Nelson
Community Energy & Emissions
Situational Analysis

December 2010

Our Climate, Our Community Consultations

A Community Climate Action and Energy Plan that genuinely starts to reduce greenhouse gases and advance local, sustainable energy opportunities depends on the active engagement of residents, businesses, community organizations, regional utilities, and public institutions, as well as City Council and staff.

This paper will help prime stakeholders for consultations to help shape a pragmatic and innovative Community Action Plan. These consultations are taking place December 8th and 9th at the Best Western Baker Street Inn, 153 Baker Street.

Stakeholder Consultations & Invitees	Time
Local Business & Economic Development Sector Meeting co-hosted with the Nelson and District Chamber of Commerce	Wed, December 8 7:30 am - 10:00 am
Building Sector Meeting involving developers, builders, retrofit companies, architects, and building-scale renewable energy companies	Wed, December 8 1:00 pm - 3:30 pm
Community Stakeholder Workshop involving a diverse representation of businesses, community organizations, regional utilities, and public institutions	Thurs, December 9 8:30 am – 12:30 pm

Other organizations, businesses and interested members of the public are invited to attend an additional drop in consultation:

Open House
Thursday, December 9, 3:30 pm - 7:00 pm
Best Western Baker Street Inn, 153 Baker Street

Acknowledgements

This paper was authored by HB Lanarc with contributions by the City of Nelson and Community Energy Association.

Developing the Community Climate Action and Energy Plan is being supported by the City of Nelson and generous contributions from the Union of BC Municipalities, the British Columbia Provincial Government and the Government of Canada.

Cover Photo: BobbyH_80 (flickr) Thanks!

1. Context for Action

This discussion paper begins to explore key issues that will inform development of a Community Climate Action and Energy Plan for Nelson. The *Situational Analysis* is organized accordingly:

Please focus on the sections that most interest you – it is not necessary to read entire document.

Questions that will be explored during consultations

A. **What actions would I like to take** to reduce GHGs and use energy more sustainability in my life, and in my business or organization? What resources would I need to take action?

- Actions could relate to the building you live or work in, your energy supply, how you travel, what you purchase and how you dispose it, goods you sell or services you deliver.

B. **What strategies can the community adopt** to promote energy sustainability and reduce greenhouse gas emissions?

- Strategies can include projects, actions, policies, programs. They could be undertaken by the municipality, public or private sector organizations, non-profits, individuals, partnerships.

C. **What major trends** over the next 10-20 years will influence our economy and should be considered in *local* efforts to promote energy sustainability and greenhouse gas reductions.

- Trends could be social, economic, environmental, technological or public policy related.

D. **What key opportunities and challenges influence our capacity to** promote energy sustainability and reduce greenhouse gases?

- Challenges and opportunities could be financial, knowledge, costs, lifestyles, topography, public opinion, resource availability, and demographic change. They could be local or global.

1. PROJECT BACKGROUND

The City is developing a Community Climate Action and Energy Plan.

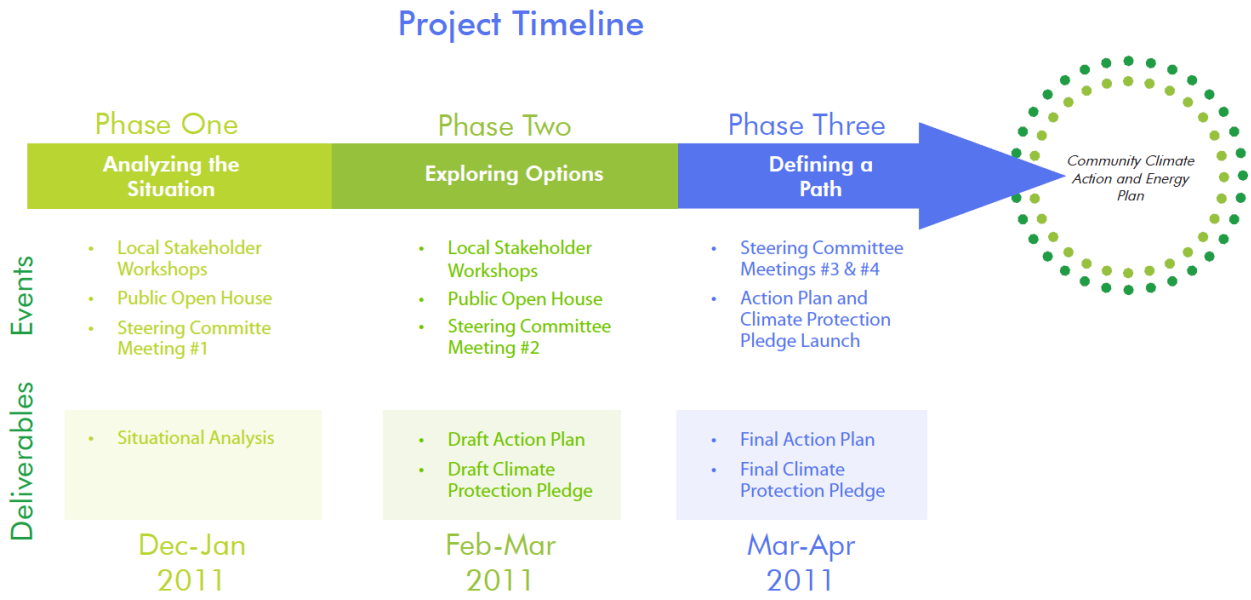
In contrast to many communities, however, sustainable energy and emission management is not a fundamental departure from its past nor present. For Nelson, this Plan will build on its complete, compact, highly-liveable character, heritage building preservation, and a historic commitment to energy security that began more than a century ago in establishing its own hydro-electric utility.

The Plan will be informed and shaped by implementation of sustainability principles under the proposed Path to 2040 Sustainability Strategy, recent transportation plans, district energy studies, and the major downtown and waterfront plan.

The Plan will serve as a blueprint for energy savings and greenhouse gas reduction for the community, and meet the following objectives:

- Exceed the City's regulatory requirement to establish greenhouse gas reduction targets and policies and actions for achieving these targets in its Official Community Plan.
- Build on and make recommendations to existing City policies and plans so as to best integrate climate and energy into ongoing municipal business activity.
- Develop appropriate targets and strategies for community-wide GHG reduction and community energy use, as well as sector-specific targets that will guide implementation and support monitoring.
- Establish a clear implementation path that identifies specific tasks for City departments and community partnerships, as well as action opportunities for individuals, and private, public and non-profit players.

The Plan will rely on the community's most critical resource – its residents, businesses, community organizations, regional utilities, and public institutions. To develop and implement a Plan that resonates with the community, Council and staff will work closely with stakeholders and the public. A series of events for stakeholders and the public will be held in December and February, building on the input that has shaped Path 2040.



2. RATIONALE FOR ACTION

Climate Science, Policy and Local Government

The relative stability of the earth's climate over the last 10,000 years has allowed human civilization to flourish. However, through burning oil, coal, and gas, and by clearing large tracts of land for housing, forestry and agriculture, humans have increased carbon dioxide concentrations in the atmosphere to levels not seen for at least 650,000 years. These heat-trapping gases are contributing to an incremental rise in global temperatures disrupting natural and physical systems upon which our health and prosperity depend.

The most recent International Panel on Climate Change (IPCC) report (IPCC 2007a) concluded that global emissions need to peak before 2015, with 50-85% reductions below 2000 levels by 2050, if we are to avoid tipping points that will cause dangerous disruptions, such as severe agricultural collapses, water shortages, droughts and sea level rise.

The economics are also increasingly clear. Commissioned by the British Government and authored by former World Bank Chief Economist Nicholas Stern, the *Economics of Climate Change* estimated the costs of reducing greenhouse gas emissions to a safe level were one percent of global gross domestic product; compared to a loss of up to 20% of global GDP if we do nothing. Stern concluded that 'the benefits of strong, early action on climate change outweigh the costs.' [1]

Communities are vulnerable to climate change due to an extensive infrastructure supporting high concentrations of people and economic activity. Insurance Bureau of Canada data show costs of property damage from natural catastrophes doubling every 5 to 10 years and has attributed much of this growth to climate change.[2] From floods to fires and windstorms, BC communities have been experiencing higher and higher costs. Many local governments have also begun to realize that when disaster strikes, they are on the front lines.

