

NWT Carbon Tax

Discussion Paper

Department of Finance

May 29, 2012

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NWT Carbon Tax Discussion Paper

Executive Summary

This paper reports the findings of an investigation into the implications of a carbon tax on Northwest Territories (NWT) residents and businesses and the NWT economy as a whole.

A carbon tax is a consumption tax levied on fuels based on carbon content and is generally used as a policy tool to increase the price of producing greenhouse gas emissions. This paper proposes a carbon tax that is revenue-neutral for the GNWT with net revenue collected returned to rate-payers through reductions in taxes, rebates, subsidies or other redistributive mechanisms. However, the actual mechanisms for the revenue re-distribution are beyond the scope of this paper.

The paper examines the implications of a carbon tax of \$10 per tonne of carbon dioxide equivalent emissions (CO₂e), which equate to a tax rate of 2.34 cents per litre on gasoline, 2.73 cents per litre on motive diesel fuel and 2.79 cents per litre on heating fuel.

During 2010-11, NWT residents and businesses consumed approximately 381 million litres of fuels that would be subject to the carbon tax. Under a tax rate of \$10 per tonne of CO₂e emissions, the GNWT would have collected approximately \$10 million in carbon tax revenues. An additional 27 million litres of fuels, representing approximately 7 per cent of NWT greenhouse gas emissions, were consumed by governments and other tax-exempt entities, the equivalent of nearly \$750 thousand in carbon tax revenues at \$10 per tonne of CO₂e emissions.

The data was sufficient to estimate the impact of a carbon tax of \$10 per tonne of CO₂e emissions on some industries for the 2010-11 fiscal year:

- 53.6 million litres in aviation fuel was sold in the NWT, representing approximately 13 per cent of NWT greenhouse gas emissions and \$1.37 million in carbon tax revenue. This is nearly 2.5 times greater than the aviation fuel tax revenues collected under *Petroleum Products Taxation Act*.
- 16.3 million litres of diesel were consumed by the NWT Power Corporation (NTPC) for electricity generation, representing four per cent of the NWT's greenhouse gas emissions and \$450 thousand in carbon tax revenue. Thirty-five per cent of the diesel consumed by the NTPC is used to generate electricity in remote communities.
- 136 million litres of diesel was consumed by the NWT's three diamond mines, representing about 35 per cent of NWT greenhouse gas emissions and \$3.77 million in carbon tax revenues.

A model commissioned by the Department of Environment and Natural Resources estimates that a carbon tax of \$10 per tonne of CO₂e would, over five years, reduce NWT greenhouse gas emissions by 0.7 per cent relative to the case where no carbon tax is implemented. However, greenhouse gas emissions would still rise over the same five year period regardless of the carbon tax due to increased economic activity assumed in the model.

A carbon tax designed for the NWT must take into account the fact that the NWT is a small, open, resource based economy and those characteristics make for a different set of consequences than would be experienced in other more diverse economies. For examples:

- A carbon tax will increase costs for all NWT businesses and residents, with the lowest income individuals and those in small, remote communities being relatively more burdened. While it is possible to implement a tax that is revenue-neutral at the GNWT level, it is not possible to create one that will be neutral at the level of households and businesses; at this level there will be winners and losers.
- Remote communities that are heavily reliant on carbon-based fuels will be disproportionately burdened by a carbon tax. Further, these communities, particularly those above the tree line, have limited opportunities to reduce their consumption of carbon-based fuels by making use of alternative fuels.
- By increasing the cost of fuels, a carbon tax will increase the cost of participating in traditional activities, including hunting, fishing and trapping, which are an important part of the NWT's heritage and remain important to many NWT individuals and communities.
- The lowest-hanging fruit will be the first picked. That is, the easiest and least costly changes that can be made to reduce consumption of carbon-based fuels will be pursued first. As time passes, it will become more difficult to achieve further reductions, unless there are considerable technological improvements that allow for low-cost reductions.
- By itself, a carbon tax may not be enough of an incentive to reduce greenhouse gas emissions. It is necessary that NWT residents and businesses be technically able to make reductions in their emissions at affordable costs. This will require the availability of economically viable alternatives to reduce consumption of carbon-based fuels. If residents and businesses are unable to adopt or gain access to affordable alternatives, for financial or technical reasons, a carbon tax will increase costs but will do little to reduce emissions.
- Implementing a carbon tax in the NWT will increase the costs of doing business within the territory and would make the NWT a less competitive for businesses, compared with jurisdictions that do not have a carbon tax. Fuel-intensive industries such as exploration for and extraction of minerals, oil and gas, which represent the backbone of the NWT economy, may be especially hard hit.

Northwest Territories Carbon Tax Discussion Paper

1. Introduction

The purpose of this paper is to provide information on how a carbon tax would affect the Northwest Territories (NWT) economy.

A NWT carbon tax could be levied on carbon-based fuels to put a price on greenhouse gas emissions. The carbon tax would therefore provide a direct incentive for consumers and industry to reduce the use of carbon-based fuels, either through reducing their carbon-based fuel use or by investing in alternative energy technology. The policy question asked in this paper is whether using carbon taxes as a price signal in the NWT with its small and extremely open economy with a harsh climate, remote communities and sparse population would be effective.

Section 2 outlines how a carbon tax would be structured and administered in the NWT. Section 3 examines the effect of a carbon tax on NWT communities and industries. Section 4 discusses the budgetary, environmental and socioeconomic implications of the tax. Section 5 presents the conclusions.

This discussion paper does not reflect government tax policy; rather, it is intended to provide the background and context to facilitate public discussion, and to solicit input from residents and businesses.

2. Carbon Tax Structure and Administration

Carbon Tax Base

The proposed NWT carbon tax would be applied to most carbon-based fuels consumed in the NWT. Therefore the carbon tax base would include fuels taxed under the current NWT fuel tax base and heating fuel, propane, natural gas and naphtha. The carbon tax would be in addition to the NWT fuel tax, levied under the *Petroleum Products Tax Act*, on gasoline, aviation fuel and diesel used in combustion engines.

Exemptions

Some fuels would be exempt from the carbon tax depending on how they are used or sold. Examples include:

- Fuel contained in sealed, pre-packaged containers holding up to four litres as these would be administratively difficult to collect;
- Fuel sold in the NWT and exported by the seller for use outside the territory because the GNWT only has the authority for direct taxation;
- Fuel brought into the territory in the tank of a non-commercial aircraft or ship and used in the operation of the aircraft or ship for ease of administration;
- Up to 182 litres of fuel brought into the territory in the tank of a motor vehicle other than a commercial vehicle or locomotive and used in the operation of that vehicle for ease of administration;

- Fuel used by visiting armed forces as defined in section 2 of the federal *Visiting Forces Act*. This legislation exempts military personnel from fuel tax while they are visiting another country, serving with the armed forces of another country or attached to another country. This is a standard exemption that is also included in the NWT *Petroleum Products Tax Act*, and,
- Wood and biomass will be exempt from the carbon tax because it is considered a renewable energy source.

Municipalities, hospitals, and other government entities will be exempt from the carbon tax because they are already exempt from the NWT fuel tax. Consideration was given to making these entities pay the carbon tax to provide them with an incentive to reduce their consumption of carbon-based fuels. However, the funds required to pay an internal carbon tax would be unavailable to fund programs currently provided by these entities.

The Department of Public Works and Services (PWS) makes the majority of decisions influencing the GNWT's greenhouse gas emissions, including paying all GNWT utilities. Savings from investments that the PWS undertakes to reduce carbon-based fuel consumption are put into the Capital Asset Retrofit Program. This program is used to reduce the GNWT's energy costs through investments in deferred maintenance and capital.

Carbon Tax Rates

Implementation of a carbon tax is a straightforward application of a tax rate based on the amount of carbon emitted by each of the taxed fuels on combustion. The proposed NWT carbon tax does this by basing the carbon tax rate on tonnes of carbon dioxide equivalent emissions (CO₂e). The CO₂e is the amount of carbon dioxide, methane and nitrous oxide released into the atmosphere with the combustion of a carbon-based fuel. Table 1 provides fuel carbon contents determined by Environment Canada. These amounts were used to establish the specific tax rates for each fuel listed in Table 2.

The initial carbon tax rate must be set at a level high enough to encourage the reduction in carbon-based fuel use and low enough that it gives people and businesses an opportunity to adjust. If the intent is to gradually increase the tax rate then the schedule for future tax rate increases should also be established well in advance so tax payers can incorporate the higher costs into their decision-making.

