Alaska-Canada Rail Link
Strategic Environmental Assessment:
Canadian Economic Impacts
Final Report
D1.c

Prepared for

Alaska-Canada Rail Link (ACRL)

By

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Canadian Economic Impacts: Final Report

1 Introduction

Informetrica Limited was asked by the MacLeod Institute to undertake an economic impact study of the Alaska-Canada Rail Link (ACRL). Other parties were analyzing the environmental, socio-economic, and benefit-cost dimensions of the project.

The study of the impact of a large construction project can be likened to dropping a rock into a pond. If one looks at the pond in its entirety, the impacts are modest (if it is a large pond). However, near the entry point of the rock, there are sizeable waves that ripple outward. After the rock reaches bottom, it displaces some water, raising the level of the pond everywhere somewhat. This is more akin to the operations phase of the project, with some increase in the level of activity, but not in a readily discernible manner. Of course, if the rock is very big, and some part of it remains above water, then there is a permanent change in the pond, with a new "island" formed by the rock. As well there is a permanent rise in the level of the pond.

This project is further complicated by the shape of the “rock” spanning one state – Alaska, one territory – Yukon, and one province – British Columbia. In addition, the project is designed to link together the Alaska Railroad (ARR) system with the Canadian rail systems (CNR and CPR), which are also connected to the major U.S. rail systems. Network economies will provide access for people and businesses in Alaska, Yukon, and northern B.C. to rail service connections throughout North America.

Rail Link Construction Impacts

How big is the “rock”? The Alaska-Canada Rail Link (ACRL) is a standard-gauge rail line that is over 1,500 miles in length, with a capital cost of $11.8 billion in current U.S. dollars. Most of the mileage and the construction costs are in Canada (1,323 miles and $10.6 billion).

The route for the ACRL determines both the total expenditure and the annual capital outlay. The one chosen for the impact study is the Delta Junction to Ladue (Alaska Segment) to Carmacks to Watson Lake (Yukon Segment) to Hazelton (B.C. Segment) with a spur from Carmacks to Whitehorse to Skagway.

Construction costs average about US$7.68 million per mile (CD$9.05 million). In Alaska, construction costs are lower (about US$5.60 million per mile) while in Canada they average about US$8.01 million per mile (Yukon - US$8.34 million per mile and BC US$7.52 million per mile).

	Total Project	Alaska	Canada	Yukon	British Columbia	Rest of Canada
Miles of Track	1,536	213	1,323	791	532	0-
Investment (Millions, US$)	$11,800	$1,200	$10,600	$6,600	$4,000	-
Investment (Millions, CD$)	$13,900	$1,500	$12,400	$7,700	$4,700	-

The construction phase of the project will generate about 206,000 person-years of employment, about 15,000 in Alaska and over 190,000 in Canada. Direct construction employment will be 67,200 person-years, with over 9,000 in Alaska and about 58,000 in Canada (33,000 in Yukon and 25,000 in BC). The balance of employment results from the employment among suppliers to the project (indirect) and the employment induced from the higher incomes in construction and supplier firms. Many of the indirect and induced jobs are in other parts of Canada and the US[1].

	Total Project	Alaska	Canada	Yukon	British Columbia	Rest of Canada
Construction Employment	67,200	9,200	58,000	33,000	25,000	-
Indirect and Induced Employment	139,300	5,700	133,600	21,800	35,700	76,100
Total Employment	206,500	14,900	191,600	54,800	60,700	76,100

This paper describes the anticipated economic and fiscal impacts of an Alaska-Canada Rail Link on the Canadian economy. Data developed during the first phase of the ACRL feasibility study form the basis of the analysis. This report summarizes the main findings in the body of the report. Separate Appendices provide additional details for:

1. specific project assumptions,
2. impacts,
3. the base case (economy without the ACRL,
4. mining developments,
5. fiscal effects,
6. economic development opportunities, and
7. CPI impacts.

[1] The US estimates do not include employment in the lower 48. An approximation would be about 13,000 person-years of employment elsewhere in the US.

2 ACRL Construction Impacts

The capital costs for the Canadian segment of the ACRL are expected to be CD$12.4 billion, approximately 90 per cent of the entire project. See Appendix 1 for further details on the capital cost assumptions.

The Canadian economic output generated by this spending will be approximately CD$27 billion. ACRL construction will provide an estimated 58,000 construction jobs in Canada from 2010 to 2014, of which 33,000 will occur in Yukon and 25,000 in British Columbia. Construction labour income will exceed CD$2.8 billion over the same period.[2] Indirect and induced employment will provide an additional 134,000 jobs and an estimated CD$11 billion in labour income, from 2010 to 2020.[3]

3 ACRL Operations Impacts

The operations phase of the rail link requires resources for maintenance of the right-of-way, equipment maintenance, the transport of goods, and the administration of the operating activities (billing, payroll, etc.). Annual ACRL employment for operations would be about 490 full-time equivalents (FTEs) with about 50 in Alaska, 260 in Yukon, and 180 in BC. The ACRL operations will have a direct impact of CD$290 million per year on the economic output of the Canadian economy.

The Gross Domestic Product (GDP) for the rail link operations should cover the wage bill, net interest paid, capital consumption allowances, and a regulated rate of return for invested capital. However, the revenue is insufficient to cover these capital costs. There is an implicit assumption that any shortfalls are covered by the US and Alaska governments, with minor contributions from Canada. Alternatively, the governments could operate the roadbed/right-of-way with an annual charge tied to the use of the line by railroad companies. Any losses would show up as losses by a Crown corporation. Depending on the method of covering these costs, GDP might be affected.

The real action arises from the induced activity in mining in Yukon and BC, along with the induced employment in the rest-of-Canada to supply the indirect needs of the rail and mining sectors and the induced needs arising from the increase in labour income.

The introduction of rail transportation as an option is expected to result in the development of a number of mines in Yukon and northern BC. The rail line operation and mine activity together result in a direct and indirect impact on the economic output of CD$1.2 billion per year. Total economic output generated specifically by the operation

[2] To convert to US dollars multiply Canadian dollar value by 0.85.

[3] Indirect effects (employment and GDP) will occur at the same time as the direct effects, in this case 2010 to 2014. Induced effects can occur over a longer period because of sticky wages and prices, and increased government spending due to an improved debt position. In the case of ACRL, construction induced impacts occur from 2010 to 2020.

of the rail line and mine activity is approximately CD$1.6 billion per year (induced effects of CD$400 million per year). The mining sector is examined below in somewhat more detail and in Appendix 4.

4 Other Important Impacts

4.1 *Yukon and BC Resupply*

Approximately 147,000 tonnes of goods per year enter into Yukon (54,700 tonnes of goods per year by truck on the Alaska Highway and 93,000 tonnes of petroleum products from the pipeline from Skagway, Alaska). Only 23,800 tonnes could be competitively transported by the ACRL from existing truck transportation services. This would result in an annual re-supply saving of CD$4.5 million, or a 32 per cent reduction in total transportation costs (excluding pipeline services). Other saving measures include CD$30 per tonne or CD$150 per capita.

The reduction in demand for truck services for resupply will be somewhat offset by the increased demand for trucking from other sources, which include new mine development and other short hauls to and from the rail line to nearby locations. Re-supply modal shifts for northern British Columbia would have similar characteristics to the Yukon re-supply picture, but to a lesser extent.

The gains from resupply are quite small relative to those in Alaska. This makes sense since we are resupplying about 30,000 people in Yukon and over 600,000 in Alaska.

4.2 *CPI impacts*

The drop in transportation costs reduces the CPI by approximately 0.2 to 0.3 per cent, in the first four years, followed by a fairly stable average impact of 0.1 per cent.

The drop in the CPI has a number of anticipated effects like softening nominal wage rate demands in the early years and spurs both consumer demand for goods and business investment.

The erosion of the CPI comes from the response to increased demand. As demand increases there is also an increase in employment demand, which lowers the unemployment rate. The lower unemployment rate puts upward pressure on wage rate demands and nominal wage income increases with an impact of more than twice that of real demand. Consequently, there is an increase in unit labour costs which puts upward pressure on prices.

Real disposable income is increased on average by 0.4 per cent, and peaks in the fourth year with an impact of 0.5 per cent. Improvements in the first three years are derived mainly from the CPI drop, while the remaining years are dominated by improved nominal income gains.

4.3 *Alaska Highway gas pipeline impacts*

The construction of the Alaska Highway Pipeline will require the mobilization of significant tonnage of pipe, fuel and equipment over a very short period of time. The use of a rail system for transporting inputs should reduce the costs of construction.

Due to lack of truck transportation rates we have taken the expected ACRL rates and applied a multiplier to simulate truck rates at two, three and four times the ACRL rate (shown in the table below).

			Truck Revenue		
Commodity	**Tonnes**	**ACRL Revenue**	**2x ACRL Rate**	**3x ACRL Rate**	**4x ACRL Rate**
Pipe	1,309,700	$16,516,920	$33,033,840	$49,550,760	$66,067,680
Fuel	161,100	$2,277,590	$4,555,180	$6,832,770	$9,110,360
Equipment	121,800	$7,243,860	$11,340,240	$15,436,620	$19,533,000
TOTAL	**1,592,600**	**$26,038,370**	**$48,929,260**	**$71,820,150**	**$94,711,040**
		Saving from ACRL	$22,890,890	$45,781,780	$68,672,670

Notes: Original ACRL rates available in Informetrica Working Paper 1.
Mobilization to Haines Junction has been kept at the base values.

If the switch from truck to rail results in a halving of the freight rate then there is an opportunity for a CD$22.9 million saving on pipeline construction costs. Larger savings will be available from larger reductions in freight rates.

This saving would lead to a lower pipeline tariff (regulated return based on capital expenditure) and therefore a larger netback for the natural gas producers in Prudhoe Bay and the Alaskan government.

4.4 *Other oil and gas industry impacts*

Exploration and development of oil and gas activities in the Yukon and northern British Columbia would benefit from reduced transportation costs of material inputs. The magnitude of the savings is uncertain at this point in time.

4.5 *Highway maintenance savings*

The ACRL will reduce re-supply truck traffic along some of the major roads in Yukon, primarily Alaska Highway, Campbell Highway and the Klondike Highway. On average these highways account for 11 per cent of the Yukon's capital expenditure on highways (CD$6 million), and 36 per cent of the Yukon Government total capital expenditure.

There are no estimates of the magnitude of the capital expenditure relief from the reduced truck traffic, but a rough estimate of about CD$1 million per year for both BC and Yukon would not be unreasonable. Some capital repairs will still be necessary, even if truck volumes are lower.

4.6 *Emission impacts*

Rail is more energy efficient than trucking, so we would expect that there should be some energy efficiency improvements from this modal switch. However, total energy in the Canadian economy may be increased because a large portion of Canadian rail transportation comes from displacing US transportation services. So the US will require less energy because they are getting goods to the Canada-US border whereas before they would have to get them to Seattle or Tacoma and move them to Anchorage.

Additional development of mines will also increase energy use, although with a rail transportation system less than if trucks were the primary mode of transportation.

4.7 *Mining impacts*

The ACRL is expected to aid in the development of mines in the Yukon and northern British Columbia with production in excess of one billion tonnes of metal and coal ore over the first 40 years of operation. (See Appendix 4 for further details.)

There are some mines that are likely to proceed in Yukon and BC even if the railroad is not built. With the ACRL, these mines become potential customers. These mines make up Tier 1 in our taxonomy.

Four Yukon mines and two BC mines are expected to start operation before the ACRL project is completed. These mines are economically viable irrespective of whether the ACRL project goes ahead or not. With the ACRL in place, transportation of mined commodities should switch from trucking to rail to exploit lower transportation costs.

The projects in the Yukon expected to start before ACRL comes into operation are:

- Division Mountain
- Minto
- Wolverine
- Howard's Pass

The projects in BC expected to start before ACRL comes into operation are:

- Kemess North
- Kemess South

The following 9 mines are expected to come into operation taking advantage of ACRL as the main transportation mode. These are referred to as the tier 2 mines.

- Yukon
    - Fyre (copper)
    - Kudz Ze Kayah (lead-zinc-copper)
    - Grum (lead-zinc)
    - Ice (copper)
    - Swim (lead-zinc)
- British Columbia
    - Lost Fox (anthracite coal)
    - Hobbit Boatch (anthracite coal)
    - Summit (anthracite coal)

- Ground Hog Coalfield (anthracite coal)

Most of these projects are expected to come into operation after 2020, accounting for almost 11.1 million tons of concentrate or coal to be railed via ACRL, bringing in around $114 million of average revenue for the railway annually. Almost $339 million worth of capital investment is needed for all of these mines to come into operation.

The total impact of these mines amounts to an average of $917 million on national output, of which, $460 million accrues to Yukon and $195 million to British Columbia. The mines also account for an average of 7,800 full-time equivalent jobs annually from 2020 onwards, of which 4 thousand will be located in the Yukon and more than 2 thousand in British Columbia.

Furthermore, ACRL may induce more exploration activities that result in new mines (Tier 3). Using the expert opinion survey data from the mineral assessment project at Yukon Economic Development, we can say that within a 50 per cent confidence interval, 120 new mines are expected to be developed within Yukon as an effect of ACRL. These mines will bring in 0.7 million tons of minerals worth $714 million to be transported by ACRL on an average annual basis for 40 years beyond our forecast horizon of 2025. This will directly result in 431 full-time equivalent jobs per year. Essentially, as the tier 2 mines' outputs are reduced, new mines can be expected to fill the gap to keep a steady flow of minerals from Yukon. The BC portion of ACRL may also contribute to this effect, bringing in an average of 0.6 million tons of minerals worth $592 million annually for 40 years, and directly generating more than 500 full-time equivalent jobs per year.

Finally, if the mammoth Crest iron deposit is developed into a mining project, we may see a $750 million US$ milling and processing plant and 4 pellet plants of 7 million metric-tons per year capacity worth $450 million US$ each. Crest is expected to produce 28 million tons of iron pellets per year at full capacity.

5 Other Information

In addition to the economic impact studies Informetrica Limited was asked to supply information to those undertaking the financial studies, including the benefit-cost studies. After several iterations, a set of tables were developed that used 2006$ and extended the estimates to 2055. These tables are attached as Appendix 8 to complete the documentation.

As a byproduct of our work on this project, numerous tables can be produced with substantial industrial and provincial detail. Please discuss your requirements with us.

Appendix 1: The Direct Effects of the ACRL

1 Introduction

Identifying and quantifying the direct effects of a project is one of the most important aspects of producing an economic impact.[4] The direct effects are the assumption set for an impact, and in most cases will be the largest influence on the total impact.

Omitting or not identifying a particular assumption can lead to either upside or downside risks to the impact. Certain assumptions may need to be omitted due to a lack of information.

2 Methodology

The direct effects of the Alaska-Canada Rail Link (ACRL) have been determined through an extensive literature and data review of Stage One findings. Most of the Stage One papers and workbooks are in final or near final form, which means that the direct effects should not change a great deal from the current view.

The direct effects assessed in this paper include:

- Capital expenditure
- Operation costs
- Revenue
- Other considerations

A current limitation of the Stage One papers is that a single route option was not used for all analyses. This means that the direct effects are only consistent in their given section but not between sections, which is a risk to the impact results.

3 Data

3.1 *Capital Expenditure*

The route chosen for the ACRL will determine both the total expenditure and the annual capital outlay. The one chosen for the impact study is the Delta Junction to Beaver Creek (Alaska Segment) to Carmacks to Watson Lake (Yukon Segment) to Hazelton (BC Segment) with a spur from Carmacks to Whitehorse to Skagway. This would be a total project investment of almost US$12 billion (shown in table 1).

[4] There are three types of effects in an economic impact. The project (construction and operations phase) defines the direct effects to final demand components or intermediate industry demand Indirect effects are impacts on industries that supply goods to directly affected industries (i.e. sawmills provide wood to the construction industry). Induced effects are impacts that are caused by change in incomes (i.e. more construction workers means more income, which means increased consumer expenditure).

Table 1: ACRL Capital Expenditure

	US$ Millions	CD$ Millions	Miles	$Mn / mile	% of total
ACRL Mainline					
Delta Junction to Beaver Creek	$1,215	$1,429	196	$7.293	10%
Beaver Creek to Carmacks	$2,720	$3,201	223	$14.352	23%
Carmacks to Watson Lake	$3,302	$3,884	403	$9.638	28%
Watson Lake to Hazelton	$3,953	$4,650	497	$9.356	33%
Sub-total	$11,190	$13,164	1,319	$9.981	95%
ACRL Spur					
Carmacks to Whitehorse	$445	$524	111	$4.716	4%
Whitehorse to Skagway	$190	$224	106	$2.109	2%
Whitehorse to BC border	$97	$114	54	$2.109	1%
BC border to AK border	$63	$74	35	$2.109	1%
AK border to Skagway	$30	$36	17	$2.109	0%
Sub-total	$635	$747	217	$3.443	5%
Total	**$11,825**	**$13,911**	**1,536**	**$9.057**	**100%**
Canadian Total	$10,579	$12,446	1,323	$9.408	89%
Alaskan Total	$1,245	$1,465	213	$6.879	11%

Sources: WP B3(a) Infrastructure costs for full rail route.
Carmacks to Whitehorse to Skagway captial costs provided from the CostModel.xls.
Whitehorse to Skagway split based on distance and cost per mile.

Approximately 55 per cent of the capital expenditure will occur in the Yukon, 35 per cent in British Columbia and 10 per cent in Alaska. On average, the ACRL project will cost CN$9 million per mile, with the Canadian segments costing approximately CN$9.4 million per mile.

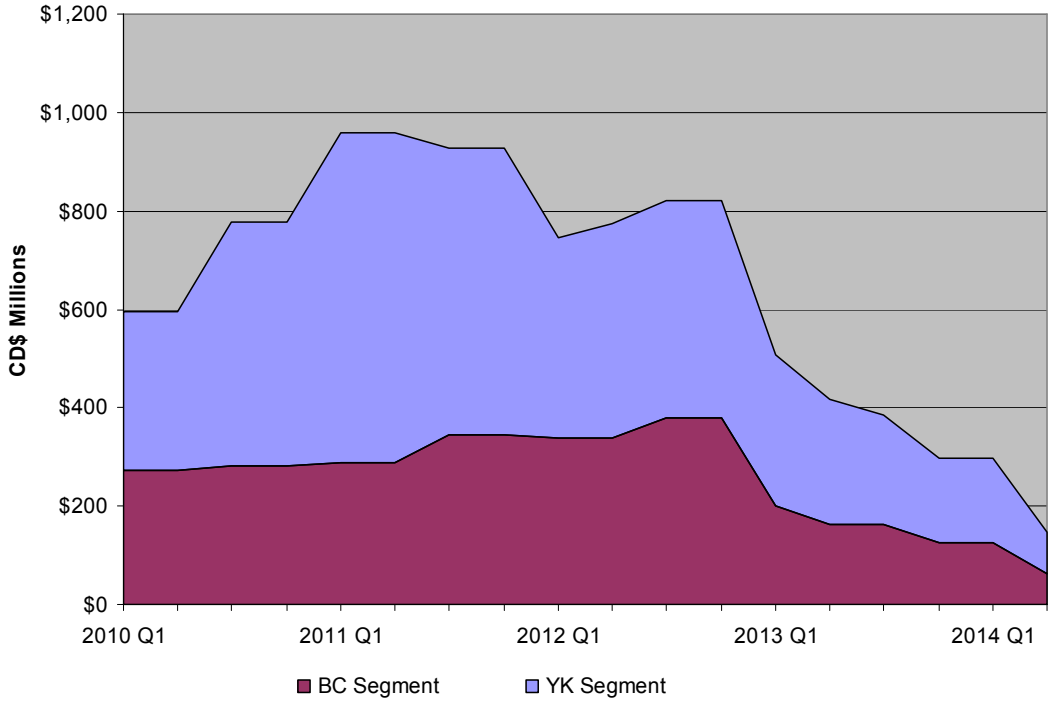
Table 2: Capital Expenditure: Ladue Border to Carmacks to Watson Lake to Hazelton

	US$ Millions	CD$ Millions	2010	2011	2012	2013	2014
Track - 136# CWR w/ Hardwood or Concrete Ties	$1,262	$1,485		$119	$475	$713	$178
Embankment Grade & Sub-ballast	$2,464	$2,899	$966	$966	$966		
Tunnel Construction	$529	$622	$156	$467			
Embankment Protection Structures	$280	$329	$110	$110	$110		
Railway Bridge Structures Over Water/Debris	$1,080	$1,271	$508	$508	$254		
Highway-Railway Intersections	$292	$344	$86	$258			
Add Portion of Route on Other Segment	$86	$102			$61	$41	
Communications, Power, & Detectors	$238	$280		$30	$89	$118	$44
Sidings and Terminals	$398	$468		$49	$148	$197	$74
Total Route Construction Costs							
Contingencies & Environmental Mitigation							
Contingencies (25% above)	$1,657	$1,950	$456	$627	$526	$267	$74
Environmental Mitigation (2% above)	$166	$195	$46	$63	$53	$27	$7
Sub-total	$8,453	$9,945	$2,328	$3,196	$2,681	$1,362	$378
Engineering & Environmental Studies							
Eng. Environmental Study & Approval (3% subtotal	$254	$298	$70	$96	$80	$41	$11
Owner Overview Costs (3% subtotal)	$254	$298	$70	$96	$80	$41	$11
Engineering & Project Mgnt (12% subtotal)	$1,014	$1,193	$279	$384	$322	$163	$45
Total Estimated Route Cost	**$9,975**	**$11,735**	**$2,747**	**$3,771**	**$3,163**	**$1,608**	**$446**
Average Cost per Mile	$8.804	$10.357					
BC Segment	**$3,953**	**$4,650**	**$1,110**	**$1,264**	**$1,435**	**$652**	**$188**
YK Segment	**$6,022**	**$7,085**	**$1,637**	**$2,507**	**$1,728**	**$955**	**$258**

Sources: WP B3(a) Infrastructure costs for full rail route.
Expenditure schedule based on an outline obtained from Moe Mahendran, and construction begins in 2010.
Alaskan portion not included. WP B3(a) provides a total estimate of US$1,047 million.
Carmacks to Whitehorse to Skagway captial costs are not included, but required for impact. CostModel.xls provides a value of $645 million.

Table 2 shows capital expenditure by year for the ACRL mainline.[5] The breakdown of types of expenditures is taken from "Infrastructure costs for full rail route" (WP B3a).[6] We have moved the construction period up from a start date of second quarter 2012 to first quarter 2010. This allows for the ACRL line to be operational for pipeline mobilization related to the Alaska Highway Pipeline (AHP) construction scheduled to start in 2015.

Figure 1: Expenditure profile by region in Canada, ACRL mainline



Based on the Canadian mainline expenditure profile shown above, there should be 12 consecutive quarters with capital expenditure exceeding CD$600 million.

Historically, capital expenditure in rail has been split two-thirds structures (embankment, track, etc.) and one third machinery and equipment (M&E). ACRL would, at most, have only a small number of locomotives or cars, so only 10 per cent of the total capital expenditure will be allocated to M&E. This M&E will be used for the construction, and possibly maintenance, of the rail line. At this point we will assume that North America

[5] An equivalent quarterly table is available at the end of this section.
[6] Moe Mahendran provided a rough time line of the ACRL project by type of activity. This was used to allocate expenditure by quarter.

has enough excess capacity in locomotives and cars to cover all the additional demand from ACRL traffic.[7]

"Infrastructure costs for full rail route" also provide the capital replacement and ROW maintenance costs over 40 years for the Yukon and BC portions of the rail line. This analysis has been extrapolated to provide rough estimates for all the rail route portions (shown in table 3). The Informetrica Model (TIM) provides for some rail repair based on gross revenue (10 per cent of gross revenue), but an adjustment (up or down) may be required to get a view consistent with the maintenance costs shown below.

Table 3: Maintenance and ROW costs over a 40-year life span of the ACRL, CD$ millions

	Capital Costs	Miles	Maintenance cost over 40 years	Share of initial investment	Maintenance cost per year
ACRL Mainline					
Delta Junction to Beaver Creek	$1,429	196	$205	14.4%	$5.1
Beaver Creek to Carmacks	$3,201	223	$333	10.4%	$8.3
Carmacks to Watson Lake	$3,884	403	$597	15.4%	$14.9
Watson Lake to Hazelton	$4,650	497	$756	16.2%	$18.9
Sub-total	$13,164	1,319	$1,890	14.4%	$47.3
ACRL Spur					
Carmacks to Whitehorse	$524	111	$75	14.4%	$1.9
Whitehorse to Skagway	$224	106	$32	14.4%	$0.8
Sub-total	$747	217	$107	14.4%	$2.7
Total	**$13,911**	**1,536**	**$1,997**	**14.4%**	**$49.9**

Sources: WP B3(a) Infrastructure costs for full rail route.
Carmacks to Whitehorse to Skagway captial costs provided from the CostModel.xls.
Skagway to Carcross is 68 miles with capital upgrade cost of approximately US$100 million.
Estimate in grey based on 14.4% of initial investment.

3.1.1 Carmacks to Whitehorse to Skagway Spur

It has recently been assumed that the Spur can be built in one calendar year. We will assume that this will occur in 2010, and this segment of the rail line will be operational in 2011. Maintenance costs will also reflect the fact that this rail line is operational.

Division Mountain Coal is very likely to use this to transport goods to tidewater. So the ACRL revenue from this project can begin in 2011 (see minerals section for dollar value of revenue).