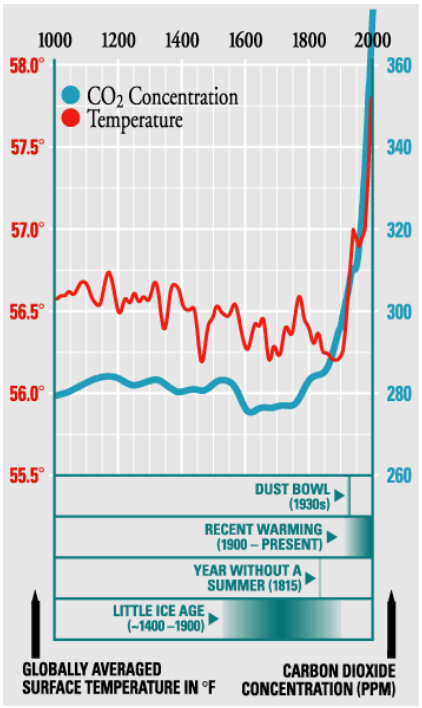


Figure 1: CO2 Concentration and Mean Temperature. Since the 1900s global average temperature and atmospheric CO2 concentration have increased dramatically. The rapid rise in surface temperature and CO2 is one of the indications that humans are responsible for most of this warming. (Source: National Academy of Sciences)

Changes expected in Nelson area during this century include:[3]

Warmer annual temperature

- Glacier retreat in surrounding areas
- Changes in seasonality of stream flow
- Increased evaporation
- Longer fire seasons may result in more interface fires that threaten communities and infrastructure

Winter warming

- Mid-winter thaw events may damage roads and cause ice jams and flooding with damage to infrastructure such as bridges
- Fewer days of snow, impacting winter recreation/tourism such as skiing

Warmer, drier summers

- Possibility of more prolonged and intense droughts with lower water supply during periods of peak demand
- Reduced soil moisture and increased evaporation, increasing irrigation needs at the same time of year that streamflows are expected to decline
- Higher temperatures encourage the growth of unfavourable algae and bacteria, adversely impacting water quality
- Possible declines in recharge rates for groundwater sources
- Improved potential for high value crops, if sufficient water is available; warmer temperatures may favour weeds, insects and plant diseases

[1] HM Treasury. Stern Review on the Economics of Climate Change. http://www.hm-treasury.gov.uk/sternreview_index.htm

[2] Insurance Bureau of Canada. (May 4, 2003) Hurricane Juan insurance tab tops $113 million: points to need for preventive measures.

[3] Pacific Climate Impacts Consortium 2010. Data accessed from Plan2Adapt tool: www.plan2adapt.ca

In addition, the community will experience disruptions that occur in other parts of the world such as the rising price and periodic constraints in agricultural production.

Local governments assert significant influence over local land use, transportation patterns, building energy use and solid waste management — all significant emission sources. Local government decisions influence approximately 50% of greenhouse gases.[4]

Of all levels of government, local governments also have the most direct relationship with citizens – through the services they deliver. If personal carbon footprints are going to change, it is because local governments will help them step more lightly.

Global and Regional Energy Security

Energy has been called the Achilles Heel of modern Western society. Energy inputs to our economy and society have grown dramatically – everything we consume and do in our communities depends on energy – while easily accessible (low-cost) supply is declining.

- The International Energy Agency expects global energy demand to increase 45% by 2030.[5]
- The US Energy Information Administration low cost estimate of oil is $115 per barrel by 2020. Their high estimate is $185.[6]
- Provincial electricity rates are forecasted to double by 2020.[7]
- Natural gas prices are expected to rise but not as significantly, 13-85%, by 2020.[8]

The volatility in oil and natural gas prices expected by most industry and government sources is potentially worse than rising energy costs. These fluctuations create uncertainty about the future, compromising budget forecasting and long term planning.

BC Climate and Energy Policy Developments

In light of the scientific evidence on the dangers of climate change, the BC Government announced in 2007 a commitment to reduce provincial GHG emissions 33% below current levels by 2020 and 80% by 2050. While many factors influenced development of these targets, the most important from a risk management perspective is their consistency with scientific evidence on the scale of reductions necessary to avoid dangerous, runaway climate change. These high level targets are reinforcing existing goals to reduce energy consumption and promote low carbon electricity.

Since this time, the BC Government has begun to develop policies that will require and support all sectors to contribute to these commitments. Some local government policy drivers for change include:

- **Green Communities Act:** In 2008, amongst other changes, Bill 27 required new content in Official Community Plans (by 2010) and Regional Growth Strategies (by 2011), specifically: "…targets for the reduction of GHGs… and policies and actions… [for] achieving those targets"

[4] Several sources arrive at similar figures including: Torrie, Ralph. (1998) Municipalities Issue Table Foundation Paper prepared for the Canadian Government's National Climate Change Process; and BC Ministry of Environment and BC Ministry of Community Development calculations used in public presentations (2008, 2009).

[5] International Energy Association. World Energy Outlook 2008 Fact Sheet: Global Energy Trends.

[6] Energy Information Administration 2009. Annual Energy Outlook, p. 161.

[7] BC Hydro Directive 17, 2006 IEP/LTAP Long Term Rate Increase Forecast filed with BC Utilities Commission. The average residential customer spends about $720 per year on electricity.

[8] Energy Information Administration 2009. Annual Energy Outlook.

- **Climate Action Charter:** The BC Government and local governments signed a voluntary commitment to collaborate and work locally to:
  - Measure and report community GHG emissions
  - Create complete, compact, energy efficient rural and urban communities
  - Become carbon neutral in local government operations by 2012
  - The City of Nelson has signed the Charter
- **GHG Reduction Targets Act:** Bill 44 added rigour to the reduction targets, specifically:
  - Province-wide GHG emissions reduction will be legislatively required to be 33% below 2007 levels by 2020 and 80% by 2050;
  - Public sector organizations, including school districts, health authorities and post secondary institutions, will be carbon neutral by 2010.
- **BC Energy Plan:** Launched in 2007, the Plan features 55 policy actions to address climate change and energy security. Key policies include:
  - Clean generation and conservation goals
  - Building energy efficiency goals (see BC Building Code below)
- **BC Building Code:** The recent revisions contain some of North America's highest building energy efficiency standards. The BC Energy Plan includes 2020 targets for 20% reductions in energy use per home, and a 7% reduction in energy consumption per m^2 of commercial floor space. Due to the long turnover of building stock, reaching these targets will require stringent energy efficiency requirements for new buildings in the Building Code, and aggressive retrofit measures. Provincial officials have indicated that by 2020, net zero energy homes may be required, standards for larger (part 3) buildings may be 43% more efficient than current regulations.[9]
- **Nelson Hydro, FortisBC and Terasen Gas:** Because of its hydroelectric dams, Nelson Hydro has relatively low infrastructure costs, and thus customers enjoy some of the lowest electricity rates in North America. To mitigate against rising energy demand and costs, FortisBC and Terasen Gas operate large energy conservation and efficiency programs for residential, commercial and industrial customers.

Notes & Ideas

A. **Actions I would like to take** in my life, business or organization

B. **Strategies the community can take**

C. **Key opportunities and challenges** influencing action

D. **Major trends** that should be considered

[9] Based on HB Lanarc's communications with Provincial code authorities

3. COMMUNITY ENERGY AND EMISSIONS SNAPSHOT

The energy and emission profile for Nelson looks similar to most communities in British Columbia, with transportation and buildings comprising the largest shares. Table 1 provides a snapshot of community-wide energy (converted to gigajoules—GJ) and emissions (reported in tonnes of carbon dioxide equivalent-T-CO_2e). Figure 3 and Figure 4 graphically illustrate the percentage contribution of each sector to the overall totals.

