OIL SANDS EXPANSION AND KINDER MORGAN:
THE EMISSIONS IMPLICATIONS

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Prime Minister Trudeau claims that without B.C. agreeing to accept the Kinder Morgan pipeline expansion, "we won't get a national price on carbon and we would never meet our Paris targets".[1]

Proponents of the pipeline project say the B.C. government is threatening to upset a delicate national consensus that would allow Canada to both expand pipelines (to facilitate the continued growth of Alberta's oil sands industry) and at the same time ensure that all provinces support a plan (called the *Pan Canadian Framework*) to reduce Canada's total emissions.

Mr. Trudeau's threat is that if Alberta does not get the pipeline, it will not co-operate in promised measures to reduce the rise of carbon emissions – and, in consequence, Canada will not be able to meet its target. Alberta is Canada's largest emitting province, currently accounting for 37% of Canada's total annual emissions.

We need an absolutely candid public discussion of the emissions implications of oil sands expansion. The debate in B.C. about the pipeline expansion has been focused on oil spills and the effectiveness of spill recovery.

The economic rationale underlying the approval of the Kinder Morgan and Line 3 pipelines is the planned expansion of Canada's oil sands production from the 2015 level of 2.5 million barrels per day to 4.5 million by 2040.[3]

The evidence shows that, between now and 2030, technological innovation cannot lower carbon intensity per barrel fast enough to alter the existing trend, in which emissions continue to increase in step with rising production.[4] The Government of Canada's most recent numbers (*Canada's 3rd Biennial Report*, December 29, 2017)[2] tell the story:

Figure A: Oil sands emissions and production figures from *Canada's 3rd Biennial Report*

	2005	**2015**	**2020**	**2030**	**change 2015-2030**
Emissions	35	71	89	115	**+44 Mt CO_2eq**
Production	1.065	2.526	3.361	4.236	**+1.719 million bpd**

Source: *Canada's 3rd Biennial Report to UNFCCC* (December 29, 2017), Table 5.9

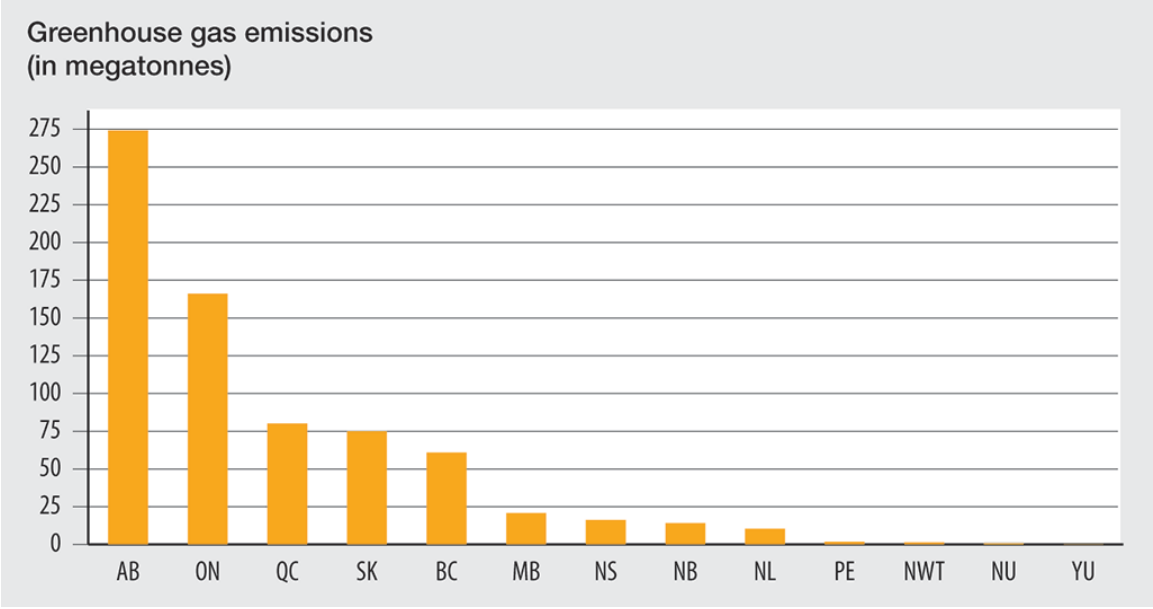
If we continue to expand oil sands output as currently projected, annual emissions in that industry will be about 44 million tonnes (Mt) higher by 2030 than they were in 2015.[5]

The question is whether this 44 Mt increase can be reconciled with Canada's commitment to reduce our total emissions 30% by 2030 below the 2005 level, down to 523 Mt. Under current policies, the total is expected to be 722 Mt by 2030. To meet the target, cuts of 200 Mt will have to be achieved within the next decade.

Where do we find 200 Mt of cuts?

It is helpful to understand how Canada's current emissions are distributed among the different provinces. Figure B represents provincial emissions levels in 2015.

Figure B: Provincial and Territorial GHG Emissions



Source: *National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada*, Environment and Climate Change Canada, 2017. This graph published in *Perspectives on Climate Change Action in Canada – A Collaboration Report from Auditors General* (March 27, 2018).

To begin, even if all of Alberta's new carbon reduction policies (including its carbon price) are fully implemented, by 2030 its total emissions will be at about the same level as they are today – or possibly reduced about 20 Mt to around 254 Mt – *but still well above the 2005 level*. The problem is that growth of oil sands emissions between 2015 and 2030 will cancel out most of the reductions promised by Alberta over the next decade. In consequence, the entire burden of making deep cuts below the 2005 level will fall on the other provinces.[6]

Second, the oil and gas sector, Canada's largest emitting sector (26% of the national total) will be unable to contribute any share of the needed reductions – because it will still be increasing. Even if promised new regulations to cut methane emissions (mainly in the

natural gas industry) are fully implemented in the next decade, the entire oil and gas sector will achieve a net reduction of only 5 Mt by 2030, below the 2020 level.[7]

That means four key sectors of our economy (transportation, buildings, heavy industry, and electricity) which together are expected to account for 410 Mt of Canada's total emissions in 2020, will have to cut their combined emissions by about 50% within ten years – if we are going to meet the target.[8]

No government assessment shows that is feasible.[9] Based on "current measures", the *3rd Biennial Report* confirms that only 29 Mt of net reductions are expected between 2020 and 2030 in those four sectors – a fraction of what we need.

"Current measures" is a key term in government projections of future emissions. It means carbon-reduction policies that have already been adopted by the Federal Government and by provincial governments, up to September 2017. We can have a degree of certainty that these policies will be funded and implemented. They offer some real assurance that the promised emissions reductions will actually occur, between now and 2030.

What about the remaining cuts we will need to meet the target – the other 172 Mt?

In December 2016, the government published a booklet called the *Pan-Canadian Framework on Clean Growth and Climate Change*, which contained a long list of promised future policies.[10] Those promises, in a revised form, are repeated in the recent *3rd Biennial Report*.

The most recent version of the *Framework* plan identifies 79 Mt of additional cuts to the above four sectors over the next decade (called "additional measures"), but they depend on promises of future policies not yet developed. Even if we count on all that, the remaining shortfall is still 119 Mt – more than half of all the cuts we have to make over the next twelve years. The plan says 59 Mt of the shortfall will be accounted for by purchasing international "carbon credits". But those cuts will not occur in Canada at all. We will be paying for emissions reductions in California, not de-carbonizing the economy in Canada. The other 60 Mt of the shortfall is covered by promises that over the next decade we will lower the carbon-intensity of fossil fuels used in Canada, and by vague assurances about "investing in public transit, clean technology, and innovation…" (*Report*, Figure 5.6, p. 153), which means future policies that do not yet exist.[11]

Mr. Trudeau also promises a "national carbon price". According to the *Pan-Canadian Framework* document, a carbon price (by means of a carbon tax or a cap-and–trade system) is one of the "four pillars" of what it calls a comprehensive plan (see section 1.2, "Pillars of the Framework", p. 2).

But the existing agreement between the Federal Government and the provinces promises only that the carbon price for all jurisdictions in Canada will start at a minimum of $10 per tonne in 2018 and rise by $10 per year, to $50 per tonne by 2022. The scheme, summarized in the *Framework* document, provides that any further increase in the carbon price will not be decided until "early 2022". There does not yet exist any agreed carbon pricing plan for Canada that ensures prices will rise above $50 after 2022. We do not

know what the carbon price might be during the seven years after that, up to 2030 – or indeed whether it will increase at all.

The promised future emission reductions depend on the stringency of a carbon-pricing scheme that remains unknown for the crucial seven-year period after 2022. Energy economists in Canada have warned that if we are going to rely on carbon pricing as a principal policy to achieve our emissions reduction target by 2030, the carbon price during the next decade will need to rise very substantially over the next decade – to as much as $150 or $200 per tonne of CO_2.[12]

Under this plan, the only certainty is that Alberta will get its pipelines – and the oil sands industry will continue to grow. The other provinces will make the required deep cuts below the 2005 level, if they can.

The risks of proceeding with the expansion of oil sands production in Alberta are unconscionable, because we have no reasonable assurance that the other provinces can achieve the needed deep emissions reductions between now and 2030.

In B.C., the provincial NDP government on March 22, 2018 announced generous new discounts in provincial tax and electricity pricing policies to encourage foreign investors to commit to building LNG facilities on the B.C. coast. It is beyond reason that, when we are already confronted with a projected 44 Mt rise in the annual level of oil sands emissions between 2015 and 2030, we would choose in B.C. to embark on new efforts to attract emissions-intensive LNG plants to the west coast – a development that would add another 10 Mt to 20 Mt to the annual total, if just one or two facilities are built.[13] That potential increase is not mentioned in the new version of the *Framework* plan.

Global oil consumption

Another deep contradiction, unanswered, lies at the heart of our national policy.

The economic benefits of the Kinder Morgan pipeline have been much discussed by the National Energy Board (NEB) and in the media. The foundations of the economic case were set out in the NEB's January 27, 2016 report, *Canada's Energy Future 2016*: *Energy Supply and Demand Projections to 2040.* The NEB concluded in its analysis that growth in global oil consumption, especially in Asia, will remain strong for another twenty-five years. Based on that projection of increasing oil demand worldwide for several more decades, the NEB forecast that Canada's oil sands production would increase from the 2014 level of 2.4 million bpd to 4.8 million bpd by 2040 – a doubling of production. Later, in October 2016, the NEB published an update (titled *Canada's Energy Future 2016 Update*) that lowered the NEB's projections due to uncertainty about future oil prices. The *Update* projected that oil sands production will reach 4.3 million bpd (instead of 4.8) by 2040.

To deliver that expansion of oil sands production by 2040, about 2 million bpd of new pipeline capacity will have to be built in Canada to move the bitumen to market. The two

projects now approved (Kinder Morgan and Line 3) will add enough new capacity to transport an additional 960,000 bpd, which will accommodate almost 50% of the industry's total planned expansion to 2040. The economic viability of this plan – building new pipelines and a near doubling of oil sands production by 2040 – is based on the expectation that *the global appetite for oil will continue to grow for at least another twenty-five years.* That is the key assumption underlying the economic case.

