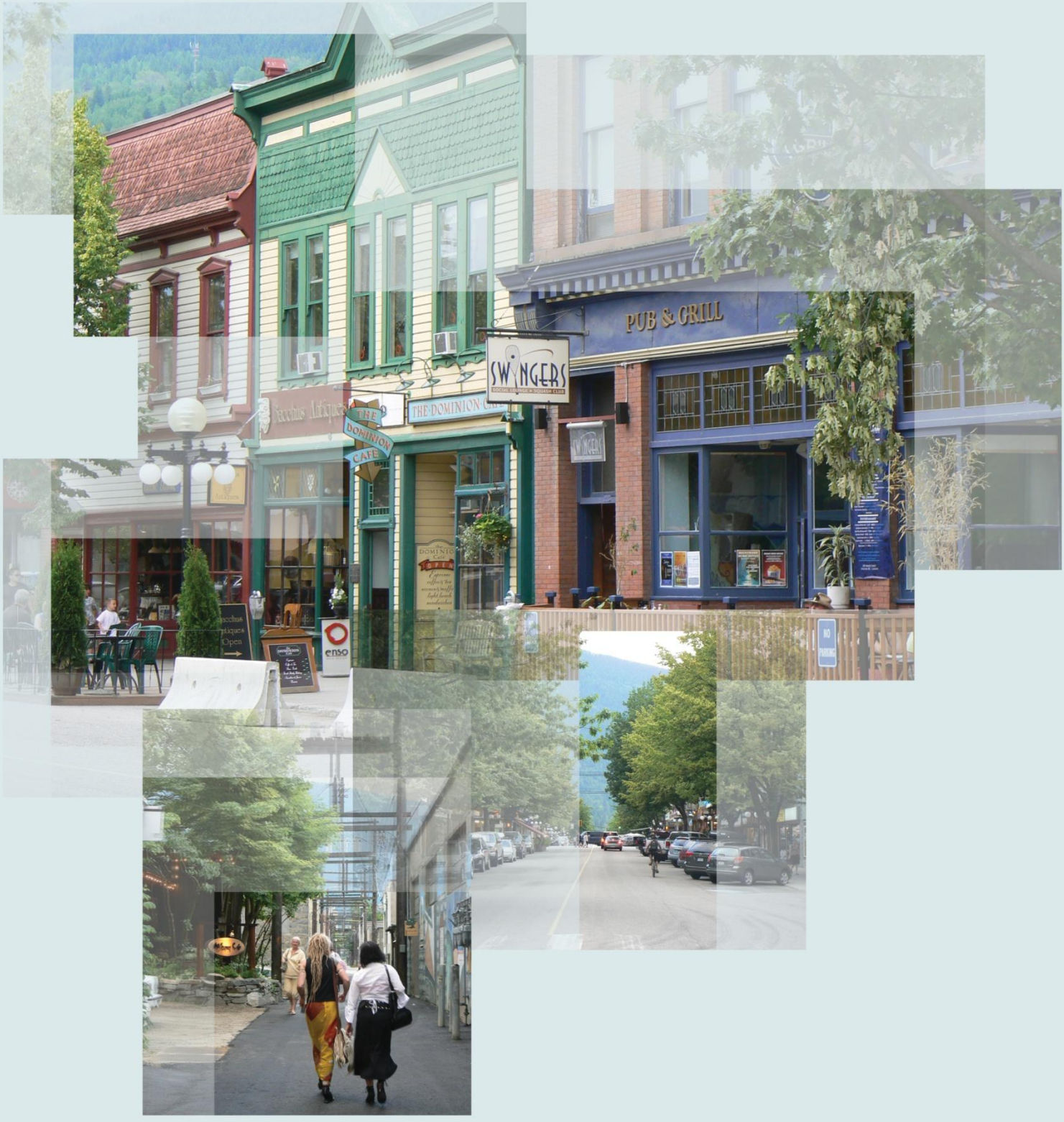

Low Carbon Path to 2040

Community Energy and Emissions Action Plan

August 2011

CITY OF NELSON

Revised Sept. 22.11

Acknowledgements

Development of *Low Carbon Path to 2040* was a City of Nelson initiative. The Plan's vision, strategies and actions have been strongly shaped by input from Council, staff, community stakeholders and the broader public. See Appendix F: Engagement Attendees for a list of those that contributed to the Plan.

CITY OF NELSON

Funding

Developing this Plan would not be possible without financial support from the Union of BC Municipalities, the British Columbia Provincial Government, and the Government of Canada.

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Dallas Johnson, Planner, City of Nelson (Project Coordinator)
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Executive Summary

Nelson has a long tradition of conscientious community building from the economic vitality of our downtown to our 100 year old hydro-electric utility and the vibrant diversity of community organizations. Today, our community is vulnerable to the twin risks of global warming and steadily rising, volatile energy prices.

