of Targeted Measures for All Options

Targeted measures refer to a broad range of policy instruments, including incentives, covenants, regulations and, possibly, fiscal measures. The menu which follows describes potential targeted measures that could be used as elements for all options. They draw heavily on the work of the 16 NCCP Issue Tables and subsequent analysis and studies by AMG and others.

The menu contains measures that are estimated to result in emissions reductions up to the order of 155 MT, including the effect of Action Plan 2000 and Budget 2001. This is more than would be needed, so choices will have to be made about the most appropriate measures to implement. In fact, some of the measures on this menu are alternatives to one another and it might not be appropriate to implement one if the other was considered prospective. The Government wants advice from provinces, territories and stakeholders on what those choices should be and invites provinces and territories to indicate those measures that they would propose to implement as a contribution to achieving the overall goal.

Note that the emissions reductions identified for each measure should be considered indicative, since the specific amount of emissions reductions that would come from any specific measure or package of measures is dependent on the measures chosen. For instance, selecting measures from the menu to reduce emissions from the electricity sector may alter the amount of emissions-reduction potential from other choices in the menu, such as those related to more energy-efficient equipment.

Some elements of this approach would appear to be part of the solution for all countries addressing climate change.

*For example, the U.S. **Energy Policy Act of 2002**, which was recently passed in the U.S. Senate, contains close to 200 targeted measures, including programs, tax incentives, research initiatives and regulations, that affect a broad range of sectors, from electricity to transportation to oil and gas.*

Examples of the measures being considered by the U.S. in this

Act include:

- *devoting US\$1.8 billion from fiscal years 2003-2011 to coal-based projects, including carbon capture and sequestration.*
- *funding for energy research and development programs, including energy-efficient housing and industrial and transportation energy efficiency, is set at \$700 million in fiscal year 2003, rising to \$983 million in fiscal year 2006;*
- *many measures, such as: a proposed regulation forbidding truck idling for more than 15 minutes; a national Green School Bus pilot program with up to \$40 million in grants by 2006; and \$225 million for the expansion of research and development on hybrid electric and fuel cell vehicles; and*
- *the establishment of the Office of Climate Change Technology within the Department of Energy. The Office will have a total budget of US\$4.75 billion from fiscal years 2003-2011, to manage an energy technology research and development program that directly supports a new climate change strategy.*

For each sector, we would welcome suggestions from those involved as to how each could contribute and what choices would make the best policy sense for their

particular sector. We will also want to consider whether any measure could achieve more than suggested, or if the goal set out is unreasonably burdensome.

Buildings			
	GHG reduction in 2010 (MT CO ₂ equ.)	Jurisdiction	Policy Instrument
Existing Housing: Accelerate the energy efficiency retrofit (envelope upgrades and fossil fuel space and water heating equipment) of 20% of the housing stock in 2012.	1.5	federal / provincial	incentive
New Commercial Buildings: Increase the number of buildings built to be at least 25% better than the existing Model National Energy Code for Buildings level, so that by 2012 all new construction is to that level.	0.4	federal/ provincial/ municipal	incentive/ regulation
New Housing: Increase the construction of houses built to the R2000/EnerGuide for Houses 80 level, so that by 2012 all new homes are built to that level.	0.4	federal/ provincial/ municipal	voluntary/ regulation/ incentive
Existing Commercial Buildings: Stimulate and accelerate significant energy efficiency envelope and HVAC retrofits, and fuel switching of fossil fuel space and water heating equipment to at least 20% of the commercial stock.	1.2	federal/ provincial	voluntary/ regulation/ incentive
Equipment: Ensure that all fossil fuel space and water heating equipment attains technically feasible and economically attractive energy performance levels by 2012.	Included in measures above	federal/ provincial	regulation
Total	3.5		
AP 2000 Measures	6.2		

Oil & Gas			
	GHG reduction in 2010 (MT CO ₂ equ.)	Jurisdiction	Policy Instrument
Leak reduction regulation	5.0	provincial	regulation
Fugitive emissions information program	0.5	federal/ provincial	voluntary
Acid gas injection regulation	1.4	provincial	regulation
CO ₂ capture & storage infrastructure assistance	2.2	federal/ provincial	incentive
CO ₂ enhanced recovery incentive	1.4	federal/ provincial	incentive
Reduced flaring from oil production	5.0	provincial	regulation
Utilization of most energy-efficient equipment	3.0	federal/ provincial	regulation/ incentive
Total	18.5		

Electricity			
	GHG reduction in 2010 (MT CO ₂ equ.)	Jurisdiction	Policy Instrument
Renewables: Expand and extend renewable energy production incentive; Improved market access	13.0	federal/ provincial	incentive/ regulation
Improved East-West power transmission; Complete review process for hydro development	6.0	federal/ provincial	incentive
CO ₂ capture & storage demonstration on new & existing coal plants	4.5	federal/ provincial	incentive
Retrofit existing Alberta and Saskatchewan coal plants with CO ₂ capture & storage	15.0	provincial/ federal	regulation/ incentive
Total	38.5		
AP 2000 Measures	14.0		