For this discussion paper, an initial carbon tax rate is set at \$10 per tonne of CO₂e, which is the initial British Columbia rate. The \$30 per tonne tax rate presented in Table 2 was considered too high as an initial NWT carbon tax rate given British Columbia's difficulties in introducing a carbon tax at the lower \$10 per tonne rate. A schedule for future rate increases is not discussed. The carbon tax would increase the overall tax rate on the five fuels that are currently taxed under the NWT *Petroleum Products Tax Act* and introduce a tax on heating fuel, propane, natural gas and naphtha.

Table 1: Fuel Carbon Contents

	CO ₂	CH ₄ (CO ₂ e)	N ₂ O(CO ₂ e)	Total (CO ₂ e)
Gasoline (kg/litre)	2.289	0.003	0.050	2.342
Motive diesel (kg/litre)	2.663	0.001	0.070	2.734
Non-Motive diesel (kg/litre)	2.663	0.003	0.120	2.786
Aviation fuel (kg/litre)	2.342	0.046	0.070	2.458
Heating fuel (kg/litre)	2.663	0.003	0.120	2.786
Propane (kg/litre)	1.51	0.001	0.030	1.541
Natural gas (kg/m ³)	1.891	0.010	0.015	1.916

Source: Environment Canada

Table 2: Proposed NWT Fuel and Carbon Taxes

	Fuel tax	Carbon tax rate ¹		Total tax	
		\$10/tonne	\$30/tonne	\$10/tonne carbon tax	\$30/tonne carbon tax
		(cents/litre)			
Gasoline	10.70	2.34	7.03	13.04	17.73
Motive diesel	9.10	2.73	8.20	11.83	17.30
Non-Motive diesel	3.10	2.79	8.36	5.89	11.46
Aviation	1.00	2.46	7.37	3.46	8.37
Jet	1.00	2.56	7.67	3.56	8.67
Railway	11.40	2.73	8.20	14.13	19.60
Heating fuel	0	2.79	8.36	2.79	8.36
Propane	0	1.54	4.62	1.54	4.62
Natural gas	0	1.92	5.75	1.92	5.75
Napha	0	2.55	7.65	2.55	7.65

¹ Carbon tax based on \$10 and \$30 per tonne CO₂e for each fuel type.

Revenue Neutrality

The carbon tax is not intended as an additional revenue source for the GNWT but rather as a policy tool for discouraging fossil fuel consumption. Therefore, the carbon tax is to be revenue-neutral where all revenue collected would be returned to taxpayers through reductions in taxes, rebates, subsidies or other redistributive mechanisms. However, these carbon tax offsets will not be revenue-neutral for individuals and businesses because the re-distributive mechanisms will be too broad. In order for a carbon tax to be revenue neutral at the individual level, actual carbon tax paid by each household or business would have to be monitored. At the individual level there will be winners and losers due to differences in consumption habits, household income, family size, community of residence, or whether the tax could be passed on. For example, a household may pay an additional \$400 annually in carbon tax, but may only receive \$300 in income tax reductions. Individuals and families who use less fuel will pay less tax than those who consume more.

Even with exemptions for the GNWT itself, the carbon tax will increase GNWT expenditures through higher energy costs for the NWT Housing Corporation (NWT HC) and social assistance clients and higher freight costs for government purchases. As well, Crown corporations will pay the carbon tax just as they pay the current NWT fuel taxes. The carbon tax will increase costs for the Northwest Territories Power Corporation (NTPC), especially in communities that depend on electricity from diesel or gas-powered generators. Although these communities will not see much of an electricity cost increase because the GNWT currently subsidizes a portion of consumption to match rates in Yellowknife, which relies on hydroelectric generation, the cost to the GNWT for the subsidy will increase. This subsidy to consumers to keep electricity affordable, will also serve to diminish the price incentive of the carbon tax.

The additional GNWT operating costs and administrative costs will be netted from carbon tax revenues before the remaining carbon tax revenue is returned to residents and businesses through either income tax rate reductions or credits. The design and amount of revenue-neutrality provisions cannot be determined until the burden of the tax is fully established. Without this understanding of the incidence of the tax, the design of the offsets is premature.

A carbon tax is a regressive tax. This means that the lowest income individuals will pay a greater proportion of their income in carbon tax compared to those at higher incomes. In the NWT, the burden of a carbon tax burden will fall most heavily on families and individuals with low income and on individuals and businesses in remote communities that depend heavily on carbon-based fuels. Residents of these communities already have the highest cost of living in the NWT and have few viable alternatives for heating, electricity-generation, and transportation. A carbon tax may provide the theoretical price signal telling NWT residents and businesses to reduce consumption of carbon-based fuels, but in absence of viable alternatives it may not be possible to make significant reductions. The degree to which redistribution decreases the regressive nature of the carbon tax will depend on the mechanisms employed for redistribution.

Implementation of the BC Carbon Tax - Lessons Learnt

The British Columbia (BC) carbon tax was designed to be revenue neutral through a low income tax credit for individuals, reductions in the first two personal income tax rates and corporate measures that include reductions in the corporate income tax rates and property tax credits.

After increasing carbon tax rates each year since the July 1, 2008 introduction, the 2012-13 BC Budget announced that no further carbon tax rate increases are planned until the government completes a comprehensive carbon tax review, including revenue neutrality and its impact on business competitiveness. The review follows two successive years where the cost of tax measures enacted to offset the impact of the carbon tax exceeded carbon tax revenue by \$124 million and \$192 million in 2010-11 and 2011-12, respectively.

Fair and Effective Carbon Pricing: Lessons from BC, a 2011 report published by the Canadian Centre for Policy Alternatives and the Sierra Club BC, noted four serious flaws in British Columbia's carbon pricing:

- The carbon tax rate is set too low to have a significant impact on carbon emissions;
- The carbon tax has become revenue negative because the cost of tax cuts and credits exceeds the carbon tax revenue collected;
- The requirement for public sector organisations to pay offset payments in order to become carbon neutral has resulted in reduced public services; and.
- Even after tax cuts and credits are factored in, the carbon tax has a disproportionate impact on low-income residents and most benefits the highest income households that are also the biggest emitters.

For administrative ease, the intention is to redistribute the majority of carbon tax revenue through personal and corporate income taxes such as:

- Development of a credit delivered under the tax system similar to the NWT Cost of Living Credit or merely increase this credit to include additional credit for carbon taxes. This credit could be differentiated by regions or zones that represent the degree of dependence on carbon-based fuels.
- Reduction to the lowest personal tax bracket. Tax rate reductions do not help those individuals whose incomes are so low that they are not paying income taxes.
- A corporate income tax credit could be provided to corporations to offset the impact of the carbon tax on territorial business.

Work on the most efficient types of redistributive mechanisms is ongoing but is difficult because the implications of carbon taxes, especially in remote communities, are difficult to measure. For example, it is relatively simple to determine how much a carbon tax adds to the cost of heating for the average household, but in a remote community neither the homes nor prices of goods and services represent the territorial averages. This can be further complicated in cases where housing and fuel is subsidized. It is not clear in such cases how much should be redistributed or to whom.

Tax Administration

The carbon tax would be administered by the GNWT Department of Finance Treasury Division's Taxation Administration section. Collection of the tax will be simplified by bundling together the collection of carbon tax and fuel tax and designating current fuel tax collectors as carbon tax collectors.

3. Analysis

The analysis below considers the initial incidence of carbon tax and does not include the mitigating effects of revenue redistribution.

Analytical Framework and Data

The following analyses focuses on the community-level impact of a NWT carbon tax by using community-level data available from the GNWT Petroleum Products Division (PPD) and GNWT fuel tax records. Appendix A presents a fuller description of data availability and shortcomings.

Petroleum Products Division (PPD) Data

The PPD manages the purchase, transport, and storage of bulk petroleum products for 16 small NWT communities (see Appendix B), with an average population of less than 300 persons per community. In these communities, the PPD is the sole importer of fuel.

In twenty NWT communities, the PPD provides maintenance to NWT Power Corporation (NTPC) power plant fuel storage facilities, and manages the purchase, transport, and storage of diesel fuel on behalf of the NTPC.

