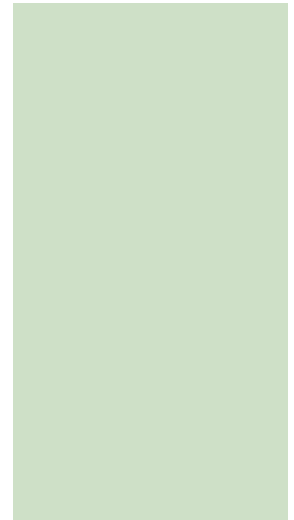


Enbridge Pipe Dreams and Nightmares

The Economic Costs and Benefits of the Proposed Northern Gateway Pipeline

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by Marc Lee

MARCH 2012



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ENBRIDGE PIPE DREAMS AND NIGHTMARES: THE ECONOMIC COSTS AND BENEFITS OF THE PROPOSED NORTHERN GATEWAY PIPELINE

By Marc Lee

March 2012

ABOUT THE AUTHOR

Marc Lee is a Senior Economist with the BC Office of the Canadian Centre for Policy Alternatives, and the Co-Director of the Climate Justice Project. Marc is the co-author with Kenneth Carlaw of *Climate Justice, Green Jobs and Sustainable Production in BC*, released September 2010, and author of *Fair and Effective Carbon Pricing: Lessons from BC*, released February 2011.

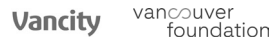
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CCPA
CANADIAN CENTRE
for POLICY ALTERNATIVES
BC Office

1400—207 West Hastings Street
Vancouver BC V6B 1H7
604.801.5121 | ccpabc@policyalternatives.ca

www.policyalternatives.ca

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Summary

THE PROPOSED ENBRIDGE NORTHERN GATEWAY PIPELINE (NGP) is a \$5 billion investment that, if approved, will transport 525,000 barrels per day of Alberta's oil sands bitumen to Kitimat, BC, where it would be shipped by super-tanker to China. Supporters of the NGP argue that it is in Canada's national economic interest to diversify oil and gas trade to Asia, and that the pipeline will promote economic growth. Enbridge gives the impression of substantial new jobs from the NGP, and claims that the pipeline will create 63,000 person-years of employment during its construction phase, and 1,146 full-time jobs once completed.

The share of total income generated by the NGP going to workers is very small by historical standards. Large profits accrue to Enbridge and oil sands producers.

This paper reviews the economic case for the NGP, and considers both the benefits and costs of the pipeline, with a focus on employment impacts. It finds that:

- Enbridge's claims about employment gains are grossly overstated, and based on modeling that makes many unjustified assumptions. The only jobs we can bank on are approximately 1,850 construction jobs per year for three years, and a handful of permanent new jobs once completed.
- Minimal processing of oil sands bitumen in Canada passes up larger employment creation opportunities from domestic upgrading and refining.
- Alternative \$5 billion investments in green jobs and industries would create between 3 and 34 times the number of direct jobs.
- The share of total income generated by the NGP going to workers is very small by historical standards. Large profits accrue to Enbridge and oil sands producers.
- Economic costs and environmental risks of the pipeline—including disruption to existing employment, potential job losses due to oil spills, and the economic costs of carbon emissions—have been ignored by Enbridge.
- If the full costs of carbon emissions from extraction, processing and combustion were counted, the pipeline would likely be uneconomical. While private gains accrue to the oil and gas industry, huge costs are borne by others.



Route of the proposed Northern Gateway Pipeline

EMPLOYMENT CREATION

The NGP is likely to be very profitable for oil sands producers and investors in the pipeline, and governments will get a share of those profits through taxes and royalties. The economic case from industry and the federal government rests on job creation. The vast bulk of work associated with the NGP, however, would come during the three-year construction phase of the pipeline.

Projections of large employment gains are based on models that greatly exaggerate actual job creation, and are stated in “person-years” of employment. In reality, total job creation from pipeline construction will be small relative to the economies of BC and Alberta and existing employment:

- Enbridge’s own assessment of construction work is an average of 1,850 jobs per year for three years, or 5,536 person-years of employment.
- If the steel pipe is manufactured in Canada, it would contribute a maximum of 3,000 person-years of employment.
- Together, construction and pipe manufacture amount to no more than 8,600 person-years of employment—only about 14% of the 63,000 person-years estimated by the modeling.
- More than two-fifths of Enbridge’s stated employment gains come from *induced* job creation, the local economic impact of expenditures by workers and governments. These impacts are particularly difficult to estimate and can easily be overstated.

Enbridge’s modeling exercise makes a number of implausible assumptions. In particular, it assumes that workers would otherwise be unemployed; yet, current labour shortages imply that the vast majority of workers would be employed elsewhere if the NGP does not go forward.

Enbridge’s modeling exercise makes a number of implausible assumptions. In particular, it assumes that workers would otherwise be unemployed; yet, current labour shortages imply that the vast majority of workers would be employed elsewhere if the NGP does not go forward.

Enbridge estimates that Aboriginal employment will fill more than one-third of regional labour requirements. However, no commitment to training local residents is specified, so work may only go to workers who already have the qualifications required. Thus, it is likely that Aboriginal workers will be more present in low-skill, low-wage employment, while temporary skilled labour will come from outside the region (and possibly from outside the country).

Once built, pipeline operations would support a total of 217 permanent jobs. Enbridge's larger public claim of 1,146 total jobs per year is derived from modeling that suffers from the same shortcomings as noted for construction jobs, including a very large share (37% of the total) coming from induced employment.

ALTERNATIVE INVESTMENTS

Another shortcoming of the modeling exercise is that it fails to compare results to alternative \$5 billion investments that would also create jobs, and more of them. While the pipeline will create temporary and some permanent jobs, the choice for policy makers is not between the NGP and nothing.

The Enbridge proposal passes up value-added employment creation opportunities from upgrading and refining in Canada. The singular objective of diversifying trade by selling Canadian oil in China is not the same as a strategy that would move Alberta's economy up the value chain, or even better, diversify it away from oil and gas. Instead, the NGP would entrench Alberta's role as an extractor of raw commodities and BC's role as an export gateway.

Investments that would reduce Canada's greenhouse gas emissions and reliance on fossil fuels should also be on the table—including renewable energy, building retrofits and energy efficiency, low-emission transportation options and advanced recycling and resource recovery. Green alternatives would create 3 to 34 times the number of direct jobs as a similar investment in the oil and gas industry.

A number of possible revenue sources could be considered to fund such a green jobs program. Even a very low carbon tax of \$10 per tonne, applied nationally, would yield approximately \$5 billion per year in government revenues. That is, it would raise the equivalent of the NGP investment *every year*, to be invested in ways that create more employment opportunities while putting Canada on a path to reducing emissions and reliance on fossil fuels.

An alternative Canadian development strategy could also meet another long-run policy objective: energy security. An increase in domestic capacity would enable an import-substitution strategy that would displace current oil imports to Central and Eastern Canada (from despotic regimes in the Middle East).

Another shortcoming of the modeling exercise is that it fails to compare results to alternative \$5 billion investments that would also create jobs, and more of them.

ECONOMIC AND ENVIRONMENTAL COSTS

Any economic gains from the NGP must be weighed against impacts on existing economic activity, and costs from adverse environmental impacts:

- In the BC development region of North Coast and Nechako, there were about 5,500 jobs in 2010 in categories that would most likely be affected by an oil spill (such as tourism and fishing) and 12,670 jobs in the Cariboo development region.
- Even if one in ten of these jobs were affected, the job losses that could result from an oil spill would be larger than new permanent jobs created by the NGP.
- Not counted in these statistics is the subsistence economy of fishing and trapping, an important source of non-market food for people in rural areas. For the Gitga'at, whose territory covers the tanker route out of Kitimat, these sources account for about two-fifths of their food supply.
- Even in the absence of a spill, the pipeline and tanker traffic will be disruptive to the existing fishing and tourism economy.

