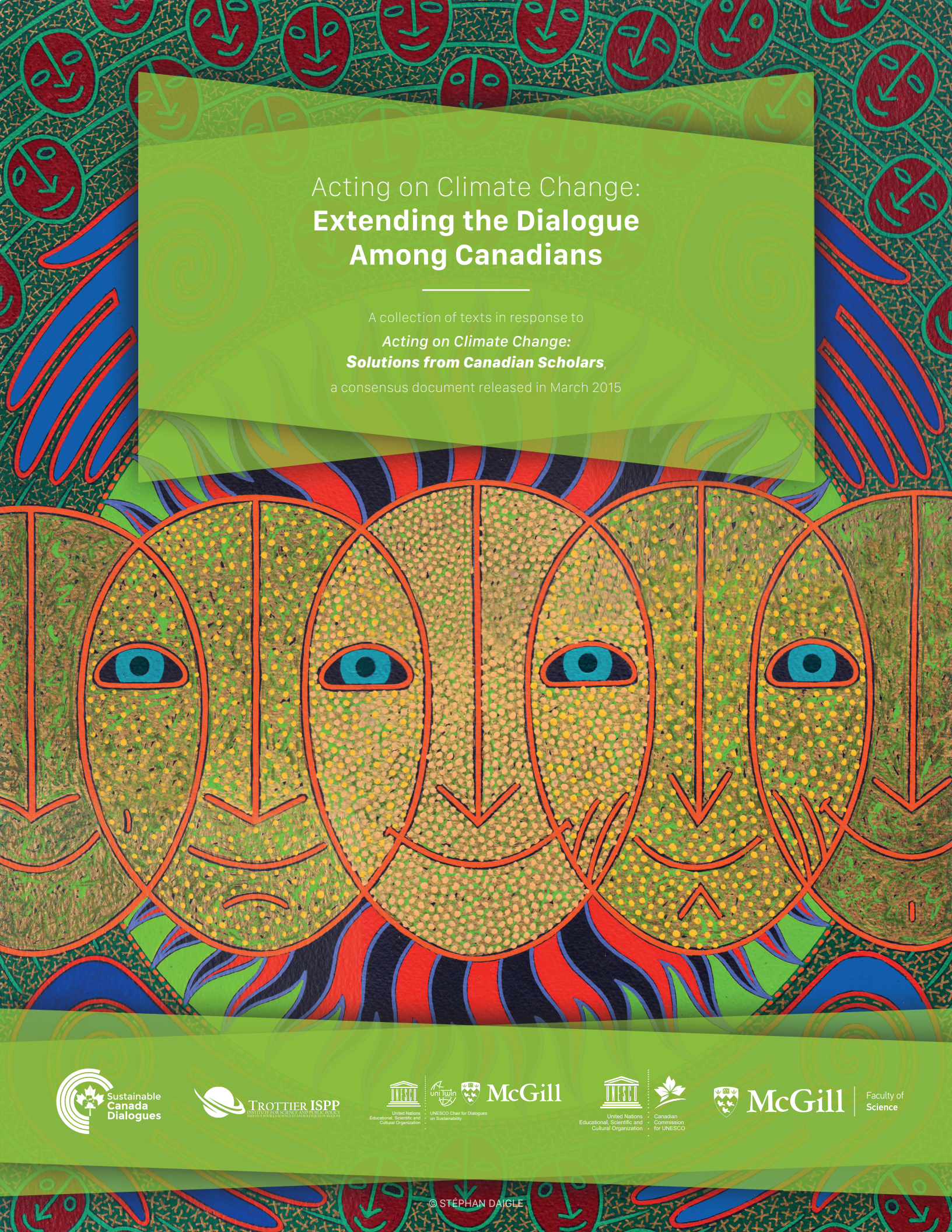

Acting on Climate Change:
Extending the Dialogue Among Canadians

A collection of texts in response to

Acting on Climate Change:
Solutions from Canadian Scholars,

a consensus document released in March 2015

Sustainable Canada Dialogues

TROTTIER ISPP
INSTITUTE FOR SCIENCE AND PUBLIC POLICY

United Nations Educational, Scientific and Cultural Organization · UNESCO Chair for Dialogues on Sustainability · McGill

United Nations Educational, Scientific and Cultural Organization · Canadian Commission for UNESCO

McGill | Faculty of Science

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Nathalie Berthélemy holds a dual competency in business intelligence (with a Master's degree in Business Informatics, France) and sustainable development and environment (Master's in Environmental Sciences, Montreal). Her many experiences in consultation enable her to offer today various services in business that combine her two fields of expertise, namely:

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- Decision-making, as a container, in order to equip organizations with methods and tools useful for decision-making by generating value-added information (content structuring in sustainable development, and the design of diagnostic and monitoring tools).

