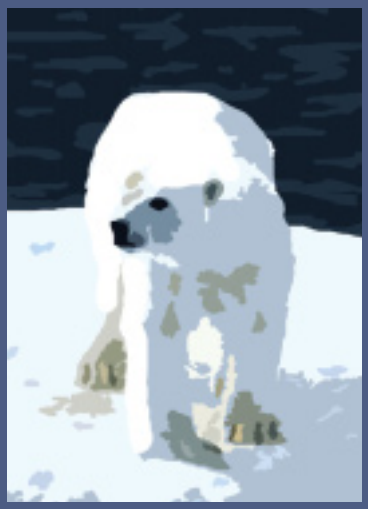
CLIMATE CHANGE MITIGATION: WHAT'S THE COST?

Katherine Cinq-Mars



How much will it cost to reduce emissions? Is it worth it? Now that the focus in the debate on climate change is shifting from the science to the economics of climate change, these are the questions that more and more people are asking. Katherine Cinq-Mars explains that the nature of the climate change challenge, "with all its complexities, uncertainties and attached moral and ethical issues," makes it very difficult, if not impossible, to reach agreement on answers to these questions. Economic analyses, she argues, "cannot be the only source of information for climate change policy." Instead of asking whether we can afford to reduce emissions or not, we need to ask more constructive questions. "Debating the scientific evidence and the total economic cost of climate change," she concludes, "has held us back from taking meaningful action for too long."

Combien en coûtera-t-il pour réduire les émissions de GES ? Le résultat en vaudra-t-il la peine ? À l'heure où le débat sur les changements climatiques passe du domaine des sciences à celui de l'économie, de plus en plus de gens se posent ces questions. Et Katherine Cinq-Mars explique que la nature même du défi, « avec ses complexités, ses incertitudes et les enjeux éthiques et moraux qui s'y rattachent », fait en sorte qu'il est très difficile sinon impossible d'arriver à une réponse unique. « Les analyses économiques, précise-t-elle, ne peuvent être les seules sources d'information en matière de politique sur les changements climatiques. » Au lieu de nous demander si nous avons les moyens de réduire les émissions de GES, mieux vaudrait soulever des questions plus constructives. Car « à force de débattre des coûts et des preuves scientifiques, nous avons beaucoup tardé à passer à l'action ».

The debate about the cost of mitigating climate change is as polarized as the debate about the scientific basis of climate change was until recently. At one end of the spectrum of opinion are those who argue that any serious effort to cut emissions will prove economically ruinous, adding that the environmental impacts won't be so severe that we can't adapt to them. At the other end are those who claim that such an effort will stimulate the economy and bring a host of side benefits and that the transition to a low-carbon economy can be smooth.

Economic analyses of climate change have also resulted in a wide range of cost estimates and have not succeeded in resolving the controversy. For instance, the Stern Review on the Economics of Climate Change published last October was meant to be the definitive economic study of climate change. It put the net annual cost of stabilizing emissions at around 1 percent of global GDP. However, the different approaches and models used to estimate the cost of mitigation resulted in a range of -2 percent (net economic gain) to +5 percent (net cost) of annual GDP with some extreme estimates putting the cost even higher. The Stern Review was criticized from both sides. Some said it grossly understated the cost of reducing emissions while exaggerating the impact costs. Others thought the whole exercise was misguided because it assumed stabilizing emissions at a level that they deemed too high and risky. In Canada, the strong and opposing reactions to the recent study put out by the federal government on the cost of achieving our Kyoto emission reduction target certainly showed how heated and politicized this debate has become.

Why do estimates of the cost of mitigating climate change vary so widely? Putting a price tag on such a complex, wide-ranging, uncertain and long-term environmental challenge is a difficult and value-laden exercise. The wide range of cost estimates reflects the different approaches and assumptions on which the economic models are built. Since climate change is likely to continue to be a cen-

tral policy challenge in Canada and may even become a key electoral issue, it is important and timely to examine some of the factors driving the differences in the numbers.

First, what is meant by climate change mitigation? There should be no misconceptions about the magnitude of the challenge of stabilizing atmospheric concentrations of GHGs at a level that would prevent "dangerous" climate change. While there is still uncertainty and debate about what constitutes "dangerous" climate change and on exactly how much emissions need to be reduced to prevent it, stabilization at any of the levels that scientists are even willing to consider will eventually require reducing global annual emissions far below current levels. In addition, the reductions will most likely occur in a context of continued population and economic growth such that, in Canada, emissions per capita and per unit of income will have to shrink to a fraction of what they are today.

Since the bulk of GHG emissions come from energy use and production, reducing emissions entails first and foremost massively increasing low- and no-carbon-emission power generation as well as achieving an unprecedented rate of energy efficiency improvement and sustaining it for decades to come. Abatement costs principally result from energy-related changes. Examples include outfitting major carbon-emitting facilities with the capacity to capture and store those emissions; changing production processes and equipment in order to release fewer emissions and/or consume less energy; better insulating houses and buildings; and switching from polluting (albeit cheap) coal to natural gas or renewable energy sources. At the most basic level, the cost of reducing emissions is a function of the level of emission reduction and the timeframe to achieve that reduction. High levels of emission reduction are more expensive in the short term because a lot of energy-using and -producing capital stock is long-lived. For example, light bulbs have a very short life-span, which makes it possible to ban incandescent light bulbs in favour of more energy-efficient bulbs over a few years. However, other energy-related capital stock such as cars, manufacturing equipment, houses and buildings, planes and urban development infrastructure has a much longer life-span, which can slow abatement progress or raise its cost. Nevertheless, the relationship between emission abatement level, timing and cost is not linear or static.

