Dawson Creek and Climate Change

Current Emissions, Projected Growth, and Needed Reductions

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Sustainable Energy Solutions

About the Pembina Institute

The Pembina Institute creates sustainable energy solutions through research, education and advocacy. It promotes environmental, social and economic sustainability in the public interest by developing practical solutions for communities, individuals, governments and businesses. The Pembina Institute provides policy research leadership and education on climate change, energy issues, green economics, energy efficiency and conservation, renewable energy, and environmental governance.

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1 About this Document

This document is part of Dawson Creek's overall initiative to move towards sustainable energy systems and reduce greenhouse gas emissions. It starts by providing some background on climate change and Dawson's Creek's role in addressing the climate challenge. The report then reviews Dawson Creek's current emissions, discusses how they could grow in the absence of action, and explains how Dawson Creek would like to change that trajectory. The City has also been taking action on climate change, and more about the current and planned initiatives can be found in *Dawson Creek's Climate Action Plan*.

This report explores community emissions (all emissions in Dawson Creek), but does not separately deal with the City's corporate emissions (emissions from municipal operations). To learn more about Dawson Creek's corporate emissions and the strategies being employed to reduce them, see *Dawson Creek Corporate Baseline* and *Carbon Neutral Dawson Creek*.

All of the Dawson Creek reports referenced in this document can be downloaded from *www.planningforpeople.ca*.

2 Tackling Climate Change in Dawson Creek

2.1 Current activities

Dawson Creek has been working on energy and climate change issues since 2004, when it started its Corporate Baseline Inventory. The corporate inventory was a first step to identifying how Dawson Creek's corporate operations used energy, the associated cost and the associated greenhouse gas (GHG) emissions. Since that time, the City has begun to implement all of the recommended actions to reduce its corporate emissions. Dawson Creek has also recently committed to be carbon neutral in its corporate operations by 2012.

Paralleling the corporate activities, the City has also investigated a number of opportunities to reduce emissions throughout the community. These have included: solar energy installations for commercial and residential buildings, energy efficiency improvements in new homes, waste to energy opportunities from biomass and sewer wastes, and electricity generation from wind energy.

In 2006, Dawson Creek began a larger Sustainability Planning process which will ensure that all planning in the city is done with consideration for economic, social and environmental sustainability. The previously completed Corporate Baseline Inventory and this report on the total community contribution to GHG emissions are an important component of the broader Sustainability Planning process.

2.2 Climate change: Why should we care?

Activities that burn fossil fuels, such as driving vehicles or generating electricity from natural gas, release greenhouse gas emissions. These emissions are causing the concentration of greenhouse gases in our atmosphere to increase because they have nowhere to go. The thicker layer of gases are trapping more of the sun's heat, warming the surface of the Earth, and leading to an increasingly uncertain climate. By reducing greenhouse gas emissions significantly, humans have the ability to begin stabilizing the concentrations of greenhouse gas emissions in the atmosphere, and reduce the risks of significant and dangerous changes in the Earth's climate.

If governments, communities, families, and businesses don't act decisively to reduce greenhouse gas emissions, the most severe impacts of climate change will become inevitable. Worldwide, the next few decades of climate change could see an increase in severe weather events, water shortages in some areas and flooding in others, an increase in vector-borne diseases, and rising sea levels.

2.2.1 Local environmental impacts

For Dawson Creek and British Columbia, climate change presents the risk of more immediate and local impacts:

- Climate change could change water levels and temperatures in rivers and streams leading to further pressures on already stressed species, such as bull trout and salmon. Even slight changes in river temperature can have major impacts on these ecosystems.
- British Columbia's forests will likely experience more forest fires and insect infestations as a result of climate change. The massive damage caused by the mountain pine beetle illustrates this concern, because its spread across the province is largely a result of warmer winters. Normally killed off by long, intense cold snaps, mountain pine beetles have been able to spread as a result of a number of mild winters.
- Rapid changes in climate, even if only relatively small, could result in loss of native species and biodiversity as environmental pressures increase.

2.2.2 Not just an environmental problem

The concerns discussed above are clearly significant and warrant decisive action on their own, but climate change is much broader than an environmental problem.

From a social perspective, all of the environmental impacts described above will have impacts on communities. Rising sea levels and changing climates will make some areas either much less suitable for communities or entirely inhabitable, shifting climates will put pressures on traditional natural resource economies such as agriculture and forestry. These examples represent just a short sampling of the many impacts of climate change on communities.