However, the International Energy Agency (IEA) has stated unequivocally that current "business-as-usual" projections showing continued growth of global crude oil production to 2040 are inconsistent with the goal of limiting the long-term rise of average global temperature to 2°C – a climate policy commitment affirmed by all signatory countries (including Canada) under the 2015 Paris Agreement.[14]

The IEA's "450 Scenario" is a mitigation scenario designed to meet that goal. It calls on all countries to adopt carbon-reduction policies that will achieve significant reductions of global oil consumption – absolute reductions starting by 2020 – that are deep enough to meet the 2°C target. The key strategy under the 450 Scenario is a gradual decline of global oil consumption, starting in 2020, to achieve about a 20% cut in worldwide oil demand by 2040, compared to the 2014 level.

The *Pan-Canadian Framework* plan is completely silent about whether the planned expansion of oil sands production to 2040 is consistent with the 2°C commitment.[15]

The path we are on

Four years ago, Canada and 194 other countries approved the accuracy of the following statement summarizing our situation, based on a comprehensive assessment of the available scientific evidence by the Intergovernmental Panel on Climate Change (IPCC):

> *Baseline scenarios (scenarios without explicit additional efforts to constrain emissions) exceed 450 parts per million (ppm) CO_2eq by 2030 and reach CO_2eq concentrations between 750 and more than 1300 ppm CO_2eq in 2100.*
>
> — IPCC, 2014, *Summary for Policymakers*, SPM 3, p. 8 (emphasis added)

The IPCC warned that as the concentration of greenhouse gases in the atmosphere moves above 450 ppm, we will face increasing average global temperatures rising more than 2°C above the pre-industrial level, over the decades that follow.[16]

If we continue on the present emissions path, by the time children now about two or three years old graduate from high school, the atmospheric carbon concentration level will likely exceed 450 ppm, bequeathing to them a dire future. We are running out of time.

NOTES

1. Trudeau statement

The Prime Minister's comment is quoted from his interview with Gregor Craigie (CBC News, February 2, 2018): see CBC News article "No carbon cuts or ocean protection without pipeline, Trudeau says" (February 2, 2018); also the *Georgia Straight* (Martyn Brown, February 5, 2018): https://www.straight.com/news/1028986/martyn-brown-losing-it-trudeau-british-columbia.

2. The Government of Canada's emissions projections to 2030

On December 29, 2017, the Government of Canada published *Canada's 7th National Communication and 3rd Biennial Report to UNFCCC*, which provides emissions projections up to 2020 and 2030. The full report can be found online at: http://unfccc.int/files/national_reports/national_communications_and_biennial_reports/application/pdf/82051493_canada-nc7-br3-1-5108_eccc_can7thncomm3rdbi-report_en_04_web.pdf.

The *3rd Biennial Report* projections for all seven economic sectors are shown in Figure C:

Figure C: Emissions projections to 2020 and 2030 (Mt CO_2eq)

	2005	2010	2015	2020	2030	Change 2005-2030
Oil and Gas	158	160	189	197	215	**+57 Mt**
Electricity	117	96	79	71	46	**-70 Mt**
Transportation	163	171	173	168	155	**-8 Mt**
Heavy Industry	86	73	75	83	97	**+11 Mt**
Buildings	85	81	86	88	83	**-2 Mt**
Agriculture	74	70	73	71	72	**-3 Mt**
Waste and Others	54	50	48	50	53	**-2 Mt**
Total	**738**	**701**	**722**	**728**	**722**	**-16 Mt**

Source: *Canada's 7th National Communication and 3rd Biennial Report to UNFCCC* (December 2017), Table 5.6. The report notes that numbers may not sum due to rounding.

The record shows that, between 2005 and 2015, the electricity sector was by far the largest source (and the only substantial source) of emissions reductions in the Canadian

economy. However, that remarkable 38 Mt cut in electricity sector emissions over ten years was to a large extent offset by a 31 Mt increase in oil and gas emissions. Based on the *3rd Biennial Report* projections, the same pattern is going to continue: between 2015 and 2030, electricity emissions are expected to decline by another 33 Mt, but oil and gas sector emissions (almost entirely driven by oil sands expansion) will grow by 26 Mt. Apart from a very modest expected cut in transportation emissions (18 Mt), no other economic sector is projected to show any meaningful reduction between 2015 and 2030.

Figure D, based on Table 5.8 in the *3rd Biennial Report*, shows emissions projections for the oil and gas industry. Oil and gas is the largest emitting sector, accounting for 26% of Canada's total emissions. The oil sands sub-sector accounts for virtually all of the expected emissions growth expected over the period 2015-2030 in this sector:

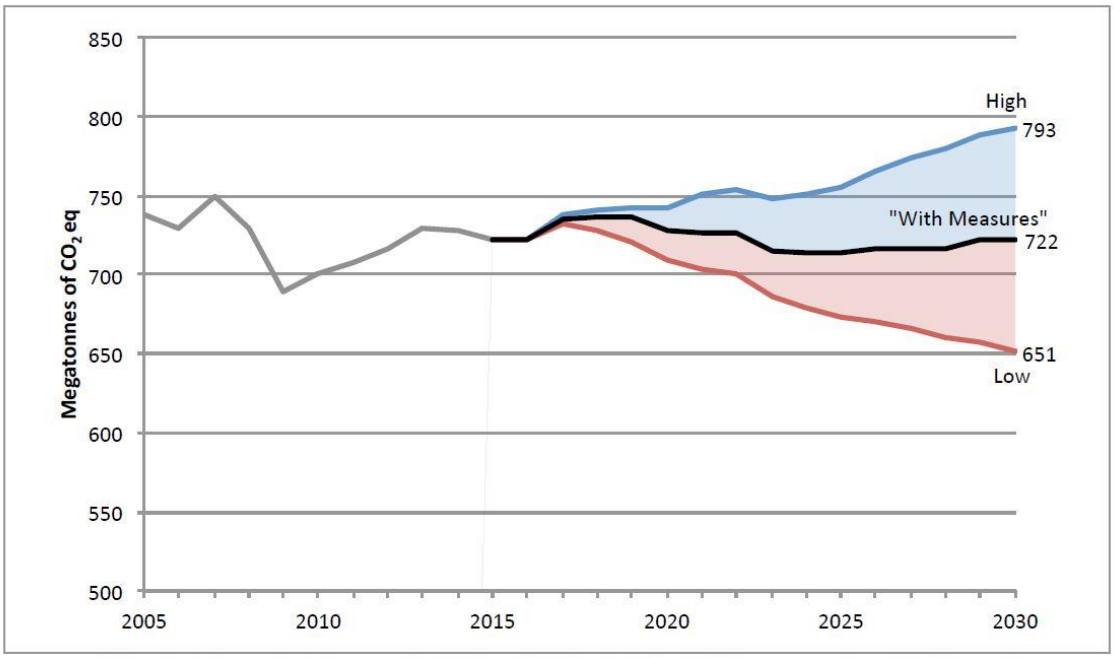
Figure D: Oil and gas sector emissions by production type (Mt CO_2eq)

	2005	2010	2015	2020	2030	Change 2005-2030
Natural Gas Production and Processing	57	49	56	50	45	**-12 Mt**
Conventional Production	30	27	31	26	23	**-8 Mt**
Oil Sands	35	53	71	89	115	**+80 Mt**
Oil and Natural Gas Transmission	12	7	10	9	9	**-3 Mt**
Petroleum Products (Refining)	22	22	21	22	22	**0**
Natural Gas Distribution	1	1	1	1	1	**0**
Total	**158**	**160**	**189**	**197**	**215**	**+57 Mt**

Source: *Canada's 3rd Biennial Report* (December 2017), Table 5.8. The report notes that numbers may not sum due to rounding.

Figure E, reproduced from the *3rd Biennial Report*, provides a convenient picture of our current situation:

Figure E: Canada's domestic emissions projections in 2020 and 2030 (Mt CO_2eq)



Source: *Canada's 7th National Communication and 3rd Biennial Report to UNFCCC* (December 2017).

The middle line is the "reference case" projection of Canada's total emissions to 2030. The other tracks indicate two other possible emissions paths, depending on the future rate of economic growth, long-term oil prices, etc. Strong growth could push the projected level up to 793 Mt. The Government of Canada's declared target for 2030 (a commitment made at the Paris Climate Conference in 2015) is 523 Mt.

We see a sharp break in the emissions trend between 2007 and 2010. Canada's annual CO_2 emissions peaked at 750 Mt in 2007. The numbers fell in 2008-2009 as a result of the 2008 financial collapse. Most of that unprecedented drop had nothing to do with any policy by governments to manage carbon emissions. The numbers fell mainly because economic activity collapsed. The low point was 689 Mt in 2009. The total drop was 61 Mt, an extraordinary reduction of emissions within the space of two years.

3. Growth of oil sands production to 2030

The final version of the "upstream emissions assessment" for the Kinder Morgan pipeline released on November 25, 2016 (*Review of Related Greenhouse Gas Emissions Estimates for the Trans Mountain Expansion Project*) adopted a forecast published by the National Energy Board (NEB) in October 2016 that oil sands production will increase from the 2014 level of 2.3 million bpd to 3.967 million bpd by 2030, and to 4.3 million bpd by 2040: see *Report*, November 25, 2016, s. B.2.1 at p. 21, "Canadian Oil Supply Growth."

In October 2017, the NEB released a new set of oil supply and demand projections (*Canada's Energy Future 2017*) that confirm this trend, projecting that oil sands production will reach 4.180 million bpd by 2030, and 4.5 million by 2040. The *3rd Biennial Report* released on December 29, 2017 gives 4.236 million bpd for oil sands production in 2030. https://www.neb-one.gc.ca/nrg/ntgrtd/ftr/2017/2017nrgftr-eng.pdf

For a discussion of Canada's expansion of oil production in the context of global trends to 2040, see Note 14: Global oil consumption and the 2°C limit (page 30).

4. Technology and the carbon intensity of oil sands extraction

The oil sands consist of immense formations of clay, silt, and sand particles coated with an outer layer of tar-like bitumen. A unique feature of extracting bitumen from the oil sands, in comparison to recovering crude oil in the form it is found in most other places in the world, is that the process requires massive amounts of heat and steam to separate the bitumen from the sand and clay in which it is embedded. Bitumen in its natural state in the earth has a *high viscosity*. Heat must be used to make it melt – to make it flow.

Most of the oil sands formations in Alberta are located too deep underground for surface mining. Surface mining is gradually declining in relative importance, although its vast open pits and tailings ponds remain the most visible symbol of the industry. The most common extraction method being developed now, called "in situ", involves drilling into deep deposits of oil sands, perhaps 400 to 600 feet underground, and then drilling a series of horizontal wells which may extend a kilometer or more in length through the bitumen saturated deposit. In the in situ process, high-pressure steam is injected underground for lengthy periods, eventually causing the bitumen to soften and separate from the granular sand and clay in which it is embedded and drain through the earth into the lower well from which it is pumped to the surface.