PPD sales records provide precise volumes for each bulk fuel sold in each community, but fuel consumption cannot be separated into exempt or non-exempt consumers because no information is available regarding the nature of consumers of the fuel. Estimating the share of fuels used by exempt consumers within individual communities served by the PPD would require the application of a territory-wide average, with no means to verify the applicability of this average to any of the communities.

The 16 communities that are fully serviced by the PPD represent 11 per cent of the territorial population, with no single community having a population greater than 600 persons in 2011. Combined these represent 4.5 per cent of NWT greenhouse gas emissions for the 2010-11 fiscal year.

Department of Finance Fuel Tax Data

The Department of Finance collects tax on specific fuels in accordance with the *Petroleum Products Taxation Act*. Tax collectors, including some wholesalers, retailers and large-scale consumers, are required to file a return detailing their transfers, sales and consumption of taxable fuel.

The NWT fuel tax records are of collectors servicing 17 communities that represent the remaining 89 per cent of the territorial population and are served primarily by commercial fuel suppliers. These communities were responsible for approximately 40 per cent of NWT greenhouse gas emissions during 2010-11.

Returns filed by fuel tax collectors detail the volumes of fuel sold, transferred and consumed. Consequently, fuel tax returns provide total territorial fuel consumption by fuel type for communities not serviced by the PPD and total fuel tax exemptions by fuel type. However, these returns identify the community where the tax collector has its headquarters and therefore do not indicate the community or region in which the activity took place. Returns filed from outside the territory are not assigned to any community.

Allocation of the fuel tax to communities was done by:

- where collectors operate in a single community, all their fuel tax volumes are treated as being consumed within that community.
- For collectors servicing multiple communities, the specific communities they served were identified using publically available information. Fuel volumes reported by these collectors, were allocated to communities based on population shares of all communities in which the collector operates.
- For collectors where their services could not be limited to specific communities, volumes were allocated to non-PPD services communities based on population.

For example, the fictitious Company ABC, files tax returns from Yellowknife and the Department of Finance fuel tax records assign the company's fuel volumes to Yellowknife. However, according to their corporate website, Company ABC operates retail fuel sales outlets servicing Behchoko, Fort Providence, Hay River, and Yellowknife. The fuel tax data does not specify how much fuel is sold in each community therefore Company ABC fuel volumes will be allocated to each community in proportion to each community's share of the serviced population.

The NWT fuel tax base is more narrowly defined than the potential carbon tax base. Therefore no data is available for the certain fuels that will be subject to a carbon tax, such as natural gas and naphtha. However, fuel tax collectors do provide records on other untaxed fuel, such as diesel used for heating and propane.

The allocation of fuel in proportion to the population may lead to over-estimating the fuel consumed in more heavily populated communities while under-estimating the fuel consumed in less heavily populated communities. As a result, this may result in the over-estimation of the incidence of a potential carbon tax in larger communities and the under-estimation of incidence in smaller communities.

Due to the nature of the data available and the allocation method employed in these analyses, it is not possible to verify the volumes of fuel allocated to any particular community that is not serviced by the PPD. Verification would require more information from fuel tax collectors and large-scale consumers of fuel.

Commercial Transportation and Diamond Industry

The remaining 55 per cent of NWT greenhouse gas emissions could not be attributed to any specific community from the tax records and includes fuel consumed by transportation, industrial operations, and aviation services.

Table 3 summarizes the share of NWT fuel consumed in communities based on GNWT administrative records and the allocation rules discussed in this section. All gasoline and propane consumption is allocated to communities through these allocation rules, but most diesel fuels and all aviation fuels are unassigned. Rather than using a formula to allocate the balance of the fuels to communities, these balances are identified, quantified and aggregated to commercial, aviation and rail transportation and diamond mines.

Table 3: Allocation of fuel consumed, by fuel type and source, as a Share of NWT Total, per cent

Fuel Type	Communities identified by		Total assigned to communities	Commercial Transportation, Aviation, Rail and Diamond Mines	Total
	PPD records	Fuel tax records			
Gasoline	6	94	100	0	100
Diesel (motive)	4	34	38	62	100
Diesel (non-motive)	6	14	20	80	100
Heating Fuel	9	59	68	32	100
Propane	0	100	100	0	100
Aviation	0	0	0	100	100

Findings – Initial Incidence of a NWT Carbon Tax

The potential carbon tax revenues for communities serviced by the PPD is presented in Table 4. The PPD data also identifies naphtha, which will be subject to the carbon tax but is not a taxed fuel under the *Petroleum Products Taxation Act*. Since PPD data does not distinguish fuel consumed by government and other exempt consumers from that consumed by non-exempt

consumers, Table 4 treats all fuel as potentially taxable even though it is probable that exempt entities consume a substantial proportion of each fuel in these communities.

Table 4: Potential Carbon Tax Revenues by Fuel Type in Communities serviced by the PPD

Community	2011 Population	Carbon tax by fuel type (dollars)					Total
		Gasoline	Motive Diesel	Non-Motive Diesel	Heating Fuel	Naptha	
Colville Lake	160	3,127	1,804	4,516	3,839	16	13,302
Deline	552	10,172	4,710	20,725	25,056	9	60,672
Fort Good Hope	585	12,708	6,151	21,829	26,058	10	66,756
Gameti	311	3,945	1,349	8,796	9,163	0	23,253
Jean Marie River	72	1,384	983	3,057	2,267	0	7,691
Lutselk'e	310	5,302	1,067	12,096	13,059	12	31,536
Nahanni Butte	119	2,109	761	5,298	3,140	0	11,308
Paulatuk	341	3,226	1,807	11,970	17,167	0	34,170
Sachs Harbour	135	1,962	916	8,624	10,563	34	22,099
Trout Lake	95	2,943	2,210	N/A ¹	3,161	0	8,314
Tsiigehtchic	128	3,040	1,651	6,083	9,202	0	19,976
Tulita	552	10,340	5,790	19,357	24,844	5	60,336
Ulukhaktok	479	5,262	1,841	16,271	23,310	76	46,760
Wekweeti	145	1,948	1,131	N/A ¹	4,784	0	7,863
Whati	509	5,515	2,754	13,186	12,799	3	34,257
Wrigley	116	2,803	2,049	5,967	6,097	0	16,916
Total	4,609	75,786	36,974	157,775	194,509	165	465,209

¹The PPD does not supply diesel for electricity generation in these communities.

For the small remote communities serviced by PPD, heating fuel accounted for 43 per cent of greenhouse gas emissions during the 2010-11 fiscal year. In Paulatuk, Sachs Harbour and Ulukhaktok, all of which are above the tree line and on the Arctic Coast, heating fuel accounted for approximately half of the greenhouse gas emissions. In other communities serviced by the PPD the proportion of greenhouse gas emissions from heating fuels ranged from 28 per cent in Nahanni Butte to 46 per cent in Tsiigehtchic. The share of greenhouse gas emissions from heating fuel in Wekweeti is estimated at 61 per cent; however, this is partly because Wekweeti does not consume non-motive diesel for electricity generation.

Non-motive diesel for electrical generation accounts for one third of community greenhouse gas emissions in communities serviced by the PPD, ranging from 30 per cent in Tsiigehtchic to 47 per cent in Nahanni Butte. Together, heating fuel and non-motive diesel fuels account for 75 per cent of fuels consumed in the PPD serviced communities. Decreasing greenhouse gas emissions through reduced carbon fuel usage will require different energy sources for both heating and electrical generation. To date, this technology is not available at prices that the carbon tax of \$10 per tonne CO₂e would make economical.