Climate change poses challenges from an economic perspective too. Although many of the opportunities to reduce emissions can save money, many will result in higher overall costs. At the same time, a large number of economists support taking these actions because the costs of inaction will inevitably be higher. In 2006, the former Chief Economist of the World Bank carried out a review of costs associated with climate change for the British government. The report concluded that a five degree Celsius rise in average temperatures could reduce global economic output by as much as 20 per cent. To stabilize emissions and minimize further temperature increases, on the other hand, would cost only 1 per cent of the world's combined gross domestic product.

In the same way that the challenge is broader than environmental, the solutions provide a broader set of benefits. Measures to reduce GHG emissions in cities can involve positive changes to community design such as improved infrastructure for active transportation. These features, in combination with well-designed public spaces can help create vibrant, healthy places to live and do business. Actively pursuing energy efficiency and renewable energy could also be a significant source of new employment opportunities in Dawson.

2.3 Why Dawson Creek?

In terms of Canadian or global greenhouse gas emissions, some people might say that Dawson Creek is just a drop in the bucket. What can the community and the City hope to achieve by taking action? Such sentiments unnecessarily discount an array of creative community-based solutions that will be absolutely critical in the overall effort to reduce greenhouse gas emissions.

Strong provincial and federal action is absolutely necessary to ensure bold and innovative climate change solutions become a reality. Without these partners, municipalities will not be able to achieve the deep cuts in emissions needed. But at the same time, municipalities have the ability to create their own unique solutions and tap into opportunities that other levels of government are unable to access.

In addition to the general role that municipalities can play in climate change solutions, Dawson Creek is well positioned to advance solutions particularly relevant for smaller and northern communities. While larger cities like Vancouver have started taking steps to reduce emissions, Dawson Creek can serve as an example northerly municipality that is proactive in addressing greenhouse gas emissions.

Dawson Creek has recognized the opportunities and need for municipal leadership on climate change. In response, the City has worked to understand the issues, identify solutions, and started to take action.

3 Dawson Creek Emissions Inventory

3.1 Community emissions

Using data supplied by the provincial government, the Pembina Institute compiled a greenhouse gas (GHG) emissions inventory for Dawson Creek for the year 2005.[1] The emissions inventory includes greenhouse gas emissions from all homes, businesses, and industrial buildings in Dawson Creek, as well as emissions from vehicle travel and waste management in Dawson Creek.

In total, the community produced 110,084 tonnes of CO_2 equivalent (CO_2e) in 2005. The sector with the greatest GHG emissions was transportation sources, accounting for 44% of emissions in the inventory. Residential buildings were the second-greatest contributor of emissions at 24%, with commercial buildings following closely at 23% of emissions. Emissions from industrial buildings stood at 4%, with solid waste disposal contributing 5% of the total Dawson Creek GHG emissions. A graphical representation of this breakdown is presented below in Figure 1 and full results are available in Appendix A.

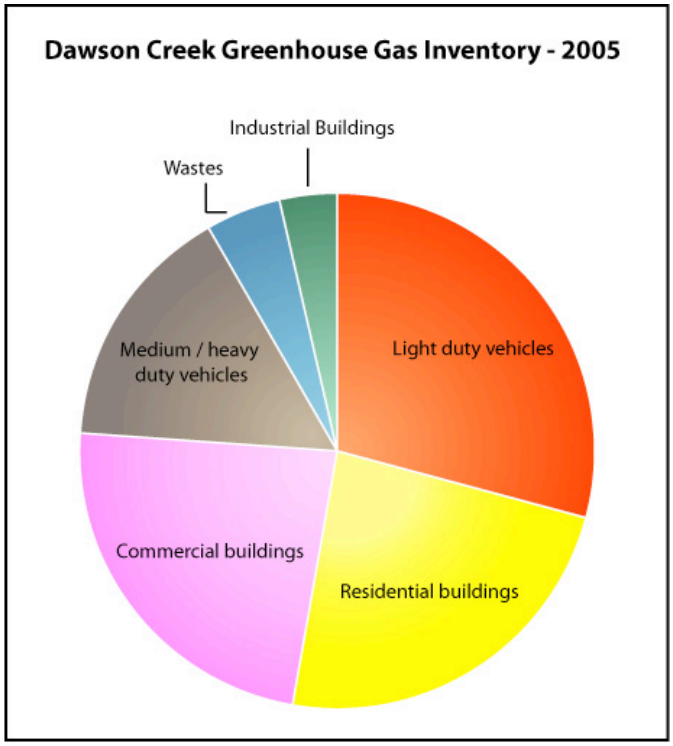

Figure 1: Sectoral breakdown of greenhouse gas emissions in Dawson Creek, 2005.[2]

[1] The sources for the provincial data include BC Hydro, Pacific Northern Gas, and the Insurance Corporation of BC.

