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Climate Change Targets for Canada
Examining the Implications

By Robert Lyman

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"Climate change"

means "...*<u>any</u> change in climate over time, whether due to natural variability <u>or</u> as a result of human activity*."

IPCC 2007 Fourth Assessment Report

https://www.ipcc.ch/publications_and_data/ar4/syr/en/mains1.html

About the Author:

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Photo credits: Shutterstock except wind farm—Clive Schaupmeyer Clouds: unknown

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Purpose

The purpose of this note is to compare the present and proposed targets for greenhouse gas emissions reductions in Canada and to assess their implications in terms of Canada's main economic sectors.

The History of GHG Emission Reduction Targets

Since 1988, when concerns were first raised at international levels about the possibility that increasing human-related emissions of carbon dioxide and other greenhouse gases (GHG) might be having an adverse impact on global temperatures, various countries have adopted targets to reduce emissions. In 1992, there was an international agreement among developed countries on a voluntary target of stabilizing greenhouse gas emissions at 1990 levels by 2005. It failed. Having not met a relatively modest target, countries agreed upon a more stringent one. In 1997 about 150 countries committed under the Kyoto Protocol to reduce GHG emissions by an average of 5% below 1990 levels by the 2008 to 2012 period. It failed miserably. Since the 1990's, twenty Conferences of the Parties have been held in efforts to broker a deal. These negotiations have floundered on the unwillingness of less developed countries to commit to emission-reduction targets that will harm their economic growth, on the increasing efforts of those countries to wring from developed countries huge financial commitments, and on the refusal of the developed countries to make such commitments.

Canada is the second largest country in the world, sparsely populated, with vast transportation needs. We withstand long, cold winters featuring short days, extremely low temperatures and lots of snow.

Our energy and resource industries would be penalized for providing the valuable materials the rest of the world demands and uses.

Winter in an Edmonton suburb.

Paris Climate Conference Dec. 2015

http://www.cop21.gouv.fr/en

Recently, under the auspices of the United Nations Framework Convention on Climate Change, some countries have discussed and occasionally made political commitments to more stringent reductions. In the Copenhagen Accord of December 2009, Canada and other countries committed politically to reduce GHG emissions to 17% below 2005 levels by 2020. In 2015, pursuant to international discussions preceding the next meeting of the twenty-first Conference of the Parties to the U.N. Convention in December 2015, the government of Canada made a political commitment to attain a 30% reduction from 2005 levels by 2030.

The European Union and the Intergovernmental Panel on Climate Change (IPCC) view even these commitments as interim goals on the way to far more stringent reductions they claim are needed. The European Union has committed politically to reducing emissions by 60% below 2010 levels (note the change in base year) by 2050. The IPCC and many environmental organizations are demanding that all countries reduce emissions by 60% below 2005 levels by 2050 and that the industrialized countries of the OECD “lead the way” by reducing their emissions by 80% below 2005 levels by 2050. Not to be outdone, the government of Ontario in 2014 committed to reduce emissions to 80% below 1990 levels (note the change in base years) by 2050.

During the meeting of the G7 industrialized countries in June 2015, the group agreed to a “common vision” of supporting the upper end of the latest IPCC recommendation of 40 to 70% reductions by 2050 compared to 2010 recognizing that this challenge can only be met by a global response.

Canada's Emissions Performance

The following table indicates the actual Canadian GHG emissions by economic sector, according to Environment Canada, as measured in terms of megatonnes (Mt) of carbon dioxide equivalent GHGs (CO2e).