The Government of Canada's *National Inventory Report 1990-2015: Greenhouse Gas Sources and Sinks in Canada* (released April 13, 2017), provides this succinct description of the in situ process:

> *The steam-assisted gravity drainage (SAGD) process used to extract crude bitumen involves injecting large amounts of steam into the producing formation, where the heat from the steam allows the crude bitumen to flow and be extracted. The steam is generally produced by combusting natural gas, resulting in emissions. Since 2005, total natural gas consumption in this subcategory has increased over 75% (Statistics Canada 1990-2016), and SAGD production has increased over 900% (AER 2016).*
>
> — *National Inventory Report 1990-2015*, p. 57

That natural-gas-driven process explains the high level of CO_2 emissions for each barrel of bitumen produced.

Improvements in technology and advances in extraction method over the past twenty-five years have achieved some success in lowering the amount of energy (fossil fuel burned) that is required to extract each barrel of bitumen. Those gains are spoken of as improvements in *carbon intensity*. A much cited figure is that over the initial fifteen years between 1990 and 2005, emissions intensity per barrel dropped by 26%, from 122 kg CO_2eq per barrel to 90 Kg CO_2eq per barrel. Notwithstanding that documented improvement in carbon intensity per barrel, total oil sands emissions in Alberta more than quadrupled between 1990 and 2015, from 15 Mt to 71 Mt.

The problem is that the comparatively small "gain" in the reduction of the amount of CO_2 per barrel (26% over that 15-years period) was more than offset by the huge increase in the number of barrels produced. Between 1990 and 2005, production quadrupled from less than 400,000 bpd to 1.7 million.

The average carbon intensity of all oil sands operations in 2015 (including in situ, mining, and upgrading) was 79 kg CO_2eq per barrel. But if we look at the period between 2005 and 2015, the annual level of oil sands emissions doubled – from 35 Mt to 71 Mt.

The Government's *3rd Biennial Report* acknowledges that emissions in the oil sands industry will continue to rise more or less in step with production up to 2030. Reductions in carbon intensity will be offset by other factors:

> *In the forecast, several factors could lead to increasing intensity in the oil sands subsector, such as declining reservoir quality, aging of existing facilities, and shifts from mining operations to more emissions-intensive in situ extraction processes. On the other hand, clean technology deployment could lead to significant emissions intensity reductions in the subsector. Considering the uncertainties associated with these counterbalancing trends in oil sands emissions intensities, the projections keep the emissions intensities of new oil sands productions at the level of existing technologies.*
>
> — *3rd Biennial Report*, p. 139 (emphasis added)

5. Alberta's 100 Mt oil sands emissions "cap"

Media discussion and political leaders frequently claim that oil sands emissions are going to be curbed because the Province of Alberta has imposed a 100 Mt cap on the total annual level of oil sands emissions. The suggestion is that this "cap" will help Canada meet its emissions reduction target by 2030.

The recent *3rd Biennial Report* explains that the currently projected increase of oil sands emissions to 115 Mt by 2030 will in fact be *within the cap limit*, and represents only 99 Mt of oil sands emissions as defined by the cap (see notes g and h at pp. 138-139 of the report). Therefore, the cap will not stop the annual level of oil sands emissions from growing by 44 Mt between 2015 and 2030. The 100 Mt cap does not apply to, or restrict, the growth of *additional emissions* generated by the expansion of "new upgrading" in Alberta. The cap also exempts additional emissions attributed to cogeneration.

6. Province of Alberta: emissions projection to 2030

The Government of Canada's *3rd Biennial Report* gives this estimate of the Alberta's total emissions to 2030:

Figure F: Province of Alberta – Federal emissions projections to 2020 and 2030 (Mt CO_2eq)

	2005	2015	2020	2030
Alberta	233	274	278	287

Source: *Canada's 3rd Biennial Report* (December 29, 2017), Table 5.27.

The above projection is based on current measures: it takes into account the future benefit of all the major new carbon-reduction policies put in place up to September 2017 by Alberta and by the federal government. It does not include the impact of promised regulations to reduce methane reductions in the oil and gas industry – because the methane regulations have not yet been implemented. It does include the shutdown of all coal-fired electricity generation in the province by 2030.

The Government of Alberta's *Climate Leadership Plan Progress Report*, released in December 2017, provides us with a more optimistic projection about the expected impact of Alberta's new policies by 2030. It includes the benefit of policies not yet implemented. It assumes full implementation of all future measures promised in Alberta's Climate Leadership Plan (CLP), and takes into account future federal policies that have been promised:

Figure G: Province of Alberta – Alberta's emissions projections to 2020 and 2030 (Mt CO_2eq)

	2015	2020	2030
Alberta	274	270	254

Source: *Alberta Climate leadership Plan Progress Report*, 2017 Policy and Economic Expectations ("with CLP and federal climate policies"), (December 29, 2017), Table 1.

The *Progress Report* takes into account a promised 14 CO_2eq cut of methane emissions in Alberta by 2030, below the business-as-usual level. It also includes 7 Mt of additional future reductions based on the government's promise that when Alberta's existing coal-fired electricity plants are replaced (mainly with natural gas), 30% of the replacement will be renewable energy sources.

Assuming that Alberta's total emissions could decline to 254 Mt by 2030, that is only a 20 Mt cut below the 2015 level – and still 20 Mt *above* the province's 2005 level. Canada's national commitment is 30% below the 2005 level. To meet that target, Alberta would need to reduce its emissions to 163 Mt by 2030.

At present, Alberta accounts for about 37% of Canada's total emissions – due to the dominant role of the emissions-intensive oil and gas industry in that province. If Alberta follows this path and meets its 254 Mt estimate – and even if the other provinces could achieve all the needed additional cuts required to meet Canada's 523 Mt target – by 2030 Alberta's economy will account for an astonishing 48% of Canada's total emissions.

Alberta's *Progress Report* (Table 2 at p. 9) acknowledges that, under this forecast, the oil and gas sector in Alberta will account for 145 Mt of the province's total 254 Mt emissions by 2030 – about 57% of the province's total. Emissions from the expanding oil sands industry will account for most of the oil and gas sector share in Alberta.

It is clear, therefore, that expanding oil sands production (and the resulting emissions growth) is having a defining impact on the problem we have to solve.

The *Progress Report* also includes a more ambitious scenario, which proposes that Alberta's total emissions could fall as low as 222 Mt by 2030 (Table 1 p.8). However, that outcome is not supported by quantified or detailed policies showing how that additional 32 Mt of reductions might be achieved. This scenario is described as based on the CLP (the same policy package that supports the 254 Mt forecast), but with the added words: "plus Potential Reductions from Innovations". So it is dependent on unspecified future technological innovations.

The Alberta Climate Leadership panel conceded, in its original *Report to Minister* on November 20, 2015, that the proposed new measures in the province's Climate Leadership Plan would have only a limited impact on the province's total emissions:

> *Many will look at these emissions reductions and claim that our policies will not place Alberta on a trajectory consistent with global 2° goals, and in some sense this is true – the policies proposed for Alberta in this document would not, if applied in all jurisdictions in the world, lead to global goals being accomplished.*

The panel concluded that more aggressive policies to substantially reduce oil sands emissions (i.e., a higher carbon price to induce more rapid technological changes to reduce emissions intensity) are "not tenable", because they would raise production costs for Alberta producers and make the industry uncompetitive against lower-cost oil production in other jurisdictions:

> *However, more stringent policies in Alberta would come at significant cost to the province due to lost competitiveness, with negligible impaction on global emissions due to carbon leakage. As a panel, we have looked at this challenge and concluded that while we do not have an architecture that, in the short-term, will be consistent with meeting global goals, the approach we are proposing will position Alberta to make a meaningful contribution in the longer-term. In the meantime, imposing policies in Alberta that are more stringent than what we have suggested is not tenable, until our peers and competitor jurisdictions adopt policies that would have a comparable impact on their industrial sectors.*
>
> — *Report to Minister*, "Outcomes and Impacts", p. 11 (emphasis added)

"Carbon leakage" means that if Alberta were to adopt more stringent policies aimed to eliminate or substantially cut the projected growth of oil sands emissions, the additional costs (incurred by producers to adopt required new technologies to lower emissions per barrel) would make Alberta's bitumen production more expensive, and therefore uncompetitive. Alberta's production and exports would as a result decline – but crude oil producers in the U.S., or in Saudi Arabia or elsewhere, would increase their output.

The choice for Alberta is to pursue the economic benefits of continued expansion of its oil sands output, or, in the alternative, adopt more stringent carbon prices and tougher performance standards that would achieve deeper reductions in emissions per barrel – but it cannot do both, according to the panel.

That is the dilemma. The Alberta panel recommended the path of continued expansion, on the grounds that imposing more stringent emissions reduction in the oil sands would result in "sacrificing wealth and prosperity" in Canada (i.e., lower production levels) while other countries increase their output to replace our exports.

7. Reduction of methane emissions

The Liberal Government promised in 2016 that it would enact regulations to reduce methane gas emissions in the oil and gas industry by 40-45% below 2012 levels by 2025. In 2014, 48 Mt CO_2eq of methane was generated by the oil and gas sector (*Canada's 2016 Greenhouse Gas Emissions Reference Case*, Table A18) mostly in Alberta and B.C., where it is associated mainly with natural gas extraction and processing. The promised methane reductions are cited in the "additional measures scenario" set out in the *3rd Biennial Report*, which estimates that methane regulations, if implemented, would allow 22 Mt CO_2eq of future emissions reductions in the oil and gas sector, taking into account the impact in all provinces, including Alberta.

At present, both the Federal Government and Alberta are drafting their own methane regulations. Alberta's *Climate Leadership Plan Progress Report* (December 2017) estimates that the regulations will achieve a 14 Mt reduction of methane emissions by 2030, in Alberta.

Methane emissions in the oil and gas sector are broadly acknowledged to be a compelling opportunity for reductions. A large proportion is caused by the *deliberate flaring or venting of natural gas into the atmosphere* and by "fugitive" leaks during natural gas production, transmission, storage, and processing. Technologies to monitor and reduce leaks are available and economically viable. For a detailed discussion, see *Economic Analysis of Methane Emission Reduction Opportunities in the Canadian Oil and Natural Gas Industries*, Environmental Defence Fund, October 2015, https://www.pembina.org/reports/edf-icf-methane-opportunities.pdf .

There is some uncertainty about the future of the proposed regulations. On June 29, 2016, Canada, the U.S., and Mexico announced a joint strategy to reduce methane emissions 40-45% by 2025. But after the inauguration of the Trump administration, the U.S. announced that it was going to back away from the proposed scheme. The industry in

Canada has since raised concerns it will become "uncompetitive" if it is forced to comply with methane regulations when foreign competitors are not.

8. Meeting the 2030 target of 523 Mt

Canada's Third Biennial Report (December 29, 2018) shows the expected emissions cuts that can be achieved with "current measures": see Table 5.6, p.137. Table 5.28 at page 153 takes into account the impact of promised "additional measures".

As for the oil and gas sector, under current measures total emissions (including oil sands) are expected to reach 215 Mt by 2030. According to the *3rd Biennial Report,* methane regulations, if fully implemented, could achieve 22 Mt CO_2eq of reductions across Canada by 2030 (discussed at p. 139 of the report). Table 5.28, under "additional measures", shows total oil and gas sector emissions reduced to 192 Mt by 2030, if the promised methane regulations are adopted.