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ACCUMULATION OF ICE ON THE SAINT LAWRENCE RIVER

Contributed by

NATHALIE BERTHÉLEMY

A Comprehensive Look at Canada's Greenhouse Gas Emissions:

Which Actions for Which Reduction Targets?

Original text in French available at *www.sustainablecanadadialogues.ca/fr/vert/versundialogue*

In accordance with the international climate agenda, Canadian federal and provincial governments have periodically set greenhouse gas (GHG) emission reduction targets. In May 2015, for example, Canada committed to reducing its GHG emissions to 30% below 2005 levels by 2030 but, for the time being, has failed to reverse the overall upward trend in emissions affecting climate. Because the spectrum of GHG emissions covers multiple aspects of our economy and society, it is important to establish an overall picture that can facilitate the review of objectives to be set and actions to be taken.

To take a step forward in this direction, I propose to use my summary tool, "the CO_2 Manager"[1], developed in its first version in 2015, to analyze the new target set by Canada in May 2015 and the actions proposed to achieve it. The tool is a dashboard showing the progression of the components of GHG emissions in Canada, containing configurable projections and a simulation of the effects of emission reduction measures. The simulation could become the basis for a more comprehensive, publicly available tool to support analysis and decision-making.

Methodology

The methodology consists of three phases that, together, give us the GHG emissions tool:

1. Sampling from two main data sources and some complementary sources:

- Annual emissions records submitted by Canada to the United Nations[2]
- Company and institutional emissions records filed with Environment Canada[3] (565 facilities in 2013).

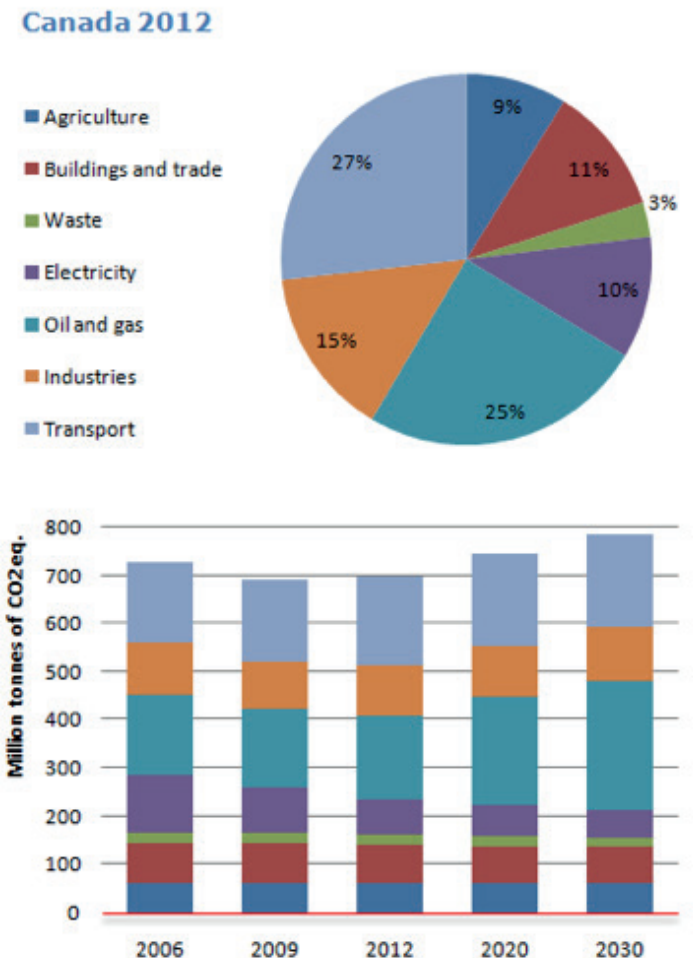
The first database presents the whole spectrum of emissions. The second provides a greater level of detail, especially for three

1 www.co2canada.net/en/purpose

2 These are data from the National Inventory Report (NIR) 1990 - 2012, Part 3, Annex 11, accessible from: http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/8108.php

3 http://www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=8044859A-1

Figure 1. Canada's emissions in 2012 by sector: actual progression 2006-2009 and projections for 2020 and 2030[9]



of the examined sectors: industry, electricity generation and hydrocarbon production. For the CO_2 Manager tool, I selected three years in the period 2004-2012, namely 2006, 2009 and 2012.