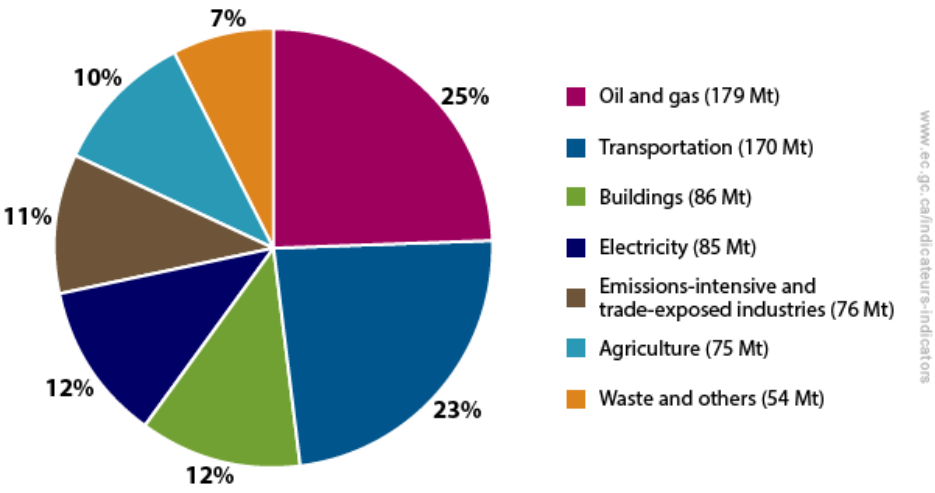
Table 1

Canadian GHG Emissions by Economic Sector (MtCO2e)

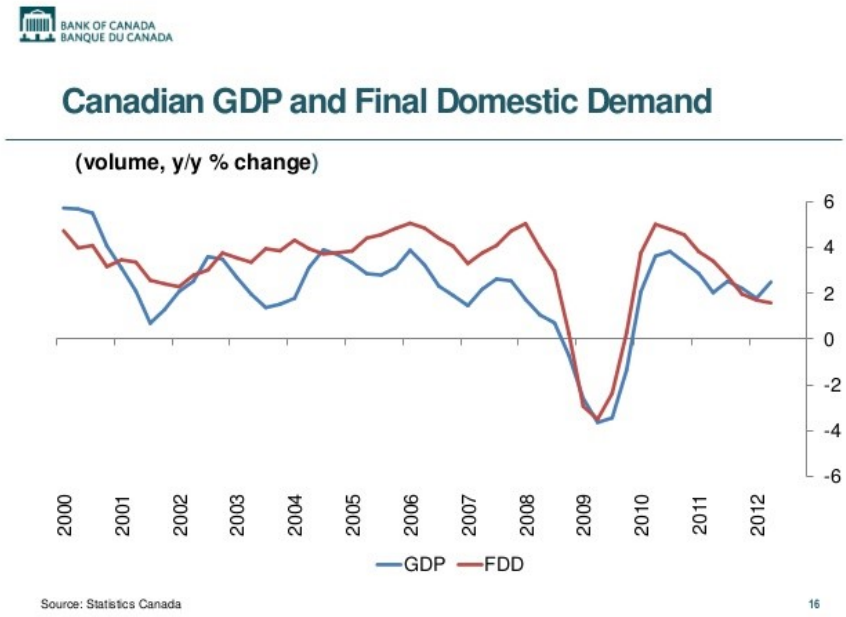
	1990	2005	2010	2013
Transportation	128	168	169	170
Oil and Gas	101	162	160	179
Electricity	94	121	99	85
Buildings	70	84	82	86
Emissions Intensive Industries	93	87	75	76
Agriculture	54	68	70	75
Waste and Others	50	49	53	54
Totals	591	737	707	726

The above table demonstrates some significant trends in the Canadian economy. Over the period from 1990 to 2005, Canadian emissions grew by one quarter, despite large expenditures by governments on emission reduction programs. The largest increase in sectoral emissions occurred in the oil and gas industry, but there were also increases in the transportation sector (mainly due to the increase in truck freight emissions and the switch to SUVs), electricity, buildings and agriculture. This emissions growth is perhaps typical of what happens when the economy is growing at a relatively fast pace. From 2005 to 2010, in contrast, total emissions actually declined due to the serious economic recession that began in 2007, the phase out of some coal-fired electricity plants, efficiency improvements and losses of firms in the industrial sector. With the resumption of higher economic growth, emissions rose again to 2013.