Two other economic sectors (waste and agriculture) show no reduction at all between 2020 and 2030. Therefore, Canada's ability to meet its emissions reduction target by 2030 depends almost entirely on our capacity to achieve very deep emissions cuts in the other four sectors (i.e., transportation, buildings, heavy industry, and electricity):

Figure H: Cuts needed in the other four sectors to meet the 30% reduction target (Mt CO_2eq)

	2020	2030	Change 2020-2030
Oil and gas sector emissions	197	192	**- 5 Mt**
Combined agriculture and waste sectors	121	122	**+1 Mt**
Other four economic sectors	410	209	**-201 Mt**
Total emissions in 2020	**728**		
Total emissions in 2030 (if target achieved)		**523 Mt**	

Source: All of the emissions projections shown in Figure H for 2020 and 2030 are taken from *Canada's 3rd Biennial Report* (December 29, 2017), with the exception of 209 Mt in the second line, which represents the upper limit for the combined emissions from the other four economic sectors if Canada's total emissions by 2030 are not to exceed the 523 Mt target.

Of the four sectors, only electricity is currently projected to achieve deep reductions between 2020 and 2030: see Figure C on p. 6. Based on current measures, the electricity sector reduction is 25 Mt. If we include promised "additional measures", the total reduction of electricity emissions between 2020 and 2030 is a remarkable 50 Mt (see *3rd Biennial Report*, Table 5.28).

However, the other three sectors in this group will provide only modest reductions, even if we include the benefit of all promised additional measures: transportation offers only 25 Mt of cuts between 2020 and 2030; the buildings sector, 17 Mt; and heavy industry *increases* by 10 Mt. (*3rd Biennial Report*, Table 5.28). Therefore, these four sectors combined offer a combined net reduction of only 82 Mt between 2020 and 2030.

In summary, we need to find in total about 200 Mt of cuts in these four sectors between 2020 and 2030 to meet the 523 Mt target. The shortfall is about 120 Mt. That is why the *Pan-Canadian Framework* plan, in its most recent version, is obliged to promise Canadians that we will purchase 59 Mt of "international cap-and-trade credits" or so-called "international allowances" (*3rd Biennial Report*, Table 5.28, p. 153). Even then, there remains a "gap" of 60 Mt, which the government says can be covered by "investing in public transit, clean technologies, and innovation" (*3rd Biennial Report,* Figure 5.1, p. 129). But we are not provided with any details showing specific policies and estimates of the future reductions that could be achieved by these generic solutions.

The problem is that if we continue to expand oil and gas production in Canada in line with current forecasts, we cannot meet our 2030 target without extraordinarily deep cuts in the other sectors – cuts that appear to be far beyond anything we have the capacity to achieve. For a detailed analysis that examines this basic problem, see David Hughes, *Can Canada Expand Oil and Gas Production, Build Pipelines and Keep its Climate Change Commitments?* (June 2016, Canadian Centre for Policy Alternatives: https://www.policyalternatives.ca/authors/david-hughes). Hughes explains that if we follow current plans to develop oil and gas resources, the other sectors will be required to reduce their emissions between 47% and 59% below 2014 levels by 2030 to meet our 523 Mt target by that year. The high estimate includes the impact of LNG development.

9. No government assessment shows that is feasible

When the Liberal Government announced the approval of two major pipeline expansion projects (Kinder Morgan and Line 3) on November 29, 2016, no public inquiry process had ever assessed whether the expected oil sands emissions growth up to 2030 could be reconciled with our commitment to reduce Canada's total emissions to 523 Mt by 2030. Three separate processes considered the project before the final decision on November 29, 2016, but not one of them examined that question:

National Energy Board (NEB) inquiry report (May 19, 2016)

Six months before the final decision, on May 19, 2016, the NEB issued its report recommending approval of the Kinder Morgan project, after a lengthy inquiry through 2014 and 2015. It was a public hearing process and it had full powers to call evidence. However, the NEB took the view that "upstream emissions" released into the atmosphere at oil sands production sites in Alberta did not fall within the scope of the environmental inquiry. Accordingly, the inquiry excluded all evidence about greenhouse gas emissions in Alberta – and excluded all scientific evidence about the impact of emissions on the climate system. The NEB panel (in a ruling on July 23, 2014) rejected an application by the City of Vancouver to call expert evidence about emissions impacts, a ruling upheld

by the Federal Court of Appeal. When the NEB recommended approval of the project in May 2016, not one sentence in the report discussed emissions or climate.

Kinder Morgan upstream emissions assessment (November 25, 2016)

The Trudeau government announced on January 27, 2016 that it would create a separate "upstream emissions assessment" procedure. It promised that the new procedure would examine *"the potential impact [of the pipeline projects] on Canadian and global emissions"*: see "Estimating upstream GHG emissions", *Canada Gazette*, March 19, 2016. It assured Canadians that the new procedure would be an "interim measure" until a promised reform of the existing NEB process could be completed.

The "upstream emissions assessment" for the Kinder Morgan pipeline was publicly released on May 19, 2016 in draft form (the report was officially titled the *Review of Related Greenhouse Gas Emissions Estimates for the Trans Mountain Expansion Project*). The document adopted the NEB's long-term forecast that global oil consumption will continue to increase for at least for another twenty-five years. Based on that forecast of growing global oil demand, the final version of the report released on November 25, 2016 accepted the NEB's forecast that oil sands production will increase from the 2014 level of 2.3 million bpd to 4.3 million bpd by 2040: see Kinder Morgan report, November 25, 2016, section B.2.1 at p. 21, "Canadian Oil Supply Growth" (http://ceaa-acee.gc.ca/050/documents/p80061/116524E.pdf).

The report found that the Kinder Morgan expansion, if built, would increase the existing capacity from 300,000 bpd to 890,000 bpd, adding 590,000 bpd of new shipping capacity (about 25% of the total projected expansion of oil sands production between 2015 and 2040). The report found that the emissions associated with the expanded volume of oil sands production transported by this additional shipping capacity would be 13 Mt to15 Mt of CO_2eq per year.[*] The report conceded that oil sands emissions will continue to increase to 2030, and they will be the main driver of Canada's total emissions:

> *The growth in emissions to 2030 is driven largely by growth in the upstream oil and gas sector and, in particular, from the oil sands. ECCC [Environment and Climate Change Canada] projections indicate that GHG emissions from the oil sands could increase from 62 Mt in 2013, to 90 Mt in 2020 and up to 116 Mt in 2030.*
>
> — Kinder Morgan report, November 25, 2016, section B.2.2, p. 22 (emphasis added)

[*] A second pipeline expansion project, called Line 3, was also given final approval on November 29, 2016, the same day as the Kinder Morgan approval. It adds 370,000 bpd of new capacity. Line 3 is routed from Alberta to Superior, Wisconsin. The emissions assessment report for Line 3 found that the additional emissions associated with the increased volume of production carried by Line 3 would be approximately 10 Mt to 13 Mt of CO_2eq per year: http://www.ceaa.gc.ca/050/documents/p80091/114134E.pdf. Therefore, the combined new capacity of both Kinder Morgan and Line 3 (960,000 bpd) will generate between 22 Mt and 28 Mt of additional GHG emissions per year.

The Kinder Morgan assessment, however, did not consider whether oil sands growth could be reconciled with Canada's commitment to reduce its total emissions to 523 MT by 2030. The report was silent about whether we can make large enough emissions reductions from other economic sectors to obtain the deep cuts we need – and to offset the continued increases in oil sands emissions.

The report did acknowledge that, based on the then available emissions projections published in February 2016 in the *Second Biennial Report*, Canada's total emissions would rise to 815 Mt by 2030. The only answer the report provided to that evidence – which showed continued growth of Canada's total emissions to 2030 – was that "recently announced provincial government policies" would be able to improve the outcome to 2030: the report said that new provincial policies "*will have an impact* on Canadian GHG emissions" (i.e., will lower the projected number). But it provided no estimation of what that future reduction would be. The report stated that the impact of these new provincial policies "were not reflected in *Canada's Second Biennial Report* as the details of these new policies were not available at time of publication" (Report, B.2.1.1, p 16-17). In other words, it said the information was not available. The assessment offered no data or analysis to indicate whether the expected increase in oil sands emissions could possibly be consistent with reaching the 523 Mt target.

The Kinder Morgan upstream emissions assessment was a closed process, so no members of the public had any chance to raise that question. The review, in its final report, released November 26, 2016, did not decide, one way or the other, if the increased oil sands production facilitated by the new pipeline would be consistent with our emissions reduction commitment. The hazard of a closed-door process is that government can quietly decide what issues will not even be discussed.

The Ministerial Panel on the Trans Mountain Pipeline (November 1, 2016)

There was a third process. The Ministerial Panel was an unusual kind of public consultation, appointed by the Federal Minister of Natural Resources in May 2016. Unfortunately, it did not have powers to call evidence, or make findings, or draw conclusions. The Ministerial Panel's only mandate was to listen to members of the public – including some of Canada's leading experts on emissions who volunteered to make submissions. People were permitted to attend a series of public meetings in Alberta and British Columbia to express their concerns about what issues and evidence had been overlooked, or inadequately dealt with, during the previous two processes.

The panel was not allowed to make "recommendations". But it found a way to make what are, in effect, a series of highly significant findings – findings that identify crucial questions that have not yet been answered. The panel says at page 46 of their report:

> *Our role was not to propose solutions, but to identify important questions that, in the circumstances, remain unanswered.*

The first "high-level question" that "remains unanswered", according to the three panel members, is whether the growth of emissions that will result from building the Kinder

Morgan pipeline can be reconciled with Canada's climate change commitment, which includes our 2030 emissions reduction target. The panel states the question this way:

> *Can construction of a new Trans Mountain Pipeline be reconciled with Canada's climate change commitments?*
>
> — *Ministerial Panel Report*, November 1, 2016, p. 46
> https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/files/pdf/16-011_TMX%20Full%20Report-en_nov2-11-30am.pdf

The panel unanimously concluded this is one of the important questions that "remain unanswered".

The Ministerial Panel's report was delivered to the government on November 1, 2016. The government did not respond. Four weeks later, the cabinet announced its decision approving the two pipelines – without any public comment on the unanswered question.

Yet, in a statement on November 30, 2016, Prime Minister Trudeau declared that the Kinder Morgan project *"fits within our national climate plan"*.

The Order in Council (November 29, 2016)

The final step in the approval of the Kinder Morgan expansion project was a decision by the cabinet – collectively the thirty members of the Trudeau Government – announced on November 29, 2016. The discussions and information considered by the cabinet in making that decision are secret, protected by the cabinet confidentiality – although we know, as I indicate below, that the cabinet considered the NEB report of May 19, 2016, the Kinder Morgan upstream assessment report of November 25, 2016, and the Ministerial Panel's report of November 1, 2016. The only public record we have of the cabinet's decision, and the justifications for it, is the formal Order in Council document released on that date, which recites, in a few short paragraphs, the grounds relied on. The Order is one page in length, supplemented by a nine-page "Explanatory Note": http://www.gazette.gc.ca/rp-pr/p1/2016/2016-12-10/html/sup1-eng.html

In reciting the reasons for the government's decision, the Order states that it "accepts" the NEB's recommendation that the Project is "required" (i.e., the economic benefits and need for the additional pipeline capacity) and that it "will not likely cause significant adverse environmental effects under the *Canadian Environmental Assessment Act, 2012*." The Order thus assures us that the NEB report contained evidence and findings that supported and justified the government's crucial decision that the project "will not likely cause significant adverse environmental effects".