3.2 *Operation Costs*

The operation costs for the ACRL are provided by Innovative Scheduling (CostModel.xls). A summary of the model's output is provided in the tables below. The operation costs for the rail lines presented in the capital expenditure are not available at

[7] There is an upside impact if additional locomotives and cars are required. The effects can vary depending on the purchaser of the new trains (Canadian or American), and from whom the trains are sourced (domestically produced or imported).

this point. The following is a presentation of the operation costs for the Minaret to Watson Lake to Carmacks to Ladue Border and the spur from Carmacks to Skagway.

Table 4: Operating Costs, US$ millions

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Maintenance of Way	$14.6	$14.9	$15.1	$15.5	$15.8	$16.1	$16.4	$16.7	$17.1	$17.4	$17.7
Maintenance of Equipment	$3.9	$3.9	$6.7	$6.6	$6.6	$6.7	$6.8	$6.9	$7.0	$7.4	$7.8
Transportation	$84.0	$82.2	$91.7	$91.2	$93.5	$95.8	$98.1	$100.6	$99.8	$108.4	$117.6
General & Administrative	$5.0	$5.1	$5.1	$5.2	$5.2	$5.2	$5.3	$5.3	$5.4	$5.4	$5.4
Operating Expenses (OE)	**$107.5**	**$106.0**	**$118.7**	**$118.4**	**$121.1**	**$123.8**	**$126.6**	**$129.5**	**$129.2**	**$138.5**	**$148.6**
Total Capital Amortization	**$1,479.3**	**$1,479.3**	**$1,479.3**	**$1,479.3**	**$1,479.3**	**$1,479.3**	**$1,479.3**	**$1,479.3**	**$1,479.3**	**$1,479.3**	**$1,479.3**
Total Operating Cost	**$1,586.8**	**$1,585.3**	**$1,598.0**	**$1,597.7**	**$1,600.3**	**$1,603.1**	**$1,605.9**	**$1,608.8**	**$1,608.5**	**$1,617.8**	**$1,627.9**

Sources: Innovative Scheduling's CostModel.xls (June 8th version)
2025 an estimate based on previous year's level and growth rate.
Amortization based on discount rate of 10% and planning horizon of 25 years.

Total operating costs are virtually constant because they are dominated by capital amortization, which is a constant amount of almost US$1.6 billion per year.[8]

Table 5: ACRL employment, wage rates and wage bill

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Employment											
Maintenance of Way	112	112	112	112	112	112	112	112	112	112	112
Maintenance of Equipment	75	73	93	91	91	91	91	91	91	91	91
Transportation	254	254	298	282	282	282	282	282	282	282	282
General & Administrative	24	24	24	24	24	24	24	24	24	24	24
Total	**465**	**463**	**527**	**509**	**509**	**509**	**509**	**509**	**509**	**509**	**509**
Average Wage Rate (US$000's)											
Maintenance of Way	$61.9	$63.1	$64.4	$65.7	$67.0	$68.3	$69.7	$71.1	$72.5	$74.0	$75.5
Maintenance of Equipment	$72.2	$73.7	$74.9	$76.4	$78.4	$80.5	$82.6	$84.7	$87.0	$91.2	$95.7
Transportation	$89.7	$91.5	$94.0	$95.7	$97.6	$99.5	$101.5	$103.6	$105.6	$116.5	$128.5
General & Administrative	$74.0	$75.5	$77.0	$78.5	$80.1	$81.7	$83.4	$85.0	$86.7	$88.5	$90.2
Average all workers	**$79.4**	**$81.0**	**$83.6**	**$84.8**	**$86.6**	**$88.4**	**$90.3**	**$92.2**	**$94.1**	**$101.3**	**$109.0**
Total Wage Bill (US$ Mn)	**$36.9**	**$37.5**	**$44.0**	**$43.2**	**$44.1**	**$45.0**	**$46.0**	**$46.9**	**$47.9**	**$51.6**	**$55.5**

Sources: Innovative Scheduling's CostModel.xls (June 8th version)
2025 an estimate based on previous year's level and growth rate.

Table 5 shows that approximately 56 per cent of employment will be for transportation. The wage bill will account for approximately 24 per cent of operating expenses; adjusting for AAR billing for car repair.[9][10]

[8] Amortization includes both CCA and interest on debt.
[9] The cars will be leased so ACRL will not have to pay for repairs or maintenance. ACRL will hire employees to do the repairs/maintenance but use AAR billing (industry standard) to recoup those costs from the owner of the cars.
[10] AAR – Association of American Railroads

Table 6: ACRL Marginal and Average Costs, US dollars

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Operating Expenses											
per Ton-Mile	$0.0193	$0.0208	$0.0223	$0.0225	$0.0228	$0.0231	$0.0233	$0.0236	$0.0233	$0.0247	$0.0262
per Loaded Car-Mile	$0.5140	$0.5109	$0.5752	$0.5702	$0.5750	$0.5799	$0.5849	$0.5900	$0.5808	$0.6140	$0.6491
per Load	$595	$602	$624	$619	$625	$631	$637	$643	$634	$671	$710
Total Operating Costs											
per Ton-Mile	$0.2849	$0.3105	$0.3004	$0.3041	$0.3014	$0.2986	$0.2959	$0.2932	$0.2899	$0.2884	$0.2869
per Loaded Car-Mile	$7.5862	$7.6392	$7.7453	$7.6946	$7.6016	$7.5099	$7.4196	$7.3306	$7.2284	$7.1699	$7.1118
per Load	$8 784	$9 008	$8 397	$8 357	$8 265	$8 173	$8 082	$7 993	$7 889	$7 833	$7 776

Sources: Innovative Scheduling's CostModel.xls (June 8th version)
2025 an estimate based on previous year's level and growth rate.
Based on revenue loads.

Table 6 examines the minimum effective rate to cover operating expenses and costs. The marginal cost of operating ACRL is approximately 2.3 cents per ton-mile, which is in the same range as other rail lines operating in North America. However, the average cost of operating the ACRL is approximately 30 cents per ton-mile, due mainly to the high cost of capital amortization. Increasing the traffic volume will lower the average price because capital amortization is fixed.

3.3 *Revenue*

There are a number of sources of revenue, which include:

- Regional re-supply
- Mobilization requirements for pipeline construction
- Minerals
- Forestry products
- Tourism

3.3.1 Regional Re-Supply

This will be a continuous source of revenue for the rail line. The "Logistics Evaluation for Regional Re-supply" by QGI Consulting is the information source for this section. The main nodes that goods are transported between are US (48 southern states), Western Canada, Whitehorse, and Alaska. The following table shows the re-supply revenue by origin and destination, based on 2003 data. Although not specified, it appears that the route used in this section of the analysis is the Fort Nelson to Watson Lake to Whitehorse to Beaver Creek to Delta Junction to Ladue Border option.

Table 7: ACRL Annual Revenue from Regional Re-supply, by Origin and Destination

		Price	Revenue (US$)			
	Short tons	($/ton-mile)	Total	Alaska	Yukon	B.C.
Industrial Products						
USA to Alaska	17,324	$0.0295	$673,194	$100,035	$319,499	$253,660
W. Canada to Alaska	141,180	$0.0295	$5,486,240	$815,241	$2,603,780	$2,067,218
Yukon to Alaska	3,026	$0.0367	$58,797	$21,744	$37,053	
W. Canada to Yukon	31,370	$0.0192	$609,515		$309,882	$299,633
Alaska to Yukon	5,425	$0.0367	$105,412	$38,982	$66,429	
Sub-Total	**198,324**	**$0.0283**	**$6,933,158**	**$976,002**	**$3,336,644**	**$2,620,512**
Intermodal						
U.S.A. to Alaska	1,947,719	$0.0734	$188,507,585	$28,011,741	$89,466,071	$71,029,772
W. Canada to Alaska	81,753	$0.0514	$5,540,766	$823,344	$2,629,658	$2,087,764
Yukon to Alaska	3,365	$0.0638	$113,730	$42,059	$71,671	
W. Canada to Yukon	17,294	$0.0367	$642,240		$326,520	$315,720
Alaska to Yukon	1,103	$0.0870	$50,844	$18,803	$32,041	
Sub-Total	**2,051,235**	**$0.0723**	**$194,855,165**	**$28,895,946**	**$92,525,962**	**$73,433,257**
Total	**2,249,559**	**$0.0686**	**$201,788,323**	**$29,871,948**	**$95,862,606**	**$76,053,768**

Sources: WP A1d - Logistics Evaluation for Regional Re-supply
$/ton-mile based on tonnage, total revenue and miles of ACRL track.
Regional breakdown of revenue based on tons, price, and length of track in region.

Industrial products will average about 2.8 cents per ton-mile, which is consistent with covering the marginal costs of operating the rail line. Intermodal goods require additional care and as a result require a higher price at 7.2 cents per ton-mile. It should be noted that industrial and intermodal goods originating from Western Canada destined for the Yukon appear to have a lower transportation cost per ton-mile by approximately 50 per cent of the average.

Based on the tonnage provided in the QGI report we find that Alaska annually receives approximately 6.3 tons per capita, while the Yukon receives 1.8 tons per capita. These are not entirely comparable. Alaska may have a higher rate for a variety of reasons, such as:

- Only marine and truck transportation has been considered, and air and pipeline may be more of a factor in the Yukon requirements,
- Bias from the year chosen (2003), or
- Alaska's GDP per capita is approximately 50 per cent higher than that of the Yukon.

In 2005, the Yukon consumed approximately 113,000 tons of petroleum products. If we assume that all of these products were imported then truck transportation only accounts for approximately 20,000 tons, leaving 93,000 tons unaccounted for. There is a petroleum product pipeline that runs from Skagway to Whitehorse which may be the source of the remaining tons. Accounting for this would increase the Yukon tons per capita to approximately 4.9, which is much closer to the Alaskan rate.[11]

[11] 93,000 tons is not an unreasonable number and may account for an "oddity" in the truck transportation data. In 2002, there is a 400% increase in petroleum product transportation along the Alaska Highway for delivery to Whitehorse. This is the same year that port renovations were occurring in Skagway, so this may have forced a temporary closure of the pipeline, but trucks were available to continue the flow of petroleum products.

For a large majority of goods currently shipped to Alaska and the Yukon, QGI originally assumed that a direct rail link would be able to displace almost all other modes of transport. This has since been revised downward to exclude 60,000 tons from trucking and 360,000 tons from marine transport to non-Anchorage ports. The modal shift to rail means that there should be a net negative direct impact on the truck and water transportation industries, and a net positive direct impact on the rail industry.

We should expect a reduction in net revenue for all the displaced modes of transport, shown in table 8.[12] With highway transportation switching to rail direct we can see that the trucking industry will see a reduction in revenues of around US$40 million, and net rail revenues increase of US$10 million. The net benefit for the user of these goods is a 75 per cent reduction in transportation costs. The net benefit from switching from rail-barge originating from Canada to Alaska is a reduction of US$5 million in transportation costs. The net benefit from switching from rail-barge from the US is a 14 per cent decrease in the transportation costs (this is inconsistent with QGI's findings, but this new view includes an upward revision to water transportation costs[13]).

The largest single source of potential re-supply income would be from the diversion of approximately 1.6 million tons of container shipping from the US Northwest, at a value of US$305 million.

Table 8: Net Revenue Impact by Mode due to Regional Re-Supply Displacement, US$ millions

	Rail-Barge from USA	Rail-Barge from Canada	Highway	All Modes
US Rail	$2.5			$2.5
Can Rail	$132.4	-$0.3	$2.7	$134.8
ACRL	$154.7	$4.3	$6.0	$165.0
Alaska Rail	$18.6	$0.4	$1.4	$20.5
Truck			-$39.9	-$39.9
US Water	-$358.0			-$358.0
Can Water		-$9.4		-$9.4
Net Revenue	-$49.8	-$5.0	-$29.8	-$84.6
Net Canada	$264.1	-$6.0	-$25.2	$232.9
Net USA	-$313.9	$1.0	-$4.7	-$317.5
Net Transportation Expenditure from Modal Shift				
Alaska	-$49.8	-$5.0	-$25.3	-$80.1
Yukon	$0.0	$0.0	-$4.5	-$4.5

Notes: Based on information from WP1dTrafficAnalysis.xls
and specific information from both QGI and Information Insights

[12] Net revenue estimates for this table are based on shipping of current commodities (origin, destination, tons) at rail direct transportation (prices, routes, miles) less the current method of transportation. It is assumed that Anchorage is the only Alaskan destination for goods.

[13] Canadian rail-barge transportation cost of approximately US$86 per ton, US rail-barge rate of US$107 per ton, and US containerized water rate of $221 per ton.

The regional re-supply is based on 2003 data; since the first year of operations is 2015 some growth assumptions will be required. Informetrica will assume that transportation costs will grow at an average of two per cent per year, and tonnage will increase based on a population/economic activity growth of two per cent, for a total of 4 per cent annual growth. The value of ACRL regional re-supply revenue in 2015 would be approximately $264 million, and grow accordingly to 2025 and beyond.

3.3.2 Pipeline Mobilization

It is assumed, for this impact, that the Mackenzie Valley Pipeline (MVP) will begin construction in 2009 and be completed before the first year of ACRL operations, so there is no pipeline mobilization revenue arising from the construction of the MVP. The Alaska Highway Pipeline (AHP) will begin construction in 2015, which coincides with the assumed first year of ACRL operations.

The AHP construction will require large amounts of pipe, equipment and fuel over a two-year period. Tonnage, revenue and carloads are summarized in the following two tables. ACRL will bring in revenue of approximately $40.7 million over this two-year period, of which $26 million is from transportation of materials for Canadian pipeline construction.

Table 9: AHP related revenue, Canada Segment

	Year One			Year Two			Total		
Delivery Area:	Tons	AlCan Rate	Revenue	Tons	AlCan Rate	Revenue	Tons	Carloads	Revenue
Beaver Cr.									
Pipe	130,700	8.20	$1,071,740				130,700	1,743	$1,071,740
Equipment-IN	20,700	64.10	$1,326,870				20,700	276	$1,326,870
Equipment-OUT				20,700	64.10	$1,326,870	20,700	276	$1,326,870
Fuel	19,900	25.50	$507,450				19,900	249	$507,450
Haines Jct									
Pipe	188,000	0.00	$0	131,000	0.00	$0	319,000	4,254	$0
Equipment-IN				3,900	63.30	$246,870	3,900	52	$246,870
Equipment-OUT				3,900	63.30	$246,870	3,900	52	$246,870
Fuel	21,900	0.00	$0	21,800	0.00	$0	43,700	547	$0
Whitehorse									
Pipe	216,000	11.00	$2,376,000	157,400	11.00	$1,731,400	373,400	4,979	$4,107,400
Equipment-IN	3,900	63.30	$246,870	24,600	63.30	$1,557,180	28,500	380	$1,804,050
Equipment-OUT				28,500	63.30	$1,804,050	28,500	380	$1,804,050
Fuel	19,400	25.20	$488,880	21,800	25.20	$549,360	41,200	516	$1,038,240
Watson Lk.									
Pipe	156,600	23.30	$3,648,780	330,000	23.30	$7,689,000	486,600	6,492	$11,337,780
Equipment-IN	3,900	31.30	$122,070	3,900	31.30	$122,070	7,800	104	$244,140
Equipment-OUT				7,800	31.30	$244,140	7,800	104	$244,140
Fuel	19,400	13.00	$252,200	36,900	13.00	$479,700	56,300	704	$731,900
Total Canada	**800,400**		**$10,040,860**	**792,200**		**$15,997,510**	**1,592,600**	**21,108**	**$26,038,370**

Source: AK Can Rail Final Report.doc

Beaver Creek and Haines Junction are not along the route outlined in the capital expenditure section; so trucking would be required to get the pipe to these delivery areas. This should reduce the ACRL revenue because the pipe should only be transported to the most efficient drop-off area.

Table 10: AHP related revenue, Alaska Segment

	Year One			Year Two			Total		
Delivery Area:	Tons	AlCan Rate	Revenue	Tons	AlCan Rate	Revenue	Tons	Carloads	Revenue
Fairbanks									
Pipe	133,700	0.00	$0	386,700	0.00	$0	520,400	6,939	$0
Equipment-IN	20,700	84.50	$1,749,150	7,800	84.50	$659,100	28,500	380	$2,408,250
Equipment-OUT				28,500	84.50	$2,408,250	28,500	380	$2,408,250
Fuel	19,900	32.30	$642,770	63,500	32.30	$2,051,050	83,400	1,043	$2,693,820
Delta Jct									
Pipe	126,000	0.00	$0				126,000	1,680	$0
Equipment-IN	3,900	77.80	$303,420				3,900	52	$303,420
Equipment-OUT				3,900	77.80	$303,420	3,900	52	$303,420
Fuel	19,400	29.70	$576,180				19,400	243	$576,180
Tok									
Pipe	275,100	4.70	$1,292,970				275,100	3,668	$1,292,970
Equipment-IN	25,700	70.90	$1,822,130				25,700	343	$1,822,130
Equipment-OUT				25,700	70.90	$1,822,130	25,700	343	$1,822,130
Fuel	39,900	27.1	$1,081,290				39,900	499	$1,081,290
Total Alaska	**664,300**		**$7,467,910**	**516,100**		**$7,243,950**	**1,122,300**	**15,622**	**$14,711,860**

Source: AK Can Rail Final Report.doc

3.3.3 Minerals

3.3.3.1 Reference Case

There are four Yukon and two BC deposits that are expected to proceed with or without an available rail line. With the ACRL in place, transportation should switch from trucking to rail to exploit lower transportation costs.

The projects in the Yukon are:

- Division Mountain
- Minto
- Wolverine
- Howard's Pass

The projects in BC are:

- Kemess North
- Kemess South

Division Mountain is expected to have annual production of approximately 1,550,000 tonnes of coal. This project is situated right next to the proposed spur from Carmacks to Whitehorse to Skagway. It is highly likely that the ACRL would be able to obtain stable revenue in the order of $7.0 million per year from this project.[14] This project should begin production in 2010 and have an approximate mine life of 22 years, so this revenue stream will end in 2032.

Minto is expected to have annual production of approximately 32,000 tonnes of copper concentrate. This project is situated right next to the main ACRL rail line, approximately 50 miles west of Carmacks. It is also likely that the ACRL would be able to obtain revenue in the order of $0.2 million per year from this project. This project is expected to

[14] Revenue estimate is based on project tonnes, at a cost of 3 cent per tonne-mile, and rough estimate of mileage of the intuitively most efficient route.

begin production in 2007 and have an approximate mine life of 13 years, so this revenue stream will end in 2019.

Wolverine is expected to have annual production of approximately 114,000 tonnes of concentrate (zinc-copper-lead). This project is situated right next to the main ACRL rail line approximately 125 miles northwest of Watson Lake. It is also likely that the ACRL would be able to obtain revenue from this project. The magnitude of the revenue will depend on the market for its concentrate. If the concentrate were shipped out of Skagway, then annual revenues would be approximately $1.7 million. However, if the concentrate were shipped to Prince Rupert or Chicago, then revenues would increase to $2.1 million. This project should begin production in 2010 and have an approximate mine life of 12 years, so this revenue stream will end in 2022.

Howard's Pass is expected to have annual production of approximately 187,000 tonnes of lead concentrate and 480,000 tonnes of zinc concentrate. This project is situated very close to the Yukon–Northwest Territories border and about half way between Cantung and Mactung. Provided ACRL can contract to ship the concentrate, annual revenues could range from $7.9 million to $11.4 million. This project should begin production in 2015 and have an approximate mine life of 21 years, so this revenue stream will end in 2036.

Kemess North and South are located in the mountains of north-central BC, near the main ACRL line between Hazelton and Dease Lake, 430 km northwest of Prince George. These are copper-gold mines currently in production, from where produced concentrate is currently transported by truck about 380 km on a gravel road to a rail spur at McKenzie, BC, and from there by rail to Noranda's Horne smelter in Rouyn-Noranda, Quebec for processing[15]. The two mines combined are expected to produce 222 thousand tons of copper per year from 2008 to 2018. Given that currently concentrates are sent to Quebec, by truck to Mackenzie and then by rail, even though the Bear Lake railway line is geographically very close to its location, it is uncertain whether the mine would use the ACRL tracks to get its product to Prince Rupert.

3.3.3.2 Impact Case

The ACRL would provide much lower transportation costs, so it is possible that other mining projects could have their rate of returns increase to the point of being viable mines. This induced investment, operations and revenue is included in this impact. Rail as a transportation option, affects mineable reserves of a project. In some cases mines will delay construction to take advantage of the lower cost structure.[16] Also existing mines may expand or extend operations when rail is an option.

If ACRL is put in place, some of the mines scheduled for production after the railway is built would have their shipments done through the railway system. Five such mines in the

[15] http://www.infomine.com/minesite/minesite.asp?site=kemess

[16] Geological reserves are based on the physical make-up of the ore body. Mineable reserves are based on operating and transportation costs and stripping ratios.

Yukon and four more in BC would come into production as induced effects of the ACRL system.

The mines in the Yukon are:

- Fyre
- Kudz Ze Kayah
- Grum
- Ice
- Swim

Fyre is a copper mine situated between Frances Lake and Ross River near the ACRL mainline. The mine is expected to produce 189 thousand tons of copper concentrate per year starting from 2015, after an initial capital investment of $104 million. Fyre has a mine life of 4 years. If the concentrate were shipped out of Skagway, ACRL can earn revenue of $2.4 million a year from Fyre. If the concentrate were to be shipped out of Prince Rupert, then revenue for ACRL could be as high as $3.4 million.

Kudz Ze Kayah is a polymetalic mine with 0.49 grade lead, 0.53 grade zinc and 0.25 grade copper situated 125 miles northwest from Watson Lake. The project is expected to begin production in 2020 and have a mine life of 9 years. A total of 191 thousand tons of concentrate is expected from the mine per year, leading to $2.4 million revenue for ACRL if the concentrate were to be shipped from Skagway. If the shipment occurs from Prince Rupert, revenues can be up to $3.8 million.

Grum is a lead-zinc mine, expected to start production in 2020 at 446 thousand tons per year after an initial capital expenditure of $122 million. The project is located near Faro, close to the ACRL mainline. With a mine life of 5 years, the project may account for revenue between $4.2 million and $10.7 million depending on whether the concentrate is shipped out of Skagway or Prince Rupert.

Ice stands about 40 miles east of Ross River. The copper mine is expected to go into production in 2020, producing 22 thousand tons of concentrate every year for 8 years. This mine may bring in $0.2 to $0.5 million of revenue to ACRL depending on whether the concentrate is shipped out of Skagway or Prince Rupert.

Swim is located very close to Faro, and is a lead-zinc mine. Starting operation in 2025, the project is expected to produce 70 thousand tons of lead and zinc concentrate per year for 9 years. This mine can bring in $0.7 to $1.8 million of revenue to ACRL depending on whether the concentrate is shipped out of Skagway or Prince Rupert.

Future Mines in BC are:

- Lost Fox
- Hobbit Boatch
- Summit
- Ground Hog Coalfield

Lost Fox, Hobbit Boatch and Summit are situated in the Klappan fields, approximately 110 miles northwest of Minaret. All three are coal fields, bringing in 10.3 million tons of coal per year, with the start operation in 2020. To begin operation, the three fields would need an initial total capital expenditure of about $611 million. Coal from Lost Fox can bring ACRL $20 million in revenue, while Hobbit Boatch and Summit can bring another $35.5 and $6.4 million respectively. Being situated so close to Minaret, the coal will be shipped out of Prince Rupert.

The Groundhog Coalfield is situated just south of the Klappan fields, and is expected to produce 1.5 million tons of coal per year from 2020. With a mine life of 15 years, this mine can bring in annual revenue of $8.8 million for ACRL.

3.3.4 Forestry

Forestry is a highly competitive industry. The current Yukon cost structure effectively prohibits entry into this market, with the most prohibitive cost coming from the lack of highly developed infrastructure.[17] A niche lumber market could provide unique conditions to spawn an industry. Unfortunately, this northern wood does not fit any current niche market.

The ACRL would result in a reduction in transportation costs, but currently it is inconclusive as to whether this will be enough to develop a competitive forestry industry. Consequently, for this impact we will assume that any increased forestry activity will be at the margin, and would only supply regional demand (home heating, construction, etc.) where long infrastructure networks are not required.

3.3.5 Tourism

In 2004, Alaska received 1,700,000 visitors, Yukon 252,000 visitors, and Northern BC had 130,000 visitors.[18]

Tourist transportation in Alaska is provided by:

- Airplane (52%)
- Personal vehicles (4%)
- Motor coaches (1%)
- Ferry (1%)
- Cruise Ship (42%)

Yukon and Northern BC are supplied by:

- Airplane (11%)
- Personal vehicles (58%)
- Motor coaches (31%)

[17] Outbound Traffic Data Development – Forestry Resources (WP A2b)
[18] Work Package A3(c): Tourism/Passenger Travel

ACRL revenue estimates from tourism have been included at an amount of $30 million per year, and have been inflated by 2% per year to 2015 and beyond. The ACRL will provide some competition to all forms of travel, but should be most competitive against highway and air visitors. We have assumed at this point that the tourism will be entirely new consumer expenditure and does not displace any of the current tourism.

3.4 *Other considerations*

A fully functional ACRL may have other ramifications that have not yet been addressed by the ACRL project.