Economic costs of the pipeline include:

- Pipeline and tanker spills will inevitably occur due to the nature of pipelines, additional corrosiveness of diluted bitumen, and challenging mountainous terrain.
- Remote operations will delay detection of spills and clean-up efforts.
- The GHG emissions facilitated by the Northern Gateway pipeline—extraction and processing in Canada and combustion in China—could be in the range of 80 to 100 Mt CO₂ per year. This is more than BC emissions total emissions of 67 Mt in 2009.

The pipeline and its oil sands product will impose climate change costs on people in other countries and in the future. Thus, private gain is created by imposing costs on people in other countries and on future generations:

- A low estimate of 80 Mt of CO₂ into the atmosphere per year with external costs of \$50 per tonne would imply \$4 billion per year in externalized costs.
- Using a higher estimate of 100 Mt at \$200 per tonne, external costs reach \$20 billion per year.
- By comparison, profits from NGP would be over \$300 million per year, plus the wind-fall gain to oil sands producers from higher prices in China is estimated to average \$3.6 billion per year. These profits are only possible by externalizing costs onto innocent bystanders.

While proponents of the Northern Gateway Pipeline have generally stooped to smearing opponents as “radicals” and “puppets of foreign interests,” they have offered few strong justifications for the pipeline other than “jobs and growth.” A full consideration of costs and benefits, including damages from GHG emissions and the costs associated with likely oil spills, suggests the NGP may well be uneconomical.

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Introduction: The Economic Case

The proposed Enbridge Northern Gateway Pipeline (NGP) is a \$5 billion investment that would transport 525,000 barrels per day of oil sands bitumen from Edmonton to Kitimat, BC, a distance of 1,170 km, where it would be loaded onto large tankers for shipment to China.

THIS BRIEF REVIEWS THE CASE FOR AND AGAINST the Enbridge Northern Gateway Pipeline, with an emphasis on economic and employment impacts. A controversial open letter from Natural Resources Minister Joe Oliver in January 2011 accused “environmental and other radical groups” of undermining Canada’s national economic interest by opposing the pipeline.¹ Oliver fails to mention oil spills or climate change, instead framing the case for the pipeline in purely economic terms:

For our government, the choice is clear: we need to diversify our markets in order to create jobs and economic growth for Canadians across this country. We must expand our trade with the fast growing Asian economies. We know that increasing trade will help ensure the financial security of Canadians and their families.

The proposed Enbridge Northern Gateway Pipeline (NGP) is a \$5 billion investment² that would transport 525,000 barrels per day of oil sands bitumen from Edmonton to Kitimat, BC, a distance of 1,170 km, where it would be loaded onto large tankers for shipment to China.³ Enbridge claims the pipeline will increase Canadian GDP by a total of \$270 billion over 30 years, while creating 62,694 person-years of employment during construction and 1,146 permanent jobs once complete.⁴

1 J Oliver, “An Open Letter from Natural Resources Minister Joe Oliver” in *The Globe and Mail*, January 9, 2012, www.theglobeandmail.com/news/politics/an-open-letter-from-natural-resources-minister-joe-oliver/article2295599/

2 While Enbridge cites \$5.5 billion, the additional \$500 million is a contingency reserve and should not be counted.

3 A parallel pipeline would also deliver imported condensate/diluent (used to make crude bitumen suitable for shipment through the pipeline) in the opposite direction. The main pipeline would transport diluted bitumen (approximately 70% bitumen, 30% diluent).

4 Enbridge Northern Gateway website, Benefits for Canadians, www.northerngateway.ca/economic-opportunity/benefits-for-canadians/



Northern Gateway Pipeline route

The economic benefit of the NGP lies in the additional income arising from building and using this new infrastructure:

- Employment income to workers, primarily in the construction phase, but also on an operating basis;
- Profits to Enbridge and partner companies that own the pipeline, and oil and gas companies if they can get higher prices in Asia; and
- Royalty and taxation revenue to federal, provincial and local governments.

While the NGP is likely to be very profitable, and governments will get a share of those profits through taxes and royalties, the case for employment gains is far weaker.

The oil and gas industry is one of the most capital intensive in the world, meaning relatively few jobs are created per million dollars of output. The largest share of job creation arises from the construction of assets and infrastructure, rather than day-to-day operations. In 2008, 56,283 workers were employed in oil and gas extraction in Canada, a further 17,904 were employed in petroleum and coal product manufacturing, and 43,824 were employed in support activities for mining and oil and gas extraction.⁵ This total of 118,011 represents only 0.8% of total Canadian employment.

This paper analyzes claims about new job creation from construction and operation of the NGP, but also considers alternative investments that would reduce Canada’s reliance on fossil fuels and its greenhouse gas emissions. It also considers value-added production in Canada and domestic energy security as alternative conceptions of Canada’s national interest. Finally, it reviews the economic costs associated with adverse environmental impacts—pipeline and tanker spills and greenhouse gas emissions—as a necessary comparison against economic benefits.

⁵ Statistics Canada, Table 2810024 – Employment (SEPH), unadjusted for seasonal variation, by type of employee for selected industries. For the latter, 87,648 were employed in support activities for mining and oil and gas extraction. Employment in mining and oil and gas is roughly split between the two, so we assume the same for support activities. In contrast, all of the employment of petroleum and coal product manufacturing is assumed to be from oil and gas.

The oil and gas industry is one of the most capital intensive in the world, meaning relatively few jobs are created per million dollars of output. The largest share of job creation arises from the construction of assets and infrastructure, rather than day-to-day operations.

Short-Term Employment in Construction

Enbridge's claim of 63,000 person-years gives the impression of many new jobs, but construction work is very short-term in nature, and the total includes a large share of spin-off jobs not directly related to construction.

THE VAST BULK OF ECONOMIC GAINS FOR WORKERS associated with the NGP come in the form of temporary jobs created in the construction phase of the pipeline. Employment numbers in economic studies are often presented as person-years of employment, rather than jobs on an annual basis. Enbridge's claim of 63,000 person-years gives the impression of many new jobs, but construction work is very short-term in nature, and the total includes a large share of spin-off jobs not directly related to construction.

In terms of hard numbers, Enbridge estimates there will be an average of 1,850 workers building the pipeline over the three-year construction period, peaking at 3,029 in the third quarter of 2015. So how do we get from an average of 1,850 workers for three-years to 63,000 person-years of employment? To answer this question we have to understand input-output models, which are based on national accounts data and the flows of income through the economy. Input-output analysis offers insights into the economic impact of new investments by going beyond the direct ("on-site") jobs created to include (a) *indirect employment*, as expenditures on the pipeline also lead to increased output and employment in the upstream industries that provide the goods and services that are inputs to construction (manufacture of steel pipe, engineering consulting services, etc.); and (b) *induced employment*, when the income received by workers (whether direct or indirect) supports jobs in the local economy through purchases of food, housing, entertainment and so forth.

That said, projections from input-output models should be interpreted with great caution.⁶ They can be problematic because they are static (no changes in technology or prices) and linear (no changes in the composition of material, energy or labour inputs). They do not consider the

⁶ For a critical perspective, see P Grady and R Muller, "On the Use and Misuse of Input-Output Based Impact Analysis" in *The Canadian Journal of Program Evaluation*, Vol. 3, No. 2, pp. 49-61, 1988, <http://global-economics.ca/input.output.multipliers.pdf>

economic impacts of alternative investments (more on this later in the paper). An input-output analysis essentially represents an extrapolation of existing economic relationships based on an increase in output.⁷

In the case of the NGP, the total job creation associated with its investment is directly linked to total expenditures in an input-output model. Half the investment will lead to half the jobs by design. Thus, one way of padding employment numbers is to overstate the total investment. For example, Enbridge's stated \$5.5 billion investment includes a \$500 million contingency reserve, which increases all estimated employment numbers by 10% compared to a \$5 billion investment. It may also be the case that the project comes in well under budget.