Industry			
	GHG reduction in 2010 (MT CO ₂ equ.)	Jurisdiction	Policy Instrument
Stimulate energy efficiency investments to help smaller companies reduce GHG emissions, find, plan and act on emission-reducing investments through a program of engagement, opportunities identification, planning assistance, financing and equipment regulation.	0.5	federal/ provincial	voluntary/ regulation/ incentive
Major investments in low emissions capital stock (e.g., co-generation, boiler replacement, electric arc furnaces, advanced pulping machines)	5.5	federal/ provincial	incentive
Total	6.0		
AP 2000 Measures	10.5		

Municipal			
	GHG reduction in 2010 (MT CO ₂ equ.)	Jurisdiction	Policy Instrument
*Landfill Gas: capture and flaring — Provincial regulations requiring capture and flaring with federal and provincial investment support programs.	7.4	provincial/ federal/ municipal	regulation/ incentive
*Landfill Gas: Electricity generation from captured landfill gas. Provincial regulation to provide access to grid and federal incentive to incite production from higher-cost plants.	0.9	provincial/ federal	regulation/ incentive
Urban Planning Support: A measure focused on improving the municipal level planning capability to reduce communities' energy intensity and GHG emissions and facilitate the introduction of other reduction measures through information networks, the development of planning tools and guidelines and expert systems.	N/A (Measure to facilitate and enhance efforts of other programs)	federal/ provincial/ municipal collaboration	incentive
Combined Heat and Power (waste heat): A mix of measures designed to incite the generation of electricity in locations where the waste heat can be captured and utilized. Requires that co-generation be incited through other means such as a DET system.	2.0	federal lead with municipal collaboration	incentive
Total	10.3		
AP 2000 Measures	1.0		

* possible offsets in DET system

Transportation			
	GHG reduction in 2010 (MT CO ₂ equ.)	Jurisdiction	Policy Instrument
Vehicle Efficiency			
Accelerated Light-duty Vehicle Scrappage: The program would pay owners of on-road (active) "clunkers" to retire their vehicles, typically after failure to pass an inspection and maintenance test.	0.2	federal/ provincial	Incentive
Energy Efficiency Measures for Light-duty Vehicles: Measures to encourage the purchase of more fuel-efficient vehicles; measures to discourage the purchase of less fuel-efficient vehicles.	0.5	federal/ provincial	Incentive/ Disincentive
Subtotal: Vehicle Efficiency	0.7		
AP 2000 Measures	5.2		

Transportation			
	GHG reduction in 2010 (MT CO ₂ equ.)	Jurisdiction	Policy Instrument
GHG-Efficient Fuels			
Optimization of Fleets Using Alternative Fuels: Voluntary initiatives including some financial incentives to increase government and large private fleet purchase of alternative fuels/vehicles.	0.8	federal	voluntary incentive
100% of gasoline is E10 and small E85 requirement that will require imports of ethanol: Standards and regulations, voluntary agreements and technology commercialization; or	6.0 (incremental to 25% from AP 2000, assumes 50% imports)	federal/ provincial	regulation
50% of gasoline is E10, standards and regulations, voluntary agreements and technology commercialization.	1.8 (incremental to 25% from AP 2000)	federal/ provincial	regulation
Bio-diesel: Financial incentive to encourage production of 500 million litres/year; Need complementary provincial actions.	1.1	federal	fiscal measure
Subtotal: GHG-efficient Fuels	3.7 - 7.9		
AP 2000 Measures	0.9		

Transportation			
	GHG reduction in 2010 (MT CO ₂ equ.)	Jurisdiction	Policy Instrument
Goods Transport			
Off-road Measure: Incentive to accelerate the replacement of older inefficient vehicles (agriculture, forestry and others) and equipment.	0.5	federal/ provincial	incentive/ regulation
Anti-idling technology for heavy truck fleets: Incentive to increase market penetration of anti-idling technology for heavy trucks.	0.6	federal	incentive
Accelerate Fleet Take-up of Best Practices: Workshops, demonstrations and education and awareness initiatives to accelerate best practices (extension of freight efficiency and technology initiative).	1.0	federal	voluntary
Improved Intermodal: Enabling fund to improve access to terminal, improve service levels and use of intelligent transport systems.	1.0	federal/ provincial	incentive
Subtotal: Goods Transport	3.1		
AP 2000 Measures	2.0		

Transportation			
	GHG reduction in 2010 (MT CO ₂ equ.)	Jurisdiction	Policy Instrument
<i>Passenger Transport</i>			
Transit Investment: Government investment in transit infrastructure and service improvement.	3.4	federal/ provincial/ municipal	incentive
Urban Showcase Renewal: Expand program funding for 2006-2010 (roughly 20 cities) to drive implementation of successful strategies from 2001-2006 phase plus new initiatives.	1.0	federal/ municipal	incentive
Parking Pricing: Increase parking charges on central business district of three largest cities.	0.5	municipal	charges
Road Pricing: Road-tolls on major inter-city and urban highways. About a 10% cost increase for inter-city travel and up to 100% for urban travel.	2.7	provincial	charges
Enforcement of Current Speed Limits: Increase compliance with speed limit on major divided highways; Average reduction of ten km on 100 km/hour highways.	1.4	provincial	regulation
Light-duty Vehicle Tire Pressure Warning System: On-board device to warn drivers tire pressure below 25% of recommended level.	0.3	provincial	regulation
Subtotal: Passenger Transport	9.3		
AP 2000 Measures	0.8		
Total Transport Measures	16.8 - 21.0		
Total AP 2000 Transport Measures	8.9		