The modal shift from truck to rail transportation of goods will greatly reduce traffic on the Alaska Highway. This will have a number of effects:

- Lower volumes of heavy vehicle traffic will reduce wear and tear on the highway, and consequently reduce requirements for highway maintenance. This will benefit the regional governments who currently maintain the highway. The second effect will be to reduce the amount of fuel (diesel) sold along the highway. This will not only affect the gas stations but also affect regional fuel tax revenue. The third effect will be to the accommodation and food industries, since truckers will no longer have to stop at key points along the highway to sleep and eat. The ACRL may be able to offset some of these shocks, or in some cases relocate the demand.
- Currently, Skagway is a destination for cruise ships and Haines is a small mineral port. Current port functions and sizes are at risk with the ACRL spur and expected freight volumes in the order of 2.5 to 3 million tonnes per year. Port redevelopment has been addressed in some of the Stage One findings, but to date there is no assessment of how this redevelopment would affect current tourism.

4 Results

This section presents the Canadian direct effects of the ACRL capital expenditure and operations.[19] Capital expenditure will be very strong from 2010 to 2012 in both the Yukon and British Columbia. The Spur to Skagway is included in table 11, and only occurs in 2010.

[19] YK – Yukon, BC – British Columbia, AB – Alberta, SK – Saskatchewan

Table 11: Capital Expenditure by Region in Canada

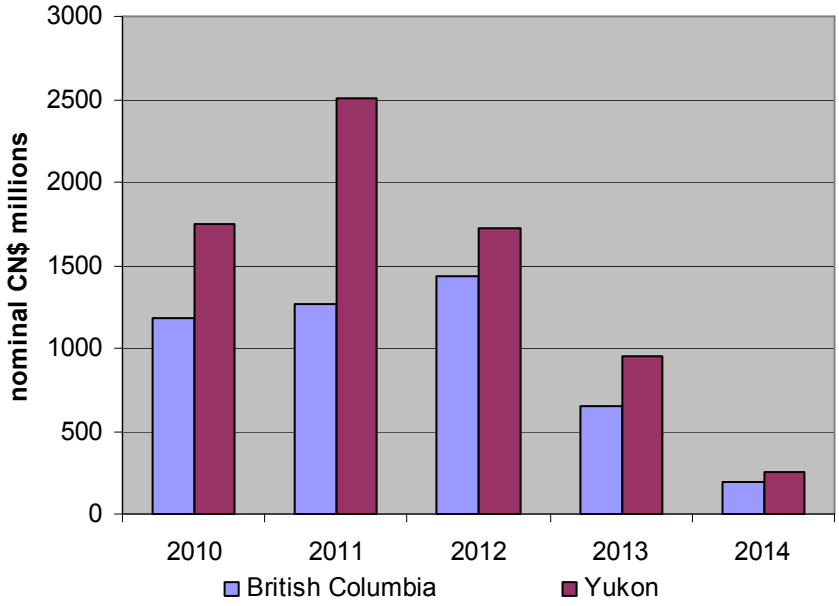
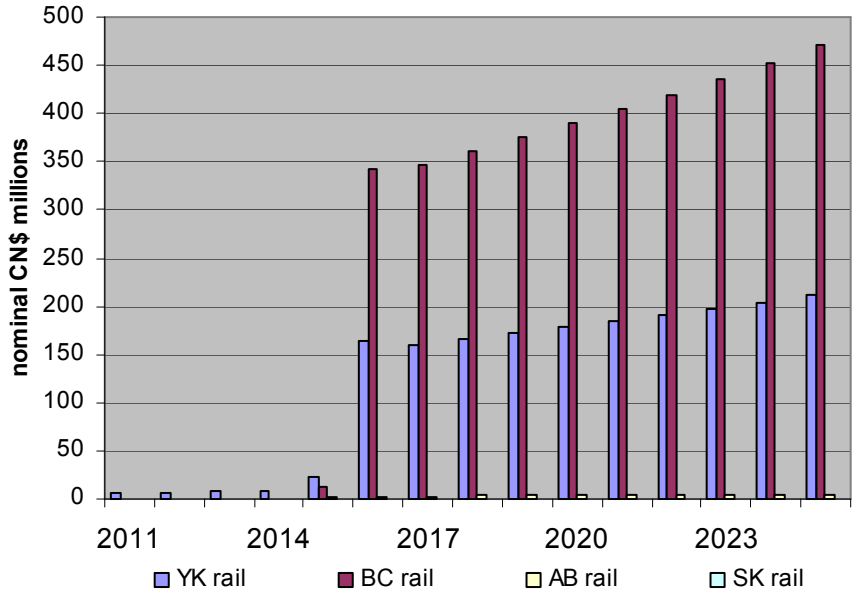


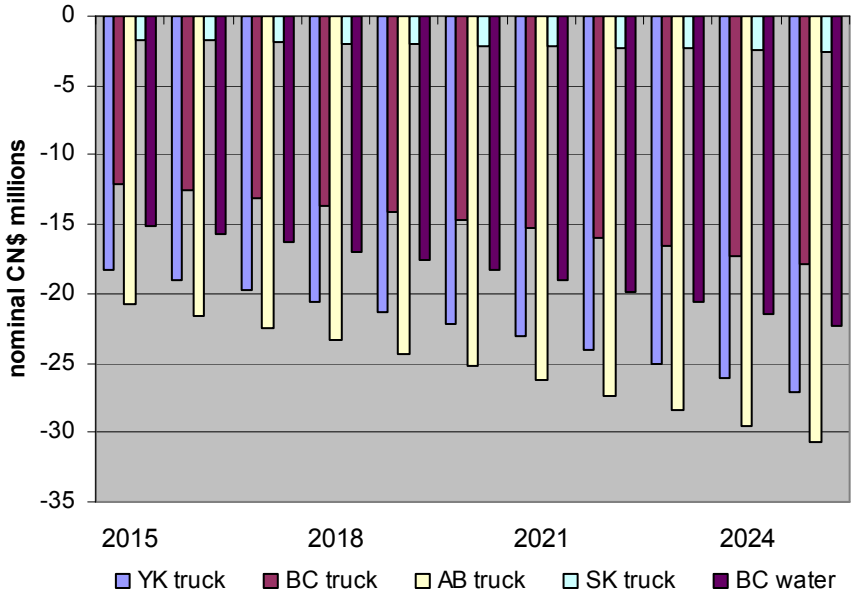
Table 12 shows the revenue of the rail industry by region. The rail industry in BC takes the lion's share of the shift from rail-barge from the US. This is because BC will have the majority of the rail lines.

Table 12: Direct Effects on Canadian Rail Industry Revenue



The two other major freight modes of transportation suffer revenue losses from the switch from rail-barge and highway to rail. This is shown in table 13.

Table 13: Direct Effects on the Revenue of Other Modes of Transportation



The data in the above three charts will be the direct effects that will be the basis of the ACRL impact on the Canadian Economy.

Table 14: Quarterly Capital Expenditure: Beaver Creek to Carmacks to Watson Lake to Hazelton

	US$ Millions	CD$ Millions	2010 Q1	2010 Q2	2010 Q3	2010 Q4	2011 Q1	2011 Q2	2011 Q3	2011 Q4	2012 Q1
Track - 136# CWR w/ Hardwood or Concrete Ties	$1,262	$1,485							$59	$59	$59
Embankment Grade & Sub-ballast	$2,464	$2,899	$242	$242	$242	$242	$242	$242	$242	$242	$242
Tunnel Construction	$529	$622			$78	$78	$156	$156	$78	$78	
Embankment Protection Structures	$280	$329	$27	$27	$27	$27	$27	$27	$27	$27	$27
Railway Bridge Structures Over Water/Debris	$1,080	$1,271	$127	$127	$127	$127	$127	$127	$127	$127	$127
Highway-Railway Intersections	$292	$344			$43	$43	$86	$86	$43	$43	
Add Portion of Route on Other Segment	$86	$102									
Communications, Power, & Detectors	$238	$280							$15	$15	$15
Sidings and Terminals	$398	$468							$25	$25	$25
Total Route Construction Costs											
Contingencies & Environmental Mitigation											
Contingencies (25% above)	$1,657	$1,950	$99	$99	$129	$129	$159	$159	$154	$154	$124
Environmental Mitigation (2% above)	$166	$195	$10	$10	$13	$13	$16	$16	$15	$15	$12
Sub-total	$8,453	$9,945	$505	$505	$659	$659	$813	$813	$785	$785	$631
Engineering & Environmental Studies											
Eng. Environmental Study & Approval (3% subtotal	$254	$298	$15	$15	$20	$20	$24	$24	$24	$24	$19
Owner Overview Costs (3% subtotal)	$254	$298	$15	$15	$20	$20	$24	$24	$24	$24	$19
Engineering & Project Mgnt (12% subtotal)	$1,014	$1,193	$61	$61	$79	$79	$98	$98	$94	$94	$76
Total Estimated Route Cost	**$9,975**	**$11,735**	**$596**	**$596**	**$778**	**$778**	**$959**	**$959**	**$926**	**$926**	**$744**
Average Cost per Mile	$8.804	$10.357									
BC Segment	**$3,953**	**$4,650**	**$274**	**$274**	**$281**	**$281**	**$288**	**$288**	**$344**	**$344**	**$337**
YK Segment	**$6,022**	**$7,085**	**$322**	**$322**	**$496**	**$496**	**$671**	**$671**	**$582**	**$582**	**$408**

	2012 Q2	2012 Q3	2012 Q4	2013 Q1	2013 Q2	2013 Q3	2013 Q4	2014 Q1	2014 Q2
Track - 136# CWR w/ Hardwood or Concrete Ties	$59	$178	$178	$238	$178	$178	$119	$119	$59
Embankment Grade & Sub-ballast	$242	$242	$242						
Tunnel Construction									
Embankment Protection Structures	$27	$27	$27						
Railway Bridge Structures Over Water/Debris	$127								
Highway-Railway Intersections									
Add Portion of Route on Other Segment	$20	$20	$20	$20	$20				
Communications, Power, & Detectors	$15	$30	$30	$30	$30	$30	$30	$30	$15
Sidings and Terminals	$25	$49	$49	$49	$49	$49	$49	$49	$25
Total Route Construction Costs									
Contingencies & Environmental Mitigation									
Contingencies (25% above)	$129	$137	$137	$84	$69	$64	$49	$49	$25
Environmental Mitigation (2% above)	$13	$14	$14	$8	$7	$6	$5	$5	$2
Sub-total	$657	$697	$697	$429	$354	$328	$252	$252	$126
Engineering & Environmental Studies									
Eng. Environmental Study & Approval (3% subtotal)	$20	$21	$21	$13	$11	$10	$8	$8	$4
Owner Overview Costs (3% subtotal)	$20	$21	$21	$13	$11	$10	$8	$8	$4
Engineering & Project Mgnt (12% subtotal)	$79	$84	$84	$52	$42	$39	$30	$30	$15
Total Estimated Route Cost	**$775**	**$822**	**$822**	**$507**	**$417**	**$387**	**$297**	**$297**	**$149**
Average Cost per Mile									
BC Segment	**$337**	**$381**	**$381**	**$201**	**$163**	**$163**	**$126**	**$126**	**$63**
YK Segment	**$438**	**$441**	**$441**	**$306**	**$254**	**$224**	**$172**	**$172**	**$86**

Sources: WP B3(a) Infrastructure costs for full rail route.
Expenditure schedule based on an outline obtained from Moe Mahendran, and construction begins in 2010.
Alaskan portion not included. WP B3(a) provides a total estimate of US$1,047 million.
Carmacks to Whitehorse to Skagway captial costs are not included but needs to be included for impact purposes. CostModel.xls provides a value of $645 million

Appendix 2: Economic Impacts of ACRL

1 Introduction

This Appendix covers the combined impact (direct, indirect, and induced effects) of the construction and operation of an Alaska-Canada Rail Link (ACRL). Descriptions of the direct effects of the construction and operation phases are presented in Appendix 1.

2 Methodologies

The direct effects are used as an input to The Informetrica Model (TIM). TIM uses the direct expenditure effects to generate both direct and indirect impacts on an industrial basis. TIM contains a fully closed input-output model, which means that direct and indirect wage changes will induce impacts on both prices and demand. These induced impacts are then iterated until convergence is achieved.

Additional direct-effect assumptions are:

- ACRL impact is not sufficient to result in a response from monetary policy, and as such does not change interest rates.
- Nominal interest rates are held constant to the reference case values.

3 TIM Results

3.1 *Demographics*

3.1.1 Population

The resident populations of the Yukon and Northern BC are not sufficient to cover the labour demands of the ACRL project. There will be a high dependency on transient workers, especially during the construction phase. These transient workers will account for approximately 75 per cent of the construction employment required for the ACRL project. By this assumption, these transient workers will also take back to their region of origin their wages earned. The other 25 per cent of construction employment will be covered by the existing labour force in the Yukon.

Permanent economic activity like the tier 2 mines would result in an influx of migration to the Yukon, the majority of which occurs in the post 2019 period. By 2025, there is an additional 5,300 people living in the Yukon. These new residents are assumed to come mainly from Ontario and British Columbia.

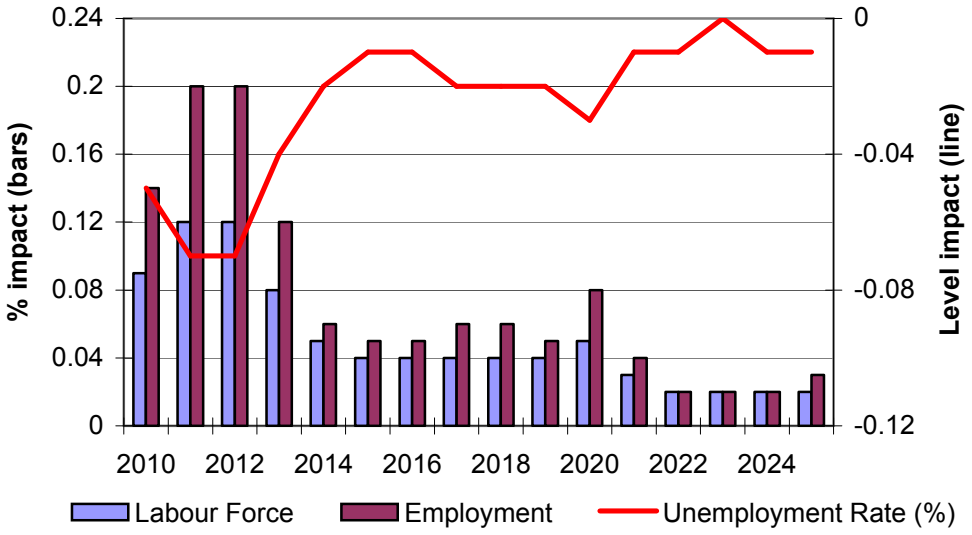
Table 15: Regional Population Impacts, persons

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Yukon	500	900	900	900	900	3000	4200	4300	4400	4900	5300
Ontario	-200	-400	-400	-400	-500	-1500	-2100	-2100	-2200	-2500	-2600
British Columbia	-200	-400	-400	-400	-400	-1500	-2100	-2100	-2200	-2400	-2600

3.1.2 Labour Force, Employment and Unemployment

The construction of the ACRL provides an immediate boost to employment. The labour force reacts, through participation rate increases, but at a slower pace resulting in an immediate drop in the unemployment rate. The unemployment rate remains below the base case economy due to the operation of the rail line, and new mine investment and operation.

Figure 2: Labour Characteristics



During the construction phase, employment impacts are quite evenly split between the Territories, British Columbia (BC) and the rest of Canada. Construction employment dominates in both BC and the Yukon. Manufacturing employment in central Canada, providing inputs to construction as well as machinery and equipment, is the main source of rest-of-Canada employment impacts.

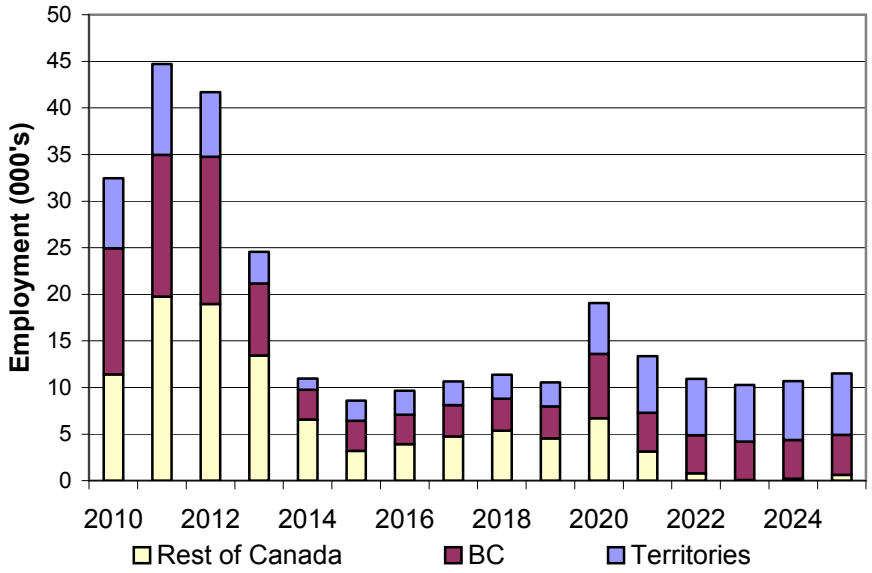
Table 16: Regional Employment Impacts, thousands of person years

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Canada	32.5	44.7	41.9	25.3	12.5	10.7	12.0	13.1	13.6	12.6	20.8	13.9	10.6	9.8	10.4	11.5
Yukon	7.5	9.7	6.9	3.4	1.2	2.2	2.6	2.6	2.6	2.6	5.5	6.1	6.0	6.1	6.3	6.6
British Columbia	13.5	15.2	15.8	7.8	3.3	3.4	3.4	3.6	3.6	3.6	7.1	4.2	4.1	4.1	4.1	4.2
Ontario	5.4	9.3	9.0	6.5	3.5	2.2	2.8	3.2	3.4	2.9	3.4	1.2	-0.1	-0.5	-0.3	0.0
Rest of Canada	6.0	10.5	10.1	7.5	4.4	2.8	3.3	3.7	4.0	3.5	4.8	2.4	0.7	0.1	0.3	0.6

The operations phase now includes the induced mining investment and operation which provides significant employment across Canada. The Yukon economy would be expected to be at near full employment in the reference case, because of the construction of the two pipelines (Mackenzie Valley and Alaska Highway). This extremely low unemployment rate would have serious implications on both wages and prices in the Yukon, unless temporary workers are hired from other regions in Canada and abroad, including Alaska.

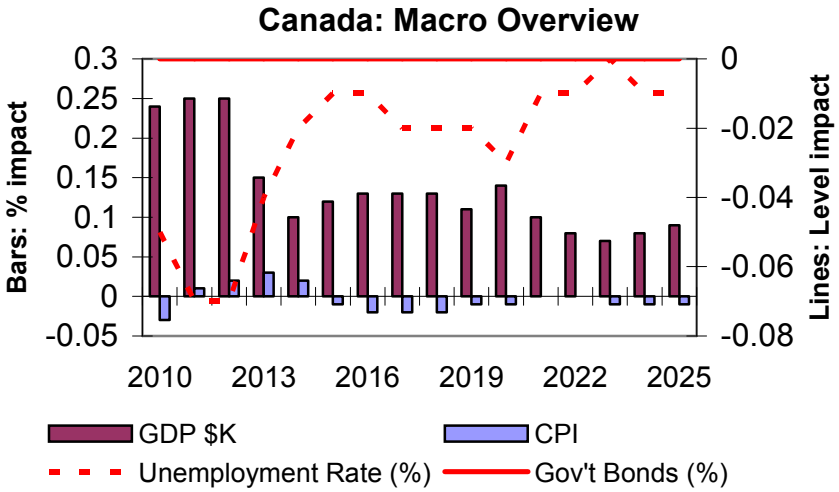
Once employment becomes scarcer upon completion of the pipelines and ACRL, temporary workers will return home.

Figure 3: Employment Impact by Region

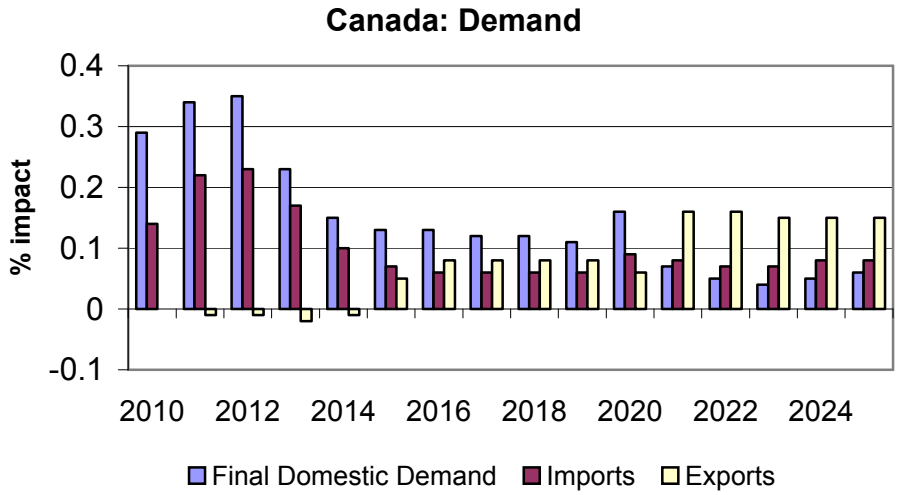


Employment for the operations phase is assumed to come from the territory or province in which the work is done.

3.2 *Gross Domestic Product*



The construction phase impacts in the first three years are almost twice the magnitude of the remaining impact. Imports leak a portion of the impact out of the economy due mainly to increased activity and availability of supply.



Exports are higher during the operations phase because the displacement of rail-barge service from Seattle-Tacoma has resulted in the Canadian export of transport service and the increase in base metal and coal exports in the latter years of the impact.

Some government expenditure is induced, at all levels, due primarily to improvements in the debt-to-GDP ratio, which helps to soften demands for fiscal prudence. Government balances are positively impacted during the construction phase and negatively impacted during the transition from construction to operations. These fluctuations are minor in a time of large fiscal surpluses. Both federal and provincial balances are improved during the operations phase from increased personal income tax and indirect taxes. Provincial governments also receive royalty income, but this is mainly from increased oil and natural gas production.

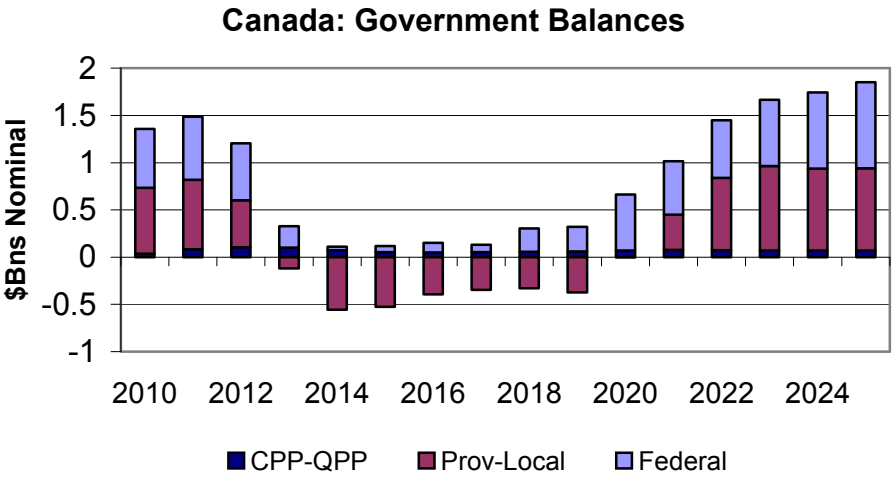
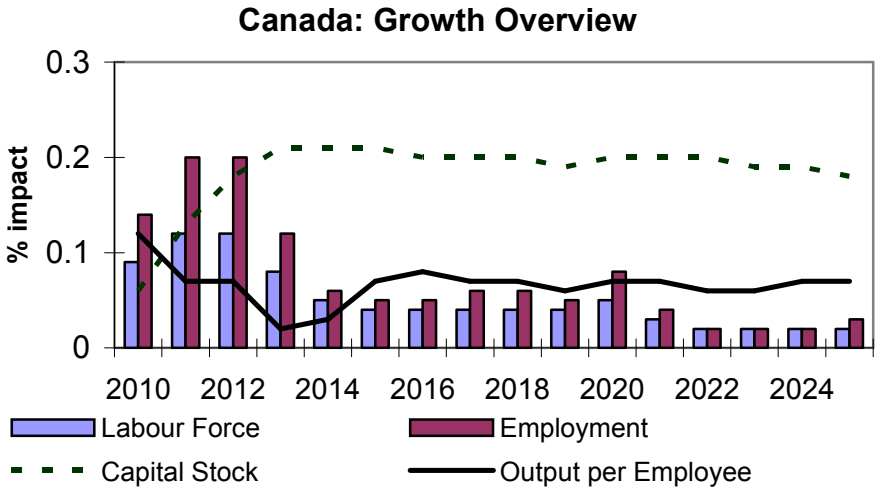


Table 17: Government Balance Impacts, millions of nominal dollars

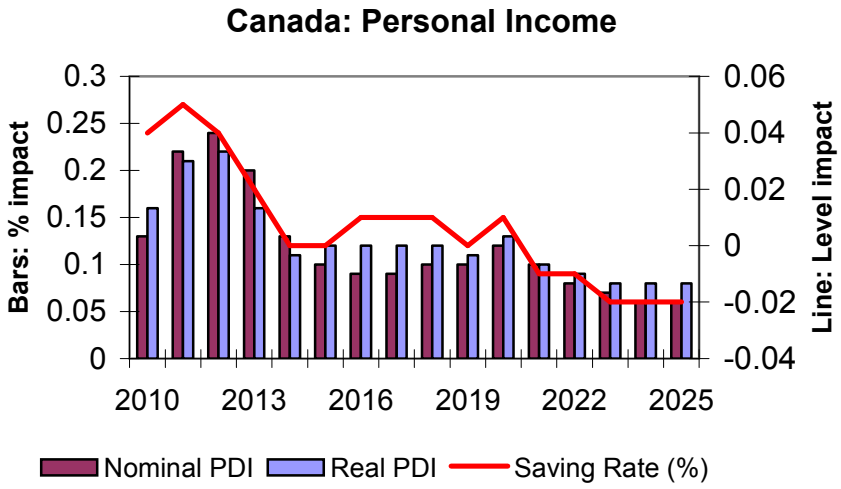
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Federal	625	668	603	229	36	61	100	80	247	261	593	564	610	699	806	911
Provincial	601	764	634	154	-248	-274	-198	-200	-234	-337	-85	160	463	619	670	744
Municipal	97	-28	-137	-273	-311	-252	-195	-145	-95	-38	84	212	302	277	198	124
CPP	30	69	87	81	59	42	37	39	43	46	55	65	60	57	57	59
QPP	6	14	19	20	17	14	13	14	15	15	16	14	14	13	13	13

Employment and labour force move in the same direction, but the combination of the two results in a lower unemployment rate. The higher capital stock has a positive impact on productivity, for most impact years.