Importantly, input-output models implicitly assume workers would otherwise be unemployed. If the NGP did not go ahead, however, the vast majority would be working somewhere else. Indeed, a concern of business advocacy organizations has been the prospect of skilled labour shortages. This is echoed by a recent study for the BC government and BC Hydro that estimates labour demand will exceed supply in Northwestern BC starting in 2012 due to the large number of resource industry projects underway.⁸ This will continue to be the case through 2015–16, when the bulk of construction is scheduled to take place. Excess demand for skilled construction workers will push up wages and take workers away from other projects. Alternatively, many of the workers may be temporary foreign workers.

Employment numbers from Enbridge's National Energy Board (NEB) application were estimated by Statistics Canada based on internal and confidential data provided by the company.⁹ This modeling exercise leads to numbers that are implausibly large: 22,764 person-years of direct employment; 13,251 person-years of indirect employment; and 26,679 person-years of induced employment.

Enbridge's own assessment of *direct jobs* in construction work is for an average of 1,850 jobs per year for three years, or 5,536 person-years of employment.¹⁰ Upfront work associated with constructing the pipeline should also be included (clerical, legal, engineering and other supporting services), though a significant portion of this work has already taken place—the \$100 million reported by Enbridge for planning, lobbying and surveying in advance of the hearings is a sunk cost, evidence of past, not future, job creation.

The main source of *indirect jobs* comes from the assumed manufacture of pipe in Canadian steel mills—this is likely, given past procurement of pipe by Enbridge, but the NEB application makes no firm commitment that this will be the case. The main candidate for sourcing steel pipe within

Input-output models implicitly assume workers would otherwise be unemployed. If the NGP did not go ahead, however, the vast majority would be working somewhere else. Indeed, a concern of business advocacy organizations has been the prospect of skilled labour shortages.

7 In economics this is known as constant returns to scale. Many industries that have large upfront costs, however, are characterized by increasing returns to scale (or economies of scale). In these industries the average cost per unit falls as output increases. For input-output models, CRS is essentially assumed at the level of the industry and supply chain due to the nature of the modeling. This analysis is also considered to be "partial equilibrium" because there is no change in relative prices that affect other parts of the economy.

8 Northwest Transmission Line Labour Market Partnerships Project, *Labour Market Research Summary*, Submitted to the Labour Market Partnerships Steering Committee, November 2011, www.bchydro.com/etc/medialib/internet/documents/projects/ntl/NTL_LabourMarket_ResearchSummary.Par.0001.File.NTL-LabourMarket-ResearchSummary.pdf

9 A customized run was done based on Enbridge's internal data (personal communication with Statistics Canada's Industry Accounts division). Enbridge was contacted to obtain a copy of the work Statscan did for them, but this request was rejected on the grounds of confidentiality. To the extent that employment benefits are overstated it is hard to determine how much of this is just the I-O model and how much stems from the data provided by Enbridge.

10 In the application, this is confusing as Enbridge shows direct jobs broken down into two components: "on-site employment," which corresponds to the 1,850 per year for three years average stated above; and, "direct input purchases," which would normally be considered indirect employment.

Canada is the Ervaz plant in Regina, which engaged in a \$90 million facility upgrade for increased pipe production in 2008. With the expansion about 500–600 workers are employed in the plant’s pipe division.¹¹ Additional employment in making steel comprises another 500 workers.¹² It is not clear how much of this capacity would be dedicated to the NGP and for how long, but even if we assume that all workers are engaged in pipe production for NGP for three years, we come up with 3,000 person-years of employment. Notably, these are not new jobs but existing employment that is sustained by the new NGP investment.

Together, construction and pipe manufacture amount to no more than 8,600 person-years of employment. This is less than one-quarter of the 36,000 (direct and indirect) person-years estimated by the input-output model. While there may be additional indirect jobs, they are likely to be very small in number.

The major driver of the large estimated employment gains lies in the *induced* category, which includes more than two-fifths (43%) of the purported person-years of employment. Induced employment is particularly difficult to measure accurately, and requires further assumptions about consumer expenditures that may result out of increased income.¹³ In the Enbridge case, induced numbers were derived by taking estimated direct and indirect job numbers and running them back through the model—that is, as if all income was new money that entered the economy from outside.¹⁴ In addition, it is also assumed that tax revenues going to governments are spent on public services, not necessarily a realistic assumption given fiscal conservatism federally, in Alberta and in BC.

All of these assumptions suggest that employment estimates widely touted by Enbridge and pipeline proponents are vastly overstated. Induced numbers should be heavily discounted, because they are modeled as if (an already overstated) 36,000 previously unemployed workers showed up out of nowhere, each earning \$68,000 per year, and paying taxes to governments that were interested in supporting public services.¹⁵ Instead, a focus on direct jobs on-site and in production of inputs for the pipeline is a more accurate indicator of the economic benefit to workers.

The danger in all of this is that a number gets established, and then becomes pasted into various summaries, briefing notes and media reports, but few people go and check the math, or consider the assumptions and caveats associated with the number. Even at face value, employment numbers from Enbridge are quite small relative to the Canadian economy and employment. Enbridge itself notes that the “overall effects on the provincial and national economies are considered not

Enbridge’s claim of 63,000 person-years gives the impression of many new jobs, but construction work is very short-term in nature, and the total includes a large share of spin-off jobs not directly related to construction.

11 B Johnstone, “Ervaz opens pipe expansion project” in *Leader-Post*, CanWest News, October 16, 2008, www.canada.com/reginaleaderpost/news/story.html?id=70c6cc3b-33fd-401f-88e6-57553e7a9151

12 Personal communication with United Steelworkers.

13 For example, a retail store whose sales double may not need to hire any additional staff if the operation was already operating below capacity. An input-output model, by contrast, would assume that doubling sales would be like opening up a second store.

14 Additional confusion results from Enbridge’s Table 4-10, which purports to show direct and indirect employment effects by industry category; it clearly includes induced employment in the form of 137 person-years of arts, entertainment and recreation employment, and 401 person-years in information and cultural industries, 2,437 in wholesale trade, 1,090 in retail trade, 1,357 in agriculture and forestry, and 423 person-years in government. To further confuse this matter, in public relations materials Enbridge has used an estimate of 39,930 person-years of stated “spin-off employment” (by adding 26,679 induced person-years and 13,251 indirect person-years), which represents 64% of the claimed employment gain of project construction. See note 16.

15 In other input-output analysis, including Enbridge’s application for the Alberta Clipper pipeline, induced numbers are left out entirely. The \$68,000 per year figure comes from Enbridge’s application.

significant relative to the overall size of these economies.”¹⁶ In BC alone, there are more than 2.4 million people employed. In spite of the rhetoric of job creation from Natural Resources Minister Oliver, there is little to support claims that the pipeline is a major job generator.

A final consideration for construction employment and economic spin-offs is the potential benefit to regions along the pipeline route and, in particular, local First Nations. Enbridge broadly assesses the potential for Aboriginal employment, estimated at 37% of regional labour requirements. The company commits to giving “first consideration for employment opportunities to qualified regional and Aboriginal residents, with appropriate skills and training, and to qualified regional suppliers of goods and services, where possible” plus “additional direct employment effects will be created through the purchases of construction goods and services from local and Aboriginal businesses in each of the six regions.”¹⁷ However, the application makes no commitment to training local residents who do not already have the qualifications required. Thus, it is likely that Aboriginal workers will be more present in low-skill, low-wage employment, while skilled labour will largely come from outside the region.

The danger in all of this is that a number gets established, and then becomes pasted into various summaries, briefing notes and media reports, but few people go and check the math, or consider the assumptions and caveats associated with the number.