[2] Full results are available in Appendix B.

B.C. (and other provinces) do not have a long history of tracking data that is suitable for municipal greenhouse gas inventories, so there will be some uncertainty in all of the above numbers. In particular, the emissions estimates for vehicles and for industrial buildings probably have the greatest uncertainty.

For the vehicles, the emissions are based on vehicles registered in Dawson Creek and the efficiency of those vehicles, but limited information is available on how much those vehicles are driven. Also, for medium and heavy-duty vehicles, the location of vehicle registrations may not align with where those vehicles are used. For example, a vehicle registered in Dawson Creek could see most of its use in Chetwynd (or vice versa). For industrial buildings, the estimated emissions don't include industrial activity that occurs just outside of Dawson Creek and they don't include non-combustion emissions from industrial sources[3]. The inventory also excludes emissions from fuels other than electricity, natural gas, diesel, and gasoline.

3.2 Understanding where the emissions come from

GHG emissions from each sector can originate from a variety of sources, but most of the emissions covered by Dawson's Creek's inventory are produced when fossil fuel are burned to produce energy. Different fuels for heating, electricity, and transportation produce different amounts of GHG emissions per unit of energy they provide (described as greenhouse gas intensity). Figure 2 illustrates the GHG intensities of different fuels. Greenhouse gas emissions are not the only environmental impact associated with energy consumption, so this chart does not provide a complete story. For example, even though electricity in B.C. is relatively clean in terms of GHG emissions, there are other land and water impacts that should be considered when deciding between energy options – in particular when deciding between new supply and energy efficiency options.

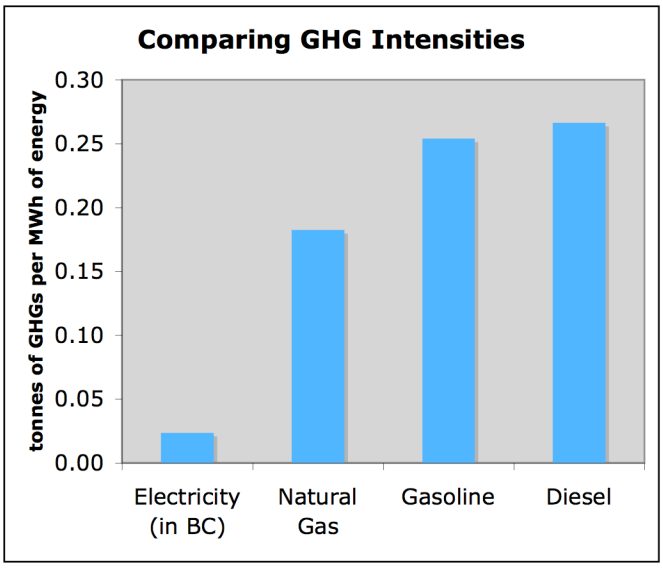

Figure 2: Comparing greenhouse gas intensities for energy options in B.C.

[3] A significant source of emissions that would therefore be missed is the venting and fugitive emissions from oil and gas activities that are a major greenhouse gas pollutant in BC, but are not produced by fuel combustion.

For light duty vehicles, most emissions come from the combustion of gasoline (97% of the 32,250 tonnes). Medium and heavy-duty vehicles also produce a considerable portion of their emissions by burning gasoline (35% of the 17,068 tonnes), but diesel fuel is also commonly used in larger trucks (59% of the total).

For residential, commercial, and industrial buildings, much of the emissions come from the use of natural gas for space and water heating (95% of the 55,575 tonnes). A significant amount of electricity is also used, but because electricity in British Columbia comes primarily from hydroelectric power, the GHG emissions are low. The picture would be significantly different in a province that produces most of its electricity from coal, because coal-fired electricity is much more greenhouse gas intensive than hydro-electricity.

Wastes contribute to greenhouse gas emissions primarily through the production of methane as materials decompose in landfills (without oxygen). This process, called anaerobic digestion, produces methane and it is the only significant source of GHG emissions in Dawson Creek's inventory that doesn't come from fuel combustion.