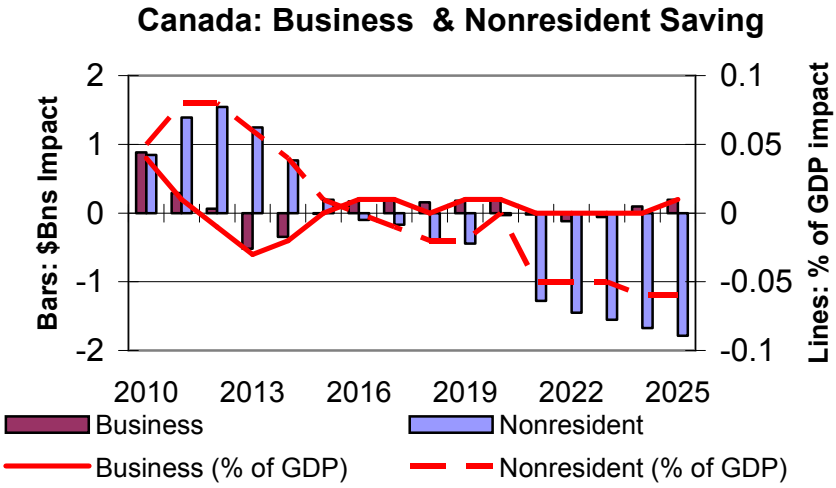
3.3 *Incomes*

Personal income is positively impacted during both the construction and operations phases. The rise in incomes results in induced consumption. During the construction phase the saving rate increases, which results in weaker-than-expected consumption. During the operations phase the saving rate is negatively impacted, which means that consumers are drawing down on the stock of savings to consume goods and services. By 2025 the stock of savings is still above the base case value, but this gap is beginning to shrink.



This is consistent with the concept that temporary workers on the construction phase could save a larger-than-normal portion of their earnings for operations' phase consumption.

During the construction phase, imports increase improving foreign incomes. During the operations phase the exports of rail services and of metals and coal from new northern mines cause export impacts to exceed imports, so foreigners spend more money in Canada than they receive. Over the longer term, this situation continues as more mineral reserves are exploited and sold abroad.

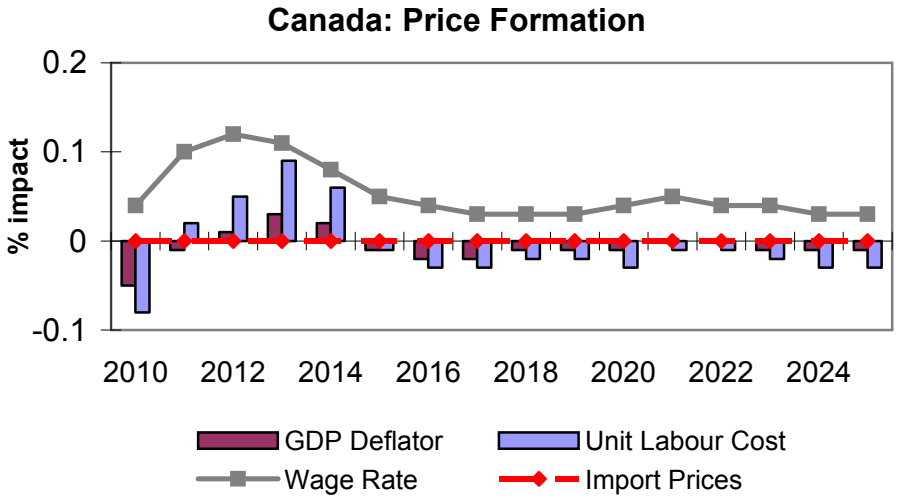


The business saving impact increases with the construction investment impact, but this is quickly eroded by increased imports. During the operation phase, corporate profits remain weak from revenue just covering the operation costs and interest payments

3.4 *Prices*

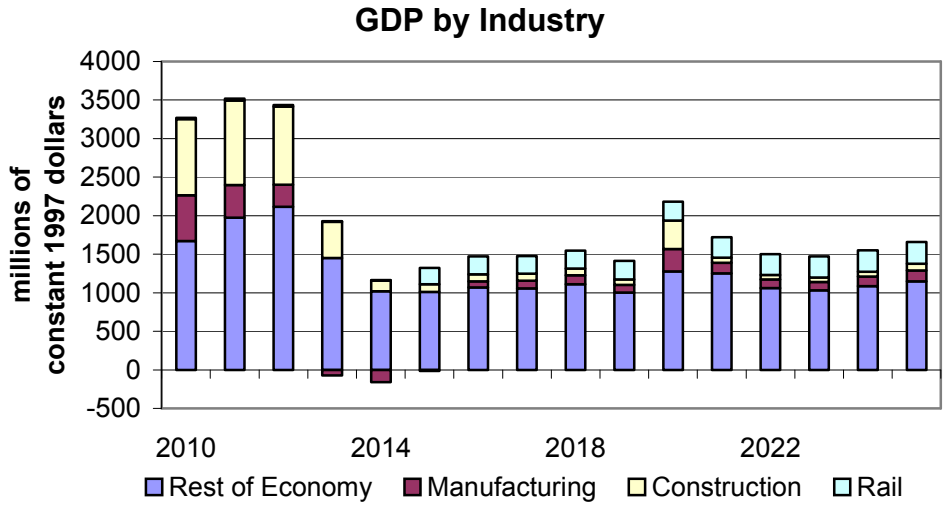
With the exchange rate fixed to the reference case, import prices remain unchanged leaving only domestic influences on price formation. Positive productivity shocks help to mitigate price pressures in the first few years through lower unit labour costs. Wage rate

impacts build over the first few years and peak in 2013, shortly before the end of the construction phase.



During the rail operation years, the negative price impact continues even with the induced mining activity.

3.5 *Industry Profiles*



As expected, the construction industry is the largest single industry impact during the construction phase. The operations phase is split between rail transportation, induced mining operations and retail trade. The remainder of the industry impacts come from other indirect and induced effects.

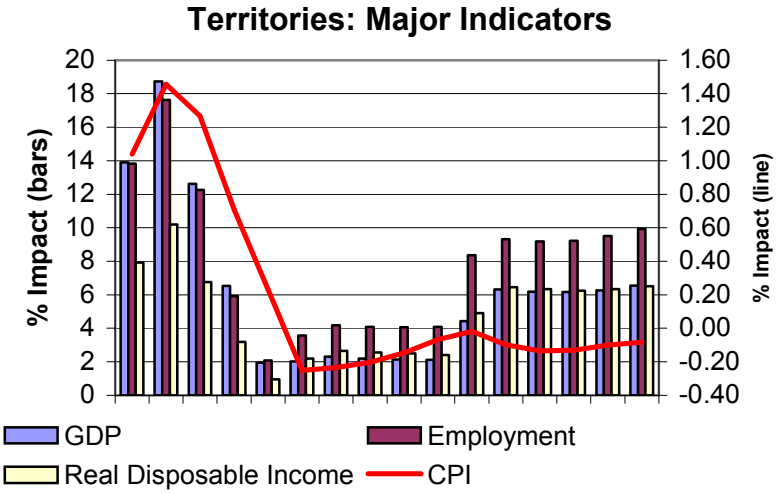
Manufacturing benefits from the first three years of the construction phase as goods are required for construction, but following this the manufacturing industry posts steady, small positive impacts.

The rest of the economy impacts are fairly evenly spread across industries with the exception of wholesale and retail trade. These two industries have a significant impact in both the construction and operations phases due to increased consumption.

4 Regional Dimensions

A conceptual issue that we have tried to address in this impact is that there can be a distinction between activity that takes place within a region and the activity's impact on residents of the region. This can be especially important in the case of the Yukon because temporary workers may be a significant share of the employment impact. Their income has a very high risk of being either shipped "back home" or a disproportionately large share of the income saved until the work contract is complete.

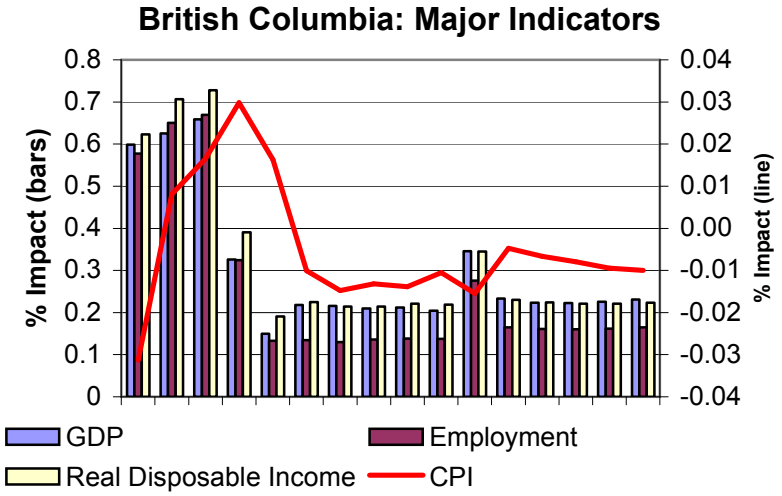
4.1 *Territories Combined*



The GDP impact on the Territories combined exceeds 12 per cent for the first three years. The GDP impact then moves to the operations phase of approximately 2.7 per cent over the reference case values. The introduction of a number of tier 2 mines boosts GDP in the final six years of the impact to around six per cent above the base. Needless to say this has a very large impact on the Yukon economy.

Real disposable income trends with the real GDP shock but at a slightly lower percentage. The real disposable income impact will result in a strong induced consumption response, and further improve regional prospects.

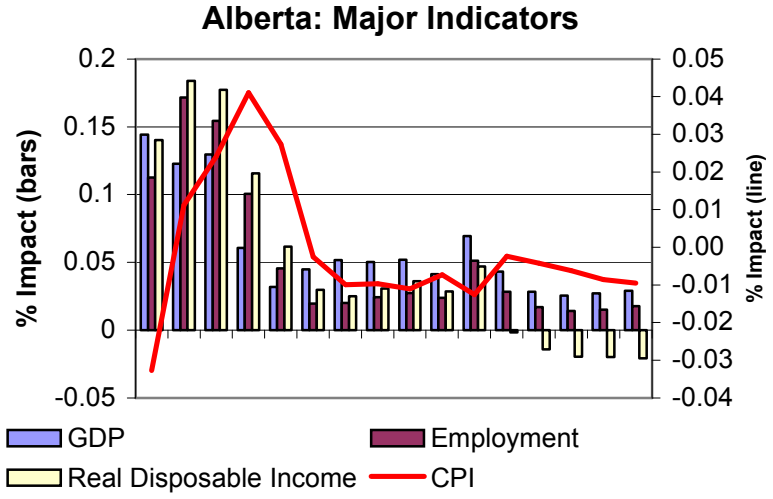
4.2 *British Columbia*



The real GDP impact in BC is almost 0.6 per cent in the early construction years. This is also the case for employment and real disposable income impacts. During the operations phase of the impact, employment impacts are approximately half the real GDP impact, which implies that there is a 0.1 per cent productivity gain. This is due to the increased productivity in the transportation sector; goods transportation has been switched to the more productive rail mode and away from truck transport.

The CPI shock follows the pattern of the national, but increased productivity should imply that prices should drop below base. The productivity gains are not realized by BC because the majority of the gains come from a modal shift in transportation, which means that the recipient of the goods actually benefits. Since the majority of the goods actually travel through BC to the Yukon and Alaska then so also do the benefits travel to these other regions.

4.3 *Alberta and the rest of Canada*



Indirect effects dominate the impact on Alberta. The majority of the impact occurs during the first three years of construction as they and the rest of Canada supply goods. These goods are from very productive industries (resources, manufacturing), which results in a sharp productivity increase in the first three years.

During the operations phase of the ACRL, Alberta's positive indirect and induced effects are softened by the switch from truck to rail transportation. Unlike BC, Alberta does not have any extra rail demand from the US to boost prospects.

The rest of Canada has impacts very similar to those in Alberta but the relative impact is much smaller.

5 Energy Demand and Emissions

Rail is more energy efficient than trucking, so we would expect that there should be some energy efficiency improvements from this modal switch. Total energy in the Canadian economy may be increased because a large portion of rail transportation comes from displacing US transportation services. So the US will require less energy because they are getting goods to the Canada-US border whereas before they would have to get them to Seattle or Tacoma and move them to Anchorage.

In Canada energy demand is up by 20,000 terajoules per year over the base case energy demand, from 2010 to 2025. Railway operation provides 15 per cent of the total. Yukon activities use 4,600 terajoules per year, and BC requires an additional 5,800 terajoules per year, also Ontario and Quebec demand a total of 7,500 terajoules per year from the ACRL impact.

Emissions are also up by 2,000 kT equivalents of CO_2 on a national basis. Contributions to this total by region: 420 kT, 720 kT, 375 kT, and 220 kT from the Yukon, BC, Ontario and Quebec, respectively.

6 Effect of Induced Mining Activity

It is assumed that nine mines, five in the Yukon and four in Northern BC, will be economically feasible with the existence of a rail system. The mines in the Yukon are:

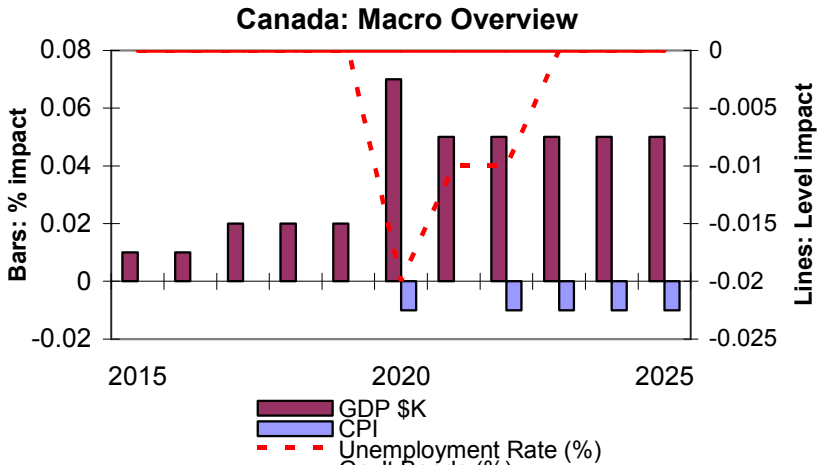
- Fyre (copper)
- Kudz Ze Kayah (lead-zinc-copper)
- Grum (lead-zinc)
- Ice (copper)
- Swim (lead-zinc)

The four anthracite coal mines in BC are:

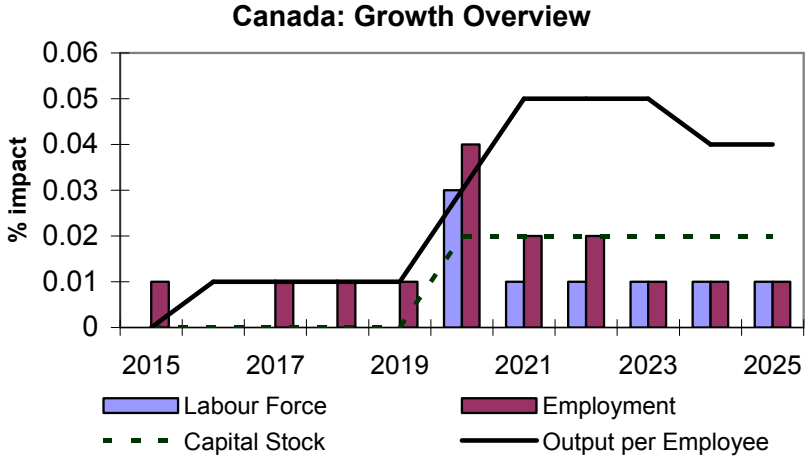
- Lost Fox
- Hobbit Boatch
- Summit
- Ground Hog Coalfield

These will have an effect on not only the regional economies but also at the national level. The large majority of these mines are expected to begin construction in 2020, one mine in 2015 and one in 2025. So the majority of the impact occurs in the last six years of the impact horizon.

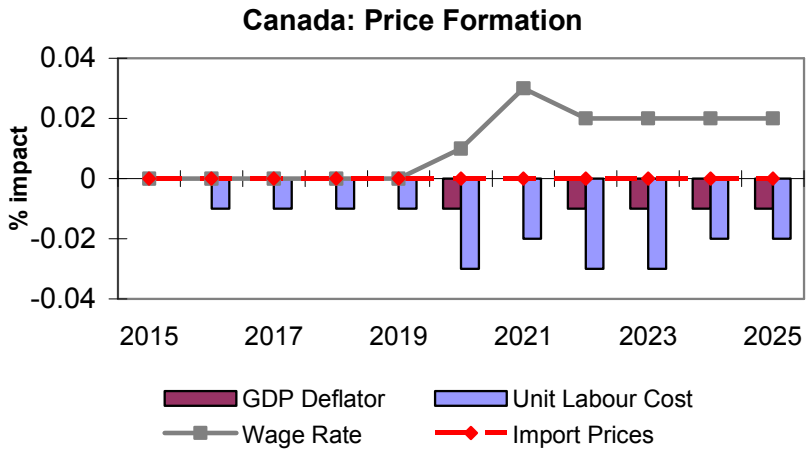
Fyre copper mine (construction 2015 and four years of operations) has only a small impact on the national economy, as shown in the table below. The mines that begin construction in 2020 have a more significant impact on the national economy.



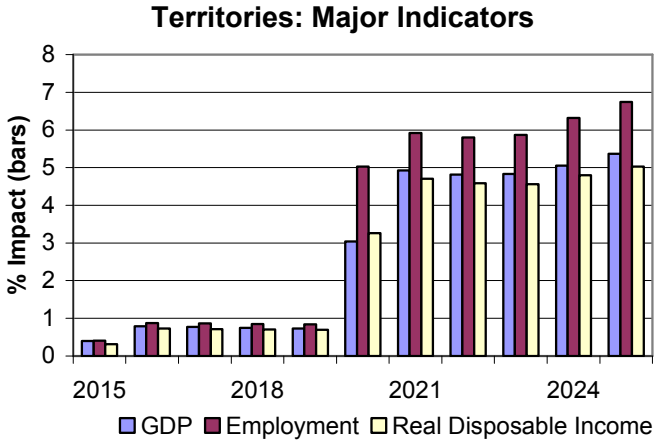
The GDP impact of the mines is approximately half the aggregate impact after 2019; this is also the case for the unemployment rate impact. Mine construction dominates the GDP impact in both 2015 and 2020. The export of the base metals and coal are the major contributors to the other years of the mine impact.



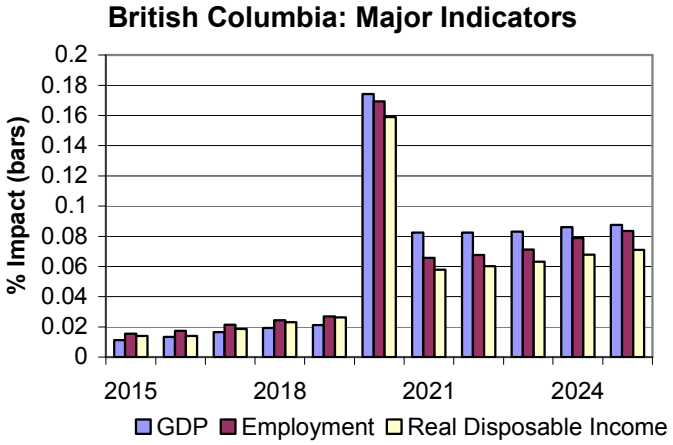
Employment impacts related to the new mines peak in 2020 which coincides with the construction of the majority of these mines. Noticeable productivity improvements can be attributed to the mine construction and operation phases.



There is an almost negligible impact on the consumer price index. Wage rates do improve over this period of the impact but these are more than offset by the productivity gains of the economy as a whole.



The Fyre copper mine is a very short lived project, but provides an almost one per cent GDP impact on the Territories economy, and a 0.5 per cent impact on employment. Kudz Ze Kayah, Ice and Grum mines result in approximately 3.5 per cent impact on the territories' GDP, employment impact are in the range of 2 to 2.5 per cent and real disposable income impacts are mainly steady at 2.7 per cent. Note that the mines account for over 60 per cent of the aggregate impact from 2021 forward.



BC impacts are primarily from the induced effects of higher activity from the mines from 2015 to 2019. In 2020, BC is expected to develop four coal mines, which will have a GDP impact of approximately 0.1 per cent on the BC economy. Employment impacts from the operation of the coal mines will average 0.06 per cent.

Appendix 3: Economic Reference Case

1 Introduction

This Appendix documents a Reference Case without the Alaska Canada Rail Link (ACRL) explicitly included in the forecast. This case includes the Mackenzie Valley Pipeline (MVP), Alaska Highway Pipeline (AHP), and six mines that are expected to proceed irrespective of whether the rail infrastructure is in place.

2 Methodology

The starting point for the analysis is to take a recent Reference Case, produced by Informetrica Limited, using The Informetrica Model (TIM). The forecast chosen is referred to as ACRLref (a variant of F0601_02). This forecast has both the Mackenzie Valley gas pipeline and the Alaska Highway gas pipeline explicitly included in it, along with four major mine developments in the Yukon and two in northern British Columbia.

Although Informetrica Limited has performed a number of impact studies of the two pipeline projects, for the present purpose, we will use our own stylized description of the projects and select the timing that is most appropriate for this study. Since we are producing a scenario for the total economy, in case of overheating, some oil sands developments may be delayed or other investment patterns modified. Policy could also seek to modify the pressures on the economy through fiscal restraint, tighter monetary policy, etc.

The resulting scenario is described through a set of tables, including Excel versions that can be used by other teams as a starting point for their economic assumptions. If scenarios are required without the pipelines, they will be at hand as byproducts of this approach. The rest of the paper describes the forecast results.

3 National Results

3.1 *Demographics*

3.2 *Population*

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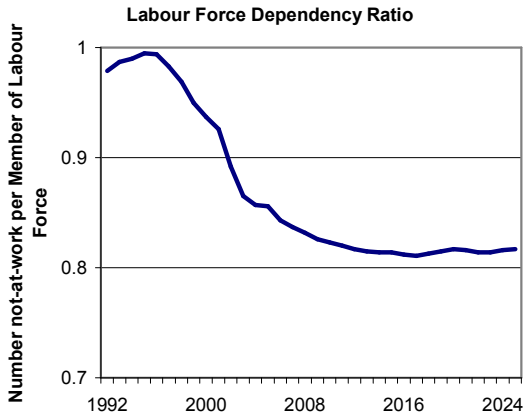
Long-term prospects for growth of the economy are constrained by demographic fundamentals and the extent to which the population participates in the workforce. In this Reference Case, growth of the population decelerates from a current 0.8 per cent to 0.5 in the last years of the forecast. A primary cause of deceleration is the increasing number of deaths relative to births. We assume there will be further reductions in death rates for each age and gender, but, as the proportion of the older population grows, the number of deaths each year rises from 245 thousand in the current year to 354 thousand by 2025. Annual births also increase, but modestly (from 339 thousand currently to 365 thousand in 2025)[20].

3.3 *Labour Force*

The forecast projects a steady deceleration in source population. The drop in labour force growth is stronger than the deceleration in source population due to a decline in the aggregate participation rate. Participation rates for people aged 65 and above stay fairly steady, while the other age groups show rising participation rates. But, with a steady rate for the aged, and the aging of the population, resulting in a structural shift to older age groups (elderly), the dependency ratio comes down and flattens out toward the end of the forecast horizon just above 0.8.

[20] Immigration makes a positive contribution to change. Throughout the projection, we assume that annual immigration is 225,000, with this number offset by an assumed emigration of 57,000. As may be deduced from the foregoing, immigration plays an increasingly important role in population change.