Emissions by Sector



Source: Environment Canada
http://ec.gc.ca/indicateurs-indicators/default.asp?lang=en&n=F60DB708-1



Source: http://www.slideshare.net/FVCAA/recent-development-in-the-canadian-economy

Implications of New Targets

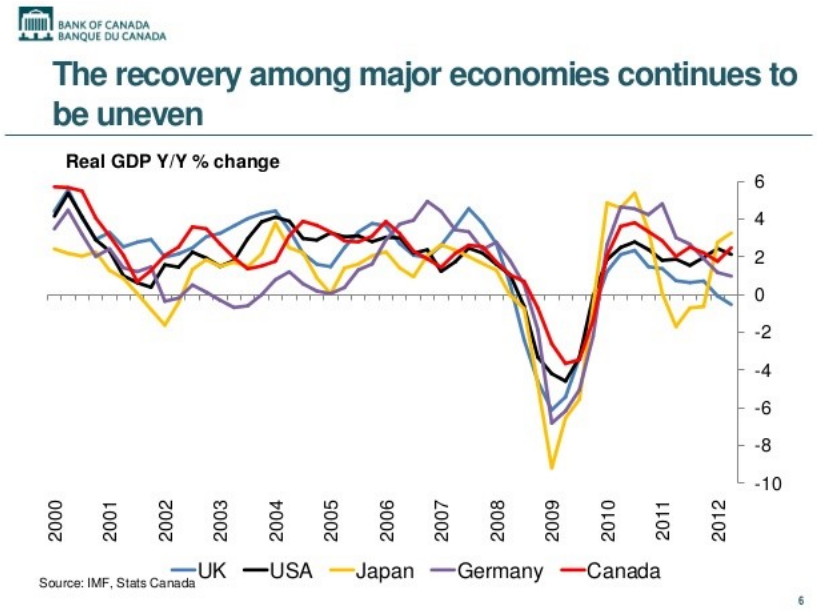
What do the percentage targets and shifting base years mean in terms of the quantities of emissions that must be avoided? The following shows the emissions levels that would be required under different targets.

Table 2

Emissions Reductions and Levels Required by Target (MtCO2e)

Target	Year	Goal
17% from 2005	2020	612
30% from 2005	2030	516
60% from 2010	2050	281
70% from 2010	2050	212
80% from 2005	2050	147
80% from 1990	2050	118

The reductions indicated would be considerably larger if the Canadian economy were to return to a pattern of faster growth. In fact, the reductions indicated above are almost certainly gross under-estimates, unless one believes that the Canadian economy will remain in the present deep recession for the next 35 years.



One can make some observations about the impacts of achieving emissions levels demanded by the targets.

The 17% 2020 target could be achieved through a 13% reduction in emissions across all sectors, or by smaller emissions reductions in some areas and the continuing phased reduction in coal-fired electricity generation. In the latter case, there will be increased costs for electricity consumers as utilities switch to more expensive fuels.

The 30% target would require either a 30% emissions reduction across all sectors or disproportionate cuts to some sectors where cuts are deemed less costly to the overall economy. Achieving this will be very difficult once coal-fired electricity generation has been substantially reduced or eliminated, especially if the economy continues to improve in terms of growth.

The 60% from 2010 target by 2050 would require emissions reductions that go far beyond what can credibly be expected to occur through efficiency improvements or technological change. It would mean reducing emissions to 281 Mt, 445 Mt below the 2013 level. This would be the equivalent of eliminating all oil and gas and electricity emissions and cutting in half emissions from transportation, emissions intensive industries and agriculture.