16 Enbridge Northern Gateway Pipeline, Sec. 52 Application, Volume 6C: Environmental and Socio-Economic Assessment (ESA)—Human Environment, Section 4: Socio-Economic Conditions, May 2010, page 4-1. [https://www.neb-one.gc.ca/ll-eng/livelink.exe/fetch/2000/90464/90552/384192/620327/624798/644539/B8-2_-_Northern_Gateway_Volume_6C_Section_4.4_-_ESA_-_Regional_Socio_and_Economic_Effects_\(A1V5D2\)?nodeid=644543&vernum=0](https://www.neb-one.gc.ca/ll-eng/livelink.exe/fetch/2000/90464/90552/384192/620327/624798/644539/B8-2_-_Northern_Gateway_Volume_6C_Section_4.4_-_ESA_-_Regional_Socio_and_Economic_Effects_(A1V5D2)?nodeid=644543&vernum=0)

17 Application, Section 4-4.

Permanent Jobs in Pipeline Operations

The input-output approach implicitly assumes that an increase in pipeline capacity reflects an increase in oil sands production. However, some have questioned this assumption.

IN CONTRAST TO THE CONSTRUCTION PHASE, the fully operational NGP will lead to very few permanent jobs. On an operating basis, Enbridge estimates 104 permanent jobs in BC and Alberta, half of which would be in Kitimat. The company states local residents will be hired, but workers could easily be moved into the region from elsewhere. In addition, another 113 people will be employed at Kitimat terminal facility. These 217 permanent jobs, however, are estimated to increase five-fold to 1,146 total jobs per year through input-output modeling of indirect and induced employment.¹⁸ These estimates of permanent jobs suffer from the same shortcomings as noted above for construction jobs (such as a large share, 37%, of the total coming from induced employment).

The input-output approach implicitly assumes that an increase in pipeline capacity reflects an increase in oil sands production. However, some have questioned this assumption, arguing that based on projections from the Canadian Association of Petroleum Producers, there will be excess capacity in the pipeline industry.¹⁹ That oil sands output may garner a higher price in Asia, which would increase profits for investors,²⁰ but would not lead to additional upstream jobs in the oil patch.

¹⁸ Ibid, Table 4-14.

¹⁹ D Hughes, *The Northern Gateway Pipeline: An Affront to the Public Interest and Long Term Energy Security of Canadians*, November 2011, http://forestethics.org/downloads/HUGHES_Northern_Gateway_Pipeline_November_2011.pdf.

²⁰ Wood Mackenzie, Inc., *A Netback Impact Analysis Of West Coast Export Capacity*, Prepared for Government of Alberta Department of Energy, December 2011, www.energy.alberta.ca/Org/pdfs/WoodMackenzieWestCoastExport.pdf. Also based on input-output modeling, the study notably does not include induced employment impacts.

Additional research commissioned by Enbridge suggests even more spectacular (and implausible) economic benefits from the pipeline: an increase in Canadian GDP of \$270 billion over 30 years.²¹ It views the pipeline as a key piece of infrastructure that facilitates higher profit margins for oil sands producers (ranging from \$1.88 to \$2.98 per barrel, depending on the year) in the Chinese market. This amounts to a windfall gain from higher prices of \$108 billion over 30 years, of which 45% is assumed to be reinvested in the industry (in line with recent trends), again estimated with an input-output model. Economist Robyn Allan's submission to the NEB argues that diverting bitumen to China will also lead to price increases of \$2 to \$3 per barrel in the North American market; in this case, gains to oil sands producers come, in part, at the expense of consumers.²²

This modeling demonstrates how input-output analysis and compound growth can be used to generate massive numbers to justify a project. About half of the gains in GDP are based on the assumption of a price premium in Asia relative to the US, of which less than 4% goes to labour income. The other half of the GDP increase is from reinvestment of profits (31% of which goes to labour), and is rooted in the assumption that the current massive growth of activity in the oil sands will continue for the next three decades, and that there is a linear relationship between output and factors of production. This is not likely to be the case, as the most accessible oil sands deposits are now under production, and future developments will be more costly in terms of energy inputs and engineering.²³

Interestingly, however, this analysis shows how much of the gains are skewed toward corporate interests in the oil sands. Out of the projected increase in Canadian GDP of \$270 billion (2016 to 2046), total labour income is expected to be \$48 billion, or an 18% share of income. This is extremely low by Canadian economic standards, which has traditionally seen a labour share of income in excess of 50% of GDP.²⁴ This is due to the extremely capital-intensive nature of the oil and gas industry.

Additional research commissioned by Enbridge suggests even more spectacular (and implausible) economic benefits from the pipeline: an increase in Canadian GDP of \$270 billion over 30 years.

21 Wright Mansell Research Ltd., Public Interest Benefits of the Enbridge Northern Gateway Pipeline Project, March 2010, included as Appendix B of Enbridge Application, Volume 2: Economics, Commercial and Financing, www.northerngateway.ca/assets/pdf/application/Master_Vol%202_Final_11May10.pdf

22 R Allan, *An Economic Assessment of Northern Gateway*, January 2012, https://www.neb-one.gc.ca/ll-eng/livelink.exe/fetch/2000/90464/90552/384192/620327/624910/785393/786558/Alberta_Federation_of_Labour_-_AFL_-_Northern_Gateway_Project_-_Written_Evidence_of_Robyn_Allan_-_A2L6X5.pdf?nodeid=786562&vernum=0. Note that Andrew Leach argues that the pass-through of price increases to consumers will be about one third less due to the market structure of the industry, "Northern Gateway and Gas Prices" in *Rescuing the Frog* blog, February 3, 2012, <http://andrewleach.ca/uncategorized/northern-gateway-and-gas-prices/>

23 See, for example, the NEB evidence from C.J. Peter Associates Engineering, which looks at future need for more-intensive *in situ* production of oil sands, whereas most current production is from surface mining. https://www.neb-one.gc.ca/ll-eng/livelink.exe/fetch/2000/90464/90552/384192/620327/624910/701951/777684/C.J._Peter_Associates_Engineering_-_January_18,_2012_Oral_Evidence_Presentation_Slides_-_A2K4V4?nodeid=777599&vernum=0

24 Although the share has been falling in recent decades. Author's calculations based on System of National Accounts, Gross Domestic Product – Income-Based, various years, Statistics Canada catalogue no. 13-019-XWE, Vol. 1, No. 2, Table 1.

Alternative Investments and Employment

Environmental impacts aside, an industrial policy focused on value-added job creation is far more likely to achieve the government's stated objective to "ensure the financial security of Canadians and their families."

THE NORTHERN GATEWAY PIPELINE IS ONE CHOICE of infrastructure in support of economic development. While the pipeline will create temporary and some permanent jobs, revenues for governments, and profits for oil and gas companies, the choice for policy makers is not between the NGP and the status quo. Any project, even digging holes in the ground and refilling them, would show positive employment gains from an input-output model exercise. Estimates in the previous sections are *gross* rather than *net* figures relative to some other alternative \$5 billion investment. In the absence of the NGP investment, those alternatives would also create jobs.²⁵

One alternative consideration, raised by labour interests in the oil and gas sector, is the potential for employment gains in Canada by additional upgrading and refining operations, rather than exporting a less-processed commodity by pipeline for processing elsewhere. As part of the National Energy Board's hearings, economic consulting firm Informetrica estimates that about 26,000 additional jobs would be created if bitumen were upgraded and refined in Canada.²⁶ Environmental impacts aside, an industrial policy focused on value-added job creation is far more likely to achieve the government's stated objective to "ensure the financial security of Canadians and their families."