Table 1 - Energy and GHG Emission Summary, 2007 [10]

		ENERGY			GHG EMISSIONS		
	Category	**GJ**	**%**		**T-CO_2e**	**%**	
Transportation	Passenger Vehicles	465,285	33%		31,835	49%	
	Recreation Vehicles	4,589	0%		306	0%	
	Commercial Vehicles	90,817	6%	*40%*	6,340	10%	*61%*
	Buses	9,150	1%		631	1%	
Buildings	Residential	447,613	31%		15,228	23%	
	Commercial/Small-Medium Industrial	403,618	28%	*60%*	11,629	17%	*38%*
	Large Industrial (UNKNOWN)	-	-		-	0.0%	
	Solid Waste	0	0.0%	*0%*	604	0.9%	*1%*
	TOTAL	1,421,072		*100%*	66,573		*100%*

Figure 3

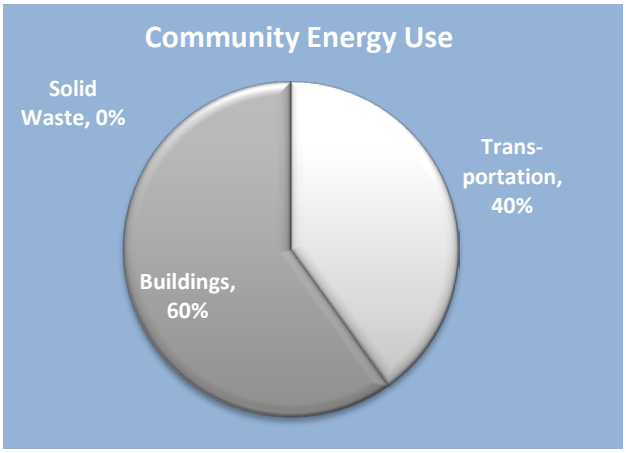
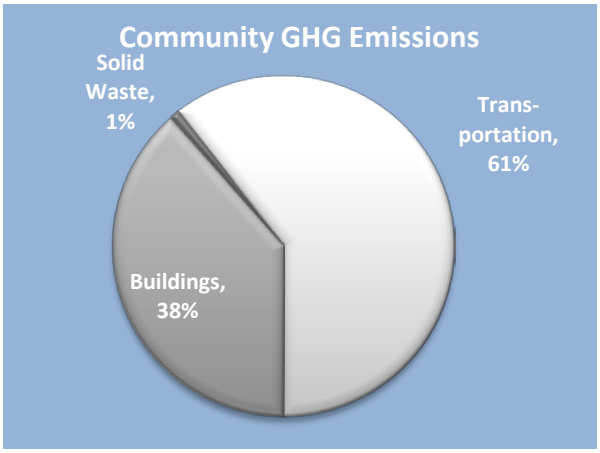


Figure 2



Two obvious differences stand out when comparing Figure 3 and Figure 4 above. Buildings comprise a larger share of community energy use and solid waste only appears in community GHG emissions. Buildings emissions are relatively smaller than their energy use because in British Columbia the vast majority of the energy used to

[10] Data Source: BC Ministry of the Environment (2007). Nelson CEEI Report 2007. http://www.env.gov.bc.ca/cas/mitigation/ceei/reports.html. Accessed October, 2010.

generate electricity does not produce GHG emissions (hydroelectric power generation). The majority of emissions come from the combustion of fossil fuels (i.e. natural gas, gasoline, diesel, heating oil) that emit carbon dioxide into the atmosphere. The primary type of *energy use* in the waste sector is for the collection and transport of waste from homes and businesses to transfer stations and landfills, registering at less than one percent of community wide energy use. GHG emissions from landfills, however, are not-energy related and thus do not appear in the energy profile. Landfill emissions occur in the form of methane – a greenhouse gas that is generated from decomposition in the absence of oxygen of food, yard waste, wood, paper products and other materials that come from living matter.

Figure 5 and Figure 6, below, also illustrate these two points and show that gasoline accounts for the largest amount of energy consumed and a majority of the greenhouse gas emissions.

Figure 5

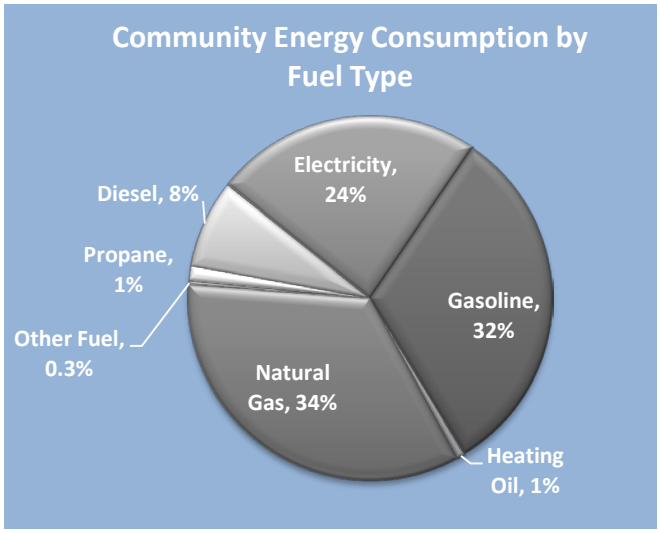
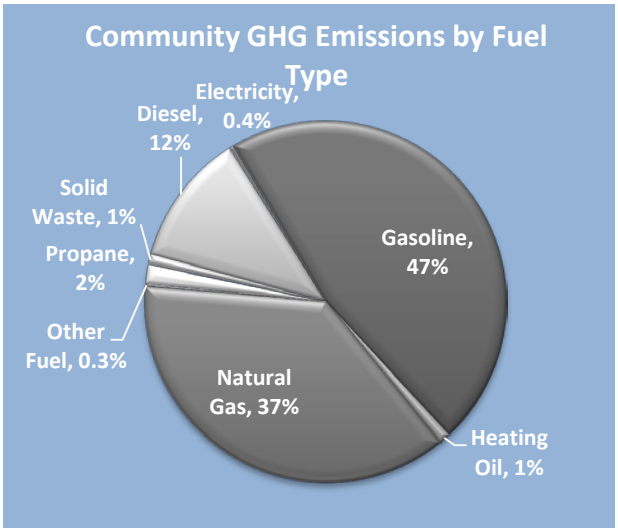


Figure 4



Expenditures on Energy

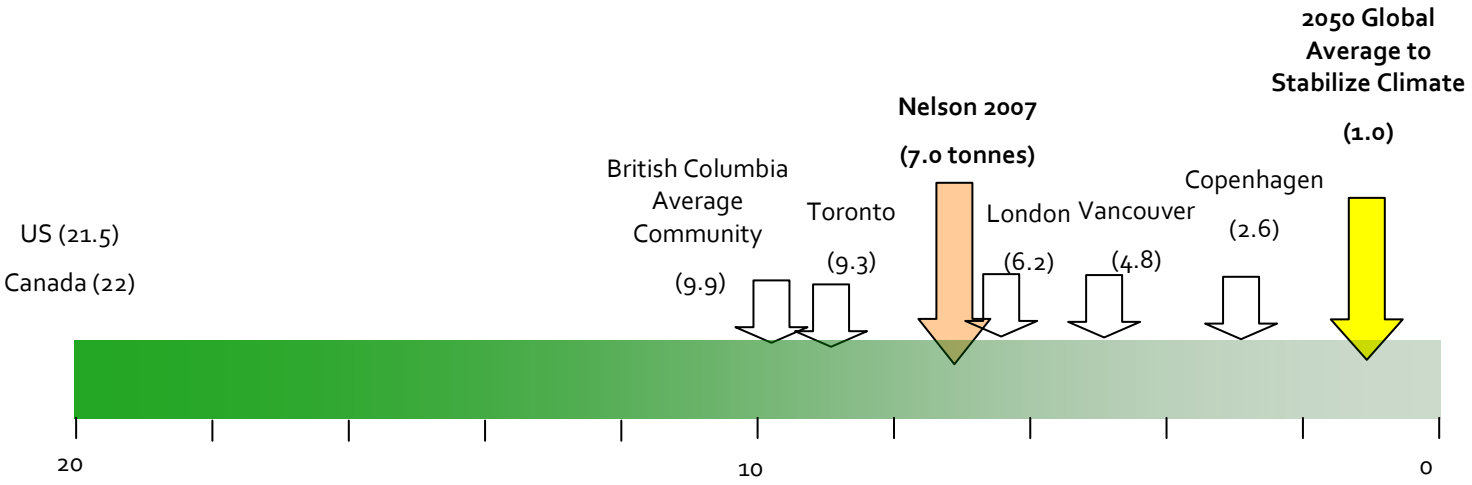
In 2007, Nelson **residents and businesses spent a combined $30.4 million on energy** or approximately **$3,200 per person per year.**[11] The $21.4 million in residential energy expenditures works out to an average of **$5,150 per household**. Energy expenditures for small and medium sized business totalled $6.6 million, or **$6,940 per business**. The other major category of energy expenditures that it is possible to estimate is fuel for tractor trailer trucks. In 2007, approximately $2 million, or $25,440 per truck, was spent on tractor trailer fuel.