Table 5: Potential Carbon Tax Revenues in Communities not served by the PPD, by fuel type

		Carbon tax by fuel type (dollars)				
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Community	2011 population	Gasoline (exempt)	Motive Diesel (exempt)	Non-Motive and other Diesel (exempt)	Heating Fuel (exempt)	Propane ³	Total
Aklavik	655	8,795 (405)	4,036 (349)	N/A	25,641 (8,096)	0	38,472 (8,850)
Behchokq̃	2,064	22,876 (1,443)	23,054 (4,498)	7 (N/A)	79,492 (17,699)	0	125,429 (23,640)
Enterprise	97	1,560 (10)	1,652 (22)	3 (45)	159 (428)	887	4,261 (505)
Fort Liard	602	22,385 (63)	27,700 (135)	21,638 (279)	10,501 (2,599)	0	82,224 (3,076)
Fort McPherson	797	31,110 (83)	32,560 (477)	27,336 (370)	9,955 (3,441)	0	100,961 (4,371)
Fort Providence	778	18,578 (81)	15,421 (8,670)	6,147 (2,432)	19,973 (9,170)	7,120	67,239 (20,353)
Fort Resolution	480	11,371 (50)	8,351 (108)	16 (223)	785 (2,119)	4,393	24,916 (2,500)
Fort Simpson	1,247	35,243 (1,487)	53,914 (14,058)	60,950 (578)	43,823 (20,462)	0	193,930 (36,585)
Fort Smith	2,478	63,506 (3,394)	67,389 (1,200)	1,155 (1,149)	71,675 (47,569)	0	203,725 (53,312)
Hay River ¹	4,020	120,750 (37,362)	162,287 (2,106)	94,026 (1,864)	81,919 (20,021)	36,791	495,773 (61,353)
Inuvik	3,504	41,856 (366)	84,998 (2,124)	81,176 (1,625)	N/A (22,919)	0	208,030 (27,034)
Kakisa	54	821 (6)	792 (12)	1 (25)	76 (238)	494	2,184 (281)
Norman Wells	844	9,517 (88)	11,624 (189)	15 (391)	1,092 (3,644)	0	22,248 (4,312)
Tuktoyaktuk	935	17,613 (10)	16,595 (N/A)	33,051 (N/A)	61,108 (8,062)	0	128,367 (8,072)
Total excluding Yellowknife	18,555	405,981 (44,848)	510,373 (33,948)	325,521 (8,981)	406,199 (166,476)	49,685 (N/A)	1,697,759 (254,244)
Yellowknife ²	19,888	605,940 (8,838)	489,897 (25,055)	53,534 (N/A)	518,513 (174,036)	184,406	1,852,290 (207,929)
Total	38,443	1,011,921 (53,686)	1,000,270 (59,003)	379,055 (8,981)	924,712 (340,503)	234,091 (N/A)	3,550,049 (462,173)

¹ Includes Hay River Reserve

² Includes Dettah

³ Not possible to identify sales to tax-exempt consumers.

Table 5 presents results for allocating volumes derived from the fuel tax records to communities. The PPD provides non-motive diesel to six communities (Fort Liard, Fort McPherson, Fort Simpson, Inuvik, Tuktoyaktuk and Yellowknife) for electricity generation, making it difficult to

compare this category of fuel across all communities. Since there may be more than one collector servicing these communities, all were included in the allocation pool when the balance of non-motive fuel was distributed by share of population.

The volume of fuel exempted from the fuel tax is allocated to communities using the same rules as described above. The amounts in brackets are potential carbon tax revenues on fuel sales to exempt consumers.

Table 6 shows the potential carbon tax in communities served by the PPD and includes non-motive diesel used for electricity generation. The table shows the estimated total carbon tax payable for each community, its impact per capita and per tax-filer. The PPD sales records are precise in the amount of fuel delivered to each community; however, the records do not allow for the identification of exempt-consumers or to differentiate between non-exempt consumers.

Table 7 shows the potential carbon tax in communities not served by the PPD. This table does not include non-motive diesel used for electricity generation. It also does not include tax-exempt fuels.

Table 6: Potential Carbon Tax Revenues in Communities serviced by the PPD, including NTPC

Community	Total Carbon Tax, dollars	Dollars per Person	Dollars per Tax Filer
Colville Lake	8,786	55	N/A ¹
Deline	39,948	72	105
Fort Good Hope	44,926	77	125
Gameti	14,456	46	76
Jean Marie River	4,634	64	N/A ¹
Lutselk'e	19,440	63	93
Nahanni Butte	6,010	51	N/A ¹
Paulatuk	22,199	65	111
Sachs Harbour	13,442	100	N/A ¹
Trout Lake	8,315	88	N/A ¹
Tsiigehtchic	13,893	109	N/A ¹
Tulita	40,978	74	132
Uluhkaktok	30,488	64	122
Wekweeti	7,864	54	N/A ¹
Whati	21,072	41	66
Wrigley	10,949	94	N/A ¹
Total	307,400	67²	N/A³

¹ In these communities data is not available for the number of tax-filers in 2009.

² average

³ insufficient information

Table 7: Potential Carbon Tax Revenues in Communities not serviced by the PPD

Community	Total Carbon Tax, dollars	Dollars per Person	Dollars per Tax Filer
Aklavik	38,472	59	89
Behchokq	125,422	61	103
Enterprise	4,262	44	N/A ⁵
Fort Liard	60,597	101	155
Fort McPherson	73,625	92	134
Fort Providence	67,239	86	116
Fort Resolution	24,916	52	80
Fort Simpson	133,001	107	132
Fort Smith	203,725	82	115
Hay River ¹	495,774	123	170
Inuvik ²	140,936	40	59
Kakisa	2,184	40	N/A ⁵
Norman Wells ²	22,247	26	42
Tuktoyaktuk	95,316	102	167
Yellowknife ³	1,798,756	90	129
Total⁴	3,286,472	75⁶	112⁶

¹ Includes Hay River Reserve.

² Estimates do not include natural gas consumed in these communities.

³ Includes Dettah

⁴ Population figure includes all NWT residents.

⁵ In these communities data is not available for the number of tax-filers in 2009.

⁶ average.

Commercial Transportation Carriers and Unattributed

During the 2010-11 fiscal year under a carbon tax of \$10 per tonne of CO₂e, the GNWT would have collected \$849 thousand from commercial transportation carriers or other collectors that could not be allocated to specific communities based on fuel tax records or other public information sources. This corresponds to approximately 8.5 per cent of total NWT greenhouse gas emissions during this time.

Although it is expected that a portion of a carbon tax paid by transportation carriers would be passed to businesses and residents, the data necessary to model these impacts is incomplete. However, a carbon tax will increase the fuel-related transportation costs and given the distances required to transport goods in the NWT, indirect costs are expected to increase. Remote communities would be the most heavily burdened by these increased costs.

Industry-specific Findings

As the available fuel-related data does not identify end-consumers or, in the case of fuel tax records, the community in which fuel is sold or consumed, it is not possible to estimate the impact of a carbon tax on any particular business or industry, with four notable exceptions: the aviation industry; electricity generation; existing diamond mines; and railway transportation, which is not disclosed for reasons of confidentiality. The impact specific to these industries is not included in community-level analyses.

Aviation Industry

During the 2010-11 fiscal year, NWT fuel tax collectors reported nearly 53.6 million litres in aviation fuel sold, which represented approximately 13 per cent of NWT greenhouse gas emissions. Under a carbon tax of \$10 per tonne of CO₂e emissions, the GNWT would have collected \$1.37 million. This is nearly 2.5 times greater than the fuel tax currently collected under *Petroleum Products Taxation Act*.

NWT residents and businesses rely on the aviation industry for personal, medical and business travel, as well as the transportation of many consumer and professional goods. This is especially true for remote communities and for mineral exploration activities which, for at least part of the year, rely exclusively on the aviation industry for transportation services.

The distribution of costs to consumers is directly affected by the degree of competition between airlines servicing the community. The more competition there is within the aviation industry including scheduled carriers and charter services, the greater will be the incentive for airlines to absorb a larger share the carbon tax to hold down prices. However, there is little or no competition in the smaller communities and therefore it is likely that the carbon tax will be passed on to residents and businesses in these communities through higher prices.

Electrical Generation

The analysis for electricity generation is limited to those communities in which some or all of the electricity was diesel generated. Data is not available to estimate the costs of a carbon tax for those communities in which electricity is generated by means of natural gas combustion; moreover, it is uncertain whether natural gas will be used in these communities in the future. Under a carbon tax, the costs of electricity generation will not increase in communities that rely solely on hydroelectric generation.

During 2010-11, 16.3 million litres of diesel were consumed by the NTPC for electricity generation in the NWT, representing four per cent of the NWT's greenhouse gas emissions. Thirty-five per cent of the diesel consumed by the NTPC is used to generate electricity in remote communities. Under a carbon tax of \$10 per tonne of CO₂e emissions, the GNWT would have collected \$450 thousand in revenues. However, in order to ensure that consumers of electricity in remote locations were not burdened by high rates, most or all of this would be subsidized by the GNWT.