3.3 How does Dawson Creek compare?

For all of British Columbia in 2005, emissions were 66,800,000 tonnes, which is 600 times larger than Dawson Creek's emissions. Since 1990, B.C.'s total emissions have increased by 33%, although emissions dropped by 2% in 2005. Of these provincial emissions, transportation accounted for 39%, residential and commercial buildings for approximately 14%, industrial emissions for 36% and wastes for 8%, with agriculture accounting for the remaining 4% of emissions.[4,5]

Due to discrepancies between the municipal and provincial inventories, it is difficult to provide a fair comparison of total per capita emissions between Dawson Creek and the rest of B.C. A fairer comparison can be provided if the scope is narrowed to personal emissions (heating, cooling, appliances, transportation, and wastes). In Dawson Creek, these sources produce a total of 63,405 tonnes, which amounts to 5.6 tonnes per capita in 2005. For B.C. the comparable figure is 4.4 tonnes per capita. It is difficult to read too much into these numbers because they are derived using different methodologies. The discrepancy could be the result of real differences or it could be produced by error or uncertainties in the data.

The province has provided similar data sets for other municipalities to produce community GHG inventories, and these do provide a common set of methodologies to facilitate a fair comparison. Figure 3 shows the per capita emissions from residential and commercial buildings, vehicles, and wastes for Dawson Creek and Smithers. Emissions from industrial buildings have been excluded.

[4] Environment Canada, 2007. National Inventory Report, 1990-2005: Greenhouse Gas Sources and Sinks in Canada. Accessed from: http://www.ec.gc.ca/pdb/ghg/inventory_report/2005_report/tdm-toc_eng.cfm.

[5] The industrial emissions included in the B.C. and Dawson Creek inventories are not directly comparable for two reasons. First, many industrial emissions occur outside municipal boundaries so the Dawson Creek industrial emissions are not necessarily representative of the industrial activity in the Dawson Creek area. Second, the Dawson Creek inventory does not capture industrial process emissions such as methane leaks and releases from pipelines.

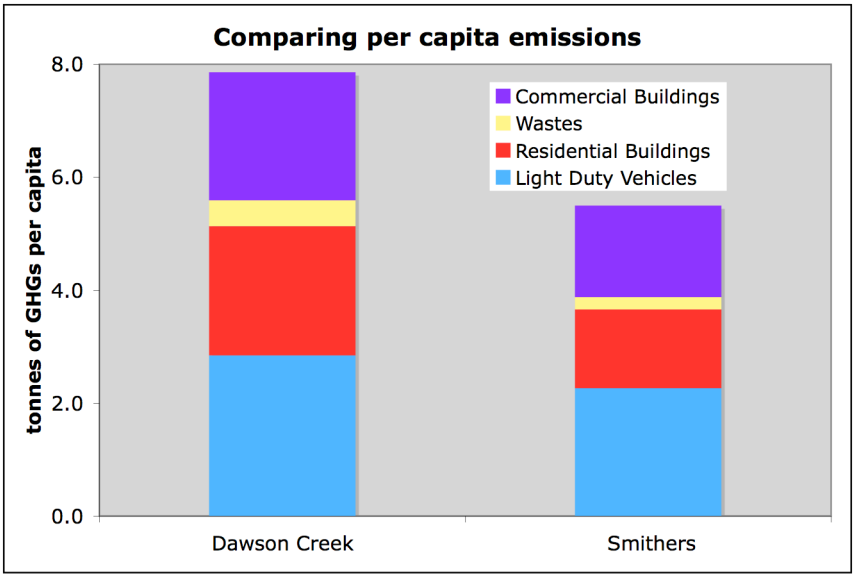

Figure 3: GHG emissions per capita in Dawson Creek and Smithers

3.4 Corporate emissions

The Municipal Energy Baseline report (including buildings, infrastructure, and fleets) was developed as part of the 2005 *Dawson Creek Corporate Baseline*. The report, using the baseline year 2003/2004, quantified the GHG emissions from municipal operations.

In total, municipal operations resulted in emissions of 2,340 tonnes of CO_2e. This means that municipal operations accounted for roughly 2% of community-wide emissions in Dawson Creek in 2003/2004. Municipal buildings produced 70% of GHG emissions from municipal operations, fleet vehicles produced 23.5%, and other infrastructure (such as streetlights) accounted for the remaining 6.5%.

The City has been actively pursuing opportunities to reduce those emissions and they have installed a number of solar hot water systems, improved the energy efficiency of lighting and heating systems, and purchased several hybrid vehicles and smaller vehicles. The City has also implemented a *Green Buildings Policy* and *Green Vehicles Policy*.

