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Data Sources and Methods for the Progress Toward Canada's Greenhouse Gas Emissions Reduction Target Indicator

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1 Introduction

The Progress Toward Canada's Greenhouse Gas Emission Reduction Target indicator (www.ec.gc.ca/indicateurs-indicators/default.asp?lang=en&n=CCED3397-1) is part of the Canadian Environmental Sustainability Indicators (CESI) program (www.ec.gc.ca/indicateurs-indicators/default.asp?lang=En&n=47F48106-1), which provides data and information to track Canada's performance on key environmental sustainability issues. This indicator is also used to measure progress towards the goals and targets of the Federal Sustainable Development Strategy (www.ec.gc.ca/dd-sd/default.asp?lang=En&n=CD30F295-1).

2 Description and rationale of the Progress Toward Canada's Greenhouse Gas Emission Reduction Target indicator

2.1 Description

The Progress Toward Canada's Greenhouse Gas Emissions Reduction Target indicator provides an overview of the projected greenhouse gas (GHG) emissions in Canada until the year 2020. This indicator is based on two scenarios developed by Environment's Canada Economic Analysis Directorate:

1. A "without measures" scenario projecting GHG emissions where consumers, businesses and governments take no action after 2005 to reduce emissions (baseline).
2. A "with current measures" scenario projecting GHG emissions by taking into account federal and provincial climate change measures announced up to May 2014. These measures must be concrete or legislated, financially backed, and specific enough to be added to the forecast.

Scenarios 1 and 2 are reported in Canada's Emissions Trends 2014 (www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=E0533893-1).

2.2 Rationale

Environment Canada has committed to publish annually a report on projections of GHG emissions. Emission projections allow for Canadians and policy-makers to view progress towards the established future target based on initiatives that are being implemented today.

2.3 Recent changes to the indicator

Some technical changes to the modelling framework were implemented since Canada's Emissions Trends 2013, notably to provide better modelling estimates of energy and emissions, and reflect improved knowledge on the contribution of land use, land use change and forestry sector to the national emissions. More details on these changes are discussed in the annex 5 of the Canada's Emissions Trends 2014 report (www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=E0533893-1).

3 Data

3.1 Data source

The data for this indicator were obtained from the Canada's Emissions Trends 2014 report (www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=E0533893-1). The data used to determine projected GHG emissions are taken from the following sources:

- Historical energy demand and supply data from Statistics Canada (www5.statcan.gc.ca/bsolc/olc-cel/olc-cel?catno=57-003-X&lang=eng);
- Historical economic data (e.g., gross domestic product [GDP], investment levels, capacity utilization) from Statistics Canada (www5.statcan.gc.ca/subject-sujet/theme-theme.action?pid=3764&lang=eng&more=0&HPA);
- Population growth projections from Statistics Canada (www.statcan.gc.ca/pub/91-520-x/91-520-x2010001-eng.htm);
- Historical GHG emissions from Environment Canada's National Inventory Report 1990-2012: Greenhouse Gas Sources and Sinks in Canada (www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=3808457C-1&offset=1&toc=show);
- Future oil and natural gas production levels from the National Energy Board winter 2013-2014 Outlook (www.neb-one.gc.ca/clf-nsi/rnrgynfmtn/prcng/prcng-eng.html);
- Future economic activity from Finance Canada's Survey of Private Sector Economic Forecasters report, June 2014 (www.fin.gc.ca/pub/psf-psp/index-eng.asp) and the 2012 Economic and Fiscal Implications of Canada's Aging Population report (www.fin.gc.ca/pub/eficap-rebvpc/index-eng.asp);
- Emissions factors derived from the Intergovernmental Panel on Climate Change (IPCC) methodology guidelines (www.ipcc-nggip.iges.or.jp/public/gp/english/); and
- Projections from the 2013 Annual Energy Outlook by the United States Energy Information Administration (www.eia.gov/forecasts/archive/aeo13/).

3.2 Spatial coverage

Coverage is national.

3.3 Temporal coverage

The GHG projections associated with Canada's Emissions Trends 2014 cover the years 2012 to 2020 for the scenario with measures and the years 2005 to 2020 for the scenario without measures. Historical GHG data cover the years from 1990 to 2012.

3.4 Data completeness

The indicator is based on analysis that incorporates the most up-to-date statistics on GHG emissions and energy available at the time the technical modelling was completed for the report. Data and information up to May 2014 are included in the Canada's Emissions Trends 2014 report (www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=E0533893-1). Annex 2 of the Trends report provides more details on baseline data and underlying assumptions for this indicator.

3.5 Data timeliness

The time lag between data availability and indicator publication allows for data collection, quality control and validation processes.

4 Methods

The emissions projections have been developed in line with generally recognized best practices, including:

- Incorporating IPCC standards for estimating GHG emissions across different fuels and processes.
- Relying on outside expert reviews and the most up-to-date data available for key drivers such as economic growth, energy prices, and energy demand and supply.
- Applying an internationally recognized energy and macroeconomic modelling framework for estimating emissions and economic interactions.
- Using a methodology to develop the projections and underlying assumptions that has been subject to peer review by leading external experts on economic modelling and GHG emissions projections, and that has been vetted with key stakeholders.

The approach to developing Environment Canada's Emissions Trends involves two main features:

- Using the most up-to-date statistics on GHG emissions and energy use, and using key assumptions from the best available public and private expert sources.
- Developing emissions projections scenarios using the detailed, proven Energy, Emissions and Economy Model for Canada, also known as E3MC.

Annex 4 of Canada's Emissions Trends 2014 (www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=E0533893-1) provides detailed information on the methodology used to develop the projections.

The land use, land-use change and forestry (LULUCF) sector contribution to emissions reduction is modeled and accounted for separately from other sectors. A LULUCF contribution estimate of 19 megatonnes of carbon dioxide equivalent (Mt CO_2 eq) is added to the "with current measures" emissions projections in 2020 as a credit towards the target. Annex 1 of Canada's Emissions Trends 2014 (www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=E0533893-1) provides more detailed information on LULUCF modelling.

5 Caveats and limitations

A series of plausible assumptions regarding, among others, the level of continuing population and economic growth, prices, demand and supply of energy, and the evolution of energy efficiency technologies were employed to make the projections. The projections assume no further government actions to address greenhouse gas emissions beyond those already in place or imminently pending as of May 2014.

The emissions projections presented in the indicator cannot be viewed as a forecast or prediction of emissions at a future date. Rather, they represent a simple projection of the current structure and policy context into the future. They do not attempt to account for the inevitable, but as yet unknown, changes that will occur in government policy; energy supply, demand and technology; or domestic and international economic and political events.

Emissions projections are subject to uncertainty and are most appropriately viewed as a range of plausible outcomes. Many of the events that shape emissions and energy markets cannot be anticipated. In addition, future developments in technologies, demographics and resources cannot be foreseen with certainty.

Annex 3 of Canada's Emissions Trends 2014 (www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=E0533893-1) provides details of alternative emissions scenarios and a sensitivity analysis that focuses on two key uncertainties: 1) the growth of the economy and 2) the evolution of oil and natural gas prices and production.

6 References and further reading

6.1 References

Environment Canada (2014) Canada's Emissions Trends 2014. Available from: www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=E0533893-1.

Environment Canada (2014) National Inventory Report 1990-2012: Greenhouse Gas Sources and Sinks in Canada. Available from: www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=3808457C-1&offset=1&toc=show.

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