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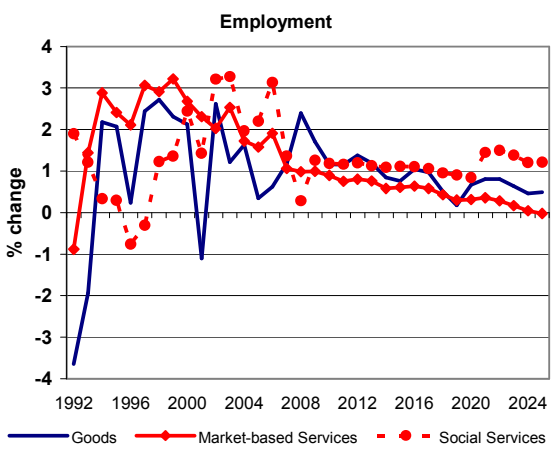
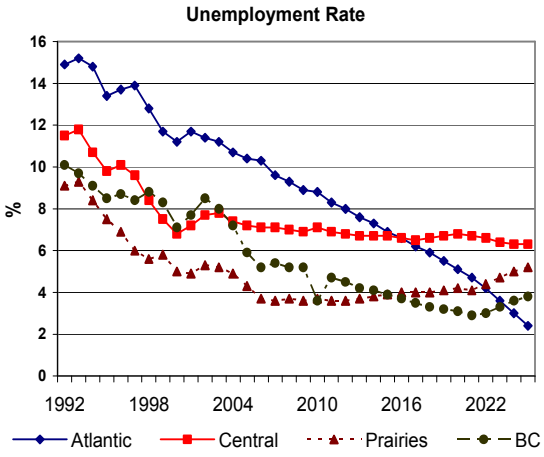
3.4 *Employment*

Growth in employment in the social services sector declines from the present high to a stable rate around the 1.1 per cent mark through 2020, after which employment growth rises further due to job creations in the health sector. Growth of market-based services slows over much of the forecast period. Employment in the sector stabilizes as the growth rate approaches zero toward the end of the forecast period. Employment in the goods sector improves for the next few years, reaching a peak in growth of almost 2 per cent in 2008. From there on, goods sector employment growth declines to a 0.2 per cent trough, with the end of the projection period seeing another rise in growth.

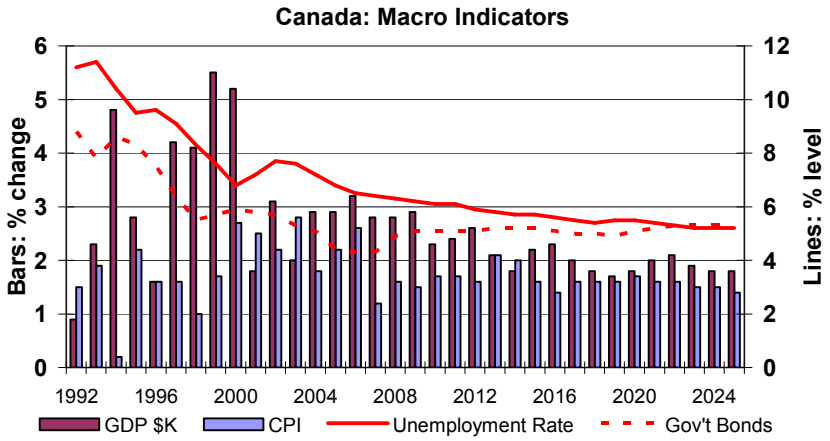




The unemployment rates fall throughout all regions of the country throughout the forecast timeframe. Unemployment in Central Canada stabilizes in the longer run around 6.2 per cent. A rise in the unemployment rate in the prairies over time is attributable principally to a rising rate in Alberta. This is consistent with a relatively slow development scenario in the oil and gas industry in the province and nationally.

The Yukon economy is expected to be fully employed with the construction of two pipelines. Any additional workers are likely to have to come from other regions in Canada and abroad, including Alaska. After the pipeline is complete, the temporary workers will return to their home provinces, leaving the residual work for Yukon workers and residents. The operations people are assumed to come from the territory or province in which the work is done.

3.5 *Gross Domestic Product*



Growth averages 2.8 per cent in the second half of this decade. The pace then weakens, ending the forecast period with growth averaging around 1.9 for the last ten years of the forecast horizon. This is due to a slowing growth in labour supply, a slow expansion of the US economy after 2010, and our assumption that the type of major changes to trade arrangements, like the Free Trade Agreement and NAFTA, that contributed to growth in the past will not occur.

3.6 *Consumption*

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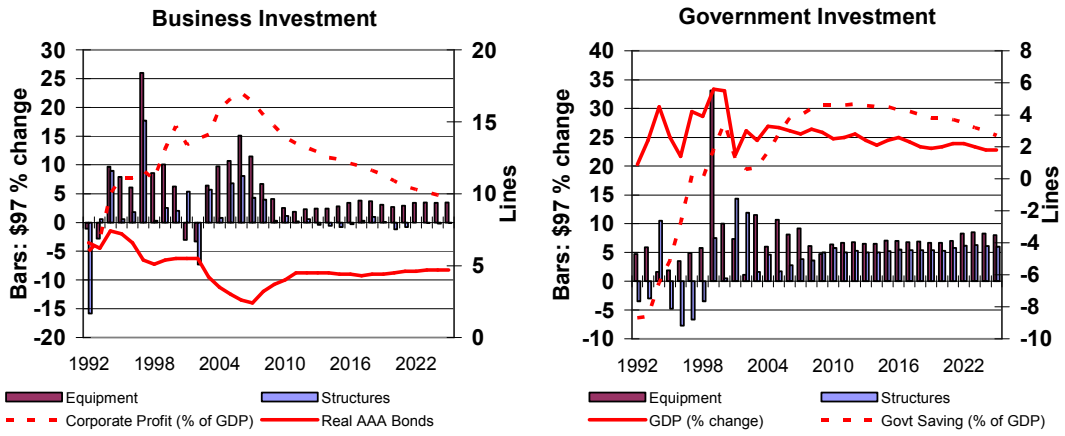
Consumption averages around 3 per cent throughout the forecast horizon. Autos-related consumption growth drops from the current rate of 3.1 per cent to a trough of 0.3 per cent in 2015, from which it accelerates to 1 per cent by the end of the forecast horizon. Demands for energy tied to households (electricity, natural gas and other fuels) slow over the longer term, mainly reflecting demographic fundamentals. Autos-related consumption growth declines in the current year, and, after an initial increase, falls until 2018. An increase in autos-related consumption toward the end of the forecast period reflects ageing and replacement of automobiles, rather than an increase in the total number of automobiles in the economy.

3.7 *Investment*



Business investment in equipment decreases from its current growth rate of 15 per cent to 2 per cent by the end of the decade. Thereafter, investment in equipment grows at a 3 per cent average until 2025. Growth in structures investment in the private sector decelerates, from a current 8.1 per cent, for the rest of this decade, after which structures investment reaches stability in level terms and shows virtually no growth throughout the balance of the forecast period. Government investments in equipment increase by an average of 7 per cent in the forecast timeframe. For both business and government spending, investment in electronic equipment will account for the largest share of equipment spending.

3.8 *Government Spending*

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Effects from Ontario's double cohort are positive for education spending in 2005 and 2006, but we assume there will be notably negative effects when the shortened high school cohort moves forward to university age in 2008. The last few years of the forecast see almost zero growth in education, due to low enrolment rates and the ageing of the general population. Spending on civil administration grows steadily an average of 2 per

cent for most of the projection period. Public expenditure in healthcare increases toward the end of the projection, reflecting an ageing population.

3.9 *Exports and Imports*

We assume that the value of the Canadian dollar vis-à-vis the US continues to appreciate rapidly in 2006 at a rate of 8.1 per cent, and at a rate of 4.3 per cent in 2007. A steady appreciation of approximately 1 per cent per year is assumed from 2008 to 2015, after which, the rate of appreciation slows to about 0.4 per cent by 2025. This results in slower growth in exports, particularly in energy exports. Machinery exports, although slow in historical perspective, continue to lead growth among exports of goods. Exports of automotive equipment slow from a past 5 per cent pace to the range of 3 per cent. Note, however, that this implies some further penetration of the US market, since demand for vehicles there is stagnating over the longer term.

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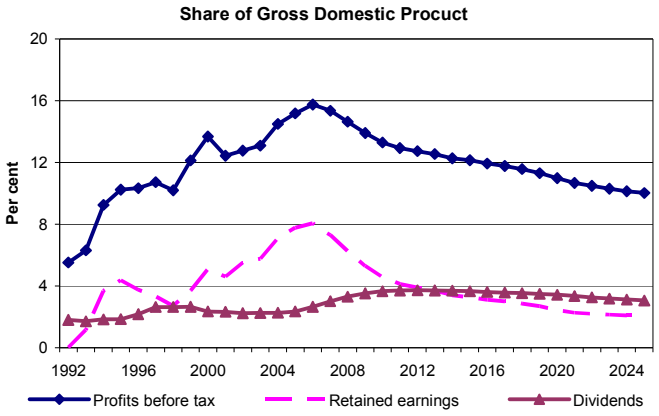
Recovering demand from Canadian business investment alongside a further strengthening of the exchange rate prompts import growth in the near term. In the longer term, import growth is in line with Canadian investment or domestic final demand. In this scenario, imports of resources and services are growing at close to the pace of the past. Growth of imported machinery, automotive products and consumer goods is notably slowed.

3.10 *Incomes*

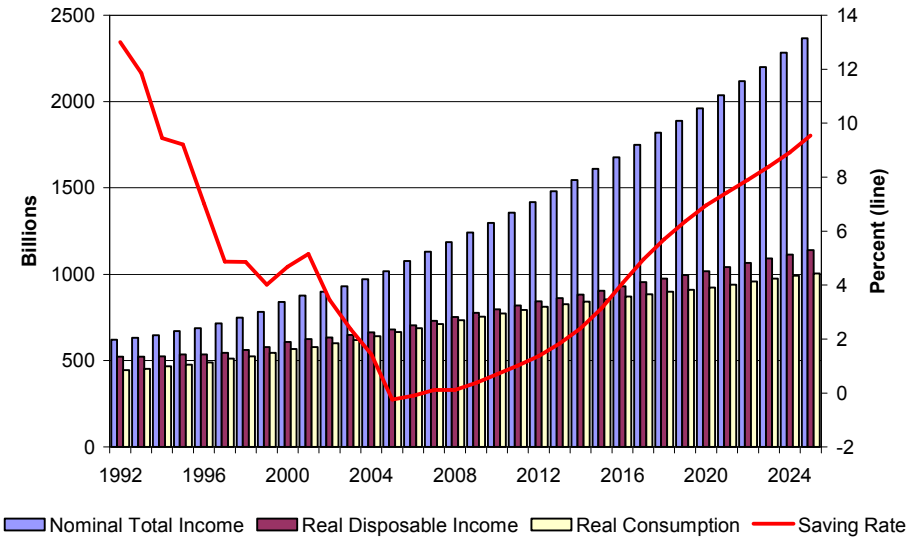
3.11 *Corporations*



Business profits before taxes as a share of gross domestic product decline slowly over the forecast period to approximately 10 per cent in 2025. Dividends paid out by Canadian corporations are steady at 3 per cent, and retained earnings (undistributed profit) are approximately 2 per cent in the longer run, down from current levels of 8 per cent.

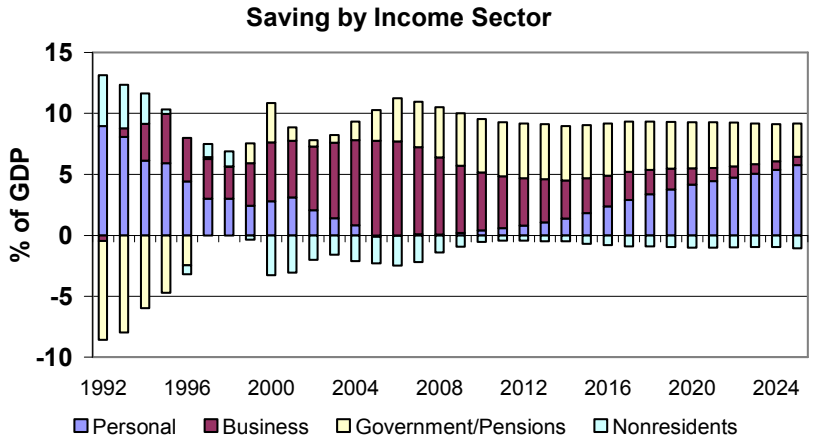
3.12 *Persons*

Personal income (total and disposable) growth is steady over the forecast period at approximately 4 per cent. The rising saving rate recovers back to approximately mid-1990 levels and keeps consumption from overheating the economy.



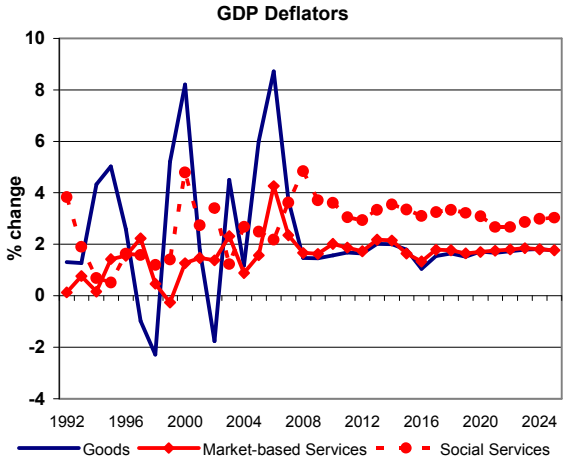
3.13 *Balances*

Domestically this is a very positive saving/balances view of the Canadian economy. Persons and business are saving, governments overall are in surplus, and nonresident saving is negative (positive current account balance) over all of the forecast years.



3.14 *Prices*

3.15 *GDP Deflator*



The private services (goods and market-based services) have stable price growth in the 2 per cent range. However, social services have price growth in the 3 per cent range after the end of the current decade.

3.16 *CPI*

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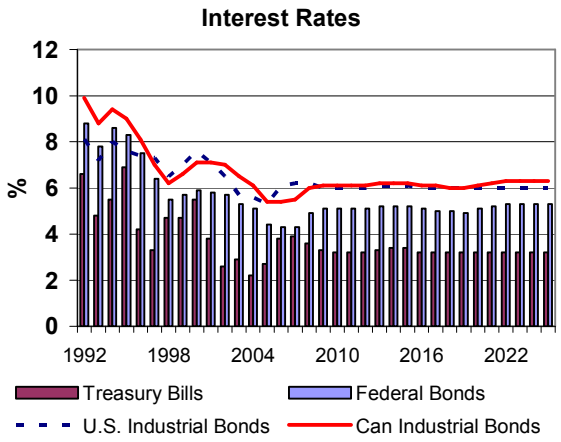
With interest rates rising in the latter half of the current decade, consumer prices respond resulting in lower inflation, an average of 1.7 per cent for the period. With future stable interest rates, the forecast shows the change in the CPI within the targeted 1 to 3 per cent level for most years of the forecast horizon.

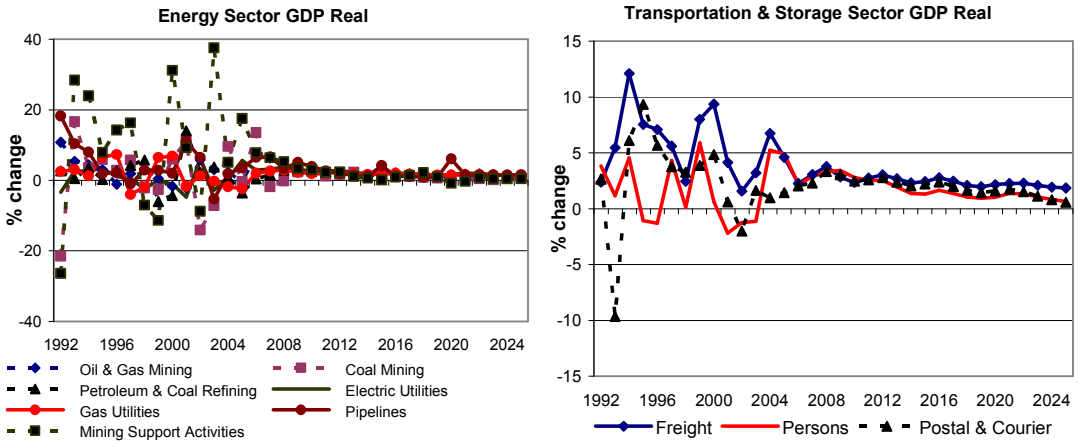
3.17 *Monetary Variables*

3.18 *Interest rates*

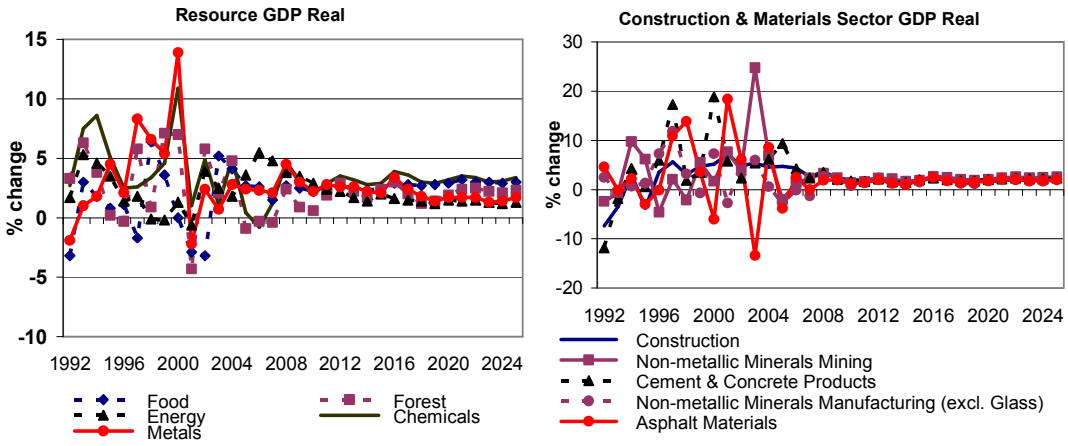


Canadian interest rates rise over the longer term reflecting similar increases in the United States. Rates for Canadian industrial bonds are about the same as those in the US after the end of this decade. The current large spread between short and long-term rates is narrowed over the next few years.

3.19 *Industry Profiles*



Growth of the energy sector slows in the long run, due to slower growth in domestic energy demand. The Mackenzie Valley and Alaska Highway pipelines become operational in 2015 and 2020, respectively. This is seen in the growth spikes in the above chart for those years.



On the construction side, recovering nonresidential building and engineering construction will strengthen in the second half of the decade. Slowing household growth, and housing starts that exceed changes in households for the last several years suggest an eroding level of starts over the forecast horizon.

4 Projects Included in Reference Case

The current Reference Case includes two pipelines and four mines.

4.1 *Mackenzie Valley Pipeline:*

We assume that construction on the Mackenzie Valley Pipeline starts in 2009 and continues till 2015. The gas field itself is built through 2012 to 2015. Following is a brief outline of the capital and machinery and equipment investment figures for the pipeline as well as the gas field development projects:

	2009	2010	2011	2012	2013	2014	2015
Pipeline Investment, 2000 $ million							
Capital Investment	51.6	237.2	484.1	661.7	617.6	600.5	
Machinery and Equipment		21.6	66.5	116.0	118.0	100.3	35.5
Gas Field Investment, 2000 $ million							
Capital Investment				335.1	457.2	285.7	43.7
Machinery and Equipment				23.3	31.8	19.9	3.0

We further assume that production starts from 2015 at 1 billion cubic feet per day.

4.2 *Alaska Highway Pipeline:*

We assume that construction on the Alaska Highway Pipeline starts in 2015, with total investment divided between the two provinces (Alberta and British Columbia) and the Yukon in the following manner (all figures expressed in constant 2000 $millions):

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total Investment	149	178	622	1676	1973	1053	395	393	314	158	79
Alberta	149	178	189	176	183	100	2	3	2	1	
British Columbia			195	667	786	417	169	168	134	68	34
Yukon			238	833	1004	536	223	222	178	89	45

Production flow starts in 2020, stepping up from 2.5 billion cubic feet in 2020 to 4 billion cubic feet in 2025.

4.3 *Mining Projects:*

There are four Yukon and two BC deposits that are expected to proceed irrespective of whether a rail line is available. With the ACRL in place, transportation should switch from trucking to rail to exploit lower transportation costs.

The projects in the Yukon are:
- Division Mountain
- Minto
- Wolverine
- Howard's Pass

The projects in BC are:
- Kemess North
- Kemess South

Division Mountain is expected to have annual production of approximately 1,550,000 tonnes of coal. This project is situated right next to the proposed spur from Carmacks to Whitehorse to Skagway. It is highly likely that the ACRL could obtain stable revenue in the order of $7.0 million per year from this project.[21] This project should begin production in 2010 and have an approximate mine life of 22 years, ending this revenue stream in 2032.

Minto is expected to have annual production of approximately 32,000 tonnes of copper concentrate. This project is situated right next to the main ACRL rail line, approximately 50 miles west of Carmacks. It is also likely that the ACRL could obtain revenue in the order of $0.2 million per year from this project. This project is expected to begin

[21] Revenue estimate is based on project tonnes, at a cost of 3 cents per tonne-mile, and a rough estimate of mileage of the intuitively most efficient route.

production in 2007 and have an approximate mine life of 13 years, ending this revenue stream in 2019.

Wolverine is expected to have annual production of approximately 114,000 tonnes of concentrate (zinc-copper-lead). This project is situated right next to the main ACRL rail line approximately 125 miles northwest of Watson Lake. It is also likely that the ACRL could obtain revenue from this project. The magnitude of the revenue will depend on the market for its concentrate. If the concentrate were shipped out of Skagway, annual revenues would be approximately $1.7 million. However, if the concentrate were shipped to Prince Rupert or Chicago, then revenues would increase to $2.1 million. This project should begin production in 2010 and have an approximate mine life of 12 years, ending this revenue stream in 2022.

Howard's Pass is expected to have annual production of approximately 187,000 tonnes of lead concentrate and 480,000 tonnes of zinc concentrate. This project is situated very close to the Yukon–Northwest Territories border and about half way between Cantung and Mactung. Provided ACRL can contract to ship the concentrate, annual revenues could range from $7.9 million to $11.4 million. This project should begin production in 2015 and have an approximate mine life of 21 years, so this revenue stream will end in 2036.

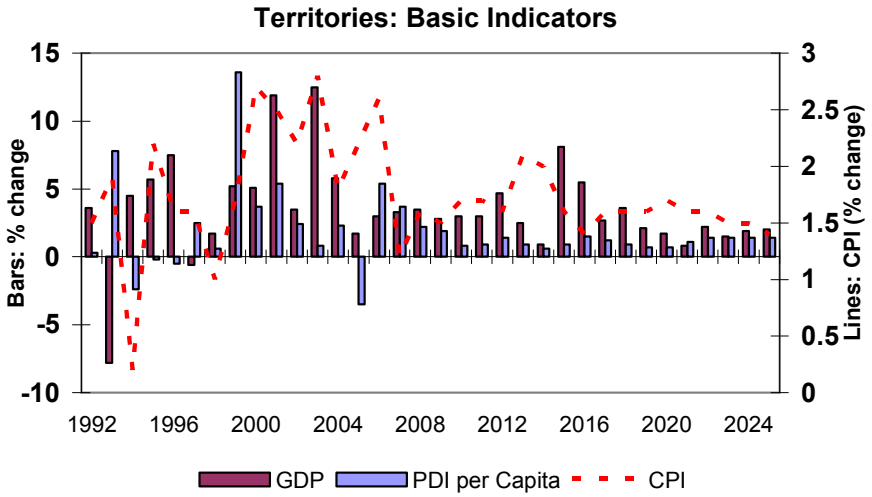
Kemess North and South are located in the mountains of north-central BC, near the main ACRL line between Hazelton and Dease Lake, 430 km northwest of Prince George. These are copper-gold mines currently in production, from where the produced concentrate is transported by truck about 380 km on a gravel road to a rail spur at McKenzie, BC, and from there by rail to Noranda's Horne smelter in Rouyn-Noranda, Quebec for processing[22]. The two mines combined are expected to produce 222 thousand tons of copper per year from 2008 to 2018. Given that concentrates are currently sent to Quebec, by truck to Mackenzie and then by rail, even though the Bear Lake railway line is geographically very close to its location, it is uncertain whether the mine would use the ACRL tracks to get its product to Prince Rupert in the future.

5 Regional Dimensions

In assessing the economic performances on a regional basis, it is important to realize that the activity listed under each region is whatever takes place within its boundaries, not the effects on residents in that region. It is possible that some residents of the Yukon may be engaged in economic activity outside the region. If a Yukon resident maintains a job in BC, the contribution to the economy would be recorded under BC activity, not Yukon. The exceptions are the personal income measures that are based on the province of residence.

