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2015 PARIS AGREEMENT — ABOUT, ACHIEVEMENTS, AND ACCOUNTING

HIGHLIGHTS

- Almost 90% of the 197 countries involved in the talks have now ratified the UNFCCC Paris Agreement on climate change.
- The ambitious Paris objective is to limit global temperature rise to 2-degrees Celsius above pre-industrial levels by 2100, and to work towards a 1.5 degree Celsius upper bound — a big challenge given forecast global population growth and concurrent energy needs.
- The production-based bias of the global greenhouse gas accounting system is past due for a review. It almost completely ignores the relationship between the production and consumption of goods and services, even though one cannot exist without the other.
- To date, neither Canada nor BC include modifications in land use, land-use change and forestry due to natural disasters, when accounting for progress towards overall GHG emissions reductions; this is a significant mistake given the potential to use land as a carbon sink.
- The accounting system does not but should incorporate double-entry book keeping for international and interstate trade in certificates that claim to represent real reductions in GHG inventories.
- Despite these accounting handcuffs, Canada and BC have made improvements in carbon intensity over time. BC surpassed the global average rate of GHG reduction while also having the fastest growing economy in Canada since 2012.
- Going forward, and absent a hard look at how we account for GHGs, the Canadian and BC economies may shrink under the pressure of mounting climate change and energy regulation. The result: increased imports of more GHG intensive products while Canada ends up ceding market share for our lower-carbon manufactured, energy and other natural resource goods.

BACKGROUND

The 2015 Paris accord is the latest installment of multilateral agreements aimed at addressing the rising concentrations of greenhouse gas emissions (GHGs) in the earth's atmosphere. Paris flows from the 1992 United Nations Framework Convention on Climate Change.[1] The Paris pre-curser, the Kyoto Protocol, failed because it set emission reduction targets for developed countries only, while enabling unrestricted emissions from developing countries. For this reason, the United States — then the world's biggest GHG-emitter — elected not to implement the Kyoto Protocol; Canada and Japan also eventually withdrew. Kyoto died in 2012. Paris differs in that it embraces more fully the 1992 equity principle whereby all countries participate and have common but differentiated responsibilities, based on their capabilities to act given varying national circumstances.

The stated aim of Paris is to limit global temperature rise to 2-degrees Celsius above pre-industrial levels by 2100, and to work towards a 1.5 degree Celsius upper bound. This is an ambitious objective in the face of forecast global population growth

[1] The United Nations Framework Convention on Climate Change (UNFCCC) was constructed as an outcome of the 1992 Earth Summit in Rio de Janeiro but not "in force" until 1994.
[2] http://www.bcbc.com/bcbc-blog/2017/what-the-expanding-global-middle-class-means.

(30% increase by 2050). Then there is the associated economic growth needed to meet not only basic material needs, notably for food and shelter, but also to provide the comforts and goods associated with a modern standard of living at a time when the global middle class is expanding rapidly (notably in Asia).[2] All of this will require an enormous amount of energy: the International Energy Agency forecasts at least a 30% increase in energy demand by 2040, with a majority — 61% — of world primary energy still being supplied by fossil fuels by the end of the 2030s.[3] At the same time, there is a collective desire to fulfill the 2030 Agenda for Sustainable Development and its 17 goals. While the goals are laudable, meeting them will depend on substantial international cooperation, resources, and energy – a tall order in an era when global institutions seem to be faltering.

Gases included in Annual Inventory to UNFCCC

- carbon dioxide (CO2)
- methane (CH4)
- nitrous oxide (N2O)
- perfluorocarbons (PFCs)
- hydrofluorocarbons (HFCs)
- sulphur hexafluoride (SF6)
- nitrogen trifluoride (NF3)

From the following sectors:

- Energy
- Industrial processes and Product Use
- Agriculture
- Waste
- Land Use, Land Use Change, and Forestry

SUM OF THE PARTS

It is widely accepted that the sum of the current Paris commitments (known as Nationally Determined Contributions, or "NDCs") falls short of meeting the agreed 2-degree Celsius objective. Practically speaking, achieving the Paris target means, at a minimum, absolute cuts in global GHG discharges of 40-70% from projected business-as-usual 2050 emissions levels, and carbon neutrality by 2100. This assumes that what the climate models predict with respect to future emissions holds true. But models only suggest possible outcomes using what we know, today. There are hints that several signatories to the Paris agreement anticipate the possibility of a more aggressive global target and/or higher individual country contributions. Discussions about what additional commitments might be needed are scheduled to take place in a 2023 "stocktake." National commitment adjustments could occur every five years, reflecting the results of formal NDC reviews.