2. Gathering and projection of data

The method I used was inspired by "hypercubes", an IT tool used in decision-making[4]. The method involves building a data set with a relatively detailed level of information that can be arranged according to the perspective of choice, according to several criteria of analysis[5]:

- Sector/subsector/component (e.g. business/facility/type of vehicle, if available)
- CO_2-equivalent emissions level/type of gas emitted
- Canada-wide/province/location
- Year

4 https://en.wikipedia.org/wiki/OLAP_cube

5 The full methodology is explained at www.co2canada.net/en/methodology

Projections were made at detailed levels for 2020 and 2030. They were based on observation of trends with linear equations associated with threshold effects, and are adjustable.

3. Integration of measures inspired by existing plans

Policy interventions are then simulated as interventions on projected data. The review tool contains a series of measures inspired by existing plans, studies and examples of regulations set elsewhere and configured for Canada. In this document, I focus my study on the actions that Canada presented as a contribution for 2030 and addressed to the UN[6].

Observable trends

First, we must acknowledge the ongoing progression of emissions in a significant upward trend over time. With the model, we see an elevation in emissions very similar to that presented by Environment Canada[7], despite not having used an identical database or grouping methodology[8].

At the level of "all sectors/all provinces", there is a decline in GHG emissions from 763 to 689 million tonnes (Mt) from 2006-2009 (Figure 1); a slight increase from 2009-2012; then a larger emissions increase reaching a total of 786 Mt in 2030. Some sectors emit more (oil production) and others become more efficient (electricity generation). In the future, the reductions are an order of magnitude lower than the increases, while most sectors remain broadly stable (transport, industry, agriculture and waste).

Proposed regulatory measures

Let us now look at the measures proposed by Canada to achieve the target of reducing GHG emissions by 30% from 2005 levels by 2030. To evaluate the impact of measures, I associate them with interventions for which I will define the parameters and that I will apply to the relevant segments (Figure 2).

These measures are:

1. *To establish more stringent standards for the transport sector, especially for models of heavy-duty vehicles designed after 2018[10];*

To simulate such a measure, I add a standard on the "utilities/all provinces" segment that ensures that sport utility vehicles (SUVs) operating from 2018 onwards consume on average 20% less gasoline for the same mileage[11]. We get a reduction of 8 Mt by 2030, corresponding to a 26% reduction below 2005 levels.

2. *Gradually reduce the use of hydrofluorocarbons (HFCs) and thus limit the emission of powerful GHGs, which are expected to increase significantly over the next 10-15 years;*

It seems possible to replace HFC gases, which have a very high global warming potential, with HFCs that rapidly degrade in the atmosphere[12]. By gradually replacing these gases used as refrigerants, in air conditioners and

6 http://www4.unfccc.int/submissions/INDC/Published%20Documents/Canada/1/CPDN%20-%20Canada%20-%20Fran%C3%A7ais.pdf

7 The study of emissions trends is available from: http://www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=E0533893-1&offset=5&toc=show

8 See www.co2canada.net/en/methodology

9 These figures are taken from a combination of data from the 1990-2012 National Inventory Report (NIR), http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/8108.php, and balance sheets filed with Environment Canada on company and institutional emissions, http://www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=8044859A-1

10 http://oee.nrcan.gc.ca/fcr-rcf/public/index-e.cfm?attr=0

11 For the models on the market in 2015, consumption of SUVs ranges from 7.4 to 21.4 litres per 100 km. http://eia-global.org/blog/bringing-hfcs-to-the-table-on-climate-and-health

12 http://www.actu-environnement.com/ae/news/hfc-gaz-effet-serre-substitution-14185.php4

in the manufacture of insulating foam, we obtain a reduction of 12 Mt by 2030. This corresponds to a reduction in the sub-segment "production and consumption of halocarbons" of 62% below 2005 levels.

3. *Reduce GHG emissions associated with electricity production from natural gas and produced by chemicals and nitrogen fertilizers;*

Across all provinces, this measure applies to three separate segments that each emits different levels of GHGs. Because Canada did not specify whether this measure would entail replacement of one technology by another, I associate it with a type of "performance improvement" intervention. Since the purpose of the measure is to facilitate achievement of the 2030 target, I set a fairly significant optimization rate of 40%.

- With the switch from coal to gas in electricity production, the segment "electricity generation from natural gas" rises sharply. The measure therefore applies to an emissions baseline of 13 Mt in 2005 to 28 Mt in 2030. By applying the measure, we obtain a reduction of 11 Mt by 2030, corresponding to a segment increase of 29% compared to 2005.

- With a similar measure, we obtain a reduction of 4.5 Mt in the "chemicals" segment and 5 Mt in the "fertilizer" segment by 2030. In these two sectors, this decrease represents a 16% reduction of the total compared to 2005.