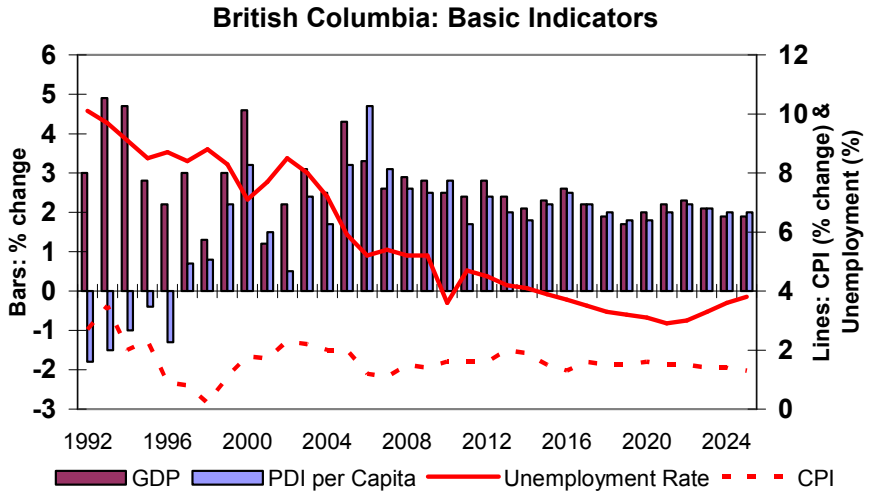
[22] http://www.infomine.com/minesite/minesite.asp?site=kemess

5.1 *Territories: Yukon, NWT, and Nunavut*



The pipeline projects and the mining projects have positive impact on the Territories economy, as can be seen in the above chart indicating high GDP growth in 2008 and 2015. We expect economies of the Yukon and NWT to experience full employment during the pipeline construction periods. Any additional workers are likely to have to come from other regions in Canada and abroad, including Alaska. After the completion of the pipeline, the temporary workers would return to their homes, leaving the residual work for Yukon and NWT workers and residents.

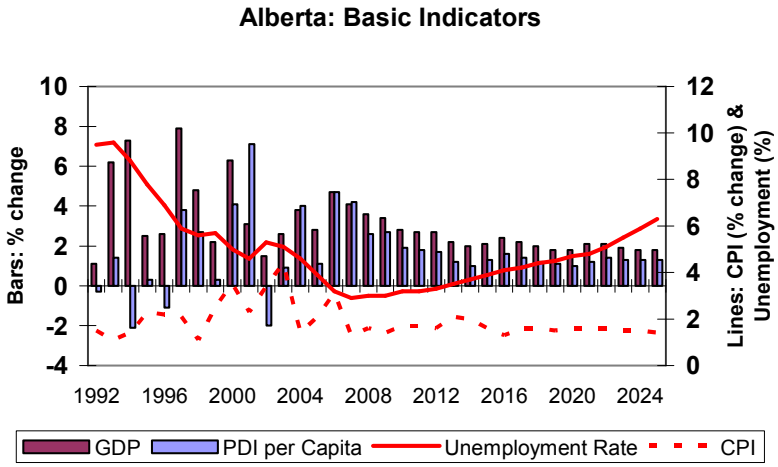
5.2 *British Columbia*



We expect a positive effect on GDP in Northern British Columbia, linked to the Alaska Highway Gas Pipeline. The above figure shows the effects leading to strong performance

in BC related both to the gas pipeline as well as the 2010 Olympics. In particular, the dip in the unemployment rate is dramatically visible during the Olympics.

5.3 *Alberta*



In the Alberta economy, the unemployment rate stays at a healthy low. Two distinct accelerations in GDP growth can be seen in the above figure, corresponding to investments for the Mackenzie Valley Gas Pipeline and the Alaska Highway Pipeline construction. Positive effects are also expected due to increased pipeline transportation and chemicals production, as well as new oil sands development for the region.

5.4 *Rest-of-Canada*

Any major positive effects will be linked to procurement patterns of the pipelines (e.g., steel industry in Saskatchewan and Ontario) or totally unrelated activities (e.g., Lower Churchill Falls development in Newfoundland and Labrador.)

6 Other Scenarios

It is possible to imagine many other equally plausible scenarios for a Reference Case or starting point for the impact studies. Commodity prices could be much higher or lower, labour markets more tight or less tight, and governments could be more pro-active in economic development or less so.

The Reference Case used here is not extreme. However, it does portray tight local labour markets in Yukon and BC because of the pipeline developments and continuation of mining.

In subsequent studies of the ACRL impacts, it may be useful to consider the conditions that would lead to a slower development path, with incremental rail additions during periods of higher commodity prices, and little activity in the periods of lower prices. More rapid development is likely to occur in a world with heightened security of transportation concerns because of global tensions or natural disasters.

Appendix 4: Mining Resources Summary

Introduction

The Yukon Territory and British Columbia are rich in mineral deposits. Mining is the major economic activity in BC and has been so in the Yukon. Currently, most mineral products in the Yukon are transported by trucks to sea ports. The presence of a railway line, like the Alaska Canada Rail Link (ACRL), would ameliorate the transportation situation by providing it at a lower cost. This would make mines that were not economically feasible become so, while those that are already operating may take advantage of the cheaper transport to increase their rate of return on investment, and hence, their mine-life. At the same time, the transporting of mining products will be one of the biggest sources of revenue for ACRL. In this light, it is important to survey the possible mines that would be affected by ACRL.

This paper lays out the key assumptions in the study. The following section describes the mines that are likely to come into operation irrespective of whether ACRL is in place or not (Tier 1 mines). But, once ACRL is operational, the mines are likely to use the new rail link instead of the trucking system as transportation. The next section describes known and identified mines that are currently not economically feasible, but will become feasible once ACRL is in place and transportation costs are lowered (Tier 2 mines). The next section goes one step further and gives a primer on the potential of new deposits being discovered due to the transport incentive provided by ACRL (Tier 3 mines). The final section describes the impact of the inclusion of the mines in the Reference Forecast as induced effects of the ACRL project.[23]

Tier 1 Mining Projects:

Four Yukon mines and two BC mines are expected to start operation before the ACRL project is completed. These mines are economically viable irrespective of whether the ACRL project goes ahead or not. With the ACRL in place, transportation of mined commodities should switch from trucking to rail to exploit lower transportation costs.

The projects in the Yukon expected to start before ACRL comes into operation are:

- Division Mountain
- Minto
- Wolverine
- Howard's Pass

The projects in BC expected to start before ACRL comes into operation are:

- Kemess North
- Kemess South

[23] The estimated tonnage and associated revenues from each mine are continually being revised to reflect latest assumptions. In this regard, the description of the mines in this document contains information as of 22 July 2006. The impacts in the study reflect the information available in June 2006. The differences between the two numbers would have had negligible effects on the impact figures and therefore, a new impact was not run to reflect the latest assumptions.

Division Mountain is expected to have annual production of approximately 1,377,669 tons of coal. This project is situated next to the proposed spur from Carmacks to Whitehorse to Skagway. It is likely that the ACRL would be able to obtain stable revenue in the order of $7.2 million per year from this project.[24] This project should begin production in 2010 and have an approximate mine life of 22 years, so this revenue stream will end in 2032.

Minto is expected to have annual production of approximately 32,030 tons of copper concentrate. This project is situated next to the main ACRL rail line, approximately 50 miles west of Carmacks. It is also likely that ACRL would be able to obtain revenue in the order of $0.3 million per year from this project. This project is expected to begin production in 2007 and have an approximate mine life of 12 years, so this revenue stream will end in 2018.

Wolverine is expected to have annual production of approximately 163,679 tons of concentrate (zinc-copper-lead). This project is situated next to the main ACRL rail line approximately 125 miles northwest of Watson Lake. It is also likely that ACRL would be able to obtain revenue from this project. Whether the concentrates are railed down to Stewart or Haines, annual revenues for ACRL would be approximately $2.6 million. This project should begin production in 2010 and have an approximate mine life of 13 years, so this revenue stream will end in 2023.

Howard's Pass is expected to have annual production of approximately 736,265 tons of lead and zinc concentrate. This project is situated very close to the Yukon–Northwest Territories border and about halfway between Cantung and Mactung. If the concentrates are railed to Stewart, ACRL can get $9.6 million of revenue from the mine per year. This project should begin production in 2015 and have an approximate mine life of 21 years, so this revenue stream will end in 2036.

Kemess North and South are located in the mountains of north-central BC, near the main ACRL line between Hazelton and Dease Lake, 430 km northwest of Prince George. These are copper-gold mines currently in production, from where produced concentrate is transported by truck about 380 km on a gravel road to a rail spur at McKenzie, BC, and from there by rail to Noranda's Horne smelter in Rouyn-Noranda, Quebec for processing[25]. The two mines combined are expected to produce 376 thousand tons of copper per year from 2008 to 2018. Given that concentrates are currently sent by truck to Mackenzie and then by rail to Quebec, even though the Bear Lake railway line is geographically very close to its location, it is uncertain whether the mine would use the ACRL tracks to get its product to Prince Rupert. If the ACRL line is used to ship the concentrates to Rupert, a total of $3.1 million of revenue can be extracted from the projects.

[24] Revenue estimate is based on project tonnes, at a cost of 3 cents per tonne-mile, and a rough estimate of mileage of the intuitively most efficient route.
[25] http://www.infomine.com/minesite/minesite.asp?site=kemess

Table 18: Mine Production

	Start Date	Capex $Million	Mine Life (Years)	Total Mineable Reserve (Tons)	Annual Mineable Reserve (Tons)	Ore to Concentration Conversion Ratio**	Annual Production (Tons)
Yukon Mines							
Division Mountain	2010	$ 84.6	22	51,582,869	2,296,114	0.60	1,377,669
Howards Pass	2015	$ 189.6	21	127,316,956	6,062,712	0.12	736,265
Grum	2020	$ 122.6	5	23,776,675	4,327,674	0.09	405,138
Swim	2025	$ 35.3	10	5,208,339	526,660	0.12	60,881
Wolverine	2010	$ 47.9	13	7,413,399	587,899	0.28	163,679
Kudz Ze Kayah	2020	$ 53.1	9	10,692,640	1,151,303	0.15	176,115
Fyre	2015	$ 94.5	4	10,075,540	2,259,738	0.09	194,132
Ice	2020	$ 33.1	8	3,927,161	468,482	0.05	21,652
Minto	2007	$ 41.5	12	8,566,105	688,945	0.05	32,030
BC Mines							
Shaft Creek*	2065	$ 656.2	21	464,344,244	22,447,027	0.01	236,442
Kemess North	2008	$ 910.7	15	467,267,560	31,151,171	0.01	203,436
Kemess South	2009	$ 196.1	15	94,581,514	6,305,434	0.03	172,434
Lost Fox	2020	$ 184.1	22	128,096,952	5,858,785	0.52	3,046,568
Hobbit Boatch	2020	$ 293.4	29	283,677,170	9,832,617	0.52	5,112,961
Summit	2020	$ 69.1	16	28,960,408	1,792,831	0.52	932,272
Groundhog	2020	$ 74.0	17	32,223,479	1,947,417	0.68	1,324,243

* These mines are expected to be developed beyond the forecast horizon

** The Ore to Concentration Conversion Ratio takes into account the ore grade, recovery grade and concentration grade for zinc, and copper metals extracted from the deposits

Tier 2 Induced Mining Projects:

There are many known deposits in the Yukon and BC that are currently not economically feasible, primarily due to the high cost of transporting the mined goods to sea ports. With ACRL in place, many such mines will become feasible due to the low rail costs. Five such mines in the Yukon and four more in BC would come into production as induced effects of the ACRL system.

The mines in Yukon are:

- Fyre
- Kudz Ze Kayah
- Grum
- Ice
- Swim

Fyre is a copper mine situated between Frances Lake and Ross River near the ACRL main line. The mine is expected to produce 189 thousand tons of copper concentrate per year starting from 2015, after an initial capital investment of $94.5 million. Fyre has a mine life of 4 years. If the concentrate were shipped out of Stewart, ACRL could earn revenue of $3.1 million a year from Fyre. Whether the concentrates are shipped to either Stewart or Haines, the revenue for ACRL can be $3.1 million per year.

Kudz Ze Kayah is a polymetalic mine with 0.49 grade lead, 0.53 grade zinc and 0.25 grade copper situated 125 miles northwest from Watson Lake. The project is expected to begin production in 2020 and have a mine life of 9 years. A total of 176 thousand tons of concentrate is expected from the mine per year, leading to revenue of $2.8 million for ACRL. The revenue figure is the same whether the concentrate is shipped to Stewart or Haines.

Table 19: Truck Transportation Cost

Mine	Destination	Miles	Annual Ton-Miles	Cost $/Ton	Total Annual Cost $
Yukon Mines					
Division Mountain	Skagway	174	239,741,903	19	26,371,609
Howards Pass	Skagway	640	471,316,309	70	51,844,794
Grum	Skagway	348	141,004,066	38	15,510,447
Swim	Skagway	348	21,189,085	38	2,330,799
Wolverine	Haines	696	113,933,446	77	12,532,679
Kudz Ze Kayah	Haines	696	122,590,265	77	13,484,929
Fyre	Haines	696	135,131,440	77	14,864,458
Ice	Haines	696	15,071,595	77	1,657,875
Minto	Skagway	301	9,654,824	33	1,062,031
BC Mines					
Shaft Creek	Stewart	168	39,676,152	18	4,364,377
Kemess N	Stewart	319	64,896,153	35	7,138,577
Kemess S	Stewart	319	55,006,550	35	6,050,720
Lost Fox	Stewart	194	590,753,908	21	64,982,930
Hobbit Boatch	Stewart	194	991,444,000	21	109,058,840
Summit	Stewart	194	180,774,983	21	19,885,248
Groundhog	Stewart	213	281,471,891	23	30,961,908

Note: Trucking cost is assumed at 11 cents per ton/mile

Grum is a lead-zinc mine, expected to start production in 2020 at 405 thousand tons per year after an initial capital expenditure of $123 million. The project is located near Faro, close to the ACRL main line. With a mine life of 5 years, the project could account for revenue between $5.6 million and $7.2 million depending on whether the concentrate is railed down to Haines or Stewart.

Table 20: Rail Transportation Cost

Mine	Destination	Truck Miles to Railhead	Train Miles	Truck Cost $/Ton	Train Cost $/Ton	Total Cost $/Ton	Total Annual Cost $
Yukon Mines							
Division Mountain	Skagway	19	174	2	5	7	10,017,787
Howards Pass	Stewart	155	435	17	13	30	22,193,049
Grum	Stewart	19	590	2	18	20	8,007,017
Swim	Stewart	19	590	2	18	20	1,203,237
Wolverine	Stewart	16	534	2	16	18	2,904,286
Kudz Ze Kayah	Stewart	12	534	1	16	17	3,064,757
Fyre	Stewart	12	534	1	16	17	3,378,286
Ice	Stewart	12	534	1	16	17	376,790
Minto	Haines	19	286	2	9	11	340,407
BC Mines							
Shaft Creek	Rupert	87	401	10	12	22	5,106,468
Kemess N	Rupert	93	264	10	8	18	3,698,242
Kemess S	Rupert	118	283	13	8	21	3,702,652
Lost Fox	Rupert	6	336	1	10	11	32,756,547
Hobbit Boatch	Rupert	6	336	1	10	11	54,974,299
Summit	Rupert	6	336	1	10	11	10,023,741
Groundhog	Rupert	37	283	4	8	13	16,666,099

Note: Trucking cost is assumed at 11 cents per ton/mile, while rail cost is assumed at 3 cents per ton/mile

Ice is located about 40 miles east of Ross River. The copper mine is expected to go into production in 2020, producing 22 thousand tons of concentrate every year for 8 years. This mine may bring in $0.3 million of revenue to ACRL.

Swim is located very close to Faro, and is a lead-zinc mine. Starting operation in 2025, the project is expected to produce 61 thousand tons of lead and zinc concentrate per year for 10 years. This mine can bring in $0.8 to $1.1 million of revenue to ACRL depending on whether the concentrate is railed down to Haines or Stewart.

Table 21: Rail Transportation Cost: Alternate Route for Yukon Mines

Mine	Destination	Truck Miles to Railhead	Train Miles	Truck Cost $/Ton	Train Cost $/Ton	Total Cost $/Ton	Total Annual Cost $
Division Mountain	Haines	19	168	2	5	7	9,760,920
Grum	Haines	19	460	2	14	16	6,420,721
Swim	Haines	19	460	2	14	16	964,860
Wolverine	Haines	16	541	2	16	18	2,934,803
Kudz Ze Kayah	Haines	12	541	1	16	18	3,097,593
Fyre	Haines	12	541	1	16	18	3,414,482
Ice	Haines	12	541	1	16	18	380,827

Note: Trucking cost is assumed at 11 cents per ton/mile, while rail cost is assumed at 3 cents per ton/mile

Future Mines in BC are:

- Lost Fox
- Hobbit Boatch
- Summit
- Ground Hog Coalfield

Lost Fox, **Hobbit Boatch** and **Summit** are situated in the Klappan fields, approximately 110 miles northwest of Minaret. The three coal fields combined are expected to produce 9.1 million tons of coal per year, once they start operation in 2020. To begin operation, the three fields would need an initial total capital expenditure of about $547 million. Coal from Lost Fox can bring ACRL $30.7 million in revenue, while Hobbit Boatch and Summit can bring another $51.5 and $9.4 million respectively. Being situated so close to Minaret, the coal will be shipped out of Prince Rupert.

The **Groundhog Coalfield** is situated just south of the Klappan fields, and is expected to produce 1.3 million tons of coal per year from 2020. With a mine life of 17 years, this mine can bring in an annual revenue of $16.7 million for ACRL.

Assuming a trucking cost per ton-mile of 11 cents and a rail cost of 3 cents per ton-mile, the difference in transportation costs for the mine products appear clearer. Of the mines listed in the table below, only Shaft Creek should opt for trucking the minerals instead of transporting them through the rail system. The final cost figures include truck transportation to the rail-head. Furthermore, for Division Mountain, Grum and Swim, it is cheaper to transport the goods to Haines instead of Skagway or Stewart.

Table 22: Comparison of Rail and Truck Transportation Costs

Mine	Truck Cost $/Ton	Total Annual Trucking Cost $	Train Cost $/Ton	Total Annual Train Cost $	Alternative Route Train Cost $/ Ton	Total Annual Train Cost $
Yukon Mines						
Division Mountain	19	26,371,609	7	10,017,787	7	9,760,920
Howards Pass	70	51,844,794	30	22,193,049		
Grum	38	15,510,447	20	8,007,017	16	6,420,721
Swim	38	2,330,799	20	1,203,237	16	964,860
Wolverine	77	12,532,679	18	2,904,286	18	2,934,803
Kudz Ze Kayah	77	13,484,929	17	3,064,757	18	3,097,593
Fyre	77	14,864,458	17	3,378,286	18	3,414,482
Ice	77	1,657,875	17	376,790	18	380,827
Minto	33	1,062,031	11	340,407		
BC Mines						
Shaft Creek	18	4,364,377	22	5,106,468		
Kemess N	35	7,138,577	18	3,698,242		
Kemess S	35	6,050,720	21	3,702,652		
Lost Fox	21	64,982,930	11	32,756,547		
Hobbit Boatch	21	109,058,840	11	54,974,299		
Summit	21	19,885,248	11	10,023,741		
Groundhog	23	30,961,908	13	16,666,099		

Note: Trucking cost is assumed at 11 cents per ton/mile, while rail cost is assumed at 3 cents per ton/mile

Tier 3 Mines: Future Development Possibilities:

The low transportation costs presented by ACRL may induce new exploration activity in the region, resulting in new discoveries of mineral deposits in the future. The Yukon

Geological Survey office conducts mineral resource assessments[26] where a panel of expert geologists is asked about the mineral potential of predefined tracts of land. Their subjective opinion on the probability of a mine of a predefined standard occurring within this tract of land is then transformed into a probability matrix where the number of standard mines in a continuous scale is given per confidence level. The following table shows selected information about probable future mines at the 50 per cent confidence level. At that confidence level, the survey reveals that there may be 124 new mines of standard size occurring within the Yukon in the future.

Table 23: Tier 3 Probabilistic Mines for Yukon

	Copper	Lead	Zinc	Totals
Rail Tons over mine life	9,601,657	5,768,460	11,988,246	27,358,363
Annual Rail Tons	240,041	144,211	299,706	683,959
Pure Metal (Tons) over mine life	2,400,414	2,884,230	5,994,123	11,278,767
Pure Metal (Tons) annual	60,010	72,106	149,853	281,969
Value of Metal ($) over mine life	10,584,014,941	4,768,978,757	13,214,779,703	28,567,773,401
Value of Metal ($) annual	264,600,374	119,224,469	330,369,493	714,194,335
Total Full-Time Equivalent Jobs over mine life	6,383	2,876	7,970	17,229
Total Full-time Equivalent Jobs per year	160	72	199	431

Note: Price of metals per pound is assumed as follows: Copper $2.00, Lead $0.75, Zinc $1.00; Mine life is assumed at 40 years

Table 24: Tier 3 Probabilistic Mines for BC

	Copper	Lead	Zinc	Totals
Rail Tons over mine life	7,969,375	4,787,822	9,950,245	22,707,441
Annual Rail Tons	199,234	119,696	248,756	567,686
Pure Metal (Tons) over mine life	1,992,344	2,393,911	4,975,122	9,361,377
Pure Metal (Tons) annual	49,809	59,848	124,378	234,034
Value of Metal ($) over mine life	8,784,732,401	3,958,252,368	10,968,267,154	23,711,251,923
Value of Metal ($) annual	219,618,310	98,956,309	274,206,679	592,781,298
Total Full-Time Equivalent Jobs over mine life	5,298	2,387	6,615	20,276
Total Full-time Equivalent Jobs per year	132	60	165	507

Note: Price of metals per pound is assumed as follows: Copper $2.00, Lead $0.75, Zinc $1.00; Mine life is assumed at 40 years

Although these mines would likely be developed after the time-horizon considered for the Informetrica impact cases, the information is useful for financial analysts conducting longer-term planning relevant to ACRL. In effect, as the tier two mines decline in production, these tier three mines should pick up and keep total mining activity at a stable level, providing justification for extrapolating the forecast beyond 2025.

Impact of ACRL Induced Mines to the Economy:

Division Mountain, Minto, Wolverine, Howard's Pass, Kemess North and Kemess South deposits are expected to be developed into operating mines before the completion of ACRL. Since these mines will come into operation irrespective of whether the ACRL project goes ahead or not, they are included in the Informetrica Reference Case for the purpose of this study.

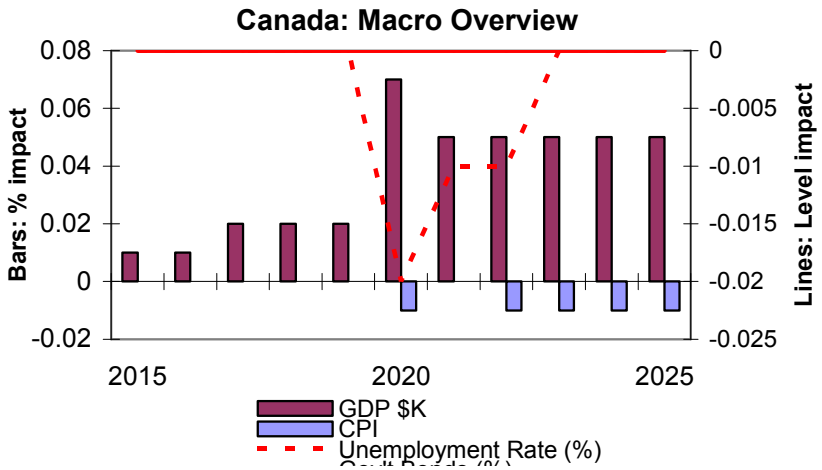
[26] http://www.geology.gov.yk.ca/projects/minass.html

The low cost of transportation due to the ACRL is expected to induce further mines to go into operation. The following mines are included in the Direct Effects of the ACRL[27] in the current study:

- Fyre (copper)
- Kudz Ze Kayah (lead-zinc-copper)
- Grum (lead-zinc)
- Ice (copper)
- Swim (lead-zinc)
- Lost Fox (anthracite coal)
- Hobbit Boatch (anthracite coal)
- Summit (anthracite coal)
- Ground Hog Coalfield (anthracite coal)

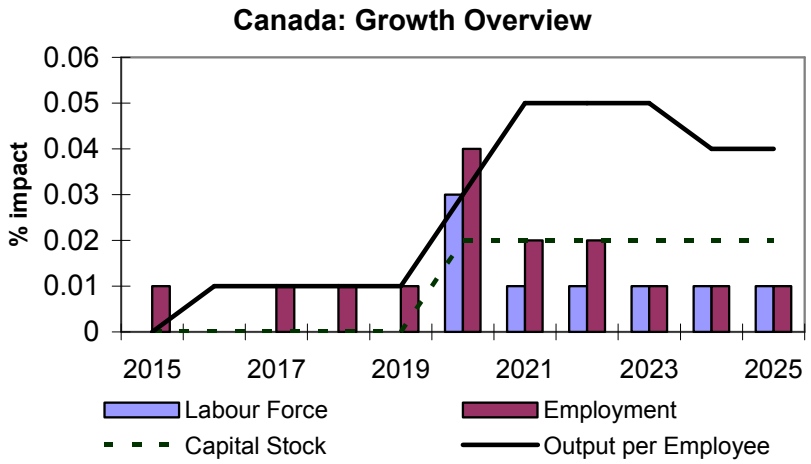
These will have an effect on not only the regional economies, but also at the national level. The large majority of these mines are expected to begin construction in 2020, and one mine in 2015 and one in 2025. Therefore, the impact occurs mainly in the last six years of the impact horizon.

Fyre copper mine (construction 2015 and four years of operations) has only a minor impact on the national economy, as shown in the table below, while the impact of those that begin construction in 2020 is more significant.