However, the NEB report did not discuss emissions or climate. The NEB inquiry had excluded any evidence about greenhouse gas emissions in Alberta – and excluded all scientific evidence about the impact of emissions on the climate system. So clearly the cabinet had not obtained any analysis, or indeed any information at all, about the emissions implications of oil sands expansion from the NEB report.

The next short paragraph in the Order in Council cites the Kinder Morgan upstream emissions assessment report, which had been released on November 25, 2016:

> *Whereas the Governor in Council, having considered upstream greenhouse gas emissions associated with the Project and identified in Environment Canada's report entitled* Trans Mountain Pipeline ULC – Trans Mountain Expansion Project Review of Related Upstream Greenhouse Gas Emissions*, and the Government of Alberta's* Climate Leadership Plan *commitment to cap oil sands emissions at 100 megatonnes of carbon dioxide equivalent per year, is satisfied that the project is consistent with Canada's commitment's in relation to the Paris Agreement on Climate Change.*
>
> — Order in Council, November 29, 2016 (emphasis added)

The "Explanatory Note" appended to the Order contains a brief paragraph entitled "Climate Change". It states that the Kinder Morgan assessment report had "indicated that *incremental emissions* are unlikely" to be caused by the pipeline expansion. For a discussion of that finding, see my Additional Note at page 33.

But the Kinder Morgan upstream emissions assessment did not address whether oil sands growth could be reconciled with Canada's commitment to reduce its total emissions to 523 Mt by 2030. The report was silent about whether we can make large enough emissions reductions from other economic sectors in Canada to obtain the deep cuts we need – and to offset the continued increases in oil sands emissions. The cabinet could not have obtained any analysis or guidance from the November 25, 2016 Kinder Morgan report to satisfy itself that the expected emissions growth from the expansion of oil sands production between 2015 and 2030 can be consistent with our 523 Mt target.

Furthermore, Alberta's commitment to impose a 100 Mt "cap" on oil sands emissions as part of its *Climate Leadership Plan* did not support a finding that Canada's total emissions can be reduced by 2030 to meet the 523 Mt target by 2030. A note in *Canada's 2016 Greenhouse Gas Reference Case* (published on December 22, 2016, about three weeks after the Order in Council was issued) explains that the 100 Mt cap, although it had been adopted by legislation in Alberta, would in fact do nothing to curb the expected rise of oil sands emissions up to 2030. The reason is that the 100 Mt upper emissions limit is set too high to have any practical impact on the expected growth of oil sands emissions over the next decade. The emissions data available in December 2016 indicated that oil sands emissions would rise to 108 Mt by 2030 (the more recent data projects that they will increase to 115 Mt by 2030). In neither case would that increase exceed the "cap" limit. Here is the explanation:

> *Based on the Alberta Government's announcement, Alberta's 100 Mt cap on oil sands emissions excludes emissions from cogeneration of electricity and new upgrading. When taking these into account, total emissions from oil sands is 93 Mt in 2030 under the reference case scenario, below the 100 Mt cap.*
>
> — *Reference Case*, "Emissions projections by sector", note 4, p. 7

Although it is not commonly understood, the 100 Mt cap does not apply to, or restrict, the growth of, *additional emissions* generated by the expansion of "new upgrading" in Alberta. Upgrading is a highly emission-intensive process that converts raw bitumen into a higher-value crude oil before it is shipped to foreign refineries for further processing. The cap also exempts additional emissions attributed to cogeneration. Notwithstanding the cap, total oil sands emissions (including upgrading and cogeneration) would be allowed to rise to about 115 Mt, or slightly higher than that, before they exceed the cap.

Therefore, it was misleading to claim, as the Order did, that Alberta's cap would contribute to achieving some reduction in oil sands emissions by 2030, below the level they would be expected to reach if the cap did not exist. If the 100 Mt cap remains in place, it may eventually have some influence on decisions about expansion of oil sands production after 2030. Our concern is meeting Canada's 523 Mt reduction target by 2030.

A third paragraph acknowledges that the cabinet has also considered the report of the Ministerial Panel:

> *"Whereas the Governor in Council has considered the Ministerial Panel's report on the Project entitled* Report from the Ministerial Panel for the Trans Mountain Expansion Project, *dated November 1, 2016.*

But the Ministerial Panel report did not provide the cabinet with any evidence to support a conclusion that the project is consistent with our Paris Agreement commitments. On the contrary, the panel had advised the government that the question remains unanswered.

Therefore, none of the three sources cited in the Order could have provided the cabinet with grounds to believe that projected emissions increases from the planned expansion of oil sands production between 2015 and 2030 are "consistent with Canada's commitments in relation to the Paris Agreement on Climate Change". None of three processes conducted an inquiry into that question.

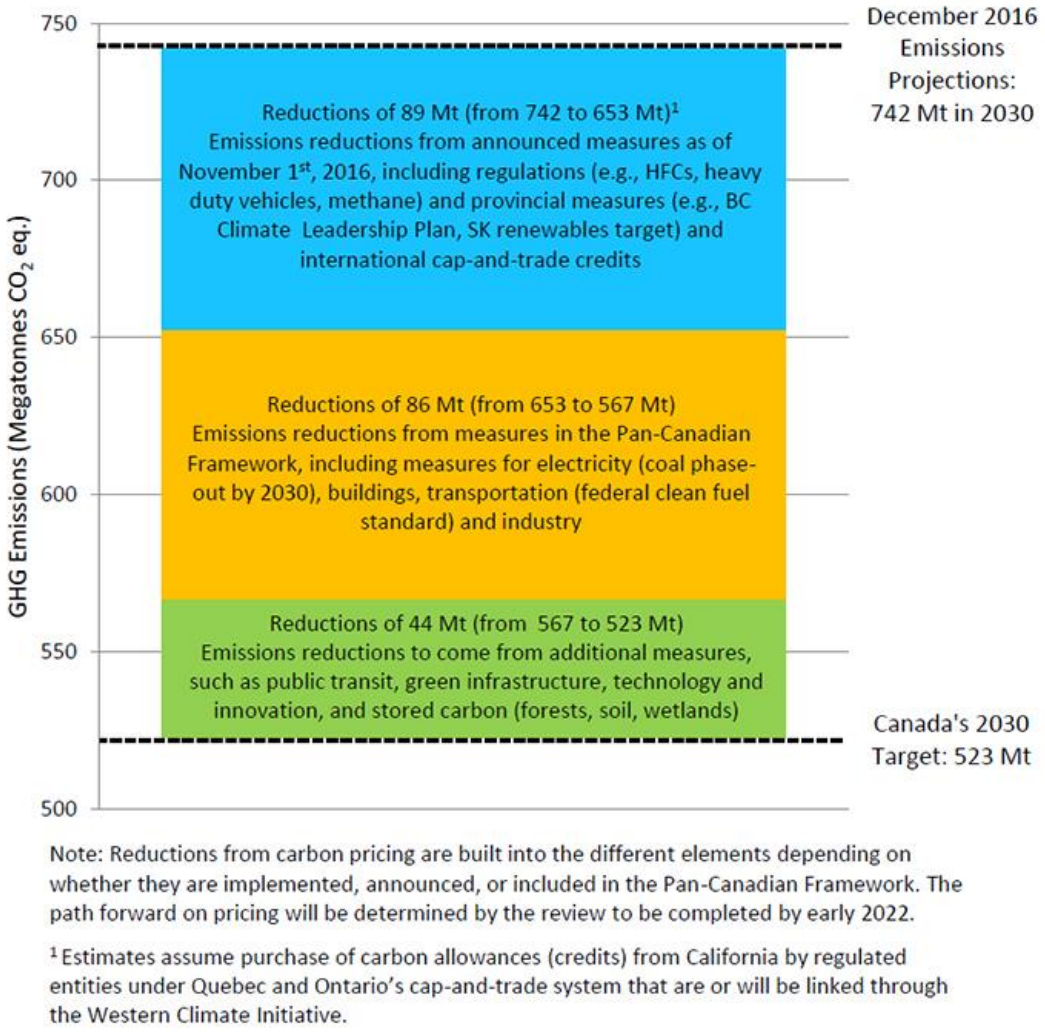
After reciting the sources of information relied on, the Order in Council declares the government "decides that … the Trans Mountain Expansion Project is <u>not likely to cause significant adverse environmental effects</u>". That sentence is the key decision.

With respect to the environmental effects of greenhouse gas emissions and their impact on the climate system, none of the three sources cited in the Order in Council provided the cabinet any evidence or analysis that could support or justify that decision.

10. The *Pan-Canadian Framework* (December 9, 2016)

The *Pan-Canadian Framework* document, described as our "national climate plan", was publicly released on December 9, 2016 – a week *after* the government approved the pipeline projects. It had never been subjected to any kind of scrutiny by a public inquiry process.

Figure I: Pan-Canadian Framework – the promised reductions



Note: Reductions from carbon pricing are built into the different elements depending on whether they are implemented, announced, or included in the Pan-Canadian Framework. The path forward on pricing will be determined by the review to be completed by early 2022.

[1] Estimates assume purchase of carbon allowances (credits) from California by regulated entities under Quebec and Ontario's cap-and-trade system that are or will be linked through the Western Climate Initiative.

Source: Pan-Canadian Framework on Clean Growth and Climate Change, page 44.

The original *Framework* document released on December 9, 2016 consisted of a long list of promises and generic strategies about future measures that provincial governments and the federal government say they will implement to reduce emissions. The *Framework* assured Canadians that based on these future policies, not yet implemented and mostly highly uncertain – *many of them not identified or developed at all* – Canada can cut its total emissions down to 567 Mt by 2030, and that other unspecified future measures (e.g., "green infrastructure") can get us to the 523 Mt target. (https://www.canada.ca/content/dam/themes/environment/documents/weather1/20170125-en.pdf) .

With the exception of a single graph on page 44 (designated "Pathway to Meeting Canada's 2030 Target", reproduced in Figure I), the *Pan-Canadian Framework* did not provide us with any detailed quantified analysis about future emissions reductions.

The graph published in the December 9, 2016 document showed a horizontal baseline representing the most recent projection of Canada's total emissions for 2030 – indicating an annual level of 742 Mt (that number was the then-available estimate for the 2030 emissions level). From that total, the scheme deducts three broad categories of future emissions reductions, grouped in tranches of 89, 86, and 44 Mt – optimistically indicating by these aggregate numbers that additional deep cuts will be achieved below the projected 2030 level. The promised cuts total 219 Mt. But those large numbers are not broken down or attributed to any specific policy, or to any specific sector.

The first category promises 89 Mt of future reductions. We are told this category comprises measures already announced by all levels of government as of November 1, 2016, *"but which do not yet have sufficient certainty to be included in the reference case"*: Government of Canada, "Modeling of greenhouse gas emissions," December 12, 2016 https://www.canada.ca/en/services/environment/weather/climatechange/climate-action/modelling-ghg-projections.html. So while the promised reductions do not have "sufficient certainty" to be counted in the *Reference Case*, we are led to believe that they are so close to being implemented that we can count on them.