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One of the main factors that affect mitigation cost estimates is assumptions about the potential and future pace of technological innovation. For instance, in the case of electricity generation, commercially available renewable energy technologies, other than hydroelectricity, are generally more expensive and have some practical limitations that have up to now prevented them from being used on a large scale. The faster more efficient and practical technologies enter the market and the faster their prices come down as production increases, the lower the costs of reducing emissions. Conversely, pessimistic assumptions about technological progress yield high mitigation cost estimates.

While visions of 3-litres-per-100 km cars becoming bestsellers next year may be too optimistic, assumptions that we have reached the apex of technological development and that future gains in energy efficiency are going to be very difficult to achieve are probably just as unrealistic. Past experience shows that when we become serious about addressing an environmental problem, solutions start to appear and dire predictions of economic ruin don't materialize. In the case of acid rain, the major emitters, metal smelters in Sudbury, initially insisted that abatement requirements were not justified and that the costs would result in "a net loss to Ontario." However, according to Pollution Probe, by 1999, Sudbury's two major producers of smelter emissions, Inco and Falconbridge, had reduced their emissions of sulphur dioxide by about 90 perccent from 1960 levels.

In the case of the ozone layer, producers of CFCs, important ozone-depleting substance initially resisted the idea of a ban on CFCs. While continuing to argue publicly against banning CFCs, privately they were doing research into finding an alternative. When they succeeded, they changed their position 180 degrees, as a ban would open a global market for their alternative product. Only a few months later, the Montreal Protocol on Ozone Depleting Substances was ratified, and is it now considered the most successful multilateral environmental agreement.

As these and many other cases show, technological development can be helped along through different

channels such as support for research and development, regulatory pressures, stimulating market demand or learning by doing.

Some argue that there are insufficient low-cost and commercially viable technologies to achieve the level of emission reductions needed to stabilize the global climate. However, this is not a justification for postponing action. First, there is an urgent need to pick the low-hanging fruit. While there is no apparent single and cheap quick fix to the problem of climate change, the experiences of businesses and communities across Canada and of other countries show that there exist a number of readily available solutions at zero or low cost. These are often not adopted because the incentives to reduce GHGs are nonexistent or too weak. The sooner they are adopted, the better. Emissions accumulate in the atmosphere and can stay for hundreds of years. If 10 megatonnes a year are cut starting today instead of in five years from now, the result is 50 megatonnes less in the atmosphere.

Even without technological breakthroughs, a number of studies have found that it would be technically possible to achieve significant emission reductions.

Last year, the National Round Table on the Environment and the Economy (NRTEE) commissioned a study on Canada's options for reducing energy-related GHG emissions to 60 percent of current levels by 2050. The study concluded that "it can be done, at least from a technological standpoint […] using existing and near-term technology only." Ensuring that Canada can achieve large emission reductions over the next few decades means adopting the policies that will facilitate this right now. The NRTEE study also called for introducing long-term price and policy signals that GHG reductions are and will continue to be a priority. Such signals are required to make sure investment decisions affecting Canada's energy use and production start taking GHGs into consideration. Houses built today to suboptimal energy-efficient standards will still be standing 30 or more years from now and will have wasted energy all that time. Retrofitting is sometimes an option, but it is often more expensive than building it right in the first place.

Cost estimates also vary depending on whether the ancillary benefits from GHG emission reductions are taken into consideration and, if so, how they are valued. Abating GHG emissions can lead to additional public health, environmental and economic benefits. For example, improving cars' and trucks' fuel efficiency can help reduce emissions that contribute to both climate change and air pollution. Raising energy efficiency standards can lead to energy savings. Some of these benefits, such as energy savings, have a market value. Other benefits, such as a lower risk of asthma and heart attacks and the associated lower hospital admissions, work absenteeism and loss of lives from cleaner air, don't have a market value. While the latter benefits are very real, it can be very complicated (and some would argue inappropriate) to put a monetary value on them, which explains why some economists choose to leave them out of their estimates.

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As for the benefits that are economically relevant and come with a price tag, their value largely depends on the choice of discount rate. The choice of discount rate can have a determining effect on the cost-benefit analysis. It determines how much future benefits are worth and how soon into the future their value dwindles down to zero when translated into a present value. The higher the discount rate, the lower the present value of future benefits. This is a crucial issue in climate change cost-benefit analysis since the ancillary benefits and the benefits from the avoided damage from climate change occur mostly in the future.