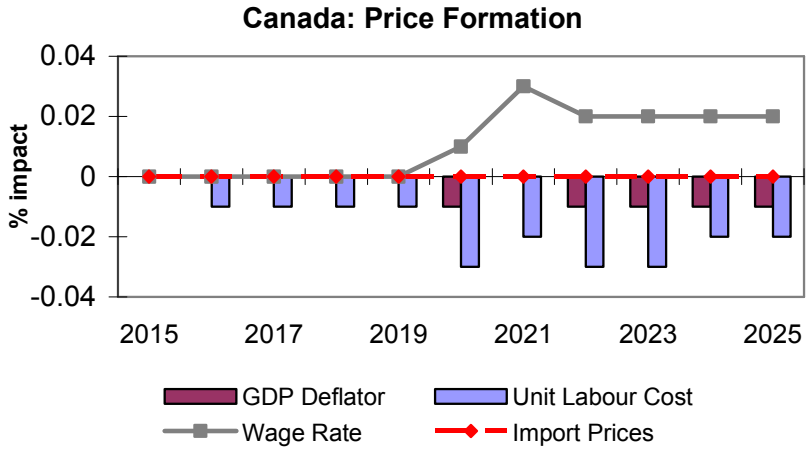


The GDP impact of the mines is approximately half the aggregate impact after 2019; this is also the case for the unemployment rate impact. Mine construction dominates the GDP impact in both 2015 and 2020. The export of base metals and coal are the major contributors to the other years of the mine impact.

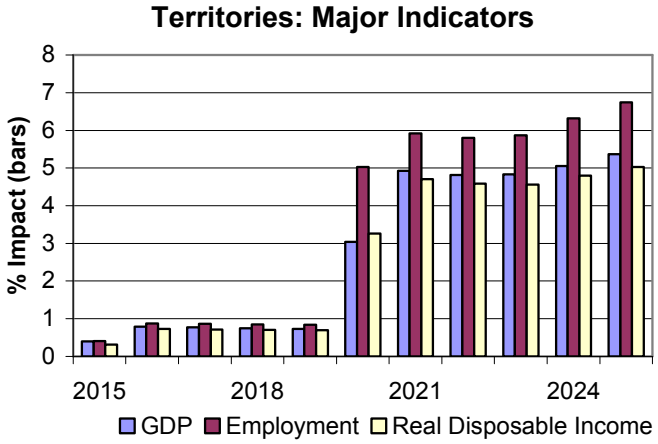
[27] The Direct Effects of the ACRL:Literature and Data Review (Work Package D1c - Economic Impacts Assessment)



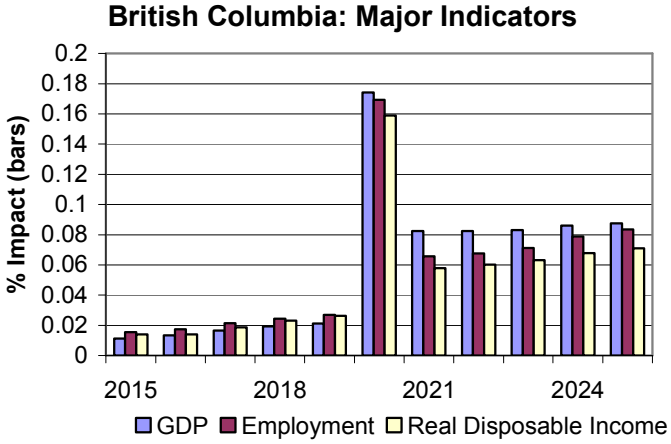
Employment impacts related to the new mines peaks in 2020, which coincides with the construction of the majority of these mines. Noticeable productivity improvements can be attributed to the mine construction and operation phases.



There is an almost negligible impact on the consumer price index. Wage rates do improve over the period of the impact but these are more than offset by the productivity gains of the economy as a whole.



The Fyre copper mine is a very short lived project, but provides a GDP impact of almost one per cent on the territories' economy, and an employment impact of 0.5 per cent. Kudz Ze Kayah, Ice and Grum mines result in approximately a 3.5 per cent impact on the territories' GDP, employment impacts are in the range of 2 to 2.5 per cent and real disposable income impacts are mainly steady at 2.7 per cent. Note that the mines account for over 60 per cent of the aggregate impact from 2021 forward.



BC impacts are primarily from the induced effects of higher activity from the mines from 2015 to 2019. In 2020, BC is expected to develop four coal mines, which will have a GDP impact of approximately 0.1 per cent on the BC economy. Employment impacts from the operation of the coal mines will average 0.06 per cent.

The deposits that have a possibility of being turned into mines beyond the forecast period are not included in the impact cases, but should be taken into account during longer-term financial planning.

Crest Iron Deposit:

Some mining prospects do not fit the patterns of Tier 1, 2 or 3, because they are very large sites. The Crest Iron Deposit is large enough to warrant its own separate analysis since the impact of Crest on the ACRL network, as well as the economy of Yukon in particular and Canada in general is significant.

The mammoth Crest Iron Deposit situated in the snake river area of northeastern Yukon is one of the largest iron deposits in North America. If developed into a mining project, Crest would produce 28 million tons per year of pellets of 67 per cent iron. One possible scenario for developing the Crest mines may include a 750 million USD milling and processing plant and 4 pellet plants of 7 metric-tons per year capacity worth US$ 450 million each. The table below outlines a possible scenario for capital expenditure for the project. This scenario assumes that Crest would start operating at partial capacity the year ACRL starts operation.

Table 25: Crest Iron Mine

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Milling and Processing	529	-	132	-	221	-	-	-	-	-	-
Pellet Plant	529	-	529	-	529	-	529	-	-	-	-
Annual Production (million tons)		7	7	14	14	21	21	28	28	28	28
Annual Value $ millions		329	329	657	657	986	986	1315	1315	1315	1315

Note: Iron Ore price assumed at US$ 44/tonne

Operating costs of Crest at full capacity is estimated at $904.4 million. This assumes a 44 per cent grade deposit and a 70 per cent mill recovery grade. Currently, we assume that milling and processing will occur at minesite, with the mined ore being railed down to Carmacks for pelletizing. A 323 mile-railway line will have to be built for this purpose. The 4 pellet plants will be built and operated at Carmacks. The resulting pellets can be railed through ACRL lines for either 249 miles to Haines or 830 miles to Port McKenzie in Alaska.

Appendix 5: Fiscal Effects of ACRL

1 Introduction

This Appendix provides estimates on the possible fiscal implications of the ACRL for provincial governments, local governments, and the federal government. (The expenditures and revenues of governments are only articulated at the national level in our model.) Positive economic activity undertaken by the private sector invariably improves the fiscal position of governments. The various tax systems take their share of increased payrolls, more consumer spending, and improved profits. If the private sector increases employment, then government transfers for social assistance and unemployment decline.

In some cases, governments increase their spending on unrelated areas when their fiscal position improves. However, this is usually less of an increase than their overall fiscal position improvements. Thus debt declines and interest payments also decline over time.

Governments may also have direct linkages to the private sector project. In some cases, there may be the need for government to spend money on training staff, providing ancillary investments, or regulating the new activity. In other cases, the project might improve the efficiency of the economy, reducing government expenditures. In the sections below each level of government is examined in greater detail.

2 Federal Government

Canada: Federal Government Revenues and Expenditures
($Nominal Mns unless otherwise indicated)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
	Impact															
Total Revenue	**474**	**631**	**679**	**471**	**326**	**301**	**320**	**334**	**571**	**586**	**749**	**712**	**692**	**741**	**827**	**927**
Direct, on Persons	164	300	350	294	207	161	157	165	179	181	230	203	164	152	146	152
Direct, on Corporations & GBE	102	37	14	-50	-29	11	30	33	31	35	38	17	10	16	36	47
Direct, on non-Residents	8	14	16	14	9	6	6	5	6	6	9	8	8	8	8	9
Contributions to Social Insurance Plans	37	65	72	57	37	27	26	28	30	29	38	32	22	19	19	21
Indirect Taxes on Production & Imports	156	202	210	139	88	82	87	87	89	84	120	94	82	83	87	92
Other Transfers from Persons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Investment Income	0	0	0	0	0	0	0	0	221	237	298	343	391	449	516	592
Transfers from Provincial Governments	-1	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0
Sales of Goods & Services	8	13	17	16	14	13	14	14	15	14	16	15	14	14	14	15
Total Expenditure	**-144**	**-62**	**42**	**207**	**267**	**229**	**214**	**249**	**319**	**322**	**156**	**144**	**87**	**47**	**24**	**16**
Current on Goods and Services	-58	18	93	182	205	172	179	221	288	163	36	3	-5	-13	-23	-30
Transfers to Persons	-100	-98	-80	-13	11	-3	-24	-33	-35	-30	-61	-5	0	0	-9	-14
Transfers to Business	10	10	10	6	5	11	12	12	12	11	13	14	13	13	14	14
Transfers to non-Residents	16	21	23	17	11	11	11	11	12	11	14	11	8	8	8	9
Transfers to Provincial Governments	-12	20	63	115	148	152	152	158	167	153	140	104	57	28	23	26
Transfers to Local Governments	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest Payments	0	-33	-68	-101	-114	-115	-117	-121	-123	13	13	18	14	11	10	11
CCA, capital acquisition and net capital transfers	7	-25	-34	-35	-23	-11	-6	-5	-5	-3	0	-4	5	5	3	0
Net Lending	**625**	**668**	**603**	**229**	**36**	**61**	**100**	**80**	**247**	**261**	**593**	**564**	**610**	**699**	**806**	**911**
Net Debt	**-625**	**-1292**	**-1896**	**-2124**	**-2160**	**-2221**	**-2321**	**-2401**	**-2648**	**-2908**	**-3501**	**-4065**	**-4675**	**-5374**	**-6180**	**-7090**
Financial Assets	0	0	0	0	0	0	0	0	2910	3156	3833	4321	4875	5563	6382	7312
Financial Liabilities	-625	-1292	-1896	-2124	-2160	-2221	-2321	-2401	262	248	331	255	200	189	202	222

2.1 *Revenues*

Federal direct taxes on persons and businesses increase, The GST yields additional revenue. All revenue sources improve. As surpluses accumulate, interest income increases. (Our operating rule for financial management is that government debt is repaid first until it reaches a threshold level. Then financial assets are accumulated. The pattern of investment income and interest payments should be analyzed together.)

2.2 *Expenditures*

Social expenditures are decreased, given the improvement in employment. Other components react positively to the growing economy. Interest payments are lower given the reduced debt.

2.2.1 Direct Effects

No outlays were incorporated as part of the ACRL impacts. It may be necessary for the federal government to move customs resources to an appropriate site for clearance of cargos to and from Alaska. This is more likely a reallocation of resources, rather than additional resources.

2.3 *Balance and Debt*

Over the period from 2010 through 2025, net financial assets of the federal government improve by $7.1 billion, This, in turn, improves the net financing flows of the federal government (by $581 million in 2025.)

3 Provincial/Territorial Governments

Canada: Provincial Government Revenues and Expenditures
($Nominal unless otherwise indicated)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
								Impact								
Total Revenue	**466**	**916**	**1026**	**839**	**552**	**443**	**487**	**519**	**545**	**526**	**693**	**674**	**646**	**686**	**786**	**913**
Direct, on Persons	97	178	207	174	123	95	93	98	106	107	136	120	97	90	87	90
Direct, on Corporations & GBE	52	19	7	-25	-15	5	16	17	16	18	19	8	5	8	18	24
WCB & Contributions to Social Insurance	5	13	19	23	22	21	19	18	18	17	18	18	17	16	15	15
Indirect Taxes	300	326	350	214	143	152	152	150	154	138	206	162	149	148	152	158
Investment Income	14	343	358	320	115	2	40	62	67	74	152	238	297	373	468	578
of which: Royalties	*10*	*337*	*345*	*304*	*106*	*3*	*47*	*72*	*75*	*80*	*72*	*137*	*137*	*135*	*144*	*160*
Transfers from Federal Government	-12	20	63	115	148	152	152	158	167	153	140	104	57	28	23	26
Transfers from Local Governments	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sales of Goods & Services	10	17	21	19	15	14	15	16	17	17	21	22	23	24	23	23
Total Expenditure	**-115**	**95**	**305**	**589**	**729**	**678**	**659**	**697**	**756**	**844**	**769**	**494**	**190**	**76**	**120**	**165**
Current on Goods and Services	-84	116	289	497	586	511	494	538	603	697	660	406	125	-25	-53	-77
Transfers to Persons	-23	-28	-17	17	48	68	83	96	112	132	146	180	207	232	253	275
Transfers to Business	20	18	19	12	10	22	24	23	23	22	26	28	26	27	28	28
Transfers to Local Governments	-27	18	82	160	191	169	136	106	74	38	-33	-128	-176	-163	-113	-67
Transfers to Federal Governments	-1	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0
Interest Payments	0	-30	-67	-98	-106	-93	-78	-68	-58	-46	-31	8	7	5	5	5
CCA, capital acquisition and net capital transfers	20	-57	-87	-96	-71	-39	-26	-22	-23	-19	-9	-20	7	9	4	-4
Net Lending	**601**	**764**	**634**	**154**	**-248**	**-274**	**-198**	**-200**	**-234**	**-337**	**-85**	**160**	**463**	**619**	**670**	**744**
Net Debt	**-601**	**-1365**	**-1999**	**-2153**	**-1905**	**-1631**	**-1433**	**-1233**	**-999**	**-662**	**-577**	**-737**	**-1200**	**-1818**	**-2489**	**-3233**
Financial Assets	0	0	0	0	0	0	0	0	0	0	743	864	1300	1913	2590	3344
Financial Liabilities	-601	-1365	-1999	-2153	-1905	-1631	-1433	-1233	-999	-662	166	128	100	94	101	111

3.1 *Revenues*

Most revenue categories improve, given the positive economic impacts of ACRL construction and operations.

3.2 *Expenditures*

3.2.1 Direct Effects

In BC and Yukon, the rail line will substitute for much of the truck traffic on the main roads moving goods to Alaska, Yukon, and northern BC. This will mean lower maintenance costs on roads, a saving for provincial governments. An offset may be the construction of grade crossings for roads that move across the rail line.

3.2.2 Induced Effects

Provincial spending on health and education has in the past been linked to the fiscal position of the provincial governments. Given the improvement from enhanced revenue, there is an induced increase in spending on health and education. This effect persists as long as the fiscal position is improved, although not all of the improvement is spent. The alternative for provincial governments is to invest in the rail line or to reduce debt that much more.

3.3 *Balance and Debt*

The fiscal position of the provincial governments is represented by the improved balance of net financial assets of $3.1 billion by 2025. In turn, this balance is used to reduce

borrowing and the debt position of the governments improves. Net interest payments are lower as a result.

4 Local Governments

Canada: Municipal Government Revenues and Expenditures
($Nominal unless otherwise indicated)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
								Impact								
Total Revenue	**7**	**66**	**145**	**213**	**230**	**207**	**172**	**144**	**118**	**83**	**22**	**-68**	**-123**	**-119**	**-72**	**-26**
Indirect Taxes	8	19	34	36	28	23	18	21	26	29	33	43	37	28	23	21
Transfers from Persons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Investment Income	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Transfers from Federal Government	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Transfers from Provincial Governments	-27	18	82	160	191	169	136	106	74	38	-33	-128	-176	-163	-113	-67
Sales of Goods & Services	27	29	29	17	11	15	17	17	18	16	23	17	16	17	18	20
Total Expenditure	**-66**	**43**	**197**	**386**	**462**	**408**	**329**	**256**	**179**	**91**	**-81**	**-308**	**-426**	**-394**	**-273**	**-162**
Total Current on Goods & Services	-50	76	235	411	465	391	300	220	136	43	-131	-367	-482	-441	-310	-192
Transfers to Persons	-18	-32	-38	-30	-20	-16	-15	-15	-14	-11	-14	-6	1	6	9	11
Transfers to Business	3	2	3	2	1	3	3	3	3	3	4	4	4	4	4	4
Transfers to Provincial Governments	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Interest Payments	0	-4	-3	3	15	29	40	48	53	56	60	60	52	37	24	15
CCA, capital acquisition and net capital transfers	24	-51	-85	-100	-79	-51	-38	-33	-34	-30	-19	-28	-1	2	-3	-12
Net Lending	**97**	**-28**	**-137**	**-273**	**-311**	**-252**	**-195**	**-145**	**-95**	**-38**	**84**	**212**	**302**	**277**	**198**	**124**
Net Debt	**-97**	**-69**	**68**	**341**	**652**	**904**	**1099**	**1244**	**1339**	**1377**	**1293**	**1081**	**779**	**502**	**304**	**180**
Financial Assets	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Financial Liabilities	-97	-69	68	341	652	904	1099	1244	1339	1377	1293	1081	779	502	304	180

4.1 *Revenues*

There are induced changes from fees, indirect taxes, and higher transfers from provincial governments. Property taxes may increase in those local communities that are served by the rail line.

4.2 *Expenditures*

4.2.1 Direct Effects

Movement of people may affect specific local governments, but collectively the effects should be minimal.

4.2.2 Induced Effects

Current goods and services increase, reflecting the more robust economy. Eventually higher local debt levels decrease spending. Transfers to persons decline as welfare payrolls shrink.

4.3 *Balance and Debt*

Net debt is only slightly higher at the end of the period ($180 million), with net debt service also slightly higher.

5 Public Pension Plan System

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
								Impact								
Canada Pension Plan																
Total Revenue	**28**	**68**	**87**	**84**	**64**	**47**	**40**	**40**	**42**	**43**	**50**	**60**	**55**	**52**	**51**	**53**
Contributions	28	66	84	80	59	40	33	32	34	34	40	48	42	38	37	37
Investment Income	1	2	3	5	6	6	7	7	8	9	10	11	13	14	15	16
Total Expenditure	**-1**	**-1**	**1**	**3**	**6**	**5**	**3**	**1**	**-1**	**-3**	**-5**	**-5**	**-5**	**-5**	**-6**	**-6**
Benefits Paid	-1	-2	0	2	4	3	1	-1	-2	-4	-5	-5	-5	-5	-5	-6
Administration	0	0	1	2	2	2	1	2	2	1	0	0	0	0	0	0
Saving	**30**	**69**	**87**	**81**	**59**	**42**	**37**	**39**	**43**	**46**	**55**	**65**	**60**	**57**	**57**	**59**
Assets	30	99	186	267	325	367	405	444	487	532	587	652	712	769	826	885
Quebec Pension Plan																
Total Revenue	**6**	**14**	**20**	**20**	**18**	**15**	**14**	**14**	**15**	**15**	**17**	**16**	**17**	**16**	**17**	**17**
Contributions	5	13	18	17	14	10	9	9	9	8	10	8	7	6	6	6
Investment Income	0	1	2	3	4	4	5	5	6	7	7	9	10	10	11	12
Total Expenditure	**0**	**0**	**0**	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**1**	**2**	**3**	**3**	**4**	**5**
Benefits Paid	0	0	0	0	1	1	0	0	0	0	1	2	3	3	4	5
Administration	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Saving	**6**	**14**	**20**	**20**	**17**	**14**	**13**	**14**	**15**	**15**	**16**	**14**	**14**	**13**	**13**	**13**
Assets	6	20	39	59	76	90	103	116	131	145	161	175	189	202	214	227

All components here are dominated by the increased employment. Tighter labour markets induce older people to continue working, reducing the CPP payouts marginally. Net assets are higher by $227 million and $885 million by the end of the period for QPP and CPP, respectively.

6 Total Government

Table 9, Sector Accounts, Government
($Nominal, Mns, SSAR)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
								Impact								
Total Revenues	**1021**	**1656**	**1813**	**1350**	**849**	**690**	**743**	**786**	**1048**	**1060**	**1425**	**1418**	**1405**	**1511**	**1698**	**1925**
Direct Taxes from Persons	261	478	557	468	330	257	250	263	285	288	366	324	261	242	233	241
Direct Taxes from Business	154	56	21	-75	-44	16	46	50	48	52	58	25	15	24	54	71
Direct Taxes from Non-residents	8	14	16	14	9	6	6	5	6	6	9	8	8	8	8	9
Contributions to Social Insurance	75	156	193	176	132	98	87	86	90	89	107	106	89	80	76	78
Indirect Taxes	464	546	594	389	259	258	258	258	269	251	359	298	268	258	261	271
Transfers from Persons	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Investment Income	15	346	364	327	124	13	52	75	302	326	467	601	710	846	1009	1197
Sales of Goods & Services	44	60	68	52	40	43	46	48	50	48	60	55	54	54	55	57
Total Expenditures	**-286**	**36**	**400**	**909**	**1124**	**998**	**915**	**938**	**1011**	**1061**	**734**	**350**	**-32**	**-139**	**-41**	**59**
Current Spending on Goods & Services	-193	210	618	1092	1258	1076	975	981	1029	903	566	42	-362	-480	-386	-299
Transfers to Persons	-142	-160	-135	-23	42	54	45	48	61	88	68	165	206	236	252	271
Transfers to Business	33	30	31	19	17	36	39	38	38	36	44	46	43	44	46	47
Transfers to Non-residents	16	21	23	17	11	11	11	11	11	11	14	11	8	8	8	9
Interest on Public Debt	0	-67	-138	-196	-205	-180	-155	-141	-128	24	41	87	72	54	40	31
CCA, capital acquisition and net capital transfers	51	-134	-207	-231	-172	-102	-71	-61	-61	-52	-29	-53	11	15	4	-16
Net Lending	**1359**	**1487**	**1207**	**210**	**-447**	**-409**	**-243**	**-213**	**-25**	**-53**	**662**	**1015**	**1448**	**1664**	**1743**	**1851**
Net Debt	**-1359**	**-2845**	**-4052**	**-4262**	**-3815**	**-3405**	**-3162**	**-2949**	**-2924**	**-2871**	**-3534**	**-4548**	**-5997**	**-7661**	**-9404**	**-11255**
Financial Assets	36	119	225	325	401	457	507	560	3527	3834	5324	6012	7075	8447	10011	11768
Financial Liabilities	-1323	-2726	-3827	-3936	-3413	-2948	-2655	-2390	602	963	1790	1464	1079	786	607	513

Combined improvement in government balances across all levels of government, including the public pension system demonstrates the inherent interest of governments in economic development as a source of increased resources for government. Collectively

governments in 2025, will have net assets about $12 billion more as result of the project proceeding.

This improvement does not mean that governments are prepared to finance the project. Rather they see the issue as any large project will enhance their fiscal position. Their question is what is the minimum they need to do to cause the project to proceed? And if one project is at the expense of another then they need to do a net calculation to decide where their preference falls. Different levels of government may have different preferences. Different departments may look at the projects through different lenses.

For the ACRL project the scene is even more complicated. Many of the economic benefits of this project accrue to Alaska through lower costs of transportation on resupply and investment goods, including support to the Alaska Highway Gas Pipeline. Longer term, mineral resources may be exploitable in Alaska that would otherwise remain dormant. Increased security of supply, national defense, and other considerations bulk much larger in Alaska with its much larger population.

7 Interests of Government Departments in Project

What are the interests of different departments? In the list below the "headlines" are noted. This and other studies in the ACRL portfolio can shed some light on these interests.

7.1 *Transport Canada*

- Extension of Canadian rail system, improved volume on whole system
- Improved utilization of Prince Rupert

7.2 *Finance Canada*

- Enhancement of Canadian infrastructure and improved economic base through development of resources in North
- Possible room for reduction of transfers to territories

7.3 *Natural Resources Canada*

- Increase in reserves for major metals
- Reduced costs of pipeline construction

7.4 *Yukon Natural Resources*

The ACRL could be the enabler that reduces the costs of new mines in Yukon sufficiently to lead to a major expansion in the mining base. (See Appendix 4)

7.5 *Yukon Economic Development*

Numerous opportunities exist for the development of new businesses to support the construction and operations phase of the ACRL, the new mines, and the improved economic base of people with incomes. (See Appendix 6 for some examples and a framework for further analysis.)

7.6 *BC Natural Resources*

The ACRL will lead to lower costs of transportation for northern BC mines. This could affect input costs and transportation out of concentrates.

Appendix 6: Economic Development Opportunities

1 Introduction

The construction and operation of a railroad generates substantial demand for inputs. The input-output table provides a recipe book for such activities, along with the current availability of suppliers in different provinces and territories. Informetrica has reviewed these inputs and identified some areas for potential further development in the Yukon.

At the same time, the tool developed for this approach allows for the allocation of GDP by separate territory, by industry, for any impact developed in TIM. Therefore, there are two pieces of information: the time path of demands on a particular sector with the current amount occurring in the Territory, along with a capacity to change the allocation to put more (or less) into that location.

2 Methodology

The Informetrica Model (TIM) generates forecasts of the Canadian economy, ten provincial economies and the combined Territories' economy.[28] This is a shortcoming when running individual territory impact scenarios. To overcome this we have developed a standalone model that shows impacts on individual territories relative to data from a particular base year.

2.1 *Base Year Data*

Statistics Canada (SC) provides a number of data sets that can be used to gauge relative impacts.

The first is the annual regional constant dollar GDP by industry. This is a very detailed view of regional GDP (ten provinces and three territories), but it has a very large number of confidential cells (proportionally more in the smaller regions), and the industry dimension and definitions change over time. Informetrica uses a variety of independent data sets (i.e., Business Register) to provide initial estimates of the confidential cells. Informetrica then uses a mathematical technique called RAS to balance these estimates with known values and totals. Informetrica uses link estimates to extend the currently active data set with terminated historical data sets. The end result is that Informetrica now has a highly detailed, internally consistent, and historically long data set of industry GDP by ten provinces and three territories.[29] These data are then used in TIM and currently updated to 2003. The Yukon GDP by industry data is then extended using the base case projection out to 2004 (the chosen base year).