A closer look at the graph, however, reveals that *55 Mt of these promised reductions* (out of the entire 89 Mt in the first category) will be obtained by the purchase of carbon allowances ("credits"). Industrial emitters who are unwilling or unable to cut their own emissions in Canada will instead be able to purchase credits from California — and continue to emit CO_2 and other GHGs into the atmosphere unabated using their existing emissions-intensive technologies. They will be able to delay the kinds of technological innovation needed to reduce emissions.

The second category, which promises an additional 86 Mt of future reductions by 2030, claims that substantial cuts will come from *"measures in the Pan-Canadian Framework … including measures for … buildings, transportation … and industry"*. But the "measures" identified in the *Pan-Canadian Framework* document are so lacking specifics that it is impossible to assess whether the proposed future carbon-reductions are viable, whether they will be funded, whether they will be politically acceptable in the various provinces, or if they will be implemented at all.

The third category in Figure I is so vague as to be meaningless. It promises 44 Mt of future reductions, but says only that they will come from "additional measures" – which are simply identified as "green technology" and "technology and innovation". This tells Canadians nothing about the feasibility of achieving future reductions on that scale.

An additional five-page document released on the government's website on December 22, 2016 provides a more detailed breakdown for 120 Mt of the promised reductions (out of the total 219 Mt) that it claims can be achieved by 2030, listed in a table entitled "Sectoral Reductions":

Figure J: Sectoral reductions information published December 22, 2016

Sectoral Reductions [1]

Sector [2]	Reductions from December 2016 Reference Case to Pan-Canadian Framework (742 Mt to 567 Mt in 2030)
Electricity	17 Mt (from 34 to 17 Mt)
Buildings	28 Mt (from 94 to 66 Mt)
Transportation	15 Mt (from 157 to 142 Mt)
Heavy Industry (including oil and gas)	56 Mt (from 330 to 274 Mt)
Agriculture, Waste and Others	4 Mt (from 127 to 123 Mt)
Purchase of WCI Allowances (Ontario and Quebec)	55 Mt

[1] Reductions in this table correspond to federal, provincial and territorial announced measures as of November 1, 2016 (blue bar) and measures contained in the Pan-Canadian Framework on Clean Growth and Climate Change (yellow bar).

[2] Sectors as defined in Canada's 2016 Greenhouse Gas Emissions Reference Case

Source: *Modelling of Greenhouse Gas Projections*, Government of Canada, December 22, 2016 (https://www.canada.ca/en/services/environment/weather/climatechange/climate-action/modelling-ghg-projections.html)

Figure J purports to show how 120 Mt of the promised cuts will be divided between the seven economic sectors. It shows that another 55 Mt of the total needed reductions will be accounted for by carbon credits. The table does not mention the remaining 44 Mt of cuts needed to meet the 523 Mt target. It is helpful to look carefully at how this table treats each sector. I consider two examples here:

Transportation

Figure J tells us that total transportation sector emissions (Canada's second largest emitting sector) are projected to decline to 157 Mt by 2030, under carbon-reduction policies already in place (called "current measures"). It claims they will be cut by a further 15 Mt, down to 142 Mt, based on future policies not yet implemented (referred to as "additional measures"). But even cutting transportation emissions to 142 Mt by 2030 would represent only a 15% cut below the projected 2020 level.

To meet the Paris target of 523 Mt, we would need much deeper reductions of transportation emissions between 2020 and 2030 – as much as a 50% reduction.

The *3rd Biennial Report* (December 29, 2017) updates that data, but there is no improvement. The new information tells us that, under "current measures", transportation

emissions will decline to 155 Mt by 2030, and that "additional measures" will reduce the number to 143 Mt (see *3rd Biennial Report*, Table 5.28 at p. 153).

Heavy industry

An unusual feature of this original *Pan-Canadian Framework* material (published on December 22, 2016) is that, in an unprecedented step, it combined two of Canada's major economic sectors – the heavy industry sector and the oil and gas sector – treating them as if they are one composite "Industry" sector. In Figure J, see the description: "Heavy industry (including oil and gas)". As a result, the original document did not disclose any separate emissions data for the oil and gas sector and for the industry sector. It claimed that the combined sector would achieve a 56 Mt reduction by 2030.

The recent *3rd Biennial Report*, which includes an updated version of the *Framework* plan, treats these two major sectors separately. In the case of oil and gas, it shows that with the benefit of future "additional policies" (i.e., the promised methane regulations), oil and gas sector emissions between 2020 and 2030 will decline from 197 Mt to 193 Mt (Table 5.28, at p. 128).

In the case of heavy industry, it reports that based on "current measures," emissions in the heavy industry sector will rise from 75 Mt in 2015 to 83 Mt by 2020, *and will rise again to 97 Mt by 2030.* Under promised future "additional measures" (not laid out in any detail), it claims that heavy industry emissions will decline slightly to 93 Mt by 2030 (see *Biennial Report*, Table 5.28 at p.153). But that outcome, even assuming it is feasible, would still provide no cuts at all below the 2020 level. In fact, it represents a *10 Mt increase above the 2020 level*.

Deep emissions cuts will need to be made in heavy industry emissions, well below the 2020 level, if we are going to meet Canada's 523 Mt target by 2030. No specific policies are disclosed to explain how substantial cuts can be achieved in the heavy industry sector (which includes the chemicals and fertilizers industries, iron and steel, cement, etc.). We are not provided with any quantified estimates of future reductions for each industry. We are being asked to trust that "innovation" and future increases in the "carbon price" will provide a solution.

If Canadians are going to be told that the expected growth of emissions from Canada's expanding oil sands industry "fits within our national climate plan," the evidence and analysis relied on to support that claim must be disclosed and tested by an open inquiry.

A proper inquiry process must be *public* – because that is our guarantee that the evidence will not be pre-selected, or exaggerated, and that contrary evidence will not be brushed aside. The integrity of the process must also be protected by the basic principles of judicial independence, so we can be confident that the authors of the report, whoever they may be, are not being influenced by pressures, discussions, or other sources of information that have not been tested in the hearing room, in public view.

11. Report of the Auditors General (March 27, 2018)

On March 27, 2018 the Auditor General of Canada in collaboration with the auditors general of all ten provinces (except Quebec) issued a joint report entitled *Perspectives on Climate Change in Canada: A Collaborative Report from Auditors General*. Under the heading "Key issues identified in audits of climate change action in Canada", the 28-page report states (emphasis added):

> *Canada's auditors general found that most governments in Canada were not on track to meet their commitments to reducing greenhouse gas emissions. … Meeting Canada's 2030 target will require substantial effort and actions beyond those currently planned or in place.* (p. 4)

The usual purpose of an auditor general's report is not to second-guess the wisdom or merits of a government's chosen policy objectives, but rather to examine whether governments have actually implemented the kind of detailed planning, funding, development of regulations, and actions needed to ensure that objectives can be achieved:

> *For the most part, auditors found that governments' plans to reduce greenhouse gas emissions consisted of high-level goals, with little guidance on how to implement actions. Details often missing from the plans included timelines, estimates of the reductions expected from individual action items, and information about funding.* (p. 4)

The auditors general emphasize that "broad goals" are not sufficient:

> *It is unclear how Canada will meet this target. Although it is important for governments to set broad goals around climate change, they must also provide detailed timelines and interim steps for achieving those goals (*page 18).

The report confirms that most provinces (including Alberta, Saskatchewan, and B.C.) have no 2030 emissions target, and Saskatchewan has not signed the *Pan-Canadian Framework*. It also acknowledges that Canada will fail to meet its 2020 Copenhagen target, a commitment made in 2009 by the Conservative Government to reduce emissions 17% by 2020, below the 2005 level. The target is 613 Mt. The *3rd Biennial Report* shows that Canada's emissions will reach 728 Mt by 2020 – just 1.4% below the 2005 level.

12. Carbon pricing

About future carbon price levels needed to meet Canada's 2030 emissions reduction target, see: *"Is Win-Win Possible?"* Marc Jaccard, Mikela Hein, Tiffany Vas (September 20, 2016): http://rem-main.rem.sfu.ca/papers/jaccard/Jaccard-Hein-Vass%20CdnClimatePol%20EMRG-REM-SFU%20Sep%2020%202016.pdf. This paper concludes that if Canada chooses to rely principally on carbon pricing to achieve its carbon-reduction goals, the price would need to increase to about $200 per tonne by 2030. Marc Jaccard is an energy economist at the School of Resources and Environmental Management at Simon Fraser University.

A broad discussion of the carbon pricing scheme in the *Pan-Canadian Framework* is found in *"Putting a price on carbon pollution across Canada: Taking stock of progress, challenges, and opportunities as Canada prepares its national carbon pricing benchmark"*, Pembina Institute (May 2017): http://www.pembina.org/reports/carbon-pollution-pricing-2017.pdf . This Pembina Institute paper is clear that substantial increases in the carbon price post-2022 will be necessary. It does not specify the future carbon price level required, but cites a study proposing a national carbon price floor of $150 per tonne by 2030.

13. British Columbia and its planned LNG industry

The potential impact of future emissions growth from B.C.'s planned LNG industry is not included in the projections set out in the *3rd Biennial Report*. The explanation appears to be that, notwithstanding multiple proposed LNG projects during the past five years, no investor has yet made a final decision to build a plant. Investment decisions have been delayed, primarily due to currently low LNG prices in Asia.

On March 22, 2018, to induce LNG projects to proceed, B.C. Premier John Horgan announced generous changes to provincial tax and electricity pricing policies. LNG is an emissions-intensive industry. A single project would significantly increase the annual level of Canada's oil and gas sector emissions. Even without LNG development, the most recent projection for B.C. (December 29, 2017) shows no significant cuts in the province's total emissions between now and 2030, based on current measures:

Figure K: British Columbia – emissions projections to 2020 and 2030 (Mt CO_2eq)

	2005	2015	2020	2030
British Columbia	64	61	59	58

Source: *Canada's 3rd Biennial Report* (December 29, 2017), Table 5.27.

The above numbers are more or less consistent with the outlook in the B.C. government's *Climate Leadership Plan*, released on August 19, 2016 by the previous provincial government of Christie Clark. That plan indicated total emissions in B.C. by 2030 will be about the same as they were in 2015, around 61 Mt, *with no absolute cuts beginning until after 2030*. The B.C. plan listed a number of policies that would, it claimed, eventually cut the province's annual emissions, but not in the next decade (*B.C. Climate Leadership Plan*, Annex I, p. 47). The new provincial NDP government, which took power in July 2017, has promised to develop a new climate plan. A 30% reduction of B.C.'s emissions below the 2005 level would require an annual target of about 40 Mt. At present, B.C. has no emissions target for 2030. Given B.C.'s current emissions outlook to 2030, serious questions arise how LNG development can be reconciled with substantial emissions reductions by 2030.