Diamond Mining

Diamond mining plays a significant role in the NWT economy. In 2010, the most recent year for which data is available, the NWT's three diamond mines contributed more than 26 per cent of NWT GDP, exclusive of any indirect or induced impacts. Due to their remote locations and intensity of operations, the existing mines consume large amounts of fuel. Even without a carbon tax, efforts are being made to reduce fuel consumption at the mines. For example, the Diavik diamond mine is currently installing four wind turbines in an effort to reduce diesel consumption by up to 10 per cent.

During 2010-11 the NWT's three diamond mines consumed approximately 136 million litres of diesel for heating, motive and non-motive purposes. This represents 35 per cent of the NWT's greenhouse gas emissions. Under a carbon tax of \$10 per tonne of CO₂e emissions, the GNWT would have collected \$3.77 million in revenues from the three diamond mines.

Territory-wide Findings

During 2010-11, approximately 381 million litres of fuels would have been subject to the carbon tax. Table 8 shows that a tax rate of \$10 per tonne of CO₂e emissions would have generated approximately \$10 million in carbon tax revenues. An additional 27 million litres of fuels, representing approximately 7 per cent of NWT greenhouse gas emissions, were consumed by governments and other tax-exempt entities, the equivalent of nearly \$750 thousand in carbon tax revenues. The share of gasoline, motive diesel and heating diesel consumed by tax exempt entities in the NWT are respectively 2.8 per cent, 7.5 per cent and 20.9 per cent. Less than one per cent of other fuel categories are consumed by tax exempt entities.

Table 8: 2010-11 Territory-wide Fuel Consumption and Potential Carbon Tax Revenues

Fuel Type	Taxable volume (millions of litres)	Carbon Tax Revenue (millions of dollars)	Tax-exempt volume (millions of litres)	Forfeited Carbon Tax Revenue (millions of dollars)
Gasoline	47.2	1.11	1.36	0.03
Motive Diesel	90.0	2.46	7.28	0.20
Non-motive Diesel	110.0	3.06	0.88	0.02
Heating Diesel	64.7	1.80	17.14	0.48
Aviation Fuel	53.6	1.37	0.26	0.01
Propane	15.2	0.23	N/A	N/A
Total¹	380.7	\$10.03	26.92	\$0.74

¹ Excludes rail diesel (for reasons of confidentiality) and natural gas

4. Implications

a) Potential GNWT Budget Impacts

Programming Costs

Under a carbon tax, fuel consumed directly by the government will be tax exempt and, as a result, will not increase costs. However, indirect costs, (for examples transportation and retail prices) might increase with the imposition of a carbon tax. The degree to which these prices could increase cannot be estimated based on available data.

Northwest Territories Power Corporation

During 2010-11, the NTPC was responsible for approximately four per cent of NWT greenhouse gas emissions. In many NWT communities where the NTPC relies on diesel for electricity generation, viable alternatives that produce fewer greenhouse gas emissions are not readily and affordably available. As a result, a carbon tax may increase costs without the desired effect in terms of reducing greenhouse gas emissions.

As a Crown corporation, the NTPC does not pay corporate income tax; however, it pays the NWT fuel tax and would pay a carbon tax. As the NTPC does not pay corporate income tax, a

reduction in the corporate income tax rate would not reduce the tax burden that would be experienced by the NTPC if a carbon tax was implemented. As a result, any mitigation of carbon tax burden faced by the NTPC must be by a means other than corporate tax reduction.

The current GNWT policy is to subsidize residential and commercial rates based on rates in Yellowknife, a community that relies on hydroelectric generation for the majority of its electricity. A carbon tax will not affect electricity rates based on hydroelectric generation. If current policy remains, it will be necessary for the GNWT to subsidize the majority of carbon tax paid by the NTPC, and NTPC consumers who rely on diesel-based electricity will not be subject to the price increases that might drive consumption changes. Consequently, without changes in current policy, no significant reductions in greenhouse gas emissions from NTPC electricity generation should be expected to result from the implementation of a carbon tax.

If a carbon tax of \$10 per tonne of CO₂e emissions were in place during the 2010-11 fiscal year and current electricity pricing policy applied, the GNWT would have been required to subsidize about \$450 thousand in carbon tax by the NTPC to ensure that rates remained unchanged.

Northwest Territories Housing Corporation

The Northwest Territories Housing Corporation (NWT HC) would also pay the carbon tax and would require another means besides a corporate tax reduction to mitigate the carbon tax burden. The NWT HC already has in place initiatives to reduce fuel consumption.

The cost of a carbon tax would have to be passed on to NWT HC tenants to influence their behaviour. In absence of this price signal, the tax will have no impact on these individuals.

If a carbon tax of \$10 per tonne of CO₂e emissions were in place during the 2010-11 fiscal year the NWT HC would have paid more than \$230 thousand in tax on heating fuels.

b) Environment

The February 18, 2011 report *An Exploration into the Impact of Carbon Pricing in the Northwest Territories: Revised Reference Case and Quantitative Policy Analysis*, prepared for the GNWT Department of Environment and Natural Resources by M. K. Jaccard and Associates Inc. (MKJA), contains estimates of the impact of a carbon tax on reducing the NWT's greenhouse gas emissions.

The MKJA's estimations of reductions in greenhouse gas emissions are calculated for a selected range of carbon taxes for different development scenarios. Under each development scenario MKJA estimates changes in greenhouse gas emissions using carbon taxes that increase stepwise over the 2010-2030 time period compared to changes in emissions if no carbon tax is implemented.

This paper does not propose a carbon tax increasing to the levels analyzed in the MJKA report. However, based on the MKJA model, it can be concluded that a \$10 per tonne of CO₂e carbon tax would result in greenhouse gas emission reductions of 0.7 per cent after five years.

In the MKJA analysis, behaviour of residents and businesses is modeled with the expectation of increasing carbon taxes. If MJKA's model was calibrated so that no increase in carbon tax was expected, the reduction in greenhouse gas emissions would be diminished.

c) Socioeconomic Impacts

Implementation of a NWT carbon tax may lead to increased cost of living within the NWT. Remote communities, which depend on long distance freight transportation, are already subject to the high costs of living and would experience the greatest increases. Further, in many of these communities, significant reductions in the consumption of carbon-based fuels may not be possible because of limited affordable and viable alternatives.

Traditional activities, including hunting, fishing and trapping, for both sustenance and income, are an important part of the NWT's heritage and remain important to many individuals and communities in the NWT. Although data is not available to estimate how increased fuel costs would affect these activities, a carbon tax will increase fuel costs and make it more expensive for NWT residents to participate in these activities. Appendix C provides the per cent share of NWT residents who participate in traditional activities and the degree to which they rely on local game and fish for food security. Ninety per cent or more of the households in Jean Marie River, Colville Lake, Kakisa and Lutselk'e rely on country foods for at least half of their food consumption.

Communities serviced by the PPD have detailed records by fuel-type and therefore it can be confidently stated that the majority of fuel consumed is related to the use of diesel for heating and the generation of electricity. In most of these communities, diesel-fuelled generators are the sole means to produce electricity. Also, due to their remote locations, diesel may also be the only viable heating fuel with current technologies and certainly it is substantially more difficult and financially less feasible to ship and consume fuels with lower carbon content, such as propane or wood pellets, to these locations. The dependence on diesel for heating and the electricity-generation and the lack of available alternate fuels may mean that the introduction of a carbon tax will not result in substantial carbon emission savings in these communities.

Adjustments that have been made to the data make conclusions less definitive for communities serviced by commercial collectors. These data show that heating of residential, commercial and other spaces are a significant proportion of fuels consumed and of greenhouse gases emitted. Increasing the cost of fuels used for heating through the implementation of a carbon tax may encourage reduced consumption of heating fuels or changes in the mix of fuels consumed for heating in communities where viable alternatives to diesel are available.

Solar or wind-turbine electricity generation could be employed in some communities; however, their reliability, efficacy and cost-effectiveness in harsh climates are not fully established, although it is accepted that the cost is higher than in more temperate climates. The remoteness of certain NWT communities may also pose challenges for adopting these technologies as installation, maintenance and repairs may require specialized labour not available in the communities or, possibly even within the territory. The Diavik diamond mine is currently installing four wind turbines capable of producing a combined 9.2 megawatts to offset diesel use at the site. The Diavik mine experience with this technology will provide valuable experience and insight for future NWT wind-turbine projects. Local geological features may make it possible to make use of geothermal energy in certain communities.