The second data set is employment by industry by region consistent with SC's Input-Output tables. This data set also has confidential cells and estimates are generated using

[28] The three territories are aggregated.

[29] This data set may not be identical to SC's data set. SC cannot comment on individual cells or say that the data sets are identical without breaking their confidentiality regulations. This leaves the only comment as "The data sets are not identical", but even that comment runs the risk of breaking the regulations under the right conditions.

other data sources and the newly generated GDP estimates. This process was only used to generate the 2004 employment data set.

2.2 *Impact*

The territories combined GDP impact can then be allocated by individual territory based on simple rules, in the case of ACRL impact the entire territories impact is allocated to the Yukon. This impact can now be compared to the 2004 base year GDP in both level and per cent impact.

The employment impact derives from the level impact of GDP divided by the 2004 base year labour productivity. [The overall Territories employment would reflect productivity changes. If we make the employment impacts consistent, do we not adjust for aggregate productivity across the Territories for a given industry?]

3 Identifying Economic Development Opportunities

The Yukon is a small economic region and as such does not have the industrial diversity of some of the larger provinces (Ontario, BC, Alberta). As a result, a large portion of goods consumed in the Territory are imported, either from abroad or from other regions in Canada. A higher (competitive) industrial diversity in a region will result in a larger regional impact multiplier through less import leakage.

Large scale projects, like ACRL and pipeline projects, in more remote areas provide unique conditions that would be unavailable under normal circumstances. The first is that during construction these projects require large amounts of goods in a very short period of time, usually followed by some long-term demand. The second is that a more local supplier has the cost/price advantage of a shorter transportation distance and quicker response time.

Economic development opportunities can be identified by comparing industry GDP impacts in the Yukon and the rest of Canada. There will be two kinds of opportunities; (1) where an industry already exists in the Yukon and obviously could be expanded to meet demand (i.e., sand and gravel quarries), or (2) where only a small or no industry exists but a large project could spur major expansion or entry into the market (i.e., cement or ready-mix concrete).

Informetrica has included a number of type 1 opportunities into the ACRL impact. These include assumptions on:

- Accommodation and food services – based on the positive impact on income of the Yukon residents
- Retail and wholesale trade services – based on the positive impact on income of Yukon residents
- Professional services – based on increased activity in the region
- Sand, stone & gravel – based on construction period demands

There remain other type 1 opportunities, but these are the most obvious to be included in the impact scenarios.

Type 2 opportunities (not included in the impact statement) would involve industries like, or engaged in:

- Wrapping and pre-welding of the pipe – this could result in a reduction in the number of on site welds and reduce the handling costs of the long-distance shipping.
- Cement ties and culverts – prefabrication of these components for the rail line construction could be done a lot closer to the construction site.
- Other light manufacturing – industries like metal fabricated products, or even cement/clinker.

The associated Excel file[30] for this Appendix provides a method to test both type 1 and type 2 opportunities (see instruction worksheet in the Excel file).

4 Overall Effect of Type 2

Using the associated Excel file, we tested a number of economic opportunities where the Yukon economy would capture a certain percentage of the rest of Canada impact. The opportunities considered are noted below.

Possible Further Deepening Opportunities (\millions of 1997 $)

Industry	Initial Impact Amount	Adjustment	Final Impact Amount
Cement	0	50%	3.5
Ready-mix concrete and products	0.2	50%	7.7
Fabricated metal products	0	10%	2.5
Air transportation	0.4	25%	8.4
Health care	0.3	10%	11.4
Accommodation and food services	3.4	20%	9.7

The result was to increase the average annual impact from $406 million (31% of the 2004 economy) to $445 million (34%). There is a cumulative impact of approximately $620 million over the period 2010 through 2025. In a full impact there would be additional induced effects on wages, prices, and the GDP of other industries.

5 Further Work

This approach is a simple, but useful, tool in determining where industrial opportunities are available and provides an approximate size.

More detailed studies could be undertaken in the future. Discussions with business communities in the Yukon, Alaska, and Northern BC may identify other probable opportunities.

[30] Yukon_impact_EcDev.xls

Appendix 7: Consumer Price Impacts

1 Introduction

A very large portion of goods (food, consumer goods, business inputs, machinery and equipment) consumed in both Alaska and the Yukon are imported from other regions in North America or from abroad. These two regions are a significant distance from the production plants in North America, but a few hundred miles closer to China and Japan by ship. The added distance to North American production facilities increases the purchaser's price from the higher transportation costs. Importers will try to minimize these costs by selecting the transportation method with the lowest cost per unit.

Operation of the ACRL will introduce another transportation option for these two remote regions. Currently, freight destined for the Yukon is being served almost exclusively by truck transportation. Freight destined for Alaska moves by rail-barge out of Seattle/Tacoma and the west coast of BC and by truck through the Yukon on the Alaska Highway.

It is anticipated that a rail line that connects the Alaska Railroad to the rest of the North American railroad system (ACRL), would result in a reduction of transportation costs on goods sold in Alaska and the Yukon. This reduction in costs would result in a lower cost of living (CPI), and raise real incomes (at least temporarily).

2 Mechanism of CPI Reduction

In the short run, the reduction of transportation costs results in lower prices of goods sold in both Alaska and the Yukon. This will be directly reflected in the CPI as the price of most goods will fall. If incomes remained unchanged, then there would be an increase in real disposable income, which would have a positive effect on consumption.

In the longer run, nominal wage rate demands would grow less rapidly and businesses would be "clawing back" some of the real wage gains. This may not be a complete readjustment back to base level real wage rates because there has been a shift in production which has resulted in an increase in productivity, which allows for real wages to be above base so long as the productivity shift is permanent. This will permanently improve their standard of living.

The price drop will not be limited to goods, service prices will also adjust down. This will occur for two reasons: (1) commodity inputs for business will be less expensive and this input cost reduction and competition in the industry will force this reduction to be reflected in their selling price, and (2) as nominal wage rate demands for all industries soften then unit labour costs (another major component in price formation) will also shrink.

With these lower nominal wages and lower nominal costs for supplies, Yukoners may be better able to compete with other regions.

There is another edge to the sword. If there are any industries that exist currently in the Yukon or Alaska due to the high transportation cost, then these industries may be at risk from imports from outside of the region with an improved and lower cost transportation system.

3 Methodology and Data Issues

Unfortunately, the price detail available for the Yukon is limited and for what is available it uses only Whitehorse as the sample. However, there are a number of different methodologies that could work around this problem and be used to analyze the CPI impact of a reduction in transportation as an input cost.

Informetrica will utilize the input-output price model in The Informetrica Model (TIM) at a national level to simulate the expected price impact on the Yukon economy.

The ex ante reduction in transportation costs paid for by Yukoners will be in the range of $4.5 million, which when scaled up to the national level would be a reduction of $3,600 million. The Canadian input-output system uses a fictive industry called "Transportation Margins" that is used to apply transportation costs on goods demanded in the economy. In order to simulate the price impact on the economy we will reduce the selling price of transportation margins to reflect the $3.6 billion reduction in costs (approximately a 16% price reduction). This price impact will be reflected in the selling prices of all goods that use these margins (pipelines are excluded).

4 Results

The drop in transportation costs reduces the CPI by approximately 0.2 to 0.3 per cent, in the first four years, followed by a fairly stable average impact of 0.1 per cent.

The drop in the CPI has a number of anticipated effects like softening nominal wage rate demands in the early years and it spurs both consumer demand for goods and business investment.

The erosion of the CPI comes from the response to increased demand. As demand increases there is also an increase in employment demand, which lowers the unemployment rate. The lower unemployment rate puts upward pressure on wage rate demands and nominal wage income increases with an impact of more than twice that of real demand. Consequently, there is an increase in unit labour costs which puts upward pressure on prices.

Real disposable income is increased, on average, by 0.4 per cent, and peaks in the fourth year with an impact of 0.5 per cent. Improvements in the first three years are derived mainly from the CPI drop, while the remaining years are dominated by improved nominal income gains.

Exports and imports increase with the lower transportation costs. Exports as they are now are a little bit more competitive. Imports rise with the increased domestic demand fueled by lower prices.

Table Z: Summary Impact Table of Transportation Margin Price Reductions

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Percent Impact											
Consumer Price Index (1992=100)	-0.3	-0.2	-0.2	-0.1	-0.1	0.0	-0.1	-0.1	-0.1	-0.1	-0.1
Labour Income (nominal $ mn)	0.0	0.1	0.3	0.6	0.7	0.5	0.3	0.3	0.4	0.5	0.5
Disposable Income (nominal $ mn)	0.0	0.0	0.2	0.4	0.5	0.4	0.2	0.2	0.2	0.3	0.3
Disposable Income (constant 1997 $ mn)	0.2	0.3	0.4	0.5	0.5	0.3	0.3	0.3	0.3	0.3	0.3
GDP at market prices (constant 1997 $ mn)	0.1	0.2	0.3	0.4	0.4	0.1	0.1	0.1	0.2	0.2	0.2

4.1 *Yukon Effects*

These effects are transferred to the Yukon economy, with a reduction in the CPI following the national pattern. The wage response is similar but muted. Many wage rates in the Yukon are based on the national wage rates (e.g., the federal government and large corporations). This suggests that there will be a larger, and more permanent, increase in real incomes.

4.2 *Alaska Effects*

The distances to Alaska are obviously greater, although the relative costs of marine transport are lower. The ACRL could save Alaskans approximately US$105 million on the cost of transportation. This would lead to a reduction in the goods portion of the Alaskan CPI by 1 per cent, and lead to a net reduction of 0.4 per cent in the total CPI.

5 Other Considerations

The rail line will drastically reduce the transportation costs of goods traveling along its corridor. However, the relative size of the benefit will shrink as goods travel greater and greater distances from the rail line to outlying communities.

The benefit of lower transportation costs is not limited to the usual re-supply merchandise, but includes more exotic goods. This could result in an increase in purchases via the internet, or other catalogue services.

The industries that have the largest negative risk from an improved transportation system will be the ones that are only competing marginally with current import prices.

Appendix 8: Supplementary Tables for Linking

Impacts of the ACRL Project on Canada's National Economy, 2010-2055

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2030	2035	2040	2045	2050	2055
								Level Impact														
Real GDP at basic prices [1]	4016	4311	4265	2415	1517	2022	2270	2263	2298	2069	2926	2119	1732	1694	1847	2024	2024	2024	2024	2024	2024	2024
Direct plus Indirect [1]	2738	3259	2542	1109	170	354	445	440	448	454	1282	1218	1212	1194	1173	1191	1191	1191	1191	1191	1191	1191
Induced [1]	1278	1052	1723	1306	1347	1668	1825	1823	1850	1614	1644	901	519	500	674	833	833	833	833	833	833	833
Industrial GDP at basic prices																						
Construction [1]	1078	1193	1104	517	165	124	117	117	109	92	411	75	61	62	73	101	101	101	101	101	101	101
Mining [1]	474	466	392	121	-16	19	143	140	137	132	121	908	905	908	910	916	916	916	916	916	916	916
Rail Transportation [1]	19	24	22	12	6	211	230	227	232	236	243	265	268	271	275	278	278	278	278	278	278	278
Retail & Wholesale Trade [1]	378	419	411	226	126	163	213	216	224	211	286	276	251	255	270	284	284	284	284	284	284	284
Accommodation & Food Services [1]	89	89	79	34	21	41	57	59	59	53	70	44	37	37	41	45	45	45	45	45	45	45
Other [1]	1978	2119	2257	1505	1216	1463	1511	1504	1536	1346	1795	552	209	160	278	400	400	400	400	400	400	400
Federal government Revenues [2]	474	631	679	471	326	301	320	334	571	586	749	712	692	741	827	927	1023	1130	1248	1377	1521	1679
Personal tax revenue [2]	164	300	350	294	207	161	157	165	179	181	230	203	164	152	146	152	168	185	205	226	249	275
Corporate tax revenue [2]	102	37	14	-50	-29	11	30	33	31	35	38	17	10	16	36	47	52	57	63	70	77	85
Sales tax revenue [2]	156	202	210	139	88	82	87	87	89	84	120	94	82	83	87	92	102	112	124	137	151	167
Other [2]	52	92	105	88	60	47	46	49	272	286	361	398	436	490	558	636	702	775	856	945	1043	1152
Federal government Expenditure [2]	-144	-62	42	207	267	229	214	249	319	322	156	144	87	47	24	16	18	20	22	24	26	29
Provincial government Revenue [2]	466	916	1026	839	552	443	487	519	545	526	693	674	646	686	786	913	1008	1113	1229	1357	1498	1654
Personal tax revenue [2]	97	178	207	174	123	95	93	98	106	107	136	120	97	90	87	90	99	110	121	134	148	163
Corporate tax revenue [2]	52	19	7	-25	-15	5	16	17	16	18	19	8	5	8	18	24	26	29	32	36	39	43
Sales tax revenue [2]	300	326	350	214	143	152	152	150	154	138	206	162	149	148	152	158	174	193	213	235	259	286
Royalties [2]	10	337	345	304	106	3	47	72	75	80	72	137	137	135	144	160	177	195	215	238	262	290
Other [2]	7	56	117	172	195	188	179	182	194	183	260	247	258	305	385	481	531	586	647	715	789	871
Provincial government Expenditure [2]	-115	95	305	589	729	678	659	697	756	844	769	494	190	76	120	165	182	201	222	245	271	299
Municipal government Revenues [2]	7	66	145	213	230	207	172	144	118	83	22	-68	-123	-119	-72	-26	-29	-32	-35	-39	-43	-47
Municipal government Expenditures [2]	-144	-62	42	207	267	229	214	249	319	322	156	144	87	47	24	16	18	20	22	24	26	29
Current Account Balance [2]	-847	-1391	-1543	-1249	-766	-194	97	166	393	440	29	1279	1448	1553	1675	1787	1973	2178	2405	2655	2932	3237
Real Balance of Payments [1]	-770	-1339	-1504	-1172	-725	-79	204	240	246	259	-211	778	836	830	803	760	760	760	760	760	760	760
Real Exports [1]	15	-42	-81	-113	-101	364	619	646	667	677	511	1421	1435	1453	1473	1491	1491	1491	1491	1491	1491	1491
Real Imports [1]	785	1298	1423	1060	624	443	415	406	421	418	722	643	599	623	670	731	731	731	731	731	731	731
Energy Consumption (Terajoules)	29336	30826	29727	15279	8463	14254	17468	17711	18235	16890	22602	22919	20434	20159	20858	21700	21700	21700	21700	21700	21700	21700
Greenhouse Gas Emissions (kt CO_2 equivalents)	2318	2389	2128	856	224	1370	1760	1819	1909	1882	2269	2807	2639	2568	2543	2523	2523	2523	2523	2523	2523	2523

Impacts of the ACRL Project on Canada's National Economy, 2010-2055 (concluded)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2030	2035	2040	2045	2050	2055
Employment																						
Total Economy [3]	32.5	44.7	41.9	25.3	12.5	10.7	12	13.1	13.6	12.6	20.8	13.9	10.6	9.8	10.4	11.5	11.5	11.5	11.5	11.5	11.5	11.5
Construction [3]	15.5	18	17.4	9.1	3.4	2	1.3	1	1	0.9	5	0.8	0.7	0.8	0.9	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Mining [3]	0.9	0.9	0.7	0.2	0	0	0.2	0.2	0.2	0.2	0.2	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Transportation [3]	1.9	3.6	3.7	3	2.1	1.8	1.9	2	2	2	2.2	2.3	2.3	2.4	2.4	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Other [3]	14.2	22.2	20.1	13	7	6.9	8.6	9.9	10.4	9.5	13.4	9.3	6.2	5.2	5.7	6.4	6.4	6.4	6.4	6.4	6.4	6.4
Population	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Disposable Income [2]	1261	2293	2659	2216	1554	1222	1188	1264	1368	1380	1762	1554	1262	1158	1123	1156	1276	1409	1556	1718	1897	2094
Real Disposable Income [1]	1505	2023	2217	1623	1179	1220	1260	1288	1346	1264	1592	1259	1070	1026	1034	1069	1069	1069	1069	1069	1069	1069
per capita [4]	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Consumer Price Index (1992=100)	-0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
percent impact	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Modal Revenue shift																						
Truck Transportation [2]	0	0	0	0	0	-53	-55	-57	-59	-62	-64	-67	-70	-72	-75	-78	-86	-95	-105	-116	-128	-142
Marine Transportation [2]	0	0	0	0	0	-15	-16	-16	-17	-18	-18	-19	-20	-21	-21	-22	-25	-27	-30	-33	-37	-40
Rail Transportation [2]	0	0	0	0	0	441	458	477	496	516	536	558	580	603	627	653	720	795	878	970	1071	1182
from domestic sources [2]	0	0	0	0	0	18	19	19	20	21	22	23	24	25	26	27	29	32	36	40	44	48
from US sources [2]	0	0	0	0	0	423	440	457	476	495	514	535	556	579	602	626	691	763	842	930	1027	1134

[1] millions of constant 2006 dollars
[2] millions of nominal dollars
[3] thousands of employees
[4] thousands of constant 2006 dollars

Impacts of the ACRL Project on British Columbia's Economy, 2010-2055

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2030	2035	2040	2045	2050	2055
	Level Impact																					
Real GDP at basic prices [1]	1085	1160	1263	653	332	493	507	501	510	492	811	540	515	523	547	575	575	575	575	575	575	575
Direct plus Indirect [1]	856	926	953	420	108	186	200	201	208	212	538	332	337	340	343	348	348	348	348	348	348	348
Induced [1]	229	234	310	232	224	306	306	300	301	280	275	208	178	182	205	228	228	228	228	228	228	228
Industrial GDP at basic prices																						
Construction [1]	461	481	557	257	84	27	19	19	17	15	221	-3	3	8	10	11	11	11	11	11	11	11
Mining [1]	80	88	80	33	5	3	5	3	3	3	11	134	134	134	134	134	134	134	134	134	134	134
Rail Transportation [1]	11	12	13	6	2	133	141	141	146	150	159	163	169	175	180	184	184	184	184	184	184	184
Retail & Wholesale Trade [1]	117	112	120	45	25	48	53	51	49	49	80	92	94	95	95	98	98	98	98	98	98	98
Accommodation & Food Services [1]	21	19	13	1	1	1	1	1	1	1	8	8	8	8	8	8	8	8	8	8	8	8
Other [1]	396	448	480	310	214	281	288	287	294	274	333	147	107	104	121	140	140	140	140	140	140	140
Energy Consumption (Terajoules)	8578	9222	9812	4966	2357	4020	4277	4290	4415	4329	6669	6116	5939	5992	6118	6273	6273	6273	6273	6273	6273	6273
Greenhouse Gas Emissions (kt CO_2 equivalents)	521	539	546	235	72	627	683	695	722	735	895	1035	1037	1050	1063	1077	1077	1077	1077	1077	1077	1077
Employment																						
Total Economy [3]	13.5	15.2	15.8	7.8	3.3	3.4	3.4	3.6	3.6	3.6	7.1	4.2	4.1	4.1	4.1	4.2	4.2	4.2	4.2	4.2	4.2	4.2
Construction [3]	6.7	7	8.1	3.8	1.3	0.4	0.2	0.2	0.2	0.2	2.8	-0.1	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Mining [3]	0.1	0.1	0.1	0	0	0	0	0	0	0	0	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Transportation [3]	0.7	1	1.1	0.7	0.4	0.8	0.8	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Other [3]	6	7.1	6.5	3.3	1.6	2.2	2.4	2.5	2.6	2.6	3.5	3.3	3.1	3	3	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Population	0	0	0	0	0	-0.2	-0.4	-0.4	-0.4	-0.4	-1.5	-2.1	-2.1	-2.2	-2.4	-2.6	-2.6	-2.6	-2.6	-2.6	-2.6	-2.6
Disposable Income [2]	979	1228	1343	793	415	456	446	467	501	528	853	606	597	605	616	642	709	783	864	954	1053	1163
Real Disposable Income [1]	858	993	1055	581	300	370	370	379	397	402	630	425	419	426	434	448	448	448	448	448	448	448
per capita [4]	0.3	0.3	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0	0	0	0	0	0
Consumer Price Index (1992=100)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0
percent impact	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	0
Modal Revenue shift																						
Truck Transportation [2]	0	0	0	0	0	-12	-13	-13	-14	-14	-15	-15	-16	-17	-17	-18	-20	-22	-24	-27	-29	-32
Marine Transportation [2]	0	0	0	0	0	-15	-16	-16	-17	-18	-18	-19	-20	-21	-21	-22	-25	-27	-30	-33	-37	-40
Rail Transportation [2]	0	0	0	0	0	312	325	338	351	365	380	395	411	427	444	462	510	563	622	687	758	837
from domestic sources [2]	0	0	0	0	0	7	8	8	8	8	9	9	10	10	10	11	12	13	14	16	18	19
from US sources [2]	0	0	0	0	0	305	317	330	343	357	371	386	401	417	434	452	499	550	608	671	741	818

[1] millions of constant 2006 dollars
[2] millions of nominal dollars
[3] thousands of employees
[4] thousands of constant 2006 dollars

Impacts of the ACRL Project on the Yukon's Economy, 2010-2055

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2030	2035	2040	2045	2050	2055
	Level Impact																					
Real GDP at basic prices [1]	1492	2069	1461	773	234	263	317	309	313	316	667	959	960	968	1004	1071	1071	1071	1071	1071	1071	1071
Direct plus Indirect [1]	1220	1688	1212	648	176	177	203	201	209	213	411	638	635	635	641	672	672	672	672	672	672	672
Induced [1]	271	380	250	126	58	87	113	108	103	103	256	322	325	335	364	400	400	400	400	400	400	400
Industrial GDP at basic prices																						
Construction [1]	686	997	698	398	116	51	22	20	19	19	115	23	23	23	27	51	51	51	51	51	51	51
Mining [1]	69	80	69	27	3	-5	96	96	96	96	-3	680	683	683	683	683	683	683	683	683	683	683
Rail Transportation [1]	4	11	9	6	4	61	72	69	74	76	78	82	84	85	87	90	90	90	90	90	90	90
Retail & Wholesale Trade [1]	143	191	112	44	15	38	43	41	39	39	79	92	93	94	95	97	97	97	97	97	97	97
Accommodation & Food Services [1]	21	19	13	1	1	1	1	1	1	1	9	9	9	9	9	9	9	9	9	9	9	9
Other [1]	570	771	561	296	94	117	83	82	83	84	389	72	68	74	102	141	141	141	141	141	141	141
Energy Consumption (Terajoules)	6040	8307	5934	3150	981	1543	2252	2195	2234	2255	3349	6894	6929	6987	7171	7471	7471	7471	7471	7471	7471	7471
Greenhouse Gas Emissions (kt CO_2 equivalents)	382	509	417	216	83	246	332	318	330	337	395	617	624	628	641	659	659	659	659	659	659	659
Employment																						
Total Economy [3]	7.5	9.7	6.9	3.4	1.2	2.2	2.6	2.6	2.6	2.6	5.5	6.1	6	6.1	6.3	6.6	6.6	6.6	6.6	6.6	6.6	6.6
Construction [3]	2.5	3.6	2.5	1.4	0.4	0.2	0.1	0.1	0.1	0.1	0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Mining [3]	0.1	0.1	0.1	0	0	0	0.2	0.2	0.2	0.2	0	1.1	1.1	1.1	1	1	1.0	1.0	1.0	1.0	1.0	1.0
Transportation [3]	0.4	0.6	0.5	0.3	0.1	0.8	0.9	0.9	0.9	0.9	1.1	1.2	1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Other [3]	4.5	5.4	3.8	1.7	0.7	1.2	1.4	1.4	1.4	1.4	4	3.7	3.5	3.6	3.9	4.1	4.1	4.1	4.1	4.1	4.1	4.1
Population	0	0	0	0	0	0.5	0.9	0.9	0.9	0.9	3	4.2	4.3	4.4	4.9	5.3	5	5	5	5	5	5
Disposable Income [2]	390	529	380	191	60	102	133	134	140	144	312	420	427	438	463	497	548	605	668	738	815	899
Real Disposable Income [1]	358	472	321	155	48	111	138	136	136	133	277	372	375	379	393	414	414	414	414	414	414	414
per capita [4]	3.4	4.4	3.0	1.4	0.4	0.8	0.9	0.8	0.8	0.8	1.0	1.3	1.3	1.2	1.0	1.0	1	1	1	1	1	1
Consumer Price Index (1992=100)	1.4	2.1	1.8	1.0	0.3	-0.4	-0.4	-0.3	-0.2	-0.1	0.0	-0.2	-0.2	-0.2	-0.2	-0.1	0	0	0	0	0	0
percent impact	1.0	1.5	1.3	0.7	0.2	-0.3	-0.2	-0.2	-0.1	-0.1	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	0	0	0	0	0	0
Modal Revenue shift																						
Truck Transportation [2]	0	0	0	0	0	-18	-19	-20	-21	-21	-22	-23	-24	-25	-26	-27	-30	-33	-36	-40	-44	-49
Marine Transportation [2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rail Transportation [2]	0	0	0	0	0	125	130	136	141	147	153	159	165	172	179	186	205	226	250	276	305	336
from domestic sources [2]	0	0	0	0	0	8	8	9	9	9	10	10	10	11	11	12	13	14	16	17	19	21
from US sources [2]	0	0	0	0	0	118	122	127	132	138	143	149	155	161	167	174	192	212	234	259	285	315

[1] millions of constant 2006 dollars
[2] millions of nominal dollars
[3] thousands of employees
[4] thousands of constant 2006 dollars