The singular objective of diversifying trade by selling Canadian oil in China is not the same as a strategy that would move Alberta's economy up the value chain, or even better, diversify it away from oil and gas. Instead, the NGP would entrench Alberta's role as an extractor of raw commodities and BC's role as an export gateway. The federal government's explicit strategy to become an "energy superpower" has reinforced Canada's historical legacy as a resource economy. This has led to a condition known as "Dutch disease," where financial flows to the oil and gas sector have

25 Dividends paid out to shareholders that are spent in the economy is another possibility.

26 It is not specified in the document, but presumably the 26,000 figure includes induced employment. Informetrica Ltd., *Written Evidence*, National Energy Board Hearing Order OH-4-2011, Appendix A to Communication Energy and Paperworkers Union Canada - EP_Evidence_(00389312)[1] - A2L7F9, <https://www.neb-one.gc.ca/ll-eng/livelink.exe?func=ll&objId=786820&objAction=Open>

inflated the value of the Canadian dollar, to the point where it is harming domestic manufacturing industries and their exports.

An alternative Canadian development strategy could also meet another long-run policy objective: energy security. An increase in domestic capacity would enable an import-substitution strategy that would displace current oil imports to Central and Eastern Canada (from despotic regimes in the Middle East). This alternative would also require new pipeline, upgrading and refining capacity, so it is not without environmental costs, but it would be feasible.²⁷ The key point is that the federal government is promoting rapid exploitation of a basic commodity without thought to Canada's future energy security. Indeed, this is a core challenge to the federal government's assertion that the interests of the oil and gas industry are synonymous with Canada's national interests.

Foreign ownership in the oil and gas sector has become entrenched, as its political influence has grown. In 2009, total assets in the oil and gas industry totaled \$461 billion, of which foreign corporations controlled 35%. US corporations alone had more than \$103 billion invested in Canada's oil patch. Foreign corporations received just over half of the revenues, and more than two fifths of the profits.²⁸ These data end in 2009, but as of 2012 it is reasonable to assume that the foreign ownership share overall has risen, with a major rise in Chinese ownership in the oil sands. Chinese investment in the oil sands is estimated at \$12–20 billion, and comprises a substantial portion of the \$100 million upfront cost to support the NGP application.²⁹ Notably, when the Chinese state oil company, Sinopec, purchased a 9% stake in the Syncrude oil consortium in 2010, it received a veto over new investments to upgrade bitumen in Canada.³⁰

Pipeline proponents almost never mention climate change, and on the rare occasion they do it is only in relation to domestic emissions from the extraction of oil and gas resources. On this basis, it is better for Canada to have processing outside the country, as it would limit the increase in Canada's official emissions. But a climate lens reveals that the national interest may in fact be to shift away from oil and gas production and consumption in favour of renewable sources of energy, greater energy efficiency, and a shift to more walkable and bike-able communities with abundant public transit options.

Using the input-output framework, we can ask what the employment impact would be if alternative investments were made in other parts of the economy to create green jobs. Table 1 shows that, with respect to *direct* job creation, green investments would create 3 to 34 times the number of jobs per million dollars of new investment, compared to oil and gas.³¹ While the same caveats and cautions about induced job creation and other critiques of input-output models are at play with these alternative investments, the table shows that, if the objective is creating employment, substantially more jobs would result from a green approach compared to an equivalent investment in oil and gas extraction or production of petroleum and coal products.

The key point is that the federal government is promoting rapid exploitation of a basic commodity without thought to Canada's future energy security. Indeed, this is a core challenge to the federal government's assertion that the interests of the oil and gas industry are synonymous with Canada's national interest.

27 For a discussion, see A Leach, "What would it take for Eastern Canada to run on Western Canadian oil?" in *Rescuing the Frog* blog, February 11, 2012, <http://andrewleach.ca/oilsands/what-would-it-take-for-eastern-canada-to-run-on-western-canadian-oil/>

28 Statistics Canada website, "Oil and gas extraction and support activities," www.statcan.gc.ca/pub/61-220-x/2009000/t031-eng.htm

29 Terry Glavin summarizes some recent multi-billion dollar investments from China in the oil sands and the Enbridge pipeline proposal in "The Real Foreign Interests in the Oil Sands" in *The Ottawa Citizen*, January 12, 2012, www.ottawacitizen.com/story_print.html?id=5981230&sponsor= and "Scrutinizing Canada's pipeline to Beijing" in *The National Post*, January 29, 2012, <http://fullcomment.nationalpost.com/2012/01/29/terry-glavin-scrutinizing-canadas-pipeline-to-beijing/>

30 CBC News, "Syncrude deal gives China veto on upgrading: Deal may lend support for cross-Rockies crude pipeline," April 14, 2010, www.cbc.ca/news/business/story/2010/04/14/sinopec-processing-veto.html. Thanks to Andrew Nikiforuk for pointing this out.

31 Data from Infrometrica's Input-Output model, which is based on Statistics Canada's 2002 Input-Output model. See notes in Table.

Using the input-output framework, we can ask what would the employment impact be if alternative investments were made in other parts of the economy to create green jobs.

TABLE 1: EMPLOYMENT IMPACTS OF \$1 MILLION OF ADDITIONAL GROSS OUTPUT				
	Direct job creation	Indirect job creation	Induced job creation	Total job creation
Fossil fuels				
Oil and gas extraction	0.74	2.87	2.24	5.85
Petroleum and coal products	0.78	2.55	2.03	5.36
Pipeline transport operations	1.25	1.71	1.21	4.17
Oil and gas engineering construction	3.89	4.83	3.19	11.91
Green investments				
Construction	6.50	4.87	5.92	17.29
Repair and maintenance	16.08	3.95	6.46	26.49
Transportation and warehousing	8.16	4.70	5.84	18.71
Transportation equipment manufacturing	2.09	3.16	2.97	8.22
Printing and related support activities	6.71	3.66	5.00	15.37
Miscellaneous manufacturing	7.37	2.86	4.12	14.35
Waste management and remediation services	19.27	4.58	5.12	28.98
Professional, scientific and technical services	4.70	3.71	7.10	15.52
Education services	24.75	2.87	8.17	35.79
Health care and social assistance	14.94	2.28	8.13	25.35
<p>Notes: The input-output calculations are derived from the public-use 2002 w-level tables. The methodology follows closely with the one used by Statistics Canada, but inventory change effects have been excluded. The impacts derived from the public-use tables will be different from StatsCan impacts for two reasons: StatsCan has access to higher dimension tables (unsuppressed w-level), and estimates of suppressed cells have been imputed by Infrometrica using various techniques.</p> <p>Sources: Infrometrica Ltd., based on Statistics Canada's 2002 w-level public-use input-output tables. Pipeline transport operations and oil and gas engineering construction from Statistics Canada 2006 input-output model.</p>				

The list of “green investments” draws on traditional job categories, as there is no standard convention for measuring green jobs in Canada,³² but it is indicative of the type of work that would be required to move Canada to a more sustainable footing. The shift to a low-carbon economy is tantamount to a green industrial revolution, and requires large investments in infrastructure. These include:

- Switching from use of fossil fuel powering electricity grids to clean sources of electric power (Enbridge itself has a growing portfolio of green energy investments);
- Building alternative transportation options (including public transit and inter-city high-speed rail infrastructure);³³
- Retrofitting homes and commercial buildings for major improvements in energy efficiency;³⁴ and
- Developing advanced recycling and waste recovery facilities that can displace the need for GHG-intensive virgin materials.

A number of possible revenue sources could be considered to fund such a program, including increased corporate income taxes on the oil and gas industry, higher royalties on extraction, and export taxes on minimally processed bitumen. But the case for a carbon tax is compelling, as it would raise the cost of emissions while providing a source of revenues. Even a very low carbon tax of \$10 per tonne, applied nationally, would yield approximately \$5 billion per year in government revenues. That is, it would raise the equivalent of the NGP investment *every year*, to be invested in ways that create more employment opportunities while putting Canada on a path to reducing emissions and reliance on fossil fuels.