The 70% from 2010 and 80% from 2005 targets by 2050 would require unprecedented changes in the Canadian economy and society, which would be even more profound if the economy were to grow at moderate levels over the next 35 years. The 70% target would mean reducing emissions to 212 Mt, 514 Mt bellow 2013 level. The 80% target would mean reducing emissions to 147 Mt., 579 Mt. below the 2013 level. Reductions of this magnitude would entail almost eliminating all oil, natural gas and coal from the energy consumption mix, shutting down the oil and natural gas production, refining and processing industries, quickly constructing several new nuclear reactors, eliminating most emissions intensive industries like steel and automobile manufacturing, eliminating all emissions from waste, and sharply cutting energy use in agriculture and buildings. Access to air travel, which is totally dependent on petroleum fuels, would have to be severely limited. Doing this would shrink Canada's 'carbon footprint', relative to its economy and population, to levels today seen only in poverty-stricken countries like Haiti, Afghanistan, North Korea and Chad. It is difficult to imagine how an energy-hungry, highly developed country whose population is constantly growing through immigration could realistically cut emissions so drastically in so short a time.

The Ontario target (80% from 1990 levels by 2050) would be worse.

Returning the Canadian economy to one in which people are left using horses and bicycles for transportation, wood for heating and whale oil or candles for lighting might have some romantic appeal for some, but it surely cannot be the future vision of those advocating stringent targets, one would think. Instead, what appears to underlie their vision is the transformation of the Canadian economy to one that is almost completely electrified. There are a few rather significant problems with this vision.

First, the only proven sources of large scale, reliable electrical energy generation with no carbon dioxide emissions are hydro and nuclear power plants. Canada has some additional hydro resources that could be developed but virtually all of the major sites would face strong opposition from aboriginal groups that would inevitably tie up development prospects for decades, if not halt them altogether. The Canadian Nuclear Safety Commission estimates that environmental assessment, licensing and construction of a new nuclear power plant should take nine years. In practice, fifteen years would be an optimistic schedule, assuming that provinces were willing to address the financial and safety issues along with public nervousness about nuclear energy in general. To further complicate matters, in 2014 a Federal Court halted Ontario's announced plans to build new nuclear reactors at Darlington over public concerns about nuclear waste, accidents and hazardous emissions. The Court ordered that a federal joint review panel be reconvened to more fully consider these issues under the Canadian Environmental Assessment Act. The prospects for a massive expansion of hydro or nuclear generation over the next twenty, or perhaps thirty, years seem remote indeed.

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Second, there are major problems of cost and reliability associated with renewable energy generation sources like wind and solar energy. Wind and solar energy represent about 3% of Canada's current electricity generation capacity. Ontario and Nova Scotia have announced that they will increase that share to 20% by 2030. Such expansion is technically feasible but has more than its share of impediments:

High costs: Industrial wind generators typically cost twice as much as conventional thermal plants and solar photovoltaic and concentration solar power (CSP) plants cost as much as ten times conventional plants. Germany has led the world in adding renewable energy to its generation mix and this has cost more than $412 billion to date (former German Environment Minister Peter Altmaier recently estimated that the program cost will reach $884 billion by 2022).

Transmission: Transmission lines carry electricity from generating plants to cities, industry and other locations where it is needed. Utility-scale wind and solar plants are often located more remotely than fossil-fueled or nuclear plants. Therefore, they require construction of new, expensive, and controversial transmission lines – and this often proves very difficult.

In practice, consumers pay twice, once for the (expensive) renewable generation and then for the capital costs of the backup thermal plants

Variability/intermittency: The wind and the sun are variable, meaning that their availability as energy sources fluctuates due to weather patterns, clouds, and cycles of day and night. The electricity output from power plants dependent on these sources varies accordingly. The demand for electricity, however, does not follow the same pattern. To cope with the difference between the supply of intermittent energy sources like wind and solar and public demand for power, utilities have to employ a wide range of planning and operational techniques that increase in cost as the proportion of renewables in the generation mix increases. Fundamentally, there is no currently economic way to store large amounts of electricity. Consequently, utilities must maintain back-up generation facilities (usually natural gas fired), frequently curtail production of existing plants and rely heavily on the import and export of power from neighbouring systems that have different generation mixes. (It is difficult and expensive to modify nuclear plants to act as "load followers", responding to reductions in electricity demand. Currently only Bruce Power's refurbished plants can do so, essentially by having a system installed that allows the generated steam to bypass the turbines.) In practice, consumers pay twice, once for the (expensive) renewable generation and then for the capital costs of the backup thermal plants