Low Carbon Path to 2040 is a Plan to strengthen the resilience of our community by minimizing these threats. This Plan builds on the City's complete, compact, highly-liveable character and heritage building preservation. It is informed by and will help shape existing municipal priorities including implementation of the community's Path to 2040 sustainability strategy. Designing and implementing the Plan relies on the community's most critical resource – its enterprising residents, businesses, workforce, community organizations, municipal staff and Council. This path leads to more resilient land use, transportation, buildings, energy supply, and waste systems. It has also helped strengthen the vibrancy, prosperity, and liveability of Nelson.

Goals

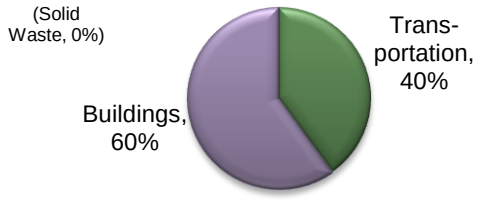
This Plan provides a vision and a clear path that builds on the community's priorities, foremostly the Sustainability Strategy, with strategies in all major energy and emission sectors:

- Land use
- Transportation
- Buildings
- Energy Supply
- Solid Waste
- Community Wide municipal implementation priorities

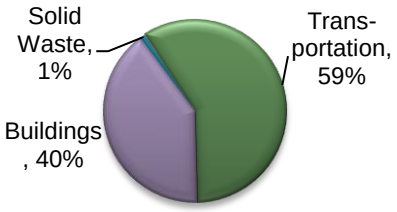
Defensible targets underpin these strategies and can be used to guide implementation, monitoring and evaluation, as well as meet the City's legislative requirement to the Province to include greenhouse gas reduction targets, policies and actions in its Official Community Plan. The Plan includes a framework for implementing short-term priority actions.

Energy and Emissions Profile

Community Energy Use: As with most BC communities, Buildings use a majority of community energy, followed by Transportation.



Community Emissions: As with Energy Use, Transportation and Buildings are the largest sources of emissions. Solid Waste sent to landfill is responsible for a relatively small share of emissions.



The Energy and Emissions profile in Nelson looks very similar to most communities in British Columbia, with Transportation as the largest source of emissions, and Buildings the largest source of energy use.[1] In

[1] Emissions reflect a combination of the quantity of energy used and the type of fuel. As electricity is a low-emissions source of energy in Nelson, Buildings are responsible for a smaller share of emissions than of energy, while transportation is responsible for a larger share of emissions than of energy. In either sector, emissions can be

2007, Nelson used 1,421,072 gigajoules of energy and was responsible for 66,753 tonnes of CO2e. Emissions **in 2007 were approximately 7 tonnes CO2e per person**. This is fairly good performance relative to other BC Interior communities.

These energy and emission consumption figures miss some of the underlying trends within the Community. Nelson, for example, has a stock of vehicles and buildings that are older and less efficient than the stock of many other communities. This drives up energy use and emissions despite the behaviour of Nelson's citizens, who drive significantly less than comparable communities and live in smaller buildings.

Energy Spending and Economic Development

In 2007, Nelson **residents and businesses spent more than $30 million on energy, or approximately $3,200 per person per year.**[2] 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 vast majority of this spending leaves town. With rising electricity and oil costs, these expenditures – along with the economic vulnerability of many people – will dramatically increase. **The conservation, efficiency and renewable energy strategies in this Plan are intended to keep a larger portion of these expenditures in the community, stimulating the local economy.**

Investing in renewable energy creates twice as many jobs as equivalent investments in new supply; and investing in conservation and efficiency creates four times as many jobs. Some of this spending is in local hardware and lumber or green building jobs for the construction trades, entry level employment in weatherization, and engineers in renewable energy system design. An even greater portion is the re-spending effect from reduced energy spending redirected towards other local economic activity such as recreation and leisure, retail and restaurants.

Strategies & Targets Overview

The Low Carbon Path to 2040 will enable Nelson to achieve the following targets over a 2007 baseline by 2040:

- **57% reduction in per capita GHG emissions** (from 7 to 3 tonnes per year)
- **43% reduction in community-wide GHG emissions**
- **26% reduction in community-wide energy use**

The strategies and key targets are summarized below by sector.

improved either through increased energy efficiency or through switching to low-carbon fuel sources, or a combination of the two.

[2] 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, FortisBC gas rates, transportation fuel costs, and fuel oil costs.

Land Use determines where residents live, work, shop, and play, and influences how they get there. Land-use policies strongly influence energy use and emission from transportation and buildings. The Path to 2040 Sustainability Strategy, along with specific strategies and actions provided below, can inform the Downtown and Waterfront planning processes.