All of these reports and policies are available at *www.planningforpeople.ca.*

4 Projected Emissions (Without Action)

What would happen if no action was taken to reduce greenhouse gas (GHG) emission in Dawson Creek? Emissions in Canada and British Columbia have been increasing since 1990, so it is reasonable to assume that if no action is taken, they would continue to increase. Figure 4 illustrates three scenarios for future growth in Dawson Creek's emissions assuming that no action is taken to reduce emissions. The three scenarios are based on low, medium, and high rates of population growth in the community. More detailed breakdowns of the sources of emissions within each scenario are available in Appendix B.

Population growth assumptions are derived from projections in the *City of Dawson Creek 2006 Parks and Recreation Master Plan*. Scenario A, assuming a "likely" population growth of 0.4% per year, would result in emissions growth of more than 25% between 2000 and 2050. Scenario B, assuming a "possible" growth rate of 1.0% per year, would see an increase of nearly 38% between the same 50-year period. Scenario C, representing a "maximum" population growth rate of 2% per year would see emissions more than double.

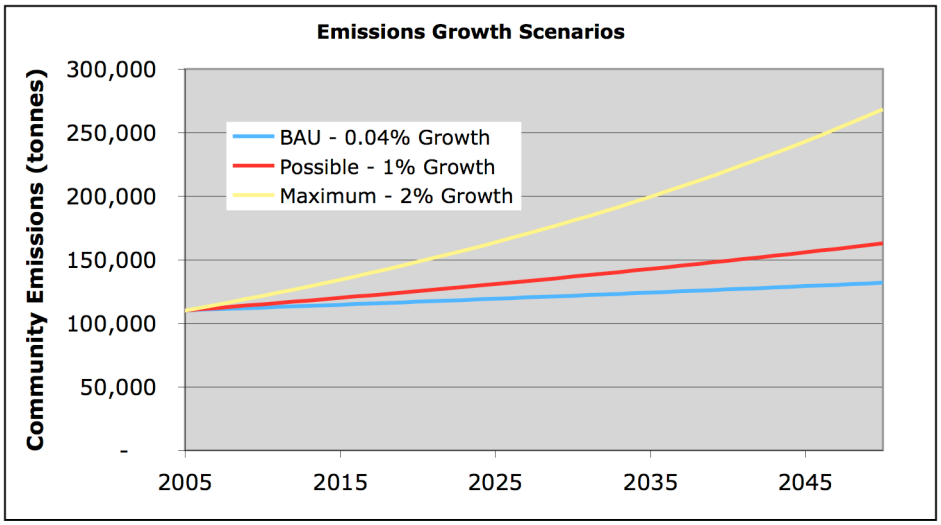

Figure 4: Scenarios for projected emissions in Dawson Creek without action to reduce emissions

The above projections are relatively simplistic projections and they do not account for the many increases and decreases in per capita emissions that can occur over time. They do not account for any intiatives by Dawson Creek (or other levels of government) to reduce emissions or other policies that could inadvertantly lead to increases in emissions. They also do not attempt to infer independent changes in behavior or technologies that could either lead to increasing or decreasing emissions. The main value of simple projections is to illustrate that doing nothing should not be an option and that significant action will be required to change these projected increases to large decreases in emissions.

5 Targeted Emissions (A Call to Action)

Recognizing the pressing need to reduce emissions, what are realistic but ambitious goals for Dawson Creek? Targets can help provide a framework for reducing greenhouse gas (GHG) emissions, and encourage measurable progress. They can also help motivate community action to reduce emissions by increasing awareness of environmental issues. Establishing targets allows Dawson Creek to:

- Assess whether the impact of proposed actions is sufficient to meet their goals.
- Evaluate whether or not existing actions are adequate to achieve these targets.
- Develop more specific targets to support the overall targets where appropriate (for example, all new homes will produce net-zero greenhouse gas emissions by 2016).
- Communicate with local businesses, organizations and individuals, and other communities and governments about the targets that Dawson Creek has adopted.

In 2007, Dawson Creek established short term, medium term and long-term GHG targets:

- 14% below 2006 levels by 2012
- 33% below 2006 levels by 2020
- 85% below 2006 levels by 2050

Importantly, these targets are in alignment with the deep reductions in emissions needed to avert dangerous climate change. They are also very close to the targets legislated by the B.C. government. It will be important to strengthen these targets if necessary as our understanding of climate change continues to evolve.

Assuming Dawson Creek meets these targets, long-term GHG emissions are projected to decline as illustrated below in Figure 5. The figure assumes that reductions will occur proportionally in all sectors, and although this is not likely to be the case, deep reductions will be needed in all sectors to achieve the medium and long-term targets.