Secondary Measures of Energy and Emission Performance

In each sector there are secondary measures of energy and emissions that can be used to better understand the aggregated energy and emission numbers. These secondary measures include ***intensity***—which is the amount of energy/emissions divided by a relevant related unit, such as population, building floor area, or amount of emissions per unit of energy. ***Indicators*** are a way of monitoring trends in energy and emissions through related activities. There is scientific evidence that GHGs will need to be reduced to an average of **1 tonne CO_2e per person, per year** by 2050 to avoid catastrophic climate change. This is equivalent to an 80% global reduction in emissions. In 2007, GHG emissions in Nelson were at **7.0 tonnes CO_2e per person, per year.**

[11] These figures are based on energy consumption from the 2007 Ministry of Environment Community Energy and Emissions Inventory and average 2007 energy expenditures from Nelson Hydro, Terasen Gas rates, transportation fuel costs, fuel oil costs

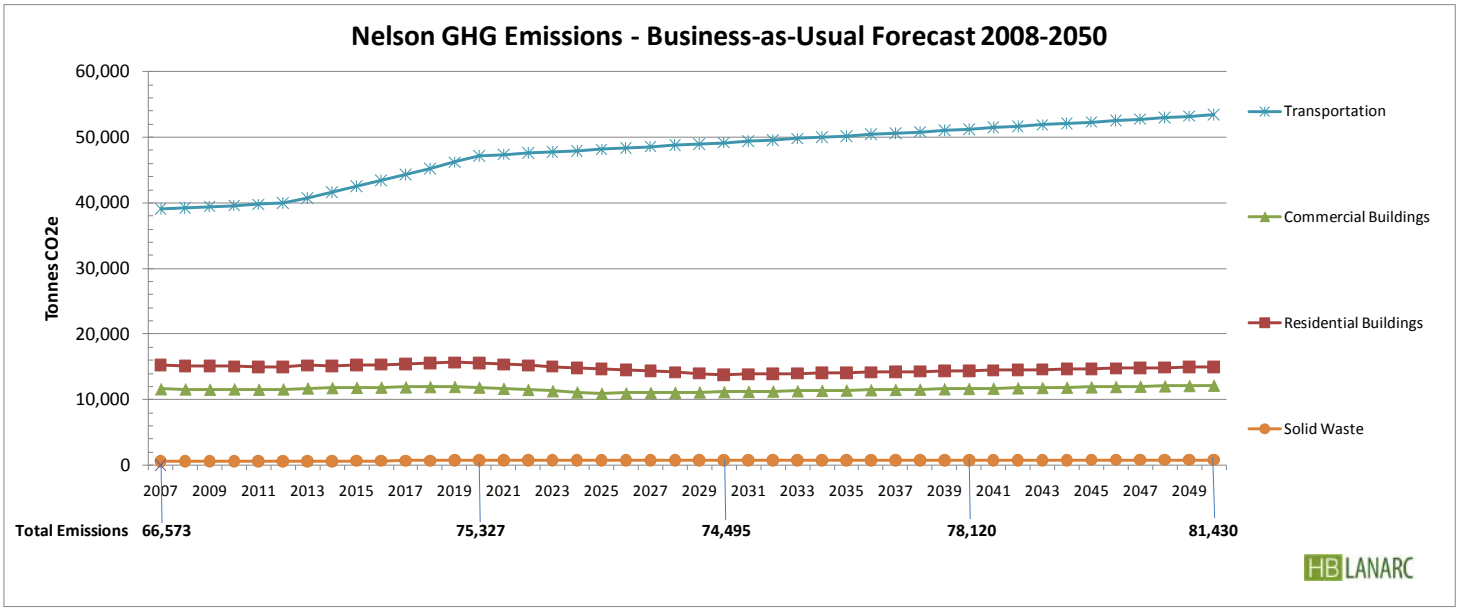
Figure 6 - Comparison of per capita emissions (tonnes CO_2e per person)



Preliminary Business-as-Usual Emission Forecast

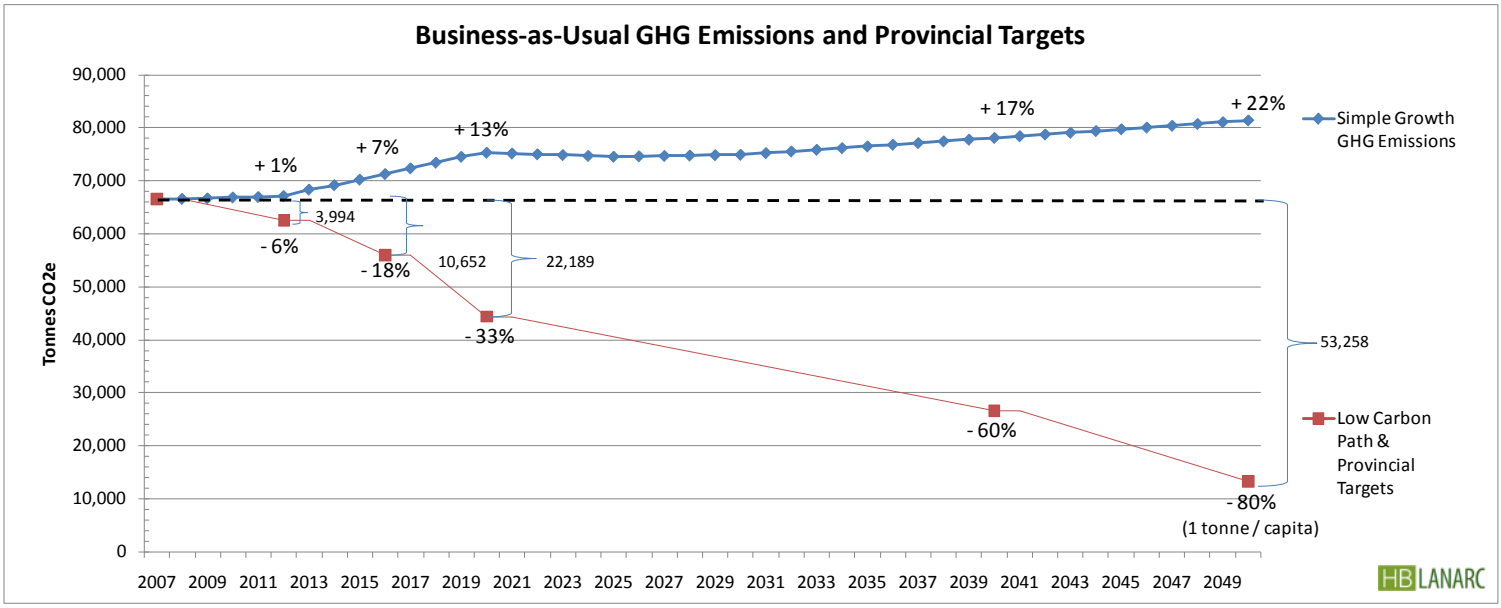
If current activities and policies were to continue through mid-century, Nelson would see its greenhouse gas emissions rise gradually, but steadily over this timeframe. Emission growth would be caused by population growth[12], with the current trend of constructing more efficient buildings acting to lessen the growth in emissions slightly. Figure 7 below illustrates the growth in emissions in each sector. Figure 8 shows business as usual emission growth in Nelson charted together with a low carbon path and the BC Provincial government targets. Significant effort and major policy changes by Nelson and senior governments will be necessary to achieve the emission reductions charted in the low carbon path.