The assumption that the transportation system could be completely electrified within thirty-five or even fifty years is also highly doubtful. No one is even talking about electrifying trucks, which are the fastest growing source of emissions in the transport sector. As for cars, despite lavish taxpayer subsidies ($8500 per vehicle in Canada, $7500 in the U.S.), the number of partly electric (i.e. hybrid) cars is far below the numbers optimistically predicted by politicians. The U.S Department of Energy, for example, now expects only about 250,000 hybrid electric cars in 2015, or 0.1% of all cars on U.S. roads. Recent research by the U.S. Congressional Budget Office indicates that all-electric cars may reach break-even prices with hybrids only in 2026 and with conventional cars in 2032, after governments spend hundreds of billions of dollars in subsidies. It will be many years after that before they represent a large proportion of the vehicle fleet.

Source:

http://www.mlive.com/news/kalamazoo/index.ssf/2011/04/electric_vehicle_charging_stat.html

An increase in electric vehicles will also create an increased demand on the power grid.

The Global Context

The IPCC thesis is that, in order to have a good chance (not a guarantee) of avoiding catastrophic temperature increases, atmospheric concentrations of carbon dioxide would have to peak below 400 to 450 parts per million (ppm) and stabilize in the long term at around 380 ppm. This thesis is based on the application of scientific knowledge and modeling of future events that remain highly controversial, notwithstanding repeated claims by the advocates that there is a consensus.

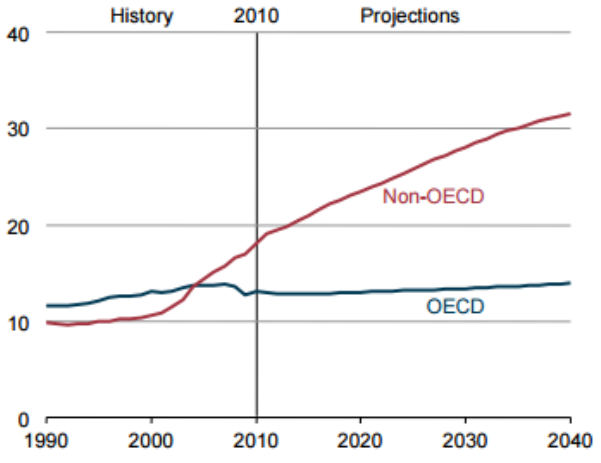
Canada represents 1.8% of global anthropogenic (i.e. human-induced) GHG emissions. That share is dropping every year, as emissions in Asia grow.

The International Energy Agency (IEA) and the U.S. Energy Information Administration (EIA) are the two most authoritative sources of data and analysis about energy supply, demand and emissions in the world.

The IEA's 2013 World Energy Outlook report estimated that global anthropogenic GHG emissions were 29,684 Mt in 2009 and projected that emissions would grow to 41,464 Mt (almost 40%) by 2030. The IEA projected that almost all (96%) of the GHG emissions growth to 2040 will occur in the developing countries, not in the Organization for Economic Cooperation and Development (OECD). U.S. emissions would grow modestly from 5418 Mt in 2009 to 5523 Mt by 2030 (2%). China's emissions, in contrast, would almost double from 7,347 Mt in 2009 to 14,028 Mt by 2030.

Using projections by region from the EIA's recent International Energy Outlook forecast, it is possible to see the effect if Canada and other OECD countries drastically reduced GHG emissions levels. The report does not include figures for 2005, so we will use 2010 instead. The following table illustrates what would happen if the OECD somehow achieved an 80% reduction from the 2010 emission level by 2040, a full ten years before the IPCC goal for 2050, while the non-OECD countries continued on their present path.