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32 For a discussion on the concept of green jobs and sustainability as they relate to GHG emissions, see M Lee and K Carlaw, *Climate Justice, Green Jobs and Sustainable Production in BC*, CCPA–BC, September 2010, www.policyalternatives.ca/greenjobs

33 See P Condon et al., *Transportation Transformation: Building Complete Communities and a Zero-Emission Transportation System in BC*, CCPA–BC, April 2011, www.policyalternatives.ca/transportationtransformation

34 See M Lee, E Kung and J Owen, *Fighting Energy Poverty in the Transition to Zero-Emission Housing: A Framework for BC*, CCPA–BC, September 2011, www.policyalternatives.ca/energy-poverty

Economic Costs of Environmental Damages

It is challenging to assign costs for externalities such as adverse health impacts and deaths in the same way one might estimate income from employment and other economic activity on the benefit side.

IN A MARKET ECONOMY, PRICES MINIMALLY REFLECT COSTS OF PRODUCTION, plus a producer mark-up, and thus serve as a signal that drives the allocation of resources. But market prices typically do not factor in health and environmental costs of production in the form of pollution, injury, illness or death. In economics, these costs paid by a third party to the transaction between buyer and seller are called external costs or “externalities.”

It is challenging to assign costs for externalities such as adverse health impacts and deaths in the same way one might estimate income from employment and other economic activity on the benefit side. Similarly, benefits of preserving the status quo—such as the benefit of clean air and water, additional years of life, or better health—can be extremely difficult to quantify in dollar terms. Some commentators argue that it is immoral and impossible to assign dollar amounts to death and reduced quality of life: that estimates of the value of human life are often derived from questionable methodologies, and pit human lives against potential costs to business.³⁵

For the Northern Gateway Pipeline, two major economic costs must be weighed against any benefits from moving ahead. First is the risk associated with pipeline and tanker spills, and second is the impact of increased greenhouse gas emissions. There would also be additional environmental and economic impacts of construction and operation of the pipeline that are not considered in detail. For example, the submission to the NEB by the Gitga’at First Nation, whose territory encompasses the tanker route out of Kitimat, notes that even under routine conditions in the absence of a spill they would experience adverse economic impacts. Tanker traffic would have an impact on traditional and commercial fisheries, reduce demand for nature-based tourism, and reduce the Gitga’at’s ability to draw investment in conservation projects.³⁶

³⁵ See F Ackerman and L Heinzerling, 2004, *Priceless: Human Health, the Environment and the Limits of the Market*, The New Press.

³⁶ R Gregory, L Failing and C Joseph, *Economic Impacts of the Enbridge Northern Gateway Project on the Gitga’at First Nation*, December 16, 2011, [https://www.neb-one.gc.ca/ll-eng/livelink.exe/fetch/2000/90464/90552/384192/620327/624910/697575/777619/Gitga’at_First_Nation_-_Gitga_at_ENGP_Economic_Impact_Report_FINAL_-_A2K4W9.pdf?nodeid=777704&vernum=0](https://www.neb-one.gc.ca/ll-eng/livelink.exe/fetch/2000/90464/90552/384192/620327/624910/697575/777619/Gitga%27at_First_Nation_-_Gitga_at_ENGP_Economic_Impact_Report_FINAL_-_A2K4W9.pdf?nodeid=777704&vernum=0)

OIL SPILLS

Crossing mountainous terrain, afflicted by wide swings in natural weather patterns, and transporting an inherently flammable and explosive substance, the question is not if the pipeline will leak, but when, how much, and how often. For First Nations communities and private landowners in proximity to the pipeline, a spill threatens their very livelihood: the work they do, the homes they live in, the food they catch, the health and well-being of their loved ones. It also threatens access to recreation opportunities and forecloses on alternative economic trajectories that may be favoured by local people.

How many people and jobs are at risk is difficult to ascertain, as development regions for which there exist statistics are much larger than the immediate vicinity of the pipeline route. A promotional piece from the BC government on BC's ocean economy cites 167,805 jobs in 2005, counting for \$7.6 billion in labour income. According to coastal First Nations, some 56,000 existing jobs in BC fisheries and tourism would be at risk in the event of a pipeline or tanker spill.³⁷ These numbers may, however, be on the high side given actual employment numbers in those regions, compared to the concentration of employment in the south coast of BC.

In the BC development region of North Coast and Nechako, there were about 5,500 jobs in agriculture, fishing, hunting and trapping; information, culture and recreation; and accommodation and food services (the job categories that would most likely be affected by an oil spill) in 2010, and 12,670 jobs in the Cariboo development region. In both regions total employment in these areas is anticipated to grow by 2015 to 6,450 and 14,920 jobs, respectively.³⁸ While these overstate the number of jobs close to the pipeline, a spill would also have ripple effects in a range of other industries, and could have environmental impacts in other areas downwater or downwind. Nonetheless, there are vastly more jobs at risk in the event of a spill than there are in operating the pipeline. Even if one in ten jobs were affected, this number would be larger than the new permanent jobs created by the NGP.

Not counted in these statistics is the subsistence economy of fishing and trapping, an important source of non-market food for people in rural areas. The Gitga'at First Nation, to take one example, note that a "majority of Gitga'at households engage actively in traditional harvesting activities and over 40% of meals are traditionally-sourced. ... A conservative estimate of the replacement value of the current Gitga'at traditional harvest is about \$2 million per year."³⁹

Beyond employment, some available data on tourism and fisheries suggest broader economic impacts. The landed value of BC's seafood harvest has ranged between \$600-700 million per year over the past decade, with wholesale value between \$1 billion and \$1.4 billion.⁴⁰ Tourism revenue for lodges, hotels and vacation rentals was more than \$100 million in the Cariboo in 2010, and \$50 million in the North Coast and Nechako region.⁴¹

Available evidence suggests that oil spills are quite common and a cost of doing business. For example, a 35-mile stretch of the Kalamazoo River in Michigan has been closed since July 2010,

The submission to the NEB by the Gitga'at First Nation, whose territory encompasses the tanker route out of Kitimat, notes that even under routine conditions in the absence of a spill they would experience adverse economic impacts.

37 G Dembicki, "Enbridge pipeline puts 56,000 jobs at risk" in *The Tyee*, September 14, 2010, <http://thetyee.ca/Blogs/TheHook/Environment/2010/09/14/First-Nations-56000-jobs-Enbridge/>

38 Regional employment data from BC Stats, www.bcstats.gov.bc.ca/data/lss/repn.asp. No comparable data are available for Alberta.

39 R Gregory et al., 2011, *supra* note 36.

40 Government of British Columbia, *BC Seafood Production*, www.env.gov.bc.ca/omfd/fishstats/graphs-tables/seafood.html

41 BC Stats, www.bcstats.gov.bc.ca/data/bus_stat/busind/tourism.asp#TRR

when 843,000 gallons of oil leaked from another Enbridge pipeline, which was transporting oil sands crude, with an estimated clean-up cost of \$500 million. But this is far from an isolated incident. An investigative report from the New York Times in the wake of that spill found that: “Since 1990, more than 5,600 incidents were reported involving land-based hazardous liquid pipelines, releasing a total of more than 110 million gallons of mostly crude and petroleum products.”⁴²

The US Office on Pipeline Safety reports statistics on pipeline spills, safety and property damage, although statistics on-line only go from 1986 to 2003. During that timeframe, 3,300 incidents led to more than 125 million gallons spilled, of which 76 million was recovered. These incidents led to a total of \$857 million in property damage, and 291 injuries and deaths.⁴³ A corporate profile by the Polaris Institute notes that Enbridge is no exception when it comes to pipeline spills. Between 1999 and 2010, Enbridge pipelines experienced 804 spills, with the release of 168,645 barrels, or 26.8 million litres, of hydrocarbons into the environment.⁴⁴

While the nature of the Northern Gateway pipeline is that it does not cross more populous areas as calculated for the US, the message is clear: spills are inevitable, causing damage to ecosystems and property, and death. Furthermore, the remoteness of the region may mean that in the event that spills or pipeline breaks do occur, they go undetected for lengthy periods of time, resulting in proportionately greater environmental damage.