In some communities it may be possible to reduce diesel consumption by increasing the consumption of locally sourced biomass (firewood) for heating. However, this option will not be available in communities above the tree line and may not be suitable for heating commercial, industrial or multi-unit residential buildings. The availability and usefulness of locally-sourced biomass as a viable alternative to carbon-based fuels for heating will depend on factors such as

local resources available for harvest. Further, if individuals in these communities are harvesting local biomass for personal use, it will be necessary for them to reallocate their time from current activities.

In communities with road access, commercially supplied alternatives such as propane, which produces lower greenhouse gas emissions than diesel, or wood pellets, which are considered to be carbon-neutral, are available for heating purposes. In other communities, such as Tuktoyaktuk or Sachs Harbour, commercially supplied alternatives to diesel may not be available. The unavailability of alternative fuels in some communities may represent a disproportionate tax burden for individuals and businesses in these communities.

The number of NWT residents residing in rental properties may also limit the impact of a carbon tax in reducing greenhouse gas emissions from heating. Even renters who are responsible for heating costs may be unable to reduce consumption of taxed heating fuel if they are not in a position to make the required upgrades to the dwelling and the property owners would have little incentive to make appropriate upgrades if they are not impacted by the increased heating costs, which would be the case in communities with low rental vacancy rates. This may reduce the effectiveness of a carbon tax in terms of reducing greenhouse gas emissions from heating.

In communities not serviced by the PPD, a greater proportion of the fuel consumed and greenhouse gas emissions produced are gasoline and motive diesel. Some of this fuel would be related to personal transportation choices, which are discretionary in nature. Consumers make choices related to the fuel efficiency of the vehicles that they own as well as the amount that they use these vehicles. Economic theory suggests that increasing the price of motive fuel by means of a carbon tax may result in changes in either the stock of vehicles owned or the amount that these vehicles are used. However, the degree to which this could be effective remains unclear. For various reasons, including lower annual kilometres driven, the stock of vehicles in the NWT is older than in other jurisdictions; this may result in a lag between the implementation of a carbon tax and any change in the average fuel economy due to changes in vehicle stock. Additionally, for at least some NWT residents, ownership of fuel-inefficient vehicles is reflective of lifestyle choices, such as boating, snowmobiling, or participation in other fuel-intensive recreation activities. This may limit the degree to which these individuals are willing to reduce their consumption of motive fuels. Further, it may reduce the overall attractiveness of the NWT as a jurisdiction in which to live for those who participate in these recreational activities as a lifestyle.

The remainder of the motive fuel assigned to communities not served by the PPD would be associated with shipping freight, primarily by road. If a carbon tax were implemented it is likely that some of the increased costs of shipping would be passed-on to consumers in terms of higher prices, while the remainder would be absorbed by freight transportation providers. The proportion of the additional cost absorbed by the transportation providers will be determined by many factors, including competition and the degree by which the provider may choose to purchase more efficient vehicles.

It is unclear how much the combined effect of lifestyle choices and a relatively low rate of turnover in the vehicle stock may reduce the efficiency of a carbon tax to reduce motive fuels.

d) Business Impacts

As the available data does not identify end-consumers or, in the case of fuel tax records, the community in which fuel is sold or consumed, it is not possible to identify or estimate the impact of a carbon tax on any particular business or industry. However, certain impacts may be expected.

Implementing a carbon tax in the NWT will increase the costs of doing business within the territory. As a remote and sparsely populated jurisdiction, it is necessary for many businesses operating within the NWT to ship the items that they consume or sell over great distances. A NWT carbon tax will increase the transportation costs faced by these businesses. Similarly, a carbon tax will increase the costs associated with heating for businesses relying on diesel, propane or natural gas for heat and may increase other costs.

How individual businesses will be affected is unclear; however, businesses operating within the NWT would become relatively less competitive than equivalent businesses operating in similar conditions in jurisdictions outside of the NWT. Consider, for example, a hypothetical producer of wood pellets in the southern portion of the territory and a comparable producer operating in a jurisdiction where they are not subject to a carbon tax. The production of wood pellets is an energy-intensive operation, as is the subsequent distribution of the product, and the NWT-based producer will face relatively higher costs than the equivalent producer in another jurisdiction, making the NWT producer less competitive, all else being equal.

It is possible that for some businesses, increasing costs and decreasing competitiveness through the implementation of a carbon tax may influence their decision to operate in the NWT. The carbon tax could represent a proverbial tipping point for some businesses, whereby they may choose not to continue or begin operations within the territory.

The flip-side of the competitiveness-reducing effect of a carbon tax is that those businesses that face the most significant reductions in competitiveness and increases in tax burden are also those with the most incentive to reduce their consumption of taxed fuels. In this case, the idiom “no pain, no gain” may apply to some businesses; those facing the relatively highest burden of a carbon tax are also those with the relatively highest incentive to change their behaviour in the desired manner, if they choose to continue operating.

For certain businesses, it may be possible to pass most or all of the carbon tax to their consumers. For example, landlords would be able to pass the increased costs to tenants through higher rents. As a result, the increased tax burden of a carbon tax on the business may be minimal, as would the impact on their competitiveness versus a comparable business in a jurisdiction with no carbon tax. For example, it may be assumed that airlines or other transportation service providers will have the ability to pass the majority of increased costs to their consumers. However, the more competitive the market in which these businesses operates, a greater the share of the tax burden would be expected to be absorbed by the business. That is, businesses facing less competition would be expected to pass a greater share of the increased costs to their consumers.

Other businesses may operate in markets that force them to absorb the full costs of a carbon tax. These businesses would experience the most significant decrease in competitiveness relative to comparable businesses in jurisdictions with no carbon tax. Most companies exporting natural resources, for example, face globally-set prices over which they have little influence. As

a result they will possess less ability to pass cost increases to their consumers and will be forced to bear a greater proportion of the increased tax burden.

Mineral extraction has long been a cornerstone of the NWT economy and ongoing economic activity within the sector depends on continued mineral exploration. Mineral exploration is fuel-intensive and there will be little ability to pass on the costs associated with a carbon tax. In recent years the mineral exploration in the NWT has decreased as a share of the Canadian total relative to many other jurisdictions, including our neighbouring territories. Imposition of a carbon tax may reduce the competitiveness and attractiveness of the NWT as a jurisdiction in which to undertake mineral or oil and gas exploration.

As any NWT carbon tax will be designed to be revenue neutral at the GNWT-level, there will be the expectation that some of the revenues will be returned to corporations through corporate income tax rate reductions or other means.

A one per cent reduction in the general corporate income tax rate, from 11.5 per cent to 10.5 per cent, would reduce 2011-12 NWT corporate income tax revenue by \$5 million. Assuming that half of the total carbon tax yield can be attributed to individuals and the other half to businesses, the corporate revenue reduction would account for half the total carbon tax yield of \$10 million expected from a carbon tax rate of \$10 per tonne of CO₂e emissions.

A general corporate tax rate reduction would not produce revenue-neutrality for any specific corporations or industries; there would be winners and losers. In theory this would provide businesses with the incentive to reduce fuel consumption in an effort to reduce their overall tax burden and become one of the winners.

e) Territory-wide Impacts

Potential effects of a carbon tax on selected macroeconomic variables were documented M. K. Jaccard and Associates Inc. (MKJA)'s *An Exploration into the Impact of Carbon Pricing in the Northwest Territories: Revised Reference Case and Quantitative Policy Analysis* report. In support of their analysis, MKJA used two established models, one to simulate the relationship between technologies as they adapt to higher priced carbon-based fuels and greenhouse gas emissions and the second model to estimate the effect of the changing carbon-based fuel prices on selected economic variables. The economic variables included gross domestic product and labour expenditures.

Table 9 is adapted from the MKJA report, using only the impacts associated with a carbon tax rate of \$10 per tonne of CO₂e emissions. The impacts presented represent the difference between the projected value of the selected variables in absence of a carbon tax, and projected values of those variables with the implementation of a carbon tax. As the first step in this process MKJA made forecasts for key economic indicators for selected years assuming the status quo, that is, that there is no carbon tax. MKJA prepared two economic forecasts, one in which the Mackenzie Gas Project (MGP) is not constructed within the time frame of the study, and a second in which the Project goes ahead on the schedule as it was projected at the time of the study. MKJA then reworked the economic forecasts for each scenario, assuming a carbon tax is levied. It should be noted that the data underlying the MJKJA report was gathered before the full extent of the global financial and economic recession on the NWT economy was known, most notably the reduced activity of the mining and construction sectors that declined 34 per cent and 56 per cent respectively in from 2007 to 2010.