Figure 7



[12] The following annual population growth rates were used in the analysis: 2008-2013: 0.4%, 2014-2010: 2.0%, 2021-2050: 0.4%

Figure 8



Energy and Emission Sources Not Included in the Snapshot

Several emission sources are not included in the BC provincial government Community Energy and Emission Inventory report, which the majority of the data in this briefing is drawn from. These include:

- large industry
- boats
- airports (planes and ground transportation)
- off-road vehicles
- construction equipment and yard/maintenance equipment
- agriculture (vehicles and livestock)
- "upstream" emissions from extraction, processing and transportation of goods consumed in Nelson

Some of these sources could be significant. Others are relatively small. Some are difficult to quantify. Others are easy. None will be quantitatively evaluated through this project. Going forward, however, the community may wish to quantify some of these emission sources and consider measures to reduce emissions from these sources.

Notes & Ideas

A. **Actions I would like to take** in my life, business or organization

B. **Strategies the community can take**

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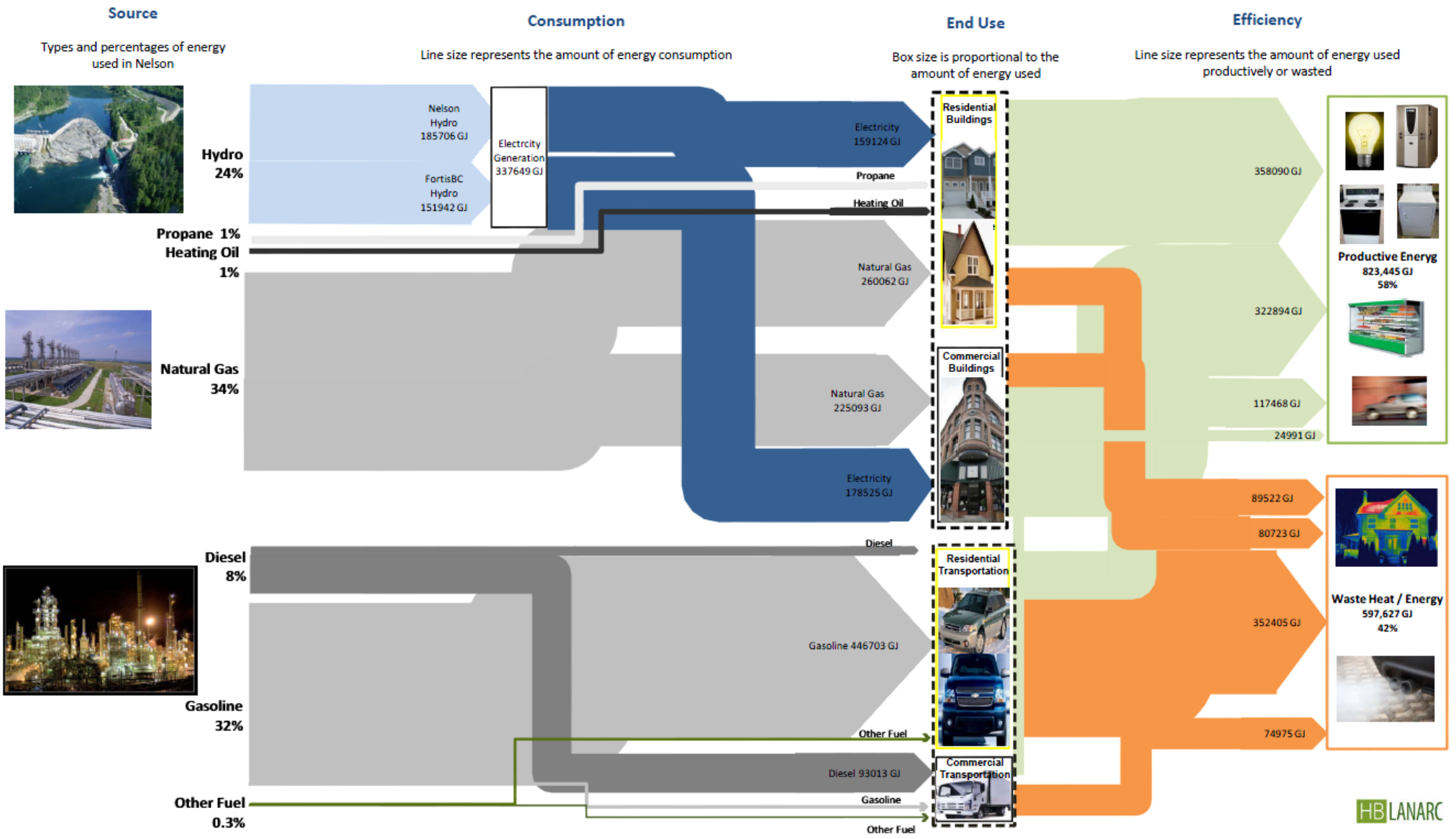
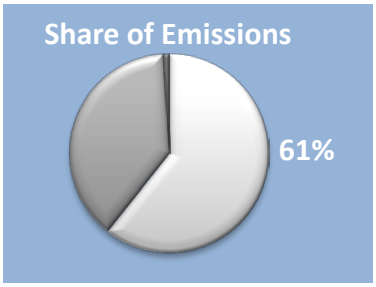
Figure 9 – Nelson Energy Consumption Flow Chart – 2007. This flowchart illustrates Nelson's relative amount of energy supply (on the left), energy end use (in the middle), and a breakdown of energy use as productive or wasted. Almost half the energy generated is "wasted" in transmission and distribution or as heat in internal combustion engines.



B. Taking Action

Some high level considerations are preliminarily identified to prime discussion for taking action in each of the key sectors: transportation, buildings, energy supply and waste. Engagement with the public, stakeholders, staff and Council will refine this analysis and enhance the strategies that will form the basis of the Plan.

1. TRANSPORTATION



Transportation is Nelson's largest source of GHG emissions—comprising 61% of total emissions—and also the fastest growing. Growth can be primarily attributed to a shift to more energy intensive light trucks and vans away from cars. Better roads and access to jobs, shopping, services and recreation at a regional level also has an influence on how much people drive.

Reducing emissions in the transportation sector involves maximizing transportation choice, reducing carbon emissions per kilometre driven, and improving access between origins and destinations.

Transportation Indicators

Energy and emissions in the transportation sector are determined by how far people travel and their mode of travel. How far people travel is shown by the Average Vehicle Kilometres Traveled (Ave VKT) column in Table 2. The mode of travel can be characterized by Vehicle Type, the Number of each vehicle on the road and the Share of Distance Traveled by fuel source. The tonnes of carbon dioxide equivalent per vehicle per year (T-CO_2e / vehicle/year) is determined by the average VKT, the vehicle type and the fuel source.