PERFORMANCE MEASUREMENT

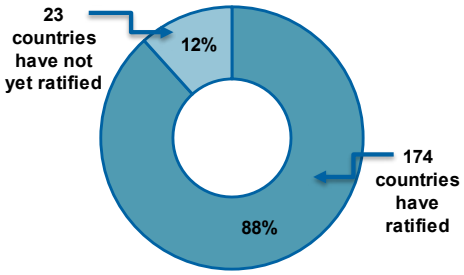
The Paris process was designed to increase performance pressure on signatories via multiple data and information filing requirements, including annual inventory (NIR) submissions, annual National Communication (NC) reports, and Biennial Update (BUR) reports. In December 2017, Canada submitted its 3rd BUR.[4] At 316 pages,[5] it is a compilation of Environment Canada's Pan Canadian Framework, 1990 to 2015 GHG inventory estimates, and the Mid-Century Strategy. The 2017 BUR does a respectable job of describing Canada and how we differ from many other nations in terms of geography, population, climate, and economy. It also reports data that could be used by governments of competing states to embarrass Canada, should we fail to meet our intended targets.

In pursuit of Canada's Paris NDC, our governments have introduced a plethora of regulatory initiatives and carbon management plans over the past 18 months. The BUR outlines these. As well, there is an extensive list of additional government measures still in the planning/policy development stages. The listed government interventions to address Canada's GHG emissions include but are not limited to:

National:

- Proposed methane regulations.
- Lowering the GHG reporting threshold to 10,000 tonnes CO2e for individual emitting facilities.
- New guidelines on GHG quantification for carbon capture, transport and storage facilities, fuel combustion, calcination processes

FIGURE 1: **PARIS AGREEMENT RATIFICATION PROGRESS (UNFCCC)**



[3] World Energy Outlook, 2016, International Energy Agency.
[4] 29 nations and the European Union out of 37 Annex 1 parties have filed their reports: http://unfccc.int/national_reports/annex_i_natcom/submitted_natcom/items/10138.php.
[5] For comparison, the Pan Canadian Framework and Mid-Century reports are both less than 100 pages.
[6] These estimates include only anthropogenic GHG releases and do not include net GHG releases arising from natural changes in land use and forest cover.

in lime manufacturing, clinker production in cement manufacturing kilns, industrial processes in aluminium manufacturing, and industrial processes in iron and steel manufacturing.

- A legislative proposal for a Greenhouse Gas Pollution Pricing Act along with an output based pricing mechanism.
- A proposal for a Clean Fuels Standard on a fuel by fuel basis.
- Strategy on short-lived climate pollutants 2017.

Provinces:

Alberta: new output based GHG regulations — Carbon Competitiveness Incentive Regulation (also the model for the federal proposal).

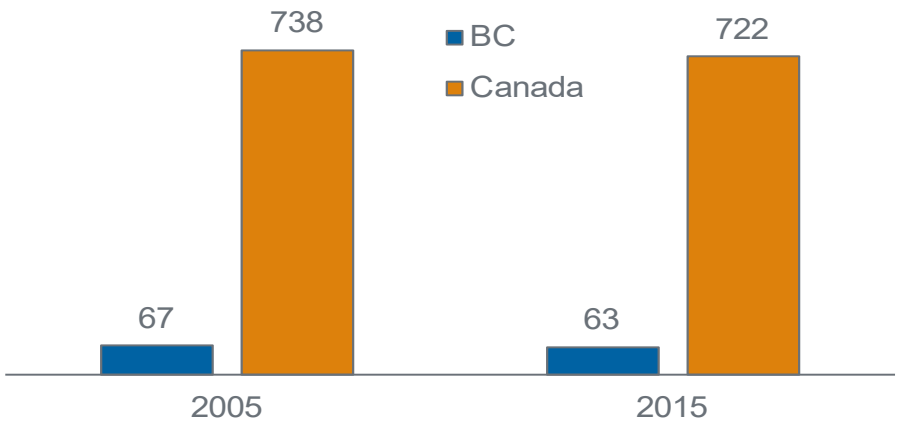
Manitoba and Saskatchewan: both have released plans for managing climate change (1) A Made-in-Manitoba Climate and Green Plan, and (2) Prairie Resilience: A Made-in-Saskatchewan Climate Change Strategy.