Based on a carbon tax of \$10 per tonne and assuming that construction of the MGP does not proceed, MJKA estimated that NWT GDP would be 0.3 per cent less in 2020 than without the tax. Furthermore, MJKA estimates that the tax will lower labour expenditures by 0.8 per cent and the average NWT salary by 0.8 per cent. These negative impacts on the future potential of the territorial economy will be greater should the MGP be constructed: GDP is estimated to be 0.6 per cent lower, labour expenditure 0.9 per cent lower and the average salary lower by 0.9 per cent.

Under a carbon tax of \$10 per tonne of CO₂e, MJKA estimates NWT households will experience small declines in consumption and economic welfare, where welfare is a function of consumption of various commodities and leisure, if the MGP proceeds. Under the scenario where the MGP does not proceed, consumption and economic welfare will remain relatively unchanged with a carbon tax of \$10 per tonne of CO₂e.

MJKA also provided the economic impact associated with a range of carbon tax rates, all based on the projected 2020 economy. The model shows that economic activity falls as the fuel tax is increased. MJKA calculates that a carbon tax of \$30 per tonne is estimated to reduce GDP between 2.1 per cent and 1.1 per cent depending on whether or not the MGP proceeds. The cumulative impact to 2030, the peak year for NWT GDP in the analysis, is not presented in the report.

Table 9: Economic Impacts of a NWT Carbon Tax

	MGP does not proceed	MGP does proceed
Market GDP	-0.3%	-0.6%
Labour expenditures	-0.8%	-0.9%
Average salary	-0.8%	-0.9%
Consumption	0.0%	-0.1%
Economic Welfare	0.0%	-0.1%

5. Conclusion

Economic theory is clear: the introduction of a carbon tax will lead to the reduction of greenhouse gas emissions through a combination of technological change or conservation. However, the degree to which a NWT carbon tax will lead to greenhouse gas reductions is unclear because of the limited availability of viable alternatives to carbon-based fuels to meet energy needs and geographically dispersed small, remote communities that depend heavily on transportation for goods.

Analysis completed by MKJA suggests that over five years of carbon taxation at a rate of \$10 per tonne of CO₂e NWT greenhouse gas emissions will be reduced by 0.7 per cent relative to the case where no tax is implemented. Whether or not a carbon tax is implemented, NWT greenhouse gas emissions are expected to rise over the same five-year period because of increased economic activity.

A key part of the carbon tax will be the design of a system of tax credits and tax rate reductions that will make the carbon tax revenue neutral at the territorial level. More information is needed to:

- Separate out the incidence of a carbon tax on businesses compared to individuals. This will require surveying fuel tax collectors and large-scale consumers of fuel to determine to which communities they are distributing their fuel.
- Determine the GNWT burden in various communities.

Setting aside the revenue neutrality issue, a carbon tax designed for the NWT must take into account the fact that the NWT is a small, open, resource-based economy and those characteristics make for a different set of consequences than would be experienced in other more diverse economies. For examples:

- A carbon tax will increase costs for all NWT businesses and residents, with the lowest income individuals and those in small, remote communities being relatively more burdened. While redistribution of carbon tax revenues may eliminate some of the disproportionate burden felt by low-income and remote residents and businesses, it will be impossible to design a compensation system that will perfectly match the burden the tax imposes. While it is possible to implement a tax that is revenue-neutral at the GNWT level, it is not possible to create one that will be neutral at the level of households and businesses; at this level there will be winners and losers.
- Remote communities that are heavily reliant on carbon-based fuels will be disproportionately burdened by a carbon tax. Further, these communities, particularly those above the tree line, have limited opportunities to reduce their consumption of carbon-based fuels by making use of alternative fuels.
- By increasing the cost of fuels, a carbon tax will increase the cost of participating in traditional activities, including hunting, fishing and trapping, which are an important part of the NWT's heritage and remain important to many individuals and communities in the NWT.
- The lowest-hanging fruit will be the first picked. That is, the easiest and least costly changes that can be made to reduce consumption of carbon-based fuels will be pursued first. As time passes, it will become more difficult to achieve further reductions, unless there are considerable technological improvements that allow for low-cost reductions.
- By itself, a carbon tax may not be a sufficient means by which to reduce greenhouse gas emissions. It is necessary that NWT residents and businesses be technically able to make reductions in their emissions at affordable costs. This will require the availability of economically viable alternatives to reduce consumption of carbon-based fuels. If residents and businesses are unable to adopt or gain access to affordable alternatives, for financial or technical reasons, a carbon tax will increase costs but will do little to reduce emissions.
- Implementing a carbon tax in the NWT will increase the costs of doing business within the territory and would make the NWT a less competitive for businesses, compared with jurisdictions that do not have a carbon tax. Fuel-intensive industries such as exploration for and extraction of minerals, oil and gas, which represent the backbone of the NWT economy, may be especially hard hit.

Appendix A: Data: Availability and Shortcomings

Limited data is available for these analyses, and there are limitations to the data that is available; fuel tax records from the Department of Finance; fuel sales records from the Petroleum Products Division (PPD); and demographic information from the Bureau of Statistics. Other data sources have been considered and investigated for these analyses. Although possibly incomplete, this appendix attempts to describe available data as well as gaps and shortcomings of this data.

1. Fuel

a. Types of Fuel

- PPD data clearly indicates the volume of each type of fuel they provide, as well as the use for low- sulphur diesel, which is sold as a multi-use product. Technical specifications are available for the fuels provided by the PPD.
- Department of Finance fuel tax records indicate the volume of fuel by type for fuels currently taxed under the *Petroleum Products Taxation Act*. In addition the fuel tax records provide information on heating fuel and bulk propane sales, both of which are untaxed.
- With the exception of heating fuel, bulk sales of propane and bulk sales of naphtha provided by the PPD, no data is available on fuels currently exempt from taxation, but which could be subject to a carbon tax. These include, but are not limited to: natural gas; non-bulk (small, sealed containers) propane and naphtha; bulk sales of naphtha supplied by tax collectors other than the PPD; butane; ethane; kerosene; and menthol.
- In communities serviced by the PPD, it is known that all diesel is of the same grade (low-sulphur diesel), regardless of how it is consumed. However, no information is available on the grade of diesels on which tax collectors submit returns to the Department of Finance. Different grades of diesel may be consumed for different purposes and this may have statistically significant impacts on the GHG emissions produced.

b. Distribution of Fuel

- For each community in which the PPD provides fuel, PPD records provides precise volumes for each type of fuel supplied. Distribution, by community, is well established for these fuels.
- Department of Finance fuel tax records do not indicate the community in which the fuel was sold or consumed; rather the geography assigned to these records corresponds to the community from which the tax collector files the return. Returns filed from outside the territory are not assigned to any community within the NWT. Distribution of fuels must be estimated.

c. Consumers of and uses for fuel

Residential/Personal

- PPD sales records do not indicate the volume or type of fuel consumed for personal/residential uses.
- Department of Finance fuel tax records do not indicate the volume or type of fuel consumed for personal/residential uses.

Commercial

- PPD sales records do not indicate the volume or type of fuel consumed for commercial uses.
- Except for those instances where a tax collector is known to be a commercial user of fuels, Department of Finance fuel tax records do not indicate the volume or type of fuel consumed for personal/residential uses.

Exempt

- At the community-level, PPD sales records do not indicate the volume or type of fuel consumed by exempt consumers.
- At the territory-wide level, Department of Finance fuel tax records indicate the volumes of exempt fuel sales by all fuel tax collectors. No community-level information is available from fuel tax records.

Crown Corporations

- The volume of non-motive diesel consumed by the NTPC is available from PPD sales records and through the Department of Finance fuel tax records, although the volumes differ slightly between the sources.
- The volume of heating diesel and other fuels consumed by the NWT HC is not available in either PPD sales records or Department of Finance fuel tax records.