Figure 10

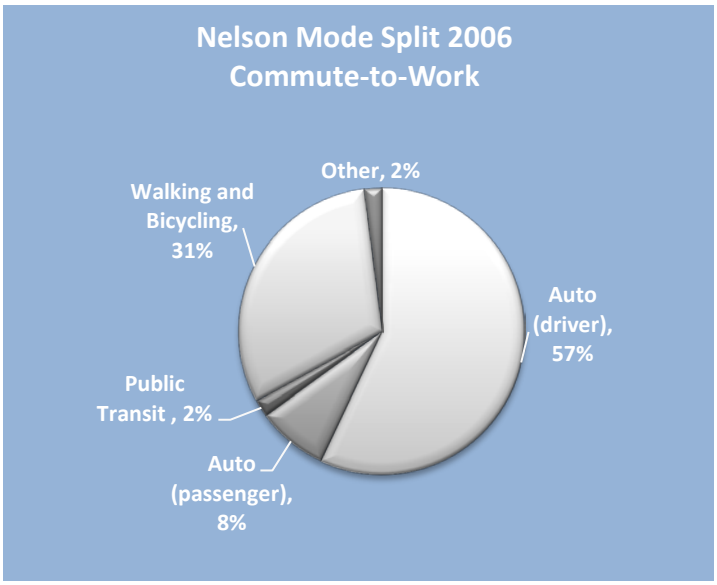


Table 2 - Transportation Emission Intensity and Indicators, 2007 [13]

Vehicle Type	Number	Ave VKT	T-CO_2e / Vehicle/yr
Cars	2,794	14,451	3.8
Lights Trucks, SUVs	2,989	18,886	7.1
Commercial Vehicles	166	41,846	38.2
Buses	13	37,688	48.5
Other	145	4,349	1.5
Total	6,171	106,484,267 (total)	

Potential Objectives

The following are example objectives that would reduce emissions in the transportation sector. These have been informed by goals and objectives that have been articulated in the *Path to 2040* sustainability plan.

Transportation

- Improve transportation choice, enabling residents and visitors to easily walk, cycle, car pool, bus as well as travel by car, and the integration of these modes
- Reduce annual per capita vehicle kilometres traveled

Active Transportation Plan (2010) *Recommended* Target: "Reduce single occupancy vehicle use to less than 50 percent in ten years."

Land use

- Design new developments that allow for transportation choice with an emphasis on active transportation and transit
- Create street and road designs and parking standards that are attractive to active transportation modes and public transit use

Complementary Objectives

- Increase the liveability of Nelson
- Reduce city expenditures on infrastructure through smarter growth and re-development

Local Leadership

Current policies and actions in Nelson:

- Transportation Planning Review and Project Implementation Strategy (2007): Phased strategy for implementation of priorized recommendations from a series of transportation studies.
- Comprehensive Active Transportation Plan (2010): Comprehensive plan to highlight multi-use trails and network for active transportation.
- Regional Transportation Plan (forthcoming 2010): Currently being developed between RDCK and RDKB to address regional transportation issues and service levels.
- Local Motion Grant Funding (2007 & 2009): Funding received for integrated walking and cycling network; upgrades to sidewalks and multi-use paths within the City.

[13] Data Source: BC Ministry of the Environment (2007). Nelson CEEI Report 2007.

- Public Transit Exchange: Establish a multi-modal downtown transit hub, improve public transit, improve roadways to encourage transit and active transportation, and active transportation network integration.
- City Transit: Strong Municipal system and update of bus fleet with the purchase of 6 new GHG-friendly buses.
- Kootenay Carshare Co-op & Ride Share
- Nelson Electric Tramway

Opportunities & Challenges

Opportunities

- Urban area is relatively compact
- Electric bicycles are ideal for the terrain of Nelson.
- Expand car co-op concept with more vehicles and municipal use of program
- Continue to develop strong pedestrian linkages, especially to schools, parks and shopping, from all areas of Nelson and develop a "people-first" concept with all municipal works and private developments.
- Use the perceived Nelson "parking shortage" in marketing the "walking solution".
- Provide bike infrastructure including bike racks, storage, and bike lanes.
- Develop business case for potential tourist/commuter ferry along North Shore, possibly modeled on Nelson Electric Tramway and paddle wheelers from an earlier era.

Challenges

- Many residents work outside of Nelson and many people who work in Nelson live in rural areas not serviced by transit.
- The city's location on a hillside creates challenges for extending bicycle infrastructure.
- Aging population
- Low density of the area does not make frequent public transit within Nelson nor service to areas outside Nelson and neighbouring communities easily viable.
- Integrating bike racks and other infrastructure could lead to increased sidewalk clutter and tripping hazards on Nelson's much used downtown sidewalks.

Best Policies & Practices

- Kelowna uses variable Development Cost Charges to reflect the costs of extending infrastructure to different densities and geographic remoteness, i.e. lower costs closer to downtown and other mixed used nodes, and higher costs further away.
- Some Gulf Islands, with limited or no transit, have developed "car-stop" signs and programs, a legal and controlled method of hitch-hiking/ride-sharing.
- Transportation Tune Up is a project in the CRD, co-sponsored by ICBC, to encourage and train people in the community to think about how to reduce their own transportation emissions and improve transit and pedestrian facilities. It creates ownership and helps people link in.
- Victoria OCP goals put people first and connect people, through future sidewalk infrastructure and safe connections, to schools, parks, bus stops, bike lanes and shopping.
- Saanich has developed the Shelburn storm water treatment project that took half a street lane to allow natural storm water treatment and created half a lane dedicated for bikes.
- Many US communities have begun to integrate school bus and some public transit services (special needs, shared buses, complete integration) to reduce costs and improve services.

Notes & Ideas

A. **Actions I would like to take** in my life, business or organization

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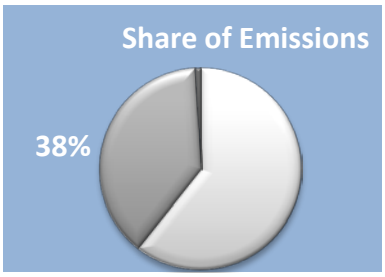
2. BUILDINGS



Buildings comprise sixty percent of all energy consumed and are the second largest source of GHGs in Nelson, accounting for approximately forty percent of emissions. Most emissions are associated with space and hot water heating.

Sustainably managing energy and emissions in buildings can be accomplished foremost through improvements in building envelopes (insulation), more efficient appliances, passive design, building typology, and operation. Changing the energy supply – also a significant opportunity – is discussed in the next section. Figure 11 and Figure 10 below show the proportion of energy used by type for the residential and commercial sectors.

Figure 12

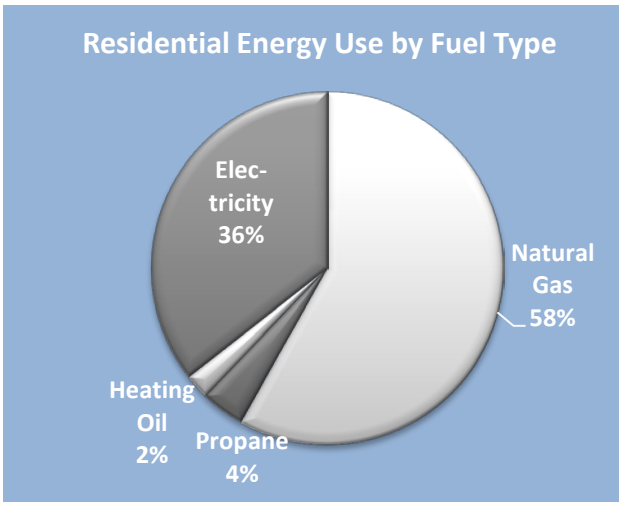
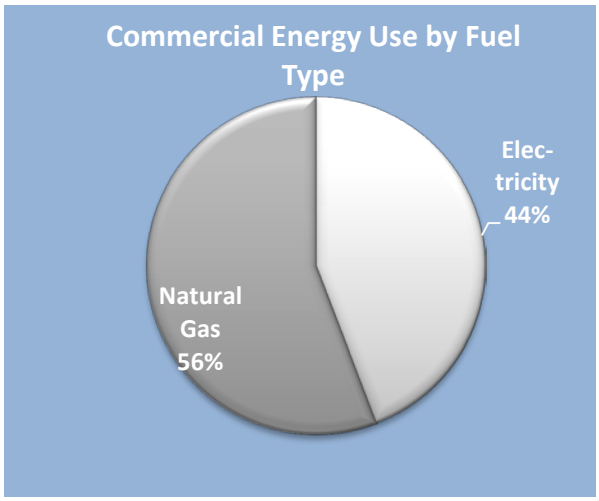


Figure 11



Buildings Indicators

Understanding which energy sources are used to heat and power the community's buildings, the amount of energy being used and greenhouse gas emissions per building (Table 4) are important pieces of information for devising buildings sector strategies. Natural gas is one of the cleanest forms of fossil energy for heating homes, but it still results in the emission of a large amount of greenhouse gases. Because 99% of Nelson's electricity is generated from hydropower—which has a very low GHG emission rate—natural gas dominates the buildings sector GHG emission profile (Table 3). Building age is another significant factor as it is often correlated with building energy performance (Table 5).