Detailed information is already available about the potential emissions impact of LNG plants. In September 2016, the Federal Government gave conditional approval to a

proposed LNG operation known as Pacific NorthWest LNG (the owners subsequently announced on July 25, 2017 that they would not proceed with that project). CEAA had previously released a Draft Environmental Assessment Report for that project, which found that emissions from the liquefaction facility, together with the associated emissions from processing the natural gas to supply the facility, would generate *11.4 Mt to 14.0 Mt of CO_2 every year for 30 years*: http://www.ceaa.gc.ca/050/document-eng.cfm?document=104785. Of that amount, 5.28 Mt would be released by the liquefaction facility itself and another 6.5 to 8.7 Mt would be generated by upstream production and processing. The Federal Government's approval included conditions that would have limited emissions *at the liquefaction facility* to 4.3 Mt. But the annual total, including upstream emissions, would still have been in the order of 10 Mt.

One new project, called BC LNG, has already received government approval. If the owners decide to proceed, it will generate 3.6 Mt CO_2eq of emissions annually at the terminal, and an additional 5.0 Mt from the associated upstream natural gas production and processing operations – for an annual total of 8.6 Mt, rising to 9.6 Mt by 2050 (Pembina Institute, "Liquified natural gas, carbon pollution, and British Columbia in 2017: an overview of B.C. LNG issues in the context of climate change", August 2017: http://www.pembina.org/reports/lng-carbon-pollution-bc-2017.pdf).

Notwithstanding the significant negative implications of LNG development on Canada's total emissions level, there was only one mention of LNG in the entire *Pan-Canadian Framework* document when it was originally released on December 9, 2016. The mention of LNG is found in a three-page section devoted to British Columbia, included in Annex II, which extols "provincial and territorial accomplishments in reducing greenhouse gas emissions and accelerating clean growth":

> *"B.C. has an abundance of natural gas, which is a lower carbon fuel that will play a critical role in transitioning the world economy off of high carbon fuels such as coal. B.C.is developing the resource responsibly, and provincial legislation will make the emerging LNG sector the cleanest in the world."*
>
> — *Pan-Canadian Framework* (December 9, 2016), p. 52

The document praises the efforts of the B.C. government (under then Premier Christie Clark) to develop the LNG industry. It claims that LNG "will play a critical role in transitioning the world … off of high carbon fuels." But it is completely silent about the growth of emissions that will result at the production and processing sites in B.C.

The recent *3rd Biennial Report* (December 29, 2017), which incorporates updated projections for future cuts under the government's *Pan-Canadian Framework* plan, includes no provision at all for any emissions increase in the oil and gas sector from LNG development. Instead, it contains this bland note:

> *Consistent with the most recent NEB projections, this report does not include the construction of any liquefied natural gas production projects nor emissions from that sector over the projection period.*

— *3rd Biennial Report*, Section 5.3.6.1 "Oil and Gas", p. 139

In a press conference on March 22, 2018, B.C. Premier Horgan declared that by producing LNG, B.C. will be "contributing to the reduction of global carbon emissions":

> *B.C. could help displace coal in Asia with cleaner LNG, said Horgan, echoing an argument Clark's Liberals had long trumpeted and the NDP had once belittled.*
>
> — *Vancouver Sun*, March 23, 2018

The point underlying that kind of claim is that once natural gas is delivered to an electricity generating plant, power can be produced with about 50% less emissions than by coal-fired generation. Energy resource scientist J. David Hughes has explained the point this way: "if one looks at burner-tip emissions only (meaning GHG emissions at the point of combustion), natural gas has roughly half the CO_2 emissions of coal" (*A Clear Look at BC LNG*, May 2015). But, as Hughes explains, that calculation does not take into account the energy-intensive LNG production process "upstream", before the fuel reaches its destination in China. Large amounts of natural gas would be consumed at the liquefaction facility in B.C. in order to liquefy the gas for marine transport; transport across the Pacific consumes energy, and so does regasification in China – all of which generate emissions. Natural gas extraction and natural gas processing in B.C. also generate substantial emissions. Natural gas venting and methane leakage add to those emissions.

Hughes explains that in studies which compare burning coal in China versus burning imported LNG, the outcomes vary depending on assumptions about the volume of upstream methane leakage during natural gas production, and the technology and efficiency of the coal plants in China. The benefits of shipping LNG to Asia to replace coal-fired electricity are not as certain as the *Framework* claims. Depending on the actual circumstances, the substitution of B.C. LNG for coal could be more emissions-intensive (https://www.policyalternatives.ca/sites/default/files/uploads/publications/BC%20Office/2015/05/CCPA-BC-Clear-Look-LNG-final_0_0.pdf).

Even if claims about the emissions-reducing benefits of shipping LNG to China are true, Canada's commitment under the December 2015 Paris Treaty is to reduce emissions in Canada to 523 Mt by 2030. Premier Horgan was silent about the significant impact LNG development in B.C. will have on emissions in Canada. The *Pan-Canadian Framework* report fails us in two ways. It makes exaggerated claims about the global benefits of LNG, unsupported by evidence, and it omits any account of the emissions growth we will see in in B.C., if the development of the industry proceeds.

14. Global oil consumption and the 2°C limit

The *Pan-Canadian Framework* plan is silent about whether the planned expansion of oil sands production to 2040 is consistent with Canada's other major climate policy commitment. Under the Paris Agreement signed in December 2015, Canada committed to "*holding the increase in global average temperature to well below 2°C above pre-*

industrial levels and to pursue efforts to limit the temperature increase to 1.5°C" (emphasis added). We are bound to ask if Canada's ambition to continue expanding the level of our oil sands production up to 2040 is compatible with keeping the increase in global average temperature to well below 2°C above pre-industrial levels.

The International Energy Agency (IEA) has developed a series of scenarios, each of which provides us with a different view of the expected future level of global oil production up to 2040. My comments here are based on the IEA's 2015 report.

The first is the "Current Policies Scenario". It calculates the future path of global oil consumption, assuming no significant new carbon reduction policies (measures designed to curb the future use of crude oil) are going to be adopted by the world's major industrial economies over the next few decades, beyond existing measures already in place. The Current Policies Scenario represents the expected trend of crude oil production if the world economy continues its current pattern of oil use (a "business-as-usual" scenario). It is a pessimistic scenario, from the perspective of climate. It is not compatible with a 2°C world. With oil demand unconstrained by carbon-reduction policies, the Current Policies Scenario projects that global oil production will increase to 117.1 million bpd by 2040, up from 90.6 million in 2014.

Figure L: IEA oil production scenarios: projections (in millions bpd)

	2014	**2020**	**2040**
Current Policies Scenario	90.6	97.5	117.1
New Policies Scenario	90.6	95.9	103.5
450 Scenario		93.7	74.1

Source: *World Energy Outlook 2015*, Table 3.1, p. 114 and Annex A pp.582-583.

Under the Current Policies projection, global oil consumption continues to grow because of expected future economic growth and population growth, and the absence of additional carbon reduction policies that reduce oil use.

A second IEA scenario, the "New Policies Scenario", is also a business-as-usual projection, but slightly more optimistic. It incorporates carbon reduction measures already adopted as of mid-2015 in countries around the world – but it also takes into account *"other relevant intentions that have been announced, even when the precise implementation measures have yet to be fully defined"* (*World Energy Outlook* 2015, p. 34). The New Policies Scenario therefore projects a more substantial curbing of future oil consumption, with global consumption rising to only 103.5 million bpd by 2040. But even the New Policies Scenario is not consistent with keeping average global warming below 2°C, as the IEA has made absolutely clear.

The IEA's "450 Scenario" is a *mitigation* scenario. It is based on the assumption that countries will soon adopt carbon-reduction policies that will achieve significant

reductions of global oil consumption – absolute reductions starting by 2020 – that are large enough to bring about gradually declining GHG emissions from the energy sector consistent with the goal of limiting the long-term rise of average global temperature to 2°C. One of the essential strategies under the 450 Scenario is to gradually reduce global oil production and consumption, starting in 2020 – in order to achieve a total reduction of about 20% between 2020 and 2040.

If global oil production must begin to decline by 2020, what are the implications for Canada? We hold the world's second largest oil reserves, some 170 billion barrels, second only to Saudi Arabia (third largest if we count Venezuela's heavy oil deposits). According to the IEA's projections (under its business-as-usual New Policies Scenario), Canada will see its oil sands output rise from 2.2 million bpd in 2014 to 4.5 million bpd in 2040: see *World Energy Outlook 2015*, Table 3.6 at p. 135. The magnitude of that increase is more or less identical to the projection developed by Canada's own NEB, which forecasts (in *Canada's Energy Future 2016 Update*) that Canada's oil sands output by 2040 will increase 2.0 million bpd above the 2014 level. Both of these estimates are business-as-usual projections.

Based on the IEA's 2015 projections, Canada's net increase of oil production over the next twenty-five years will be the *third largest in the world*, after Iraq (4.5 million) and Brazil (3.0 million). According to the IEA, six major oil producing countries have large enough oil reserves to substantially increase their own production over that period – the other three are Iran (1.9 million), Saudi Arabia (1.8 million) and Venezuela (1.1 million): see *World Energy Outlook 2015*, Chapter 3, Tables 3.6, 3.7, and 3.12. Combined, these six countries under the New Policies Scenario were projected to add 14.7 million bpd of new production by 2040, more than enough to satisfy all of the expected 12.9 million bpd net increase in global consumption – and enough extra new production to offset declining oil production in some other countries where the oil fields are gradually depleting.

In the IEA's most recent *World Energy Outlook 2017*, published on November 14, 2017, future global oil production numbers are revised, but the substance of the picture is unchanged. In the 2017 edition, the global oil supply under the New Policies Scenario rises to 104.9 million bpd by 2040 (compared to 103.5 million bpd). The U.S. is now expected, during the 2016-2040 period, to increase the annual level of its output by 2.4 million bpd, joining the group of top suppliers. Brazil's production is now projected to increase by 2.6 million bpd, Iraq by 2.5 million bpd, and Canada by 1.7 million bpd.

However, in a significant change, *World Energy Outlook 2017* discontinued publishing the 450 Scenario, which had appeared in every edition since 2009. The 450 Scenario had long been presented by the IEA as an "alternative" scenario to show a future path of global oil production consistent with limiting warming to 2°C. But in recent years, the 450 Scenario has been subjected to serious criticism. A key shortcoming is that the 450 Scenario is only consistent with a 50% probability of keeping warming below 2°C. Higher odds, say 66%, would require much deeper production cuts by 2040.

Moreover, by 2015, in advance of the Paris Conference, many scientists had reached the conclusion that even 2°C of warming could be considered excessively dangerous.

Reflecting that assessment, the Paris Agreement in December 2015 adopted a more stringent goal of keeping warming "to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C". In the 2017 edition, the IEA offered a new scenario, called the "Sustainable Development Scenario". Its target for reduced oil consumption by 2040 is substantially identical to the 450 Scenario, but it makes no claim to be consistent with the 2°C target. See *Off Track: How the International Energy Agency Guides Energy Decisions Towards Fossil Fuel Dependence and Climate Change*, Oil Change International and Institute of Energy Economics and Financial Analysis, April 2018 (http://priceofoil.org/2018/04/04/off-track-the-iea-and-climate-change/).

Canada's plan to continue increasing oil sands production provides the economic rationale for the Trudeau Government's pipeline approval decisions on November 29, 2016. We are embarking on a bold path of expanding crude oil production that, if followed by the other six or seven big suppliers, would take the world above the 2°C threshold, according to the IEA's analysis.