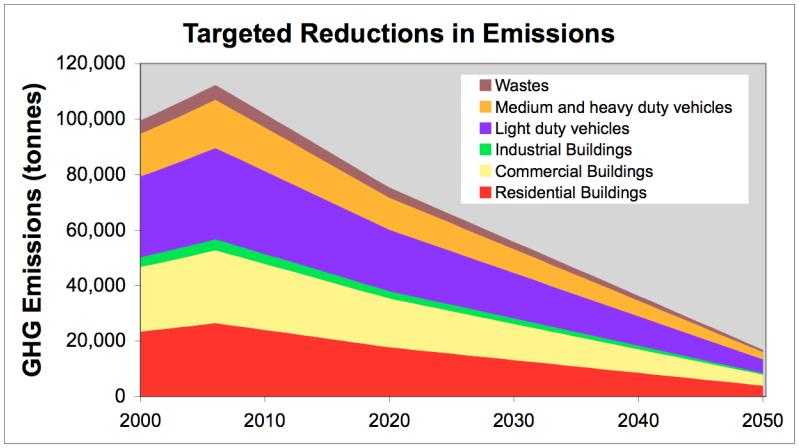

Figure 5: Targeted emissions reductions for Dawson Creek

6 Getting to the Targets

Although these targets are ambitious, they are necessary if Dawson Creek is going to contribute its fair share to a broader effort of avoiding dangerous climate change. Thankfully, Dawson Creek has many options to reduce greenhouse gas (GHG) emissions. A full path to any of the adopted targets has yet to be charted, but numerous studies have confirmed the potential exists to achieve deep cuts in emissions. For example, the National Round Table on Environment and Economy has demonstrated that Canada's greenhouse gas emissions could be reduced by 60% from 2003 levels by deploying existing technologies and sending the right policy signals.[6]

If Dawson Creek is to be successful in moving towards the targets, the following types of changes will need to be pursued aggressively and quickly:

- Transitioning to energy sources that produce less greenhouse gas emissions per unit of energy (e.g. relying on wind-powered electricity instead of coal-fired or using bio-diesel instead of conventional diesel).
- Using less energy to meet the same needs (e.g. better insulated homes or more efficient appliances).
- Changing behaviour to require less energy (e.g. living in a smaller home or driving less frequently).

The specific opportunities that fall under these three categories are detailed in *Dawson Creek's Climate Action Plan*, which can be downloaded from *www.planningforpeople.com.* This document also explains which of those opportunities are being pursued in the short-term.

[6] The National Round Table is currently examining scenarios with reductions of up to 80% below 2003 levels. Their report examining 45% to 65% reductions in Canada is available at: *http://www.nrtee-trnee.ca/eng/publications/getting-to-2050/intro-page-getting-to-2050-eng.html.*

Appendix A – Complete Emissions Inventory

Table 1 - 2005 Energy Consumption (Gigajoules) in Dawson Creek

	Electricity	Natural Gas	Gasoline	Diesel	Propane	Other	Total
Residential Buildings	136,605	483,062	-	-	-	-	619,667
Commercial Buildings	174,790	471,978	-	-	-	-	646,768
Industrial Buildings	16,126	72,563	-	-	-	-	88,689
Light duty vehicles*	-	-	434,303	7,653	5,581	-	447,537
Medium & heavy duty vehicles	-	-	83,074	140,523	16,109	-	239,706
Wastes	na	na	na	na	na	na	-
Total	327,521	1,027,603	517,377	148,176	21,690	-	2,042,367

**Includes passenger vehicles, motorcycles, scooters, light-duty vehicles*

Table 2 - 2005 Greenhouse gas emissions (tonnes) in Dawson Creek

	Electricity	Natural Gas	Gasoline	Diesel	Propane	Other	Total
Residential Buildings	1,252	24,714	-	-	-	-	25,966
Commercial Buildings	1,602	24,147	-	-	-	-	25,749
Industrial Buildings	148	3,712	-	-	-	-	3,860
Light duty vehicles*	-	-	31,363	551	336	-	32,250
Medium & heavy duty vehicles	-	-	5,998	10,104	966	-	17,068
Wastes	na	na	na	na	na	5,189	5,189
Total	3,002	52,573	37,361	10,655	1,302	5,189	110,082

**Includes passenger vehicles, motorcycles, scooters, light-duty vehicles*

Appendix B – Emissions Growth Scenarios

The following four figures show the sector breakdowns for three unrestrained emissions growth scenarios and one that achieves Dawson Creek's emission reduction targets.