Ontario: Finalized its offsets regulation and linked Ontario's new GHG market with the Quebec and California cap and trade market as of January 1, 2018.

CANADA'S AND BC'S GHG INVENTORIES

Over the last 10 years, Canada and the provinces have made progress on GHG emissions. Critics who say "not far or fast enough" tend to ignore the unique Canadian factors affecting performance, as is discussed here.

FIGURE 2: **CANADA AND BC GHG EMISSIONS (MT), 2005 AND 2015**



Source: BC Ministry of Environment, Environment and Climate Change Canada.

TABLE 1: **EXPORTS, POPULATION AND ECONOMIC GROWTH, CANADA & BC**

	Canada	BC
Natural Resources Exports % of Merchandise Exports	50%	75%
Population Growth 2005-2015	11%	12%
Economic Growth 2005-2015	21%	27%

Source: Statistics Canada, http://www5.statcan.gc.ca/cimt-cicm/section-section?lang=eng&dataTransformation=2&refYr=2017&refMonth=11&freq=12&countryId=999&usaState=0&provId=1&retrieve=Retrieve.

Between 2005 and 2015, BC accounted for 25% of the drop in Canada's GHG emissions, while being home to only 13% of the nation's population.[6,7] Both Canada and BC have made progress in reducing emissions per dollar of GDP — making ~16% and ~35% improvements, respectively, since 2005.[8] These compare to a global aggregate progress rate of 28% per dollar of economic output. Globally, GHG emissions are now more or less flat, a positive development.

Both Canada and BC have seen emissions increases in sectors such as mining/oil and gas, agriculture and forestry[9], road transport, and the production and consumption of halocarbons. This makes sense given the importance of natural resources in our economy and relatively high population growth rates[10] — and the roles that these factors play in economic growth.

[7] BC's target is 33% below 2007 levels by 2020 but for comparison purposes we have used the same timeframe as Canada.
[8] Canada CI/GDP https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/greenhouse-gas-emissions/per-person-gross-domestic-product.html.
[9] For purposes of reporting progress towards Paris goals and international comparisons, only energy use-related GHGs are currently included in Canada's agriculture and forestry sector GHG estimates. Canada's decision to exclude natural changes in soil and biomass carbon stocks is currently under review and may change.
[10] Compared to other developed nations.
[11] https://data.oecd.org/gdp/real-gdp-forecast.htm.

TABLE 2: **PERCENT DECLINE IN EMISSIONS 2005 TO 2015 BY SELECT SECTORS**

Sector	BC	Canada
Manufacturing Industries*	-29%	-10%
Construction	-38%	-11%
Commercial and Institutional	-25%	-6%
Residential	-16%	-6%
Coal Mine Fugitives	-10%	-18%
Oil and Gas Fugitives	-3%	-6%
Cement Production	-19%	-18%
Lime Production	-11%	-22%
Mineral Products Use	-52%	-52%
Aluminum Production	-37%	-31%
SF6 Used in Magnesium Smelters and Casters	-62%	-82%
Non-Energy Products from Fuels and Solvent Use	-63%	22%
Other Product Manufacture and Use	-40%	-9%
Average	**-31%**	**-19%**

* Note: Some of these reductions likely reflect a sectoral contraction given plant closures over the past decade.

Source: BC Ministry of Environment, Environment and Climate Change Canada.