15. The Kinder Morgan report and the 2°C limit

The Kinder Morgan report provided no answer to the question of whether continued growth of oil sands production to 2040 is compatible with a policy committed to keeping warming within the 2°C limit, although that question is briefly considered: see Kinder Morgan report, November 25, 2016, B.2.6, "Canadian Climate Change Commitments and Oil Sands Production" pp. 28-29. The report did refer to the IEA's 450 Scenario:

> *In the IEA's 450 Scenario, in which the world has a 50% chance of limiting the long-term increase in average global temperature to no more than 2°C, global oil demand peaks by 2020 at 93.7 MMbbl/d and declines 18% from 2014 levels to 74.1 MMbbl/d in 2040.*
>
> — *Report*, section B.2.3 "Global Crude Oil Outlook", p. 23 (emphasis added)

But the report does not explicitly agree – or disagree – with the IEA's conclusion that global oil consumption must begin to decline by 2020 or soon after, to meet the 2°C commitment. About the future trend of global oil production, the report says only this:

> *"However, a common result of modelling efforts to analyze a 2°C world is that overall global crude oil consumption declines relative to the status quo."*
>
> — *Report*, section B.2.6, page 28

That single sentence is the only acknowledgment in the report that multiple studies by climate scientists (described only as "modeling efforts") have concluded that absolute cuts in the annual level of global oil production are essential to avoid an irreversible commitment to warming above the 2°C limit. The report offers no comment on the time frame for when global oil consumption must peak and begin to decline (the 450 Scenario says by about 2020) and does not discuss the magnitude of the cuts needed by 2040.

The report says that, in some studies, scenarios show that "oil sands production is not fully consistent with a world in which global warming is limited to 2°C." It claims, however, that "other projections" show that "oil sands production could continue to expand from current levels while still limiting warming to 2°C" (emphasis added). The report summarizes what appeared to be the conflicting evidence:

> *A number of studies have considered scenarios where global warming is limited to 2°C. However, these scenarios utilize different modelling frameworks and can have vastly different assumptions around technology and economic progress. The role of technological innovation, policy design … and business behaviour …can have significant implications on Canadian oil sands production in these scenarios. As a result of the differing treatment of these variables, conclusions across scenarios are not uniform, and the impact on Canadian oil sands production is not clear. However, a common result of modeling efforts to analyze a 2 degree C world is that overall global crude oil consumption declines relative to the status quo.*
>
> — *Report*, section B.2.6, p. 28 (emphasis added)

Therefore, according to the report, it "is not clear" whether Canada's ambitions to continue expanding our oil sands production to 2040 is consistent with a world in which global warming is limited to 2°C.

16. The atmospheric carbon concentration level

The accumulating concentration of CO_2 is measured in parts per million (ppm), indicating the number of CO_2 molecules per million molecules of other gases in the atmosphere. An atmospheric carbon concentration level of 450 ppm is broadly equivalent to a 2°C increase in global average temperature. That conclusion is based on the correlation, supported by the scientific evidence, between increases in the CO_2 concentration level and warming of the earth.

An unusual characteristic of CO_2, unlike methane for example, is that once the gas is released into the upper atmosphere it does not break down. It is only removed from the atmosphere when it is absorbed by the earth's surface – by dissolving into the upper ocean (and slowly into the deep ocean) or by biological uptake into forests and plants. The problem is that we keep releasing more CO_2 into the atmosphere every year. Once we stop massive fossil fuel burning, the incremental increases in the atmospheric concentration will cease. The level will decline slowly – but only over decades and centuries – so that from the perspective of the time frame that concerns us, the accumulated level by 2030 will be irreversible.

Since before the beginning of human life on earth and up to the start of industrialization in about 1780, the CO_2 concentration level was never *higher* than 300 ppm. During the past 12,000 years, from the end of the last Ice Age until the advent of the industrial age, it was stable at about 280 ppm. By 1958, it was 315 ppm. Since then, the level has risen by

another 88 ppm. Half of all human-caused carbon emissions have occurred after1970: IPCC, 2014, *Summary for Policymakers*, SPM.3, p.7.

The carbon concentration level reached an annual average of 403.3 ppm in 2016. The increase of 3.3 ppm in one year, up from 400 ppm in 2015, was unprecedented. The annual average increase was about 2.5 ppm over the previous few years: WMO Greenhouse Gas Bulletin, World Meteorological Organization, October 30, 2017 (https://library.wmo.int/opac/doc_num.php?explnum_id=4022). Each year the atmospheric measurements follow a cycle. April and May are the high point of the cycle, September the low. *But the annual average is moving up every year.* The monthly average in April 2017 was 409.01 ppm: see National Oceanic Atmospheric Administration (NOAA), Earth System Research Laboratory, Global Monitoring Division website, http://www.esrl.noaa.gov/gmd/ccgg/trends/global.html.

In monitoring these issues, scientists add together the warming effect of all the GHGs, principally carbon dioxide, methane, and nitrous oxide. The combined concentration is measured as "CO_2 equivalent" (CO_2eq). Baseline scenarios ("business-as-usual" scenarios) are studies that calculate future levels of accumulated GHGs in the atmosphere, based on the assumption that countries around the world *do not act to substantially reduce current patterns of coal, oil, and natural gas consumption.* Recent comprehensive studies indicate that if we do nothing, the combined concentration level will exceed 450 ppm CO_2eq by 2030 (IPCC, 2014, *Summary for Policymakers*, SPM 3).

Mitigation scenarios in which it is likely that temperature change can be kept to less than 2°C (above pre-industrial levels) are characterized by carbon concentration levels of 450 ppm, or less. Furthermore, in order to stay within 450 ppm, global emissions will have to be cut by 40% to 70% by 2050, below the 2010 level:

> *Scenarios reaching atmospheric concentration levels of 450 ppm CO_2eq (consistent with a likely chance to keep temperature change below 2°C relative to pre-industrial levels) include substantial cuts in anthropogenic GHG emissions by mid-century through large scale changes in energy systems … Scenarios reaching these concentrations by 2100 are characterized by lower global GHG emissions in 2050 than in 2010, 40% to 70% globally.*[†]
>
> — IPCC, 2014, *Summary for Policymakers*, SPM 4.1 (emphasis added)

Additional Note: "incremental emissions"

The Order of November 29, 2016, includes a brief summary of the Kinder Morgan upstream assessment regarding the impact of the pipeline on Canada's total emissions.

[†] In November 2016, Canada agreed to achieve an 80% reduction below the 2005 level. Other countries (including the EU and the U.S. under Obama) also committed to 80%. In order to limit temperature increase to "well below 2°C" as agreed in the 2015 Paris Agreement, deeper cuts are required than shown in the 2014 IPPC policy summary. Delayed action to curb emissions has also accentuated the problem.

> *The assessment indicated that incremental emissions are unlikely to be expected as oil production is expected to grow by more than the capacity of the expanded line regardless of whether the line is built.*
>
> — Order in Council, Explanatory Note, "Climate Change", p. 9 (emphasis added)

This appears to be an assurance that pipeline expansion will not cause higher emissions. In order to understand what it really means, we need to examine the procedure that governed how the assessment was done. On March 19, 2016, the Liberal Government released details of the Interim Measures to assess emissions associated with pipeline projects. A notice published in the *Canada Gazette* explained the procedure:

> *The assessment of upstream GHG's will consist of two parts: (A) a quantitative estimation of the GHG emissions released as a result of upstream production associated with the project, and (B) a discussion of the project's potential impact on Canadian and global emissions.*
>
> — "Estimating upstream GHG emissions", *Canada Gazette*, March 19, 2016 (http://www.gazette.gc.ca/rp-pr/p1/2016/2016-03-19/html/notice-avis-eng.php#nl4)

The document described the procedure as "the methodology". Part A of the assessment was not complicated. The first step was to calculate the "estimated throughput" (i.e., how much diluted bitumen would be carried by the project). Part A of the assessment would calculate the total GHG emissions "associated with the project" – i.e., the volume of emissions generated every year in the course of producing the amount of bitumen that *could* be transported to markets by the new pipeline, if it were built. Part B of the assessment promised to provide Canadians with "a discussion of the project's potential impact on Canadian and global emissions". But if we read the notice in full, we can see that the "methodology" designed for Part B is formulated in a particular way, which significantly limits the scope of the inquiry:

> *The second part of the analysis discusses the conditions under which the Canadian upstream emissions estimated in Part A could be expected to occur even if the project were not built.*
>
> — *Canada Gazette*, March 19, 2016

The above wording means that in looking at the impact of "the Project", the assessment must ask this question: will the future increase in oil sands production (and therefore the future increase of emissions) made possible by the additional transport capacity of this pipeline occur *even if the pipeline is not built*? Clear guidance is given on what steps the assessment must follow to answer that question:

> *The second step involves evaluating the technical and economic potential for alternate modes of transportation to be used in the absence of the proposed project.*

Rail transport is the alternative. The assessment is therefore required to evaluate whether rail transport would be an economically viable method to transport the increased bitumen production to market, and must look at the "economic and technical potential" of the alternate mode of transport. Rail transport is more expensive than pipelines (about US$10 more per barrel, according to the assessment). The crucial question is whether long-term oil prices will be high enough to cover the extra cost of rail "in the absence of the proposed project." The Kinder Morgan report found that oil prices at about $80 per barrel or higher would make rail transport viable.

The March 18, 2016 notice was absolutely clear on how the assessment should proceed:

> *As an example, when considering whether Canadian GHG emissions would increase as a result of a crude oil pipeline project, the primary factor will be the potential increase in Canadian upstream oil production that would be expected to occur if the pipeline were not built.*

Therefore, if rail transport is an economically viable alternative, then the assessment is obliged to decide that the increased production that will be carried in the proposed pipeline *will be produced anyway, even if the pipeline were not built*. In that case, the new pipeline would not make emissions any worse – because the increased production would still occur even if the new pipeline were not approved. In that case, the pipeline will not "cause" any "incremental" emissions, according to the terminology.

Of course, in reality, emissions will increase if production grows. The Kinder Morgan assessment found that the amount of increased bitumen production carried by expanded pipeline capacity would account for an additional 13 Mt to 15 Mt of greenhouse gas emissions per year (which would represent about a 20% increase of the industry's total emissions, based on the 2015 level) – a significant increase in our total emissions.

However, in line with the methodology, the Kinder Morgan assessment was able to show that the amount of "incremental" emissions caused by the Kinder Morgan expansion will be "minimal": (see *Report*, Table 8, p. 39). Evidence was available to establish that long-term oil prices will increase to about US$78 per barrel by 2020, and will continue to rise gradually to US$102 by 2040. The assessment therefore concluded that the pipeline would cause only minimal "incremental" emissions, because the same amount of production increase (and the same emissions growth) would occur if the pipeline were not built – because rail transport would be viable as an alternate form of transport.

On the basis of that reasoning, the November 25, 2016 report to the government advised that incremental emissions from building the pipeline would be "minimal".

In truth, the accumulating concentration of CO_2 emissions in the atmosphere is the problem we are trying to solve. In light of that problem, the distinction between pipelines and rail transport is meaningless. If we increase production by 590,000 bpd (the increased capacity added by the Kinder Morgan expansion), Canada's total emissions will increase by 13 Mt to 15 Mt – whether the increased output is shipped by pipeline or shipped by rail.