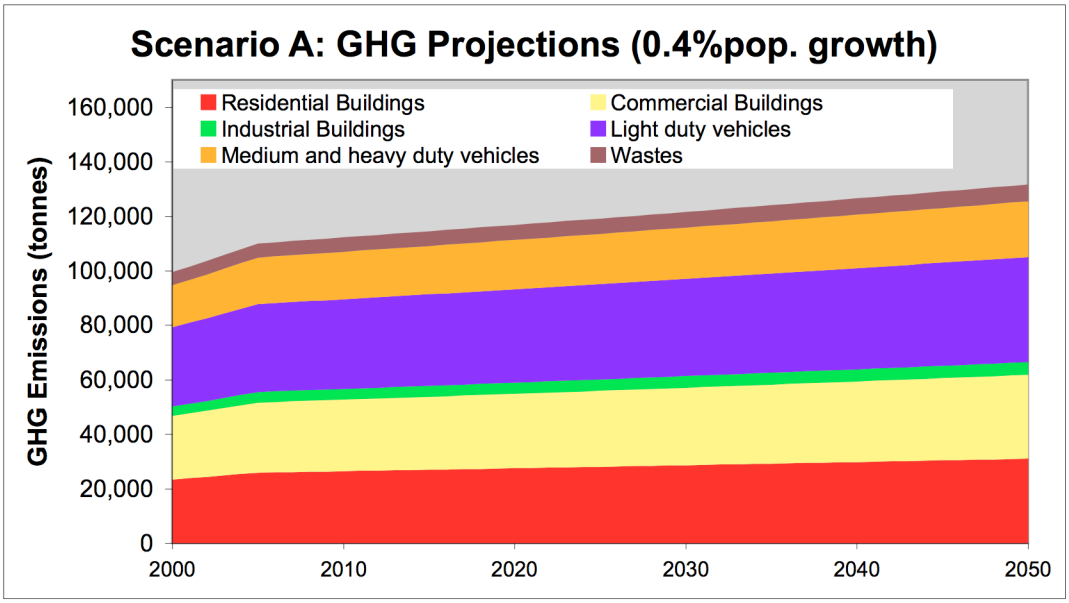

Figure 6: Scenario A - "Likely" population growth

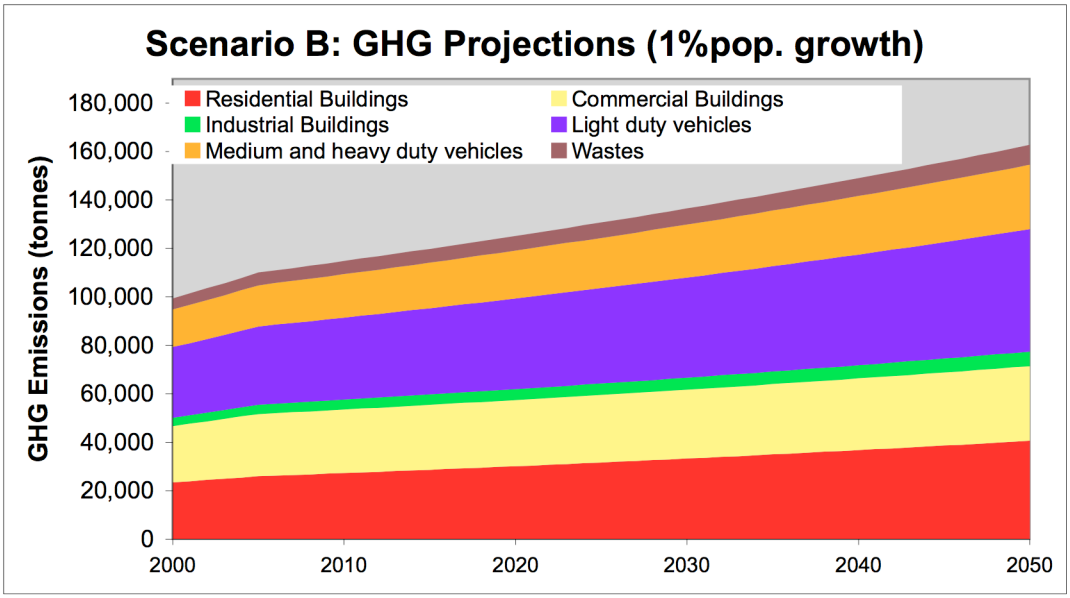

Figure 7: Scenario B - "Possible" population growth