Figure 140. World energy-related carbon dioxide emissions, 1990-2040 (billion metric tons)



http://www.eia.gov/forecasts/ieo/pdf/0484(2013).pdf

Figure 142. OECD and non-OECD energy-related carbon dioxide emissions by fuel type, 1990-2040 (billion metric tons)

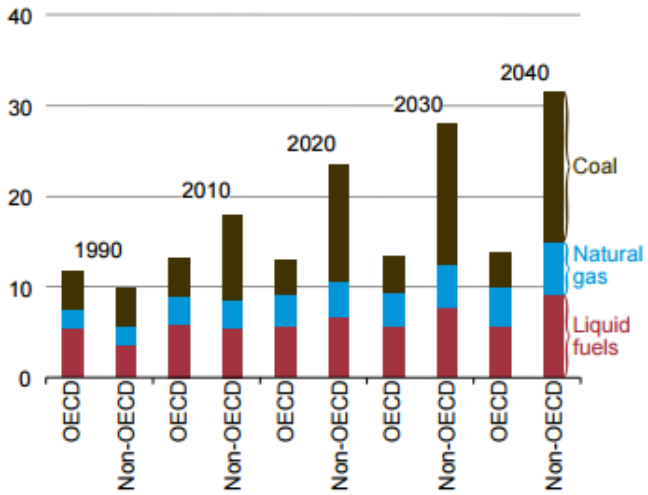


Table 3

Global GHG Emissions (Mt CO2e)

	OECD	Non-OECD	Total
2010	13,079	18,104	31,183
2040 (Base)	13,897	31,558	45,453
2040 (80%cut)	2,614	31,558	34,172

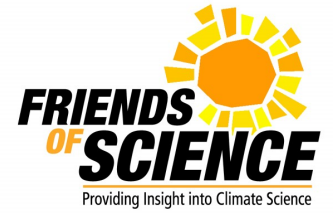
Global emissions still would *grow* by 2989 Mt, or almost 10%, from 31,183 Mt to 34,172 Mt.

Conclusion

None of the GHG emission reduction targets set by Canada in the past have been met, due to the growth in the Canadian economy. Yet, Canada and other countries are being pressured by the U.N. and various environmental interest groups to adopt ever more demanding and legally binding GHG emissions targets. Indeed, there are good grounds for questioning whether the longer-term targets are even feasible in economic, technological and political terms.

Canada represents a small share of global anthropogenic emissions. Even if Canada and other OECD countries were to meet the extraordinarily stringent emission reduction targets, global emissions would still grow above 2010 levels. While meeting the targets would prove very costly, indeed possibly destructive to Canada's economy, the IPCC goal would not come even close to being met. Canada's sacrifice, in effect, would be largely a symbolic gesture. Canadians should judge carefully how great a cost they wish to bear for symbolism.

This paper has not attempted to address the questions of whether the IPCC's analysis of the science related to climate change and modeling of the future effects of increasing GHG emissions are correct. The debate on these questions is an extremely complex one, made more so by disagreements over the sources of data and the methodologies to use. This much, however, should be clear from examining the likely effects for Canada of adopting the targets the IPCC proposes to reduce emissions and therefore "mitigate" climate change. As Canada's contribution to global emissions is equivalent in statistical terms to a rounding error applied to debatable forecasts, it would seem very unwise to continue allocating billions of dollars in scarce resources to mitigation. If one believes the IPCC, it is far better to focus on taking actions over which Canada has full control and will derive the full benefit - adapting to the possible effects of climate change.



Robert Lyman contributed this economic brief to Friends of Science Society for publication.

Friends of Science have spent a decade reviewing a broad spectrum of literature on climate change and have concluded the sun is the main driver of climate change, not carbon dioxide (CO2). The core group of the Friends of Science is made up of a growing group of Earth, atmospheric, astrophysical scientists and engineers who volunteer their time and resources to educate the public.

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