Table 3 – Buildings GHG Emission Percentage by Energy Type[14]

Building Type	Electricity	Natural Gas	Heating Oil	Propane	Total
Residential	1%	87%	5%	7%	100%
Commercial / Small-Medium Industrial	1%	99%	-	-	100%
TOTAL	1%	92%	3%	4%	100%

Table 4 - Energy/Emission Intensity, 2007 [15]

Building Type	GJ / Unit/yr	T-CO_2e /Unit/yr
Residential	98	3.3
Commercial / Small-Medium Industrial	426	12.3

Table 5 – Period of Construction for Nelson Homes [16]

Period of Construction	Number	Percentage
Before 1946	1,510	36.3%
1946 to 1960	815	19.6%
1961 to 1970	540	13.0%
1971 to 1980	530	12.7%
1981 to 1985	155	3.7%
1986 to 1990	95	2.3%
1991 to 1995	270	6.5%
1996 to 2000	120	2.9%
2001 to 2006	115	2.8%

Potential Objectives

The following are example objectives that would reduce emissions in the buildings sector. These have been informed by goals and objectives in the proposed *Path to 2040* sustainability plan.

[14] Ibid

[15] Ibid

[16] BC Stats 2010. 2006 Census Profile, City of Nelson. www.bcstats.gov.bc.ca/census

Primary:

- Reduce community expenditures on heating and electricity through building envelope and design improvements.
- Reduce or eliminate the number of remaining buildings heated by oil through fuel switching to lower carbon fuel sources.
- Promote fuel switching away from fossil fuels by providing policy incentives for renewable heating options
- Provide cost effective renewable heating opportunities to high density areas by establishing a district heating system.

Complementary Goals

- Promote economic development in Nelson by providing competitively priced heating through a district heating system.
- Develop economic opportunities in the building retrofit and renewable heating sectors.
- Establish additional municipal revenue stream from district heating utility.

Local Leadership

Current policies and actions in Nelson:

- Sustainability Checklist (2009): A checklist was created to help evaluate land development applications through the lens of the four sustainability pillars: economic, environmental, cultural, and social.
- Land Use Bylaw Amendment (2009): Allows for secondary suites in all residential zones.
- Sustainable Downtown/Waterfront Master Plan (forthcoming 2010/2011): Creation of a comprehensive plan to guide the revitalization/development of the downtown and waterfront areas, including Design Guidelines.
- Fire Department and Fortis BC (ongoing) – Fire Department personnel are working with Fortis to identify power conservation opportunities with business owners during commercial building inspections.
- Green Building Covenant: The City placed a covenant on land it was selling to ensure new buildings would meet EnerGuide 80 performance and in duplex form.
- Powersmart Program (ongoing): Nelson Hydro participates in the Powersmart Program and Nelson Hydro Customers have access to all the Powersmart incentives for improving energy efficiency.

Opportunities & Challenges

Opportunities

- Potential heating fuel switching from fossil fuels to biomass – either through solid wood combustion or through central biomass gasification and distribution through the existing natural gas pipeline network.
- Potential heating fuel switching from fossil fuels to low GHG intensity hydro electricity through expanded use of air and/or ground source heat pump technologies.
- Large-scale application of geoexchange technology using lake water is being evaluated in the District Energy Pre Feasibility study commissioned by the City.
- The City's history and experience operating an electrical utility makes establishing a district heating utility much less daunting than it is for most municipalities.

Challenges

- More than a third of existing housing stock was build before 1946. While these buildings may have been or could be significantly improved with additional insulation and weather stripping, it is often costly and technically challenging to bring these buildings up to the energy efficiency standards of more modern homes.
- Many buildings are historically and culturally important and hold heritage status limiting the types and extent of potential efficiency retrofits.

- Significant heating fuel switching to biomass sources may lead to local air quality issues if efficient and clean burning appliances are not employed.
- The current exceptionally low cost of natural gas makes fuel switching appear less economically attractive.
- During difficult economic times there is often limited capital available for investment in building retrofits and energy efficiency improvements regardless of the potential energy cost savings.
- Local topography limits the opportunities for passive solar gain in buildings during winter months.

Best Policies & Practices

- Saanich has implemented a Private Sector Green Building Policy (2007) to, in part, fast track green building applications and review existing bylaws and policies to remove barriers preventing innovation in design.
- City of North Vancouver established a Hydronic Heat Energy Service Bylaw (2004) to create a district heating service area for Lower Lonsdale, with a requirement that all new or retrofitted buildings over a certain size be connected to and use the district energy system.
- The City of Vancouver is requiring district energy and renewable heating opportunity screening assessments as part of larger redevelopment and rezoning applications.
- Bowen Island passed a rezoning policy that calls for all new housing developments undergoing rezoning to meet Built Green Gold and Energuide 80 standards
- Maple Ridge introduced a Revitalization Tax Exemption bylaw for green buildings. This bylaw provides an additional two years of tax exemption for buildings within a revitalization area that are certified LEED Silver or higher.

Notes & Ideas

A. **Actions I would like to take** in my life, business or organization

B. **Strategies the community can take**

C. **Key opportunities and challenges** influencing action

D. **Major trends** that should be considered

3. LOCAL ENERGY SUPPLY

Shifting to local, low-carbon energy sources will reduce emissions in other sectors, especially buildings, but also potentially transportation.

Local low carbon energy supply opportunities could include renewable electricity, renewable heat, district energy, and renewable transportation fuels.

Local governments have only moderate influence in generating renewable power (Nelson is a notable exception) and transportation fuels, and somewhat more on renewable heat and district energy.

Potential Objectives

The following are example objectives that would reduce emissions through changes to Nelson's energy supply. These have been informed by goals and objectives in the proposed *Path to 2040* sustainability plan.

- Promote renewable heating opportunities, supplementing the solar thermal program with geo-exchange, and sustainable biomass in residential, commercial and institutional buildings
- Promote district heating opportunities using these same feedstocks along with sewage heat
- Promote renewable energy opportunities using the area's wind and hydro resources
- Explore development of local renewable transportation fuels

Complementary Goals

- Strengthen the community's energy self sufficiency
- Increase local spending on energy supply
- Promote local job creation in renewable energy generation
- Strengthen the integration of municipal infrastructure

Local Leadership

Current policies and actions in Nelson:

- Nelson Hydro: Nelson Hydro has a variety of ongoing initiatives to reduce energy use such as:
    - Downtown conversion project from 5kV to 25kV to reduce distribution losses.
    - Evaluates transformer purchases using total ownership cost which considers transformer efficiency.
    - Substation rebuild (high efficiency power transformers selected).
    - Considers smaller and hybrid vehicles where practical.
- District Heating Pre-Feasibility Study (2010): To study the feasibility of a district heating system using lake water as a source of heat.
- Geothermal Project at Selkirk College (ongoing): Design, Build and Operate new heating system for the renovated dorms at Selkirk College

Opportunities & Challenges

Opportunities

- Municipally owned energy utility allows more straight forward incorporation of potential renewable power options in local power supply.
- Topography may allow energy recovery from domestic water pressure reducing valves.
- Kootenay Lake may represent a relatively low cost ground coupling option for building-scale or district-scale geoexchange systems.

- Waste heat recovery from arena and curling facilities may be used to offset heating requirements at adjacent aquatic centre.
- Waste heat recovery from arena and curling facilities may be incorporated into district heating system.
- Surrounded by forests – large biomass resource.
- Local expertise in small and micro hydroelectric power production.