Transportation Industry

- Data specific to fuel being consumed by the transportation industry for intra-territory transportation may partially support estimation of the indirect impacts of a carbon tax in terms of cost increases resulting from increased transportation costs. Further, the identification of this data, by mode, would allow for it to be removed from communities to which it is currently allocated, which would improve the precision of the analyses. Transportation data, by mode, is discussed further below.
- With the exception of the Jet A-1 Aviation Turbine Fuel delivered to select communities, PPD fuel sales records cannot be used to determine the quantity of fuel that is consumed by the transportation industry. However, due to the geography of many of these communities, it is probable that a much smaller proportion of fuel would be consumed by the transportation industry than in other parts of the territory.
- In communities not serviced by the PPD the only transportation-specific fuel that can be identified related to diesel consumed by railways, which is suppressed in this report for reasons of confidentiality, and the aviation industry. It is possible to identify these industries as they use unique fuels which are currently taxed under the Petroleum Products Taxation Act. It is also possible to identify certain tax collectors which are known to be providers of intra-territory transportation services.
- The composition of the vehicle fleet owned by NWT residents, in terms of age, engine displacement, and other characteristics, will influence the degree to which their personal transportation choices are impacted by the implementation of a Carbon tax. As will the rate at which these vehicles are used. It is unknown if data is available in the NWT or other jurisdictions; however, multi-jurisdiction

comparisons of personal vehicle fleet composition and utilization may provide insight as to how a carbon tax would impact GHG emissions from personal transportation in the NWT versus other jurisdictions.

Heating by fuel type

- Although unavailable at the time these analyses were undertaken, the NWT Bureau of Statistics in the future may be able to make available data sourced from the community housing survey pertaining to fuel type used for household heating in the majority of NWT communities. Such data may support or partially support analyses of community-specific dependency on carbon-based fuels for household heating.

d. Temporal

- Fuel records from the Department of Finance and the PPD are for a single fiscal year (2010-2011). At the time of analysis, multi-year data was not available from the PPD. Without investigating fuel consumption in multiple time periods it is not possible to know if the data employed in these analyses is representative. It is possible that for one of more PPD-serviced community or fuel tax collector, the records analyzed represent an atypical year.

2. Transportation, by mode

a. Road

- The volume of fuel utilized for freight transportation by roads cannot be estimated from Department of Finance fuel tax records or from PPD fuel sale records.
- Road data is collected and compiled by the Department of Transport for planning purposes. Different mechanisms are used for different circumstance.
- The Marine Services Division reports the number and vehicle types but not commodities using the five ferries.
- Truck volumes and commodities are recorded from the weigh scale in Enterprise, but the weigh station has limited hours of operation resulting in an undercount.
- Traffic counters are positioned strategically in the highway system (including winter roads) to obtain vehicle counts only at the locations. For 2010 it was estimated that over 40 per cent of all potential data was usable for determining traffic counts due to equipment issues.
- Truck traffic tonnage and number are available by destination for the Tibbitt to Contwoyto Winter Road and is provided by the Joint Venture.

b. Air

- The volume of aviation fuel is available at the territorial level from Department of Finance fuel tax records, and is available at the community level for those communities where jet A-1 aviation turbine fuel is delivered by the PPD.
- The number of local and itinerant movements at NWT airports is available from Statistics Canada; however, data is incomplete for certain airports (i.e. reports are not filed from each airport with monthly consistency).

- Data is not available regarding number of passengers, types of freight or tonnage of freight enplaned/deplaned at NWT airports.
- Information is not available regarding the fuel consumption rates of the fleet serving NWT communities.

c. Marine

- The volume of fuel consumed for marine (barge, ferry) transportation within the NWT is unavailable in Department of Finance fuel tax records and PPD fuel sales records.
- The number of marine transportation movements, type of freight, tonnage of freight and routes utilized are unknown.
- Information is not available regarding the fuel consumption rates of marine vessels serving NWT communities.
- Six communities serviced by the PPD, listed in Appendix C, receive bulk fuel by means of barges.

d. Rail

- The volume of rail diesel consumed within the NWT is available from Department of Finance fuel tax records. Due to limited rail infrastructure within the territory, the geography serviced by rail transportation is also known.
- The number of train movements, type and tonnage of freight is unknown.

3. Miscellaneous data

a. Traditional Activities

- Data available at community and territory-wide levels from the NWT Bureau of Statistics. 2008 is the most recent year for which data is available.

b. Demographics

- Population data available at community and territory-wide levels from the NWT Bureau of Statistics. 2011 data is available.
- Data regarding the number of tax filers is available for most communities in the territory as well as at territory-wide level from the NWT Bureau of Statistics. 2009 is the most recent year for which data is available.

c. Climatic Data

- Heating degree day (HDD) data is available for many NWT locations from Environment Canada. This data may be used in conjunction with data related to heating by fuel type, when and if it becomes available, to support community-specific analyses of dependency on carbon-based fuels for household heating.

Appendix B: Fuels distributed by the Petroleum Products Division

- Low Sulphur Diesel Fuel- sold as a multipurpose product. Used for: heating; powering mobile diesel vehicles; and electrical power generation.
- Unleaded Automotive Gasoline - Used for: cars; light-duty trucks; boats; and other motive purposes.
- Jet A-1 Aviation Turbine Fuel - certified aviation product, used in turbine engine aircraft. Not available in all communities.
- Naphtha Gas– also known as camp stove fuel.

Communities served by the PPD

Resupplied by All-weather Road

- Jean Marie River
- Tsiigehtchic
- Wrigley

Resupplied by Winter Road

- Trout Lake
- Nahanni Butte
- Gameti
- Wekweeti
- Whati
- Colville Lake
- Deline

Resupplied by Summer Barge

- Lutselk'e
- Fort Good Hope
- Tulita
- Ulukhaktok
- Paulatuk
- Sachs Harbour

Appendix C: NWT Participation in Traditional Activities

	Per cent of Persons 15 or older who Hunted or Fished in 2008 (%)	Per cent of Aboriginal Persons 15 or older who Hunted or Fished in 2008 (%)	Per cent of Persons 15 or older who Trapped in 2008 (%)	Per cent of Households Consuming Half or More Country Food (Meat & Fish) in 2008 (%) ¹
Northwest Territories	39.4	45.0	6.2	28.1
Beaufort Delta	48.1	53.7	9.2	43.8
Aklavik	53.7	54.5	18.3	51.3
Fort McPherson	46.6	48.2	11.6	76.5
Inuvik	40.8	46.0	7.9	25.2
Paulatuk	68.7	66.7	9.9	74.7
Sachs Harbour	72.6	82.5	10.5	61.7
Tsiigehtchic	42.9	43.5	12.2	79.7
Tuktoyaktuk	54.4	64.1	5.8	63.3
Ulukhaktok (Holman)	66.9	70.1	7.8	62.9
Dehcho	46.7	48.1	16.3	52.4
Fort Liard	58.7	61.5	29.2	66.5
Fort Providence	45.7	46.2	18.7	59.5
Fort Simpson	41.5	41.8	9.0	34.4
Hay River Reserve	35.5	36.0	9.8	56.4
Jean Marie River	55.9	56.1	16.2	90.0
Nahanni Butte	57.6	59.3	14.1	77.1
Trout Lake	74.7	75.7	36.7	81.8
Wrigley	42.9	45.8	20.9	73.8
Sahtu	44.7	45.7	12.0	60.9
Colville Lake	66.3	67.1	48.2	94.3
Déljine	49.4	48.8	14.2	77.0
Fort Good Hope	41.9	44.7	16.8	76.9
Norman Wells	42.5	42.9	2.5	29.3
Tulita	41.7	41.1	12.0	78.5
South Slave	39.5	43.0	7.6	25.5
Enterprise	20.7	32.1	0	15.0
Fort Resolution	42.6	43.2	16.7	69.4
Fort Smith	43.9	44.2	7.8	22.2
Hay River	33.7	35.8	4.0	15.7
Kakisa	51.2	50.0	34.9	94.4
Lutsel'k'e	73.3	75.6	32.9	91.9
Tłı̄chǫ	40.0	39.3	13.2	73.7
Behchokǭ (Rae-Edzo)	37.5	36.1	12.1	73.2
Gamèti (Rae Lakes)	37.9	39.2	14.0	73.2
Wekweètì	55.6	56.4	22.2	65.7
Whati	47.2	47.3	14.7	78.0
Non-Yellowknife Area	43.8	47.0	10.5	43.5
Yellowknife Area	34.5	37.9	1.4	11.3
Detah	38.5	38.4	19.8	70.0
Yellowknife	34.5	37.8	1.2	10.7
N'dilo	36.6		14.1	

¹ Refers to households reporting that 50 per cent or more of the meat or fish consumed is harvested in the NWT.