Strategies

A. Build on the Community's Complete, Compact and Centered Form to maximize low carbon transportation options and district energy
B. Encourage Secondary Suites and Infill Cottages for their inherent superior energy performance.
C. Climate Protection Design Guidelines to encourage buildings, landscapes and activity patterns that are both low-carbon and resilient to climate change

Key Targets

- By 2040, 80% of dwellings are within a 10 minute walk from local services

Transportation produces a majority of Nelsons' emissions. The strategies in this sector and the Land Use sector will complement those that have already been identified in the Active Transportation Plan.

Strategies

A. Mainstream Low Carbon Transportation throughout the community
B. Build Kootenay Rideshare Capacity
C. Enhance Public Transit Locally and Regionally
D. Implement the Nelson Active Transportation Plan
E. Low Carbon Transportation Education and Outreach to strengthen citizen and employer action

Key Targets

- By 2020, household Vehicle Kilometres Traveled (VKT) is reduced 12% from 2007
- By 2040, household VKT is reduced 33% from 2007

Buildings Most GHG emissions from buildings result from natural gas used for space and water heating. Nelson's building stock is significantly older than the Provincial average. Some of the most effective measures to reduce energy use and emissions are improvements to building envelopes (insulation) and more efficient appliances for both new construction and existing buildings.

Strategies

A. Establish a Home and Business Energy Retrofit Program
B. Increase efficiency in New Buildings
C. Encourage Secondary Suites and Infill Cottages
D. Advance Building-scale Renewable Heat
E. Capacity Building and Social Marketing to Program to ensure success of Buildings sector strategies

Key Targets

- Increase building energy retrofit rate for existing buildings to 2% by 2020
- Renewable energy is installed in 75% of buildings constructed annually by 2020

Energy Supply the source and type of energy supply influences emissions in the buildings sector. Nelson is already exploring the potential for District Energy and renewable heat. Due to steep terrain, there may also be micro-hydro opportunities in Nelson.

Strategies

A. Establish District Energy Systems in Lakefront and Selkirk-Davies
B. Maintain Near-Zero Emissions for Electricity
C. Explore Sustainable Wood for High Efficiency Heating

Key Targets

- Maintain emissions from electricity at 2007 levels
- Connect 70,000 square meters of floor space to District Energy by 2040

Solid Waste Diverting organic materials from landfill can reduce greenhouse gas emissions. There is substantial local interest in using organic waste for compost and gardening.

Strategies

A. Advance Zero Waste Education through Collaboration with the Regional District
B. Increase Recycling and Organics Diversion with Improved Local Services
C. Implement a Comprehensive Building Demolition Waste Management Program to divert waste from landfill
D. Reduce Solid Waste Generation through targeted local and regional policy

Key Targets

- By 2020, Increase organics diversion rate to 50%
- By 2040, Increase organics diversion rate to 80%

Community Wide measures cross traditional energy and emission sectors and municipal line departments and extend out into the community. These measures help ensure the municipality's ongoing business activity supports a low carbon agenda.

Strategies

A. Build City staff's capacity to support low carbon community development

B. Engage with Citizens, Businesses, Non-Profits, and Public Sector Organizations to move down the Low Carbon Path

C. Support regional food and agriculture systems to reduce greenhouse gases and vulnerability to rising food prices.

Key Targets

- By 2015, all City departments have integrated qualitative assessment of greenhouse gas emissions into their planning and budgeting processes.

Priority Actions

For each strategy, priority actions were developed in order to provide short term implementation guidance. In addition, the priority actions were assigned scores in each of five categories: greenhouse gas reduction potential, cost, profile (potential for community and public interest) and ease of implementation. Based on the average score of each priority action a priority ranking of "high, medium or low" was assigned. The priority actions and their rankings, in parentheses, follow below.

Land Use

- Integrate land use strategies into an OCP (Official Community Plan) Update and Land Use Regulation Bylaw (Medium)
- Infill home pilot project (Medium)
- Update OCP and Land Use Regulation Bylaw with infill home provisions (High)
- Climate Protection Design Guidelines (Medium)

Transportation

- Low carbon transportation policy (Medium)
- Requirement for Transportation Master Plan for new commercial developments (Medium)
- Collaborate with Kootenay Rideshare to explore enhancements to service (Medium)
- Integrated Low Carbon Transportation Study (Medium)
- Identify and address barriers to implementing the Active Transportation Plan (Medium)
- Social marketing and education (Medium)

Buildings

- Building retrofit pilot (Medium)
- Put in place one or more policy tools that will move developers to construct buildings that exceed BC Building Code energy performance requirements (High)