Challenges

- Limited local potential for several renewable electricity technologies including wind and solar photovoltaics.
- Relatively low heat demand density limits the viability of district heating in most areas of the city.
- Increased demand for electricity from building and transportation fuel switching will reduce excess locally generated electricity available for sale to other utilities and/or result in increased need to purchase additional external power to meet local needs.
- Community scale renewable energy and renewable heating projects can be capital intensive with relatively long pay back periods.
-

Best Policies & Practices

- Houston (BC) uses geothermal heating in a new premium efficiency recreational facility, and reduced infrastructure costs with solar powered park lighting.
- Okotoks (AB) has developed the Drake Landing Solar Neighbourhood using a district energy system to collect and store thermal energy over the summer and then distributes 90% of the heating requirements of the neighbourhood composed of 50 R-2000 homes.
- Quesnel has an agreement with West Fraser Timber, Terasen and BC Hydro to develop a combined heat and power system using waste heat and waste wood that will be integrated into a district energy system.
- Gibsons has established the Upper Gibsons Geo-exchange District Energy Utility owned and operated by the Town to provide heat and hot water to a new neighbourhood reducing GHGs 96% and saving residents $350,000 annually.
- A small number of BC communities in collaboration with the Province have Wood Stove Exchange Programs, offering rebates to residents to convert to high efficiency EPA certified wood stoves.

Notes & Ideas

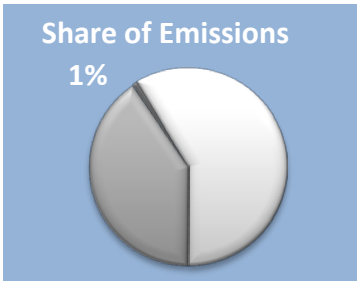
A. **Actions I would like to take** in my life, business or organization

B. **Strategies the community can take**

C. **Key opportunities and challenges** influencing action

D. **Major trends** that should be considered

4. SOLID WASTE



Waste is a relatively small source of GHG emissions in Nelson. Most of these emissions are from the decomposition of organic waste in a landfill, which releases methane, a potent GHG. It is worthwhile noting, nevertheless, that these emissions represent only a fraction of the total emissions associated with the disposed-of materials due to the material inputs, processing and transportation that takes place earlier in its lifetime (See Box 1).

Decreasing emissions in this sector would involve reducing waste, diverting it from landfills, and minimizing landfill methane emissions.

Authority and responsibility for waste management are split between the City of Nelson and the Regional District of Central Kootenay. Local governments have significant influence over emissions from solid waste through their waste management practices. Significant responsibility also rests with senior governments who have greater influence over extended producer responsibility and reduction measures.

Solid Waste

To reduce emissions from solid waste, Nelson will need to continue to divert the amount of waste it sends to landfills. This can be accomplished by increasing the amount of materials consumed, and increasing recycling, composting and reuseing.

Table 6 – Solid Waste Generation in Nelson

	2007
Solid Waste Tonnes Landfilled	4,840 [17]
Tonnes Landfilled per capita [18]	0.523

Potential Objectives

The following are example objectives that would reduce emissions through changes in solid waste management practices. These have been informed by goals and objectives in the proposed *Path to 2040* sustainability plan.

Waste Reduction & Diversion

- Establish a waste management approach that reflects the following hierarchy for liquid, solid and hazardous waste with the aim of minimizing emissions from a full life cycle perspective:
    - Reduce
    - Reuse
    - Recycle (including composting)
    - Recover energy in a sustainable manner, and
    - Manage residuals in a sustainable manner

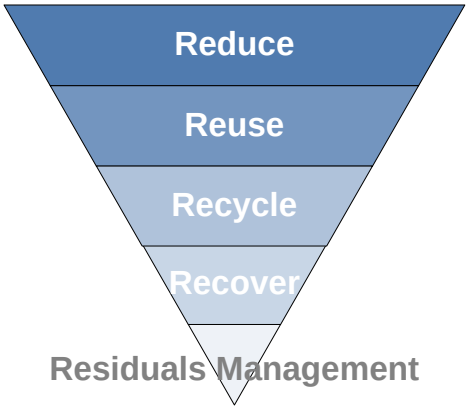
Local Leadership

- Curbside Recycling and Waste program (2008): Blue Bag program and bi-weekly garbage collection to reduce the number of vehicle trips and increase recycling rates by making recycling convenient to our residents.

[17] BC Ministry of the Environment (2010). Nelson CEEI Report 2007. http://www.env.gov.bc.ca/cas/mitigation/ceei/reports.html. Accessed October, 2010.

[18] Estimate based on population assumption of 9,474 (BC Stats estimated 2007 population for Nelson)

- The traditional sustainable waste management hierarchy is ostensibly the same as low carbon mangement framework.RDCK Resource Recovery Plan (forthcoming 2010/2011): The Regional District is in the process of updating its Resource Recovery Plan to provide the policies and strategies to guide the delivery of solid waste management and resource recovery services in the future. The plan will include zero waste principles.
- Composting (ongoing): Provided land for Earth Matters to set up demonstration project on composting.



The traditional sustainable waste management hierarchy is ostensibly the same as low carbon management waste framework. The combustion of some waste streams, however, can be very GHG intensive.

Opportunities & Challenges

Opportunities

- Existing curbside recycling program has built local capacity and raised awareness among residents
- Many engaged residents want to do more to reduce waste
- Backyard composting

Challenges

- Small population makes it less cost effective to deliver recycling and composting services
- Reducing waste in service sector businesses

Best Policies & Practices

- The Town of Ladysmith began curbside collection of organic waste. This measure, combined with a public education campaign, rapidly increased the diversion of organics.
- The City of Surrey, City of Vancouver, and Metro Vancouver are all engaged in pilots to collect food waste and kitchen scraps along with yard waste.
- St. Paul, Minnesota (USA) diverts the vast majority of wood waste from its landfill (construction waste and tree trimmings) to use as a feedstock in its district energy system.
- Metro Vancouver is looking at how to require recycling/composting space in all new multi family dwellings and commercial buildings.

Notes & Ideas

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Notes & Ideas

Waste-GHG Connections

There are different sources of GHGs associated with waste. Most commonly, emissions are associated with landfills where anaerobic decomposition generates methane, a GHG 21 times more potent than carbon dioxide. Other waste management practices also result in emission increases or decreases and the magnitude changes by waste type, and shipping distance and mode of transport. There are also significant emissions embedded in waste from extraction, processing and transport of products. A strong emission management plan for waste management will minimize GHGs by considering upstream and downstream emissions in determining the optimal management practice.

Waste and Embodied GHGs

Embodied CO_2e per tonne of waste differs significantly by material type.

Embodied CO_2e per Tonne of Waste by Material Type				
Plastic	Milled Lumber	Aluminum	Office Paper	Computer
2 t	2 t	8 t	8 t	56 t

Some waste types have relatively low material and GHG inputs, e.g. wood. There are some waste types that – because of the immense embedded material inputs and GHGs – are so valuable, they should be priorized for higher order management practices, i.e. not landfilled or combusted.

Waste Management Practices and GHGs

GHGs vary significantly by management practice and waste type. Recycling and reduction results in avoided virgin material inputs and emissions from extraction, processing and transportation. Combusting biogenic carbon (e.g. paper, wood) avoids potent landfill methane emissions and the emitted carbon is assumed to be re-absorbed by new trees. Combusting plastic is more GHG-intensive than landfilling.

Tonnes of CO2e by Waste Management Practice Per Tonne of Waste			
	Recycling	Landfilling	Combustion
Office paper	-3 t	+2 t	-.5 t
Milled lumber	-2.5 t	+1 t	-.5 t
Plastic	-1.5 t	+.1 t	+1 t

Numbers are rounded and include assumptions that would need to be adjusted to the specific Nelson context to be entirely accurate but are useful for comparison. Source: US EPA: http://www.epa.gov/climatechange/wycd/waste/calculators/Warm_home.html .