Some economists choose to use a discount rate based on the market because it better reflects the economic situation with which investors are faced. Other economists find discounting morally unacceptable and prefer to use a lower rate. The Stern Review, for example, used a very low discount rate to reflect the value to future generations of short-term efforts at climate change mitigation. This further illustrates why it is important to look at the assumptions at the basis of the cost estimates. Knowing how the dollar figures were arrived at makes it possible to decide how to balance the information provided by the cost-benefit analysis with other considerations. Cost-benefit analysis can be a useful tool to inform policy-making because there are competing demands on limited public and private resources. However, it doesn't necessarily reflect

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Environment Minister John Baird announces the phasing-out of incandescent light bulbs by 2012 and their replacement with longer-lasting, more energy-efficient bulbs.

all that has value to Canadian citizens. It cannot be the only source of information for climate change policy, with all its complexities, uncertainties and attached moral and ethical issues.

Another important factor affecting cost estimates is assumptions about how cost-effectively emission reductions can be achieved. Some climate policies are more cost-effective than others. For example, a number of economists have shown that introducing national or international emission trading significantly reduces the cost of GHG reductions, because this strategy directs investment in emission reductions to where the cost is the lowest. Another example is a carbon tax; the success of this policy can be affected by how the revenues generated by the tax are recycled and whether other economically burdensome taxes can be cut to stimulate employment and investment. (For a discussion of the cost of some climate policies, see Jaccard et al. (C.D. Howe Institute, May 2006.)

Even if it were possible to agree on the cost of mitigating climate change, whether abatement costs are seen as justified or not largely depends on the alternative, which is not mitigating. Adaptation to climate change is not costless and mitigation cannot be postponed forever. While there may well be an initial positive economic effect from climate change for Canada, due to longer growing seasons for example, even the most optimistic economic studies have cost curves that turn into the negative sooner or later. Nobody should feel comfortable with the idea that in the time that it takes to drive to the grocery store, we are releasing GHGs that will stay in the atmosphere for hundreds of years from energy that has taken millennia to store in the earth's crust.

Paying to fix environmental problems is like paying for home maintenance. Nobody looks forward to paying to fix the roof or replace the scratched wood floor. Anybody can think of a better way to spend the money and effort. However, once we start realizing how much it costs to fix environmental problems, perhaps that will serve as motivation to find ways of doing less damage to the environment in the first place.

Is any mitigation cost justified, seeing as Canada's GHG emissions account for only 2 percent of global emissions and major emitters, namely the United States, China and India, have not committed to emission reduction targets? Canada may produce only a small percentage of the world's GHG emissions, but it is among the top countries in the world in terms of emissions per capita (for comparison with other OECD countries, see Cinq-Mars, *Policy Options*, October 2006). European countries, like Sweden or Norway, also account for a small percentage of global emissions. Yet this has not prevented them from adopting ambitious climate change policies, even though their emissions per capita and per unit of income are already much lower than Canada's. Canada has a long way to go before it is in any position to justify inaction at home based on inaction in certain other countries.

Also, the fact that the United States doesn't have any national emission reduction target doesn't mean that nothing is being done to address climate change. States and cities are introducing their own climate initiatives, with Arnold Schwarzenegger, California's Republican governor, leading the advance. A number of recent developments also suggest that the wind may be changing in Washington: the Democrats' victory in the November mid-term elections, the recent US Supreme Court decision effectively forcing the Environmental Protection Agency to regulate carbon dioxide emissions from vehicles and the fact that the main candidates for the 2008 presidential election have come out in favour of federal measures to curb emissions.

Furthermore, in trying to get other countries to commit to GHG emission targets, credibility matters. But over the last decade or more, Canada has lost the credibility it once enjoyed on the global climate scene. Indeed, Canada was once an international leader on climate change.

In 1988, Canada convened the International Conference of the Changing Atmosphere, where Prime Minister Mulroney committed Canada to reducing its carbon dioxide emission by 20 percent by 2005. It has been said that the road to the landmark 1992 Earth Summit in Rio de Janeiro, where the United Nations Framework Convention on Climate Change was opened for signature, was paved with maple leaves. In the past, when faced with transnational and international environmental threats, we realized that if we were going to get other countries on board, we had to clean up our own house first. This was the case with acid rain, where Canada started reducing its own emissions before the United States was even willing to discuss it.

Finally, whether the cost of reducing emissions is seen as prohibitive or as an affordable insurance policy depends on one's location in the economy. GHG reduction will affect certain economic sectors more than others. Those who stand to lose from attempts to reduce emissions are generally keenly aware of it as their losses are likely to be more immediate and concentrated. In comparison, there are many potential winners but they are spread across the world or do not exist yet, being future generations and businesses yet to develop around technologies yet to be invented. This is a fundamental difficulty for climate change politics and it brings us to the real crux of the debate.

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The most pertinent questions in the debate on climate change are less how much climate change mitigation will cost or whether we can afford it, but how we can come to an agreement about what is a fair and politically acceptable distribution of the costs and benefits; what are the most cost-effective policies to achieve the transition to a low-carbon economy and society; and how we can develop the capacity to identify and deploy all the available solutions to the climate change challenge in a timely and smooth way. These are the questions that need to be addressed constructively. Debating the scientific evidence and the total economic cost of climate change has held us back from taking meaningful action for too long.

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