4. *Reduce methane emissions from the oil and gas sector.*

Following the model of the U.S.[13], Canada could establish regulations for oil and gas facilities and pipelines. The proportion of methane in the oil and gas sector is around 30% of emissions. With the expected increase in production in this sector, methane emissions will increase from 50 to 75 Mt of GHG in 2030.

With a set of measures to either avoid or repurpose methane emissions, and reduce them by 45% by 2030, we obtain a savings of 34 Mt by 2030, corresponding to a segment decrease of 19% compared to 2005.

In the model, these measures represent a reduction of 75 Mt, equivalent to a decline of 3.4% compared to the 2005 reference year. In other words, with these measures, emissions would reach a greater level than in 2009-2012.

Those measures that concern segments that increasingly emit GHGs total 147 Mt in 2005. To achieve greater reductions, we must work to reduce emissions in a greater number of segments.

Review of segments that emit the most GHGs

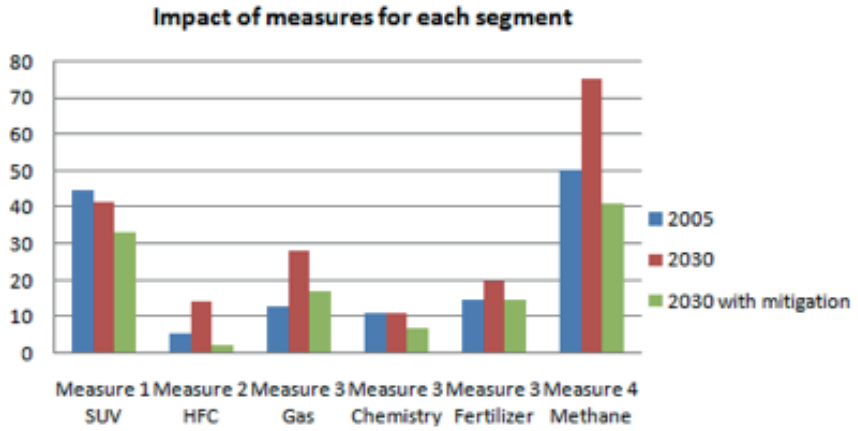
To review the segments that emit the most GHGs, I now select (by province and sector) those that together total more than 50% of emissions. I thus select 24 segments out of 500, grouped here by sector and placed on a scale of 200 million tonnes of GHG (Figure 3).

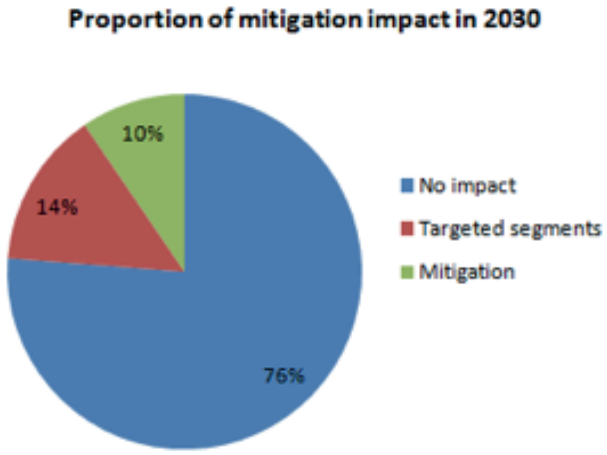
It is clear that the sharp increase in emissions expected in the hydrocarbons sector (mainly in the segment "oil sands/Alberta", which is close to 100 Mt alone[14]), cannot easily be offset by other emitting segments. For example, if reduction efforts already underway were strengthened (such as replacing coal in power stations) in all sectors, the total potential reductions would not exceed 60 Mt.

13 http://www.actu-environnement.com/ae/news/methane-fuites-reduction-gaz-effet-serre-obama-etats-unis-23662.php4

14 Projections of GHG emissions in the oil sands were made using the list of current and future projects available at http://navigator.oilsandsreview.com/listing website

Figure 2. Impact of measures by segment, for every intended measure, and share of emissions of the projected total for 2030