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Transport of diluted bitumen itself may greatly increase the risk of spills compared to conventional pipelines. Oil sands bitumen must be diluted with a natural gas liquid condensate in order to flow through pipelines, but this “DilBit” is more corrosive, acidic and sulphuric compared to conventional oil, and must be transported at higher temperature and pressure—all of which increase the potential for an uncontrolled leak. Transport of diluted bitumen is thought to explain the substantially larger number of pipeline spills in Alberta compared to the US.⁴⁵ When a spill does occur, the nature of diluted bitumen means greater toxicity of materials released, and more difficult clean up because it is heavier than water. Detecting leaks is challenging, particularly in remote areas.

Tanker spills have equal potential to be devastating. The most notorious example occurred further up the Pacific coast in 1989 with the Exxon Valdez spill. The International Tanker Owners Pollution Federation notes “Cleanup alone cost in the region of US\$2.5 billion and total costs (including fines, penalties and claims settlements) have, at times, been estimated at as much as US\$7 billion.”⁴⁶ Also close to BC, the Washington State Department of Ecology estimated that a major spill at the mouth of the Columbia River or in the Strait of Juan de Fuca could cost Washington state 165,000 jobs and \$10.8 billion in economic losses.⁴⁷

42 D Frosch and J Roberts, “Pipeline Spills Put Safeguards Under Scrutiny” in *New York Times*, September 9, 2011, www.nytimes.com/2011/09/10/business/energy-environment/agency-struggles-to-safeguard-pipeline-system.html (miles converted to km by the author).

43 Reported via Pipeline Safety Trust, *Pipeline Safety Statistics*, www.pstrust.org/resources/stats/index.htm

44 R Girard with T Davis, *Out on the Tar Sands Mainline: Mapping Enbridge’s Web of Pipelines*, Polaris Institute, 2010, www.tarsandswatch.org/files/Updated%20Enbridge%20Profile.pdf

45 Internal corrosion caused 1,257 out of 2,705 pipeline spills (>26.3 gallons) in Alberta between 2002 and 2010, which works out to 218 spills per 10,000 miles. US figure (albeit with differences in data collection and regulations) was 13.6 per 10,000 miles. See A Swift, S Casey-Lefkowitz and E Shope, *Tar Sands Pipelines Safety Risks*, February 2011, Co-published by Natural Resources Defense Council, National Wildlife Federation, Pipeline Safety Trust and Sierra Club, www.nrdc.org/energy/files/tarsandssafetyrisks.pdf

46 International Tanker Owners Pollution Federation, *Cost of Spills*, www.itopf.com/spill-compensation/cost-of-spills/

47 Calculations for Washington State Department of Ecology, based on D French-McCay, J Rowe, N Whittier, R Asch, S Sankaranarayanan, A Borowik, C Suárez and D Etkin, *Evaluation of the Consequences of Various Response Options Using Modeling of Fate, Effects and NRDA costs for Oil Spills into Washington Waters*, Volume I: Model Description, Approach, and Analysis, Phase II, Final Report, May 2006. www.ecy.wa.gov/programs/spills/studies_reports/asa_report_vol2.html

Concerns about the safety of tanker traffic on the scale envisaged by the pipeline—220 tankers per year—are exacerbated by the particular conditions of the BC coast, including narrow inlets and fjords, rocky outcroppings and winter storms, all of which increase the likelihood of collisions and sinkings.⁴⁸ As with pipelines, the highly corrosive nature of diluted bitumen heightens concerns about the possibility of weakening and leakage of tanker hulls. Moreover, the very remoteness of the proposed tanker route would significantly delay a response in the event of a spill. While Enbridge has stated plans to improve safety through double-hulled ships and use of tug boats, the stakes are high and risk of a spill can never be entirely eliminated.

GHG EMISSIONS

While full consideration of greenhouse gas emissions may be beyond the scope of the National Energy Board hearings on the Northern Gateway Pipeline, the very nature of the oil and gas industry means we must include GHG emissions among the project's external costs. Because climate change is global in nature with impacts that span decades if not centuries, there are enormous market failures associated with GHG emissions.⁴⁹ These costs can be difficult to measure because of differentiated impacts in regions in the form of droughts, floods and so forth, and with long time lags, as well as natural weather variation.

For many years, it was said that no single weather anomaly could be attributed to climate change. Instead, it was the sheer number of these events, their intensity and the wild swings between extremes that were found to be consistent with climate model projections. In recent research, however, specific weather events are being attributed to climate change, with warmer temperatures, minimally, contributing to a more extreme event than would otherwise have occurred.⁵⁰

Global re-insurance company, Swiss Re, notes current weather-related losses of about \$130 billion per year, compared to about \$25 billion per year in the 1980s.⁵¹ In 2011, the US experienced 12 weather disasters with costs exceeding \$1 billion each, and total costs of extreme weather events exceeding \$50 billion.⁵² For Canada, a 2011 report from the National Roundtable on the Environment and the Economy concluded that "climate change presents a growing, long-term economic burden for Canada," with economic costs of \$5 billion per year on average by 2020, rising to \$21–\$43 billion by 2050.⁵³

The GHG emissions facilitated by the Northern Gateway pipeline would comprise a substantial addition to emissions in Canada and importing nations. Emissions from the oil and gas industry are a substantial share of Canada's total, contributing 158 million tonnes of carbon dioxide equivalent

Because climate change is global in nature with impacts that span decades if not centuries, there are enormous market failures associated with GHG emissions.

48 A Swift, N Lemphers, S Casey-Lefkowitz, K Terhune and D Droitsch, *Pipeline and Tanker Trouble: The Impact to British Columbia's Communities, Rivers, and Pacific Coastline from Tar Sands Oil Transport*, supra note 45.

49 Because benefits and costs are so disjointed across geography and time, former World Bank Chief Economist Nicholas Stern called climate change "the greatest market failure the world has ever seen." Stern, N. (2006). *The Economics of Climate Change: The Stern Review*. Cambridge, UK: Cambridge University Press.

50 J Carey, "Storm Warnings: Extreme Weather is a Product of Climate Change" in *Scientific American*, June 28, 2011, www.scientificamerican.com/article.cfm?id=extreme-weather-caused-by-climate-change

51 Environment News Service, "Climate Change Blamed for Record Mississippi Floods" May 20, 2011, www.ens-newswire.com/ens/may2011/2011-05-20-01.html

52 J Gillis, "Harsh Political Reality Slows Climate Studies Despite Extreme Year" in *New York Times*, December 24, 2011, www.nytimes.com/2011/12/25/science/earth/climate-scientists-hampered-in-study-of-2011-extremes.html?_r=3

53 National Roundtable on the Environment and the Economy, *Paying the Price: The Economic Impacts of Climate Change for Canada*, 2011.

(Mt CO₂e) out of Canada's 2008 inventory of 734 Mt, or over one-fifth of the total.⁵⁴ However, not included in these amounts are the GHGs from the combustion of fossil fuels that are exported, which are counted in the inventories of importing countries. That is, Canadian emissions from the oil and gas industry count only the emissions associated with extraction and processing. Notably, the embodied carbon emissions in Canada's exports of fossil fuels are about 15% larger than Canada's own emissions from all domestic combustion of fossil fuels.⁵⁵

The Northern Gateway Pipeline would transport 525,000 barrels of diluted bitumen per day. The carbon content of this fuel translates into annual global emissions of approximately 70 Mt CO₂e.⁵⁶ In addition, there are emissions associated with extraction of the resource (6.5 Mt CO₂e⁵⁷) and emissions associated with the energy needed to run the pipeline and ship bitumen to Asia. Finally, there are emissions from upgrading and refining bitumen into oil and other petroleum products (8 to 9 Mt CO₂e per year,⁵⁸ although this emissions-intensive process would happen in the importing country). All in, annual emissions associated with the pipeline could be in the range of 80 to 100 Mt CO₂ per year, and this is not counting emissions associated with construction (manufacturing and transport of steel pipe, and machinery and equipment on-site).⁵⁹

Notably, the embodied carbon emissions in Canada's exports of fossil fuels are about 15% larger than Canada's own emissions from all domestic combustion of fossil fuels.