Energy Supply

- Strategic plan for district energy (Low)
- Pressure reducing valve micro-hydro monitoring and assessment (Low)
- Run-of-river micro-hydro monitoring and assessment (Low)
- Incorporate Biomass Recommendations into District Energy (DE) Phase 2 Study (High)
- Develop a Solar Ready Bylaw (Medium)

Solid Waste

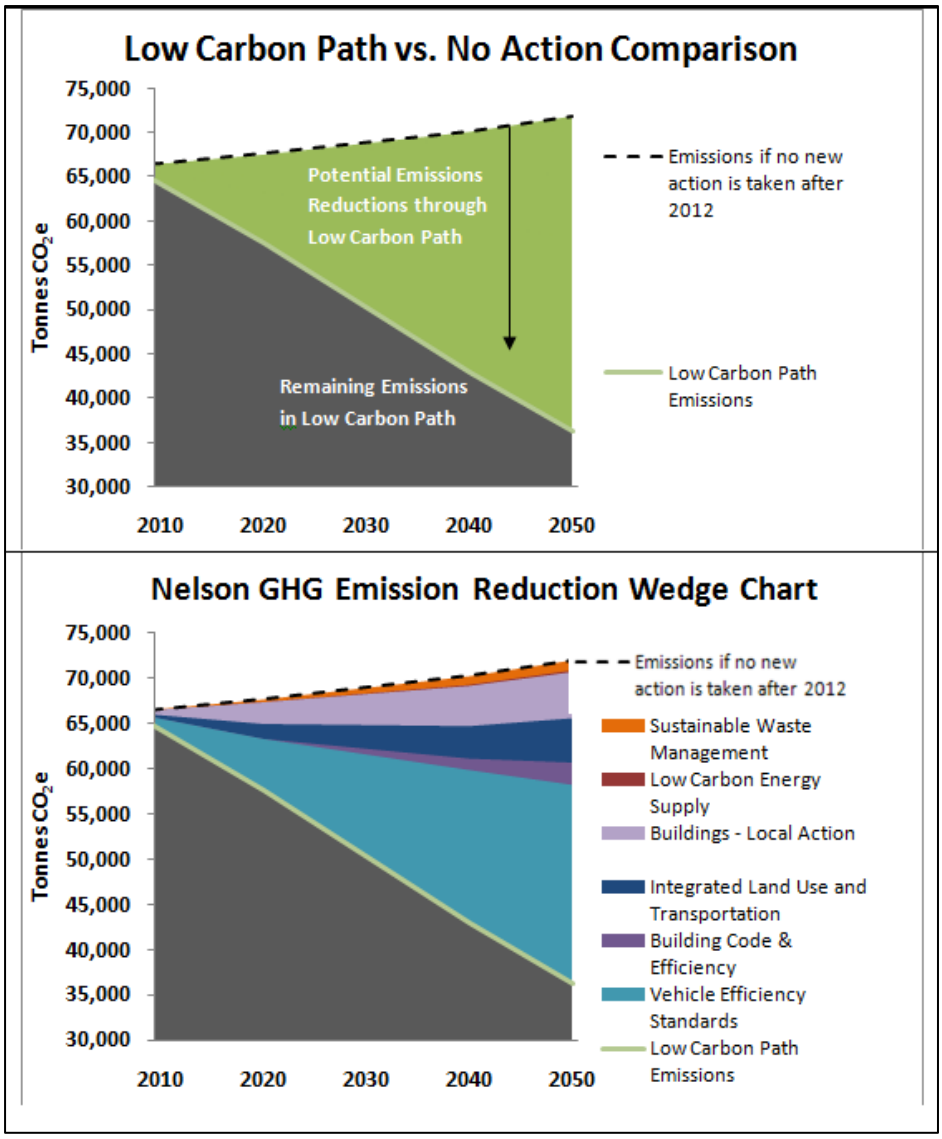
- Additional recycling and composting drop-off sites (Medium)
- Reduction of corporate carbon liability through community composting (Medium)
- Construction, deconstruction and demolition pilot project (Low)
- Letter of support to provincial and federal government to extend producer responsibility (High)

Community Wide

- Put in place a Community Carbon Offset Framework (High)
- Municipal finance carbon accounting analysis policy (Medium)
- Low carbon local business advising (High)
- Low carbon community pledge (High)
- Education and outreach hub (Medium)
- Energy and emissions economic development (High)

Low Carbon Path – Modeled Results

The Low Carbon Path is comprised of sector-specific objectives, strategies and priority actions that will result in significant GHG emission reductions and strengthen local energy sustainability. To ensure the strategies result in an emissions path that is both achievable and ambitious, modeling techniques were used to forecast future energy and emissions levels based on assumptions developed through consultations with staff, Council and community stakeholders (see Appendix A for more details