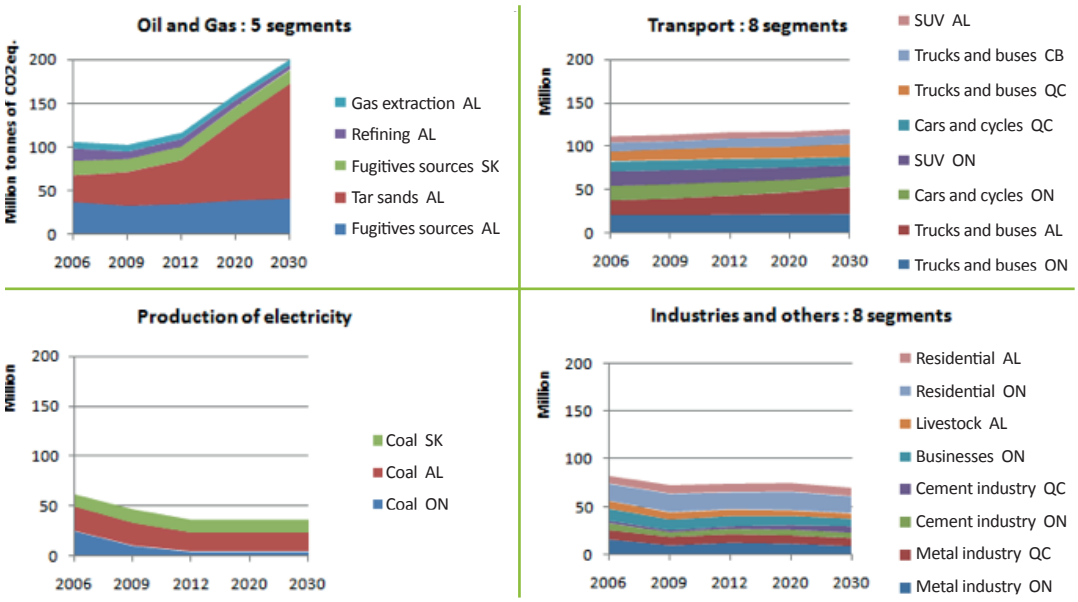


Countries that succeed in their GHG emission reduction approaches implement a combination of measures that in total target a much larger spectrum of emissions. For example, one can use sectoral measures targeting the segments that emit the most, and general measures that have an impact on several sectors simultaneously (such as a carbon market or infrastructure) to intervene on a wider spectrum.

In Canada, we should also reflect on the strategy of distribution of effort across sectors and provinces:

- If, for example, we wish to share the burden evenly among all stakeholders, each sector in each province would be asked to reduce its emissions by 30% from 2005 levels. The hydrocarbon sector will meanwhile offset the expected increase. For the "oil sands/ Alberta" segment, this corresponds more or less to a decrease of about 84% from the projected level in 2030. The structure of this industry would be deeply changed as a result. In terms of measures, this corresponds to more or less an imminent cessation of any new development (e.g. via moratorium).

Figure 3. Projected progression of the 24 segments that emit the most GHGs (i.e. those representing more than 50% of total emissions), 2006-2030



- If, however, efforts are prioritized in some "sector/province" segments while in other sectors the emissions continue to increase, these efforts, whatever they are, will amount to more than 30% of total emissions. This, of course, leads to questions of fairness and the need for interprovincial arrangements: if the burden of reductions and the compensation of increases fall to certain actors and not others, a system of rebalancing should then be put in place.

Conclusion

As the measures announced by the Canadian government in May 2015 will clearly fail to meet the target set, we must define a much more proactive GHG reduction strategy that will involve a broad emissions spectrum. Whatever the strategy, it will have a profound economic and social impact, and will interfere with the current model of development. This raises questions of equity and requires a societal debate.

By presenting a method for rapid assessment of proposed solutions, the results and simulation models can help identify the best options. Assessment of proposed solutions could be combined with other information, such as: cost of measures, level of production, efficiency, employment, tax generation, risk factors, other environmental factors, and more.

ABOUT THE INITIATIVE

SUSTAINABLE CANADA DIALOGUES

This contribution is part of a collection of texts, *Acting on Climate Change: Extending the Dialogue Among Canadians*, stemming from interactions between Sustainable Canada Dialogues, an initiative of the UNESCO-McGill Chair for Dialogues on Sustainability, and business associations, First Nations, non-governmental organizations, labour groups, institutions, organizations and private citizens.

Sustainable Canada Dialogues is a voluntary initiative that mobilizes over 60 researchers from every province in Canada, representing disciplines across engineering, sciences and social sciences. We are motivated by a shared view that putting options on the table will stimulate action and is long overdue in Canada.

Together, the contributions enrich the scope of possible solutions and show that Canada is brimming with ideas, possibilities and the will to act. The views expressed in *Acting on Climate Change: Extending the Dialogue Among Canadians* are those of the contributors, and are not necessarily endorsed by Sustainable Canada Dialogues.

We thank all contributors for engaging in this dialogue with us to help reach a collective vision of desired pathways to our futures.

FOR MORE INFORMATION, VISIT OUR WEBSITE

sustainablecanadadialogues.ca/en/scd/acting-on-climate-change