At the same time, as shown in Table 2, despite having one of the fastest growing economies in the OECD over the past decade,[11] emissions reduction rates exceeding 20% have been recorded in several Canadian industry sectors. The same story holds for British Columbia, which has ranked first among the provinces in economic growth since 2012, and yet managed to lower GHG emissions by over 30% in the sectors shown in Table 2, relative to 2005 levels. These successes should be celebrated, and yet the mantra of many environmental groups is to say we are not doing enough, fast enough.

But it is true that using a straight-line extrapolation of the current trends, neither Canada nor BC will meet their intended targets of 30% below 2005 levels by 2030, or 33% below 2007 levels by 2020, respectively. Canada would need to achieve reductions of **17 Mt per year** for the next 13 years compared to an average of 1.6 Mt per year over the past 10 years. BC would need to reduce emissions by **~7 Mt per year** for each of the next three years, compared to the 0.3 Mt per year reduction since 2007. Clearly, it is impossible to meet either of these targets without a technology disruption or drastic restructuring of economies. This points to the absurdity of picking targets without having first done the analytical legwork to support practical undertakings, the challenges of relying on poorly-informed models as if the modelled results are fact, and weaknesses in current methods of accounting for and allocating GHG liabilities across jurisdictions.

ACCOUNTING — LULUCF

In terms of accounting, Canada does not include modifications in land use, land-use change and forestry (LULUCF) due to natural disasters in the GHG accounting rules for determining progress towards meeting our NDC. Under international conventions, this means that Canada may not be permitted to take credit for natural regeneration and capital investments in the rehabilitation and recovery of significant carbon stocks lost since 2005 to forest fires and pest infestations. This is a curious situation, given how important these carbon reservoirs are to Canada's future economic health. The good news is that this decision can be reversed under the Paris operating rules — and may, in fact, be under review by the federal government.[12] It must be noted

[12] http://www4.unfccc.int/ndcregistry/PublishedDocuments/Canada%20First/Canada%20First%20NDC-Revised%20submission%202017-05-11.pdf, (1) page 4 "... the potential increases in stored carbon (carbon sequestration) in forests, soils and wetlands have not been included in the projected emissions reductions figure of 175 Mt. For a country such as Canada, carbon sequestration could make an important contribution to the achievement of the 2030 target." and (2) page 8: "Canada is examining its approach to accounting in the land use, land-use change and forestry sector. Canada will use 'the IPCC production approach' to account for harvested wood products and will exclude the impacts of natural disturbances and focus on anthropogenic emissions and removals."

[13] https://www.policyschool.ca/wp-content/uploads/2017/09/PEI-Big-Little-Feet-Dobson-Fellows.pdf.

that Norway, a nation with almost the same dependence on resource extraction to generate wealth as Canada, has relied on carbon stock regeneration in the LULUCF accounts to achieve compliance with every GHG "reduction" commitment it has made since 1997.

ACCOUNTING — PRODUCTION BIAS AND DOUBLE ENTRY BOOK KEEPING

The next accounting issue in the current national GHG inventory system is the production-based emissions bias. In fact, the current method almost completely ignores the relationship between the production and consumption of goods and services, even though one cannot exist without the other. Allocating emissions liabilities solely to a producing jurisdiction/entity ignores trade flows, the nature of comparative advantage in the global economy, and demand drivers. When combined with the conventional practice of measuring national performance in percent-reduction-from-base-year terms, this bias translates into a carbon management regulatory regime that leans toward a systemic, perpetual wealth transfer from Canada to: (1) nations that are significant energy and building product importers in the base year, and (2) nations that are less efficient/more GHG-intensive producers of those products than Canada, in the base year of the agreement.

The bias in GHG inventory accounting is a problem for Canada, as we are among the largest per capita national exporters and also one of the least GHG-intensive producers of energy and building products in the world (see box). If the current approach of assigning GHG liabilities at the point of production continues and the measure of national performance remains percent-reduction-from-base-year rather than end-use, the economies of Canada and British Columbia's may shrink and we will end up importing more GHG intensive products at the same time as we lose market share for our relatively lower carbon input energy and natural resource goods.