Agriculture & Forestry			
	GHG reduction in 2010 (MT CO ₂ equ.)	Jurisdiction	Policy Instrument
Nutrient Management: a) 50% fee rebate on soil testing; one-time payment toward changing fertilizer application. Max \$500/farm, up to 16,000 operations. b) Prairies and Atlantic: fertilizer application. One-time incentive payment, maximum \$2,000/farm.	0.5	federal/ provincial	incentive
* Conservation Tillage and Reduced Summer fallow: Incentive of \$10/ha for reduced tillage management, starting 2003. Additional \$10/ha if approved plan followed.	2.7 sink plus 1.9 sink from summer fallow for total of 4.6	federal/ provincial	incentive
* Grazing Management: Bring 2.4 million ha of land under improved management regimes.	1.5 sink	federal/ provincial	incentive
Livestock Feeding Management: Reduce N ₂ O emissions from livestock. Including up to 50% reimbursement of cost of feed analysis.	0.4	federal/ provincial	incentive
* Fast-growing Plantation Development: Expand forest in rural areas through afforestation. Invest in fast-growing species on up to 100,000 ha of private land. Other environment and economic co-benefits.	2.72	federal/ provincial	incentive
Forest Carbon Measurement and Monitoring System: Further development and operating costs to meet international reporting obligations on forest management, including new National Forest Inventory, change detection and carbon accounting system.	cannot claim any forest sinks credits without this system	federal/ provincial	incentive
Total	9.7		
AP 2000 Measures	6.1		

* possible offsets in DET system

	GHG reduction in 2010 (MT CO ₂ equ.)	Jurisdiction	Policy Instrument
Total New Targeted Measures	107.5		
AP 2000 Reductions	46.7		
Total Targeted Measures	154.2		
AP 2000 International Emission Reduction Credits	20.0		

A Possible Formula for Allocating Permits Under the Domestic Emissions Trading System set out in Option 4

Option 4 describes an approach to allocating permits which takes account of:

- a firm's growth in output; and
- a sector's potential emission intensity of production.

Such an allocation system could work in the following way:

The amount of permits a firm would receive in any year would equal:

- *its physical output in that year*
(multiplied by)
- *the benchmark emissions intensity per unit of production for that sector based on the best available technology at reasonable cost*
(multiplied by)
- *a "scale-back factor" that will be common across all sectors and is set according to the total number of permits to be made available under the DET system as a whole.*

For example, Company A currently produces \$1 million in output per year with a current emissions intensity of 20 tonnes of CO₂ per \$1,000 of output. This year Company A's emissions totalled 20,000 tonnes.

In 2010 it is estimated that Company A would produce \$1.2 million in output with an emissions intensity per unit of output of

18 tonnes of CO₂ per \$1,000. The company's emissions would total 21,600 tonnes and it would need that many permits to fully cover its emissions. The allocation of permits Company A will receive would be determined in the following way:

- **Step 1:** An emissions-intensity benchmark for this company's sector is determined to be 15 tonnes of CO₂ per \$1,000 of output, based on the best available technology at reasonable cost. This benchmark could be determined in consultation with the sector and drawing on engineering and technical studies from experts and experience in Canada and elsewhere in the world.
- **Step 2:** An overall scale-back factor of 85 per cent is applied. This scale-back factor would apply to all companies under the DET system in order to bring the total number of permits allocated within the overall number available to the system.

As a result Company A would receive 15,300 permits according to the following calculation:

$(\$1.2 \text{ million in output}) \times (15 \text{ tonnes}/\$1,000 \text{ of output}) \times (0.85 \text{ scale-back factor})$

Bottom line: Company A would receive 71 per cent of the permits needed to fully cover its emissions. The company could purchase the rest of the permits it needs on the open market from other companies under the DET system who hold surplus permits, from offsets in other sectors such as agriculture, forestry or from municipalities, or on the international market. Alternatively, Company A could invest in innovative ways

to reduce its emissions, such as it had already done between today and 2010 to reduce its emissions per \$1,000 of output from 20 tonnes to 18 tonnes.

It should be noted that the sectoral benchmark emissions intensity and the overall scale-back factor would be set in advance. In other words, Company A would know in advance how many permits per \$1,000 of output it would receive — in the example above, $15 \times 0.85 = 12.75$ permits per \$1,000 of output. Should Company A's production be greater than anticipated — say, \$1.3 million in output instead of the \$1.2 million that had been estimated — it would receive an additional 1,275 permits.



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