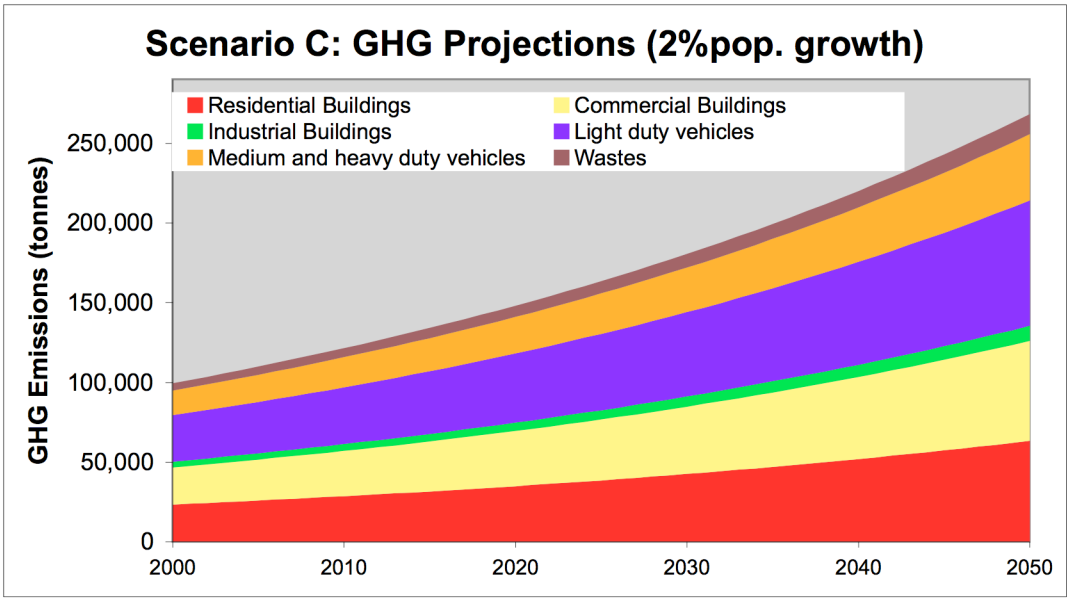

Figure 8: Scenario C - "Maximum" population growth

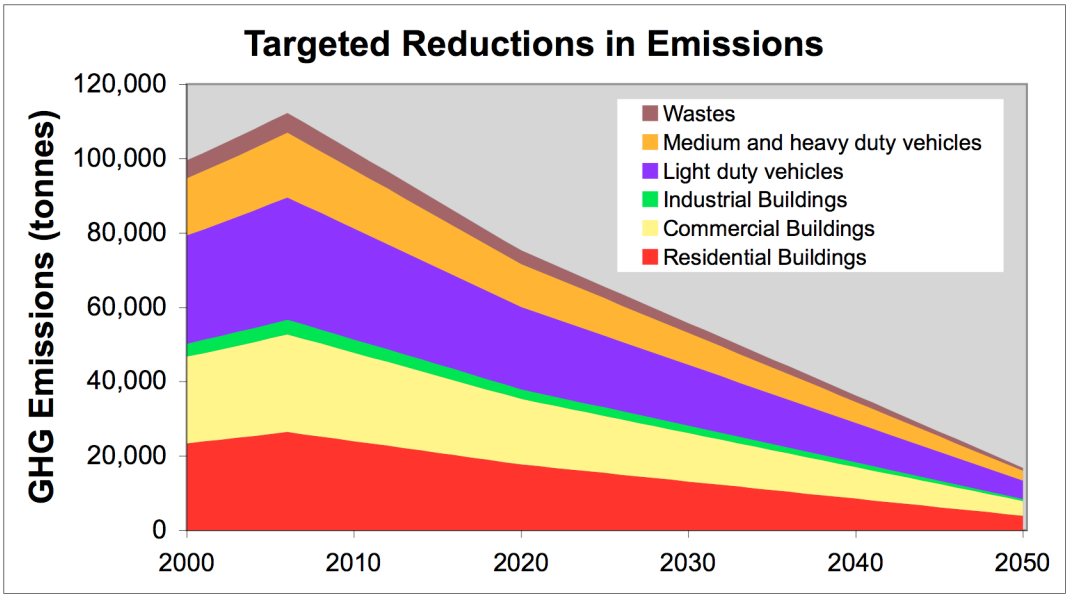

Figure 9: Targeted reductions in greenhouse gas emissions