While simplicity may have been the *raison d'etre* for today's production-biased GHG accounting system, in our view it is past the time for a reconsideration of current practices. This is necessary to ensure a more accurate representation of the links between where and how energy and other materials-intensive goods/services are produced and their eventual consumption. This includes the need for double-entry bookkeeping when accounting for international and interstate trade in certificates that claim to represent real reductions in GHG inventories. Currently, when nation A exports a real interest in a 1MtCO2e reduction to nation B, there is no balancing addition of 1MtCO2e to the exporting jurisdiction's official GHG inventory. Therefore, the traded offset is credited twice: once in the exporting jurisdiction, and once in the importing jurisdiction. This is difficult to justify.

There should be a willingness to revisit and remove the production bias in conventional GHG inventory accounting and properly deal with GHG allowances and credit trades. This would increase the likelihood

CASE 1

Canadian Natural Gas/LNG

- Fourth largest global natural gas producer.
- Current transition from fossil fuel use at processing plants to electricity along with the efficiencies of proposed BC LNG projects makes a molecule of BC natural gas less GHG intensive
- Each MWh of electricity produced using Canadian natural gas /LNG displaces an importing nation's coal fired generation, lowering global GHG emissions.
- For example, Encana's three new natural gas processing plants – Tower, Saturn, and Sunrise (with capacity of ~1,000 mmscfd) in northeastern BC, are electrified. This means that cleaning the raw gas to make transportable pipeline quality dry natural gas reduces GHG emissions from each plant by 90%.
- Result: Canada reports a GHG emissions increase where the natural gas is extracted and processed.

CASE 2

Canadian Aluminium

- Canadian smelters export ~85% of all aluminium produced.
- Canadian smelters are among the most efficient/least GHG-intensive aluminium producers in the world because they use zero-emission hydroelectricity.
- Incremental GHG reductions at Canadian smelters are costlier to achieve because they are already efficient smelters.
- Using 2005 as the base year, aluminium produced in the United States and Europe is about double the average GHG content compared to Canadian aluminium.
- Given the current accounting system, in 2030 United States and/or European smelters may be trading aluminium with credits even with aluminium GHG content at 25% higher than Canadian smelters.
- Result: GHG-intensive smelters displace less-GHG-intensive Canadian smelters' existing global market share.

of more accurate burden sharing,[13] set the opportunity for a useful conversation about behaviour change at the consumer level,[14] and enable practical solutions — the stated intention of Paris. But there appears to be a lack of recognition about the substantial benefits that Canada could gain from changing current GHG accounting rules, including among many Canadian policy-makers.

Canada's revealed comparative advantage is in energy and natural resources.[15] We are a net goods exporting jurisdiction, with many of these goods being quite energy-intensive to produce. Carbon leakage is an almost inevitable result of the current method of counting emissions. No jurisdiction, including Canada/BC, has implemented adequate protections for energy-intensive trade exposed industries. The production-based inventory method limits the number and effectiveness of workable solutions. As an example, our huge reserves of natural gas — i.e., LNG in British Columbia/Alberta[16] — and the Ontario steel-making sector, both produced using with relatively clean energy inputs and with the lowest GHG profiles among competing suppliers, may be stranded or sold at a discount. This is likely to limit progress toward the Paris targets while also harming Canada's economy.

CONCLUSION

Climate change is a global problem but with local effects and nuances. Canada and BC have made progress in reducing GHG emissions, albeit not at the speed or quantum that many hope for. Part of the reason is how we account for emissions and the fundamental disconnect between production and consumption under existing accounting conventions. Our governments can submit many plans and reports, but if the basic accounting system is flawed, then achieving the desired outcomes are harder and costs to our economy greater than is necessary or warranted.

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[14] www.greengrowthknowledge.org/sites/default/files/downloads/resource/UNEP_consuming_sustainably_Behavioral_Insights.pdf.
[15] https://wits.worldbank.org/CountryProfile/en/Country/CAN/Year/2016/Summary.
[16] NG has 56% less CO2 per mmBTU than coal.