While attributing costs to emissions can be challenging, a recent study on the external costs of GHG emissions (known as the "social cost of carbon") put them in the range of \$150 to \$500 per tonne of CO₂, equivalent to \$0.35 to \$1.17 per litre of gasoline. The high end of the estimates reaches \$893 per tonne (more than \$2 per litre of gasoline).⁶⁰ Internalizing the external costs of the pipeline into market prices would require a mix of regulation, carbon pricing and removal of any caps on liability. Indeed, the corporate form in practice limits liability to the initial investments made by owners of stock, which could be exceeded in the form of massive clean-up costs for a catastrophic spill.

54 Environment Canada, Canada's Emissions Trends, July 2011, www.ec.gc.ca/Publications/E197D5E7-1AE3-4A06-B4FC-CB74EAAA60F/CanadasEmissionsTrends.pdf

55 Includes crude oil, natural gas, petroleum products and coal. Marc Lee and Amanda Card, *Peddling GHGs: What is the Carbon Footprint of Canada's Fossil Fuel Exports?* CCPA-BC, November 2011, www.policyalternatives.ca/publications/reports/peddling-greenhouse-gases

56 Author's calculations based on emission factors in Canada's National Inventory Report. 191,625,000 barrels per year = 30.5 million cubic metres at 2.71834 Mt CO₂e per million cubic metres (83 Mt CO₂e). However, this would be the high end of the range due to diluent. One estimate by the Pembina Institute is that 30% of the product is diluent, which sets the lower bound of the range (58 Mt CO₂e). Stated figure is the mid-point of this range.

57 G Brown, J Moorhouse and J Grant, *Opening the Door for Oil Sands Expansion: The Hidden Environmental Impacts of the Enbridge Northern Gateway Pipeline*, Pembina Institute, December 2009. The authors also estimate that over the 40 year lifetime of the pipeline, incremental oil sands emissions would be 260 Mt CO₂e.

58 Author's calculations based on emission factor of 52 to 79 kg CO₂e per barrel of bitumen, and estimated 367,500 barrels per day (assuming 70% bitumen 30% diluent mix in pipeline). Emission factor also from Pembina: D Droitsch, M Huot and P.J. Partington, *Canadian Oil Sands and Greenhouse Gas Emissions: The Facts in Perspective*, August 2010, <http://pubs.pembina.org/reports/briefingnoteosghg.pdf>

59 This simplified estimate accords with a life-cycle analysis of GHG emissions from the NGP of a range of 84 to 102 Mt CO₂e per year, submitted as evidence for the NEB hearings. Kirsten Zickfeld, *Greenhouse gas emission and climate impacts of the Enbridge Northern Gateway pipeline*, written evidence submitted by ForestEthics, Attachment Q, A2K2E0, <https://www.neb-one.gc.ca/ll-eng/livelink.exe?func=ll&objId=775642&objAction=Open>

60 F Ackerman and E Stanton, *Climate Risks and Carbon Prices: Revising the Social Cost of Carbon*, published by Economics for Equity and Environment network, 2011, www.e3network.org/social_cost_carbon.html. The study comments on flawed assumptions about measurement of health and mortality impacts, and about climate impacts, in previous (lower) estimates of the social cost of carbon. But even these estimates are limited in that they count costs only as they relate to human economic activity.

Based on the numbers above, a low estimate of 80 Mt of CO₂ into the atmosphere per year with external costs of \$50 per tonne would imply \$4 billion per year in externalized costs. Using a higher estimate of 100 Mt at \$200 per tonne, external costs reach \$20 billion per year. These numbers assume that bitumen would stay in the ground in the absence of the NGP, which may not be realistic given other options, but the point is that the NGP would facilitate the combustion of large volumes of fossil fuel, and doing so imposes very large costs on third parties.

For the Northern Gateway pipeline as a whole, Enbridge's estimates for pipeline tolls and throughput imply revenues of just under \$900 million per year.⁶¹ Based on financial statements in Enbridge's 2010 Annual Report, profits from pipeline operations (after-tax earnings plus dividends) averaged 34% of revenues over the past three years. At this rate, profits from NGP would be over \$300 million per year. These are not trivial amounts, and they do not include "costs" such as lucrative executive compensation—for example, Patrick Daniel, the outgoing CEO of Enbridge, made more than \$6 million in 2009, and several other executives had more than \$1 million in compensation.⁶²

Beyond the pipeline itself, we can also weigh costs of GHG emissions against the gain in profits to oil sands producers from higher market prices in Asia, estimated to average \$3.6 billion per year.⁶³ In the current framework that does not account for external costs, this private gain is created by imposing costs on third parties. Thus, the business case for moving ahead only makes sense if one does not count the full costs associated with doing so (both the federal government and the industry ignore emissions when promoting the pipeline).

The corporate form in practice limits liability to the initial investments made by owners of stock, which could be exceeded in the form of massive clean-up costs for a catastrophic spill.

61 Enbridge Application, Volume 2, Section 3: Toll Structure and Principles, page 3-3: "Northern Gateway estimates the 2016 average Term Shipper tolls to be \$3.21 per barrel for the oil pipeline and \$4.88 per barrel for the condensate pipeline. Throughput would be 79,494 m³/d (500,000 bpd) on the oil pipeline and 27,823 m³/d (175,000 bpd) on the condensate pipeline."

62 R Girard with T Davis, 2010, *supra* note 44.

63 Wright Mansell, *supra* note 21, Table 2-4, p. 29.

Conclusion

An alternative path lies in green investments in areas like energy efficiency, renewable energy sources, public transit, waste reduction and management, and in protecting existing jobs that rely on healthy watersheds and coastlines in the impacted region.

WHILE PROPONENTS OF THE NORTHERN GATEWAY PIPELINE have generally stooped to smearing opponents as “radicals” and “puppets of foreign interests,” they have offered few strong justifications for the pipeline other than “jobs and growth.” But there are good reasons to question both the actual employment gains that would accrue to workers as well as a growth model that threatens oil spills on land and sea, and climate change impacts.

A full consideration of costs and benefits must be part of the public debate and environmental assessment process of the NEB. When including damages from GHG emissions, and the costs associated with likely oil spills, the NGP may well be uneconomical.

An alternative path lies in green investments in areas like energy efficiency, renewable energy sources, public transit, waste reduction and management, and in protecting existing jobs that rely on healthy watersheds and coastlines in the impacted region. Paying for these investments through a carbon tax or increased corporate taxes, or oil and gas royalties, would create more employment opportunities, while removing dependence on fossil fuels for domestic energy and reducing greenhouse gases.

Such a shift would, of course, require a very different kind of leadership on the part of the federal and provincial governments to make the transition to a sustainable economy a matter of national and provincial urgency. It would elevate climate action from something to be ignored to a national industrial and employment strategy. In the meantime, stopping a pipeline that further locks Canada onto a path of resource extraction and climate disruption is a sensible step toward that goal.

THE CLIMATE JUSTICE PROJECT

The Climate Justice Project is a multi-year initiative led by CCPA and the University of British Columbia in collaboration with a large team of academics and community groups from across BC. The project connects the two great “inconvenient truths” of our time: climate change and rising inequality. Its overarching aim is to develop a concrete policy strategy that would see BC meet its targets for reducing greenhouse gas emissions, while simultaneously ensuring that inequality is reduced, and that societal and industrial transitions are just and equitable.

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1400 – 207 West Hastings Street
Vancouver BC V6B 1H7
604.801.5121
ccpabc@policyalternatives.ca

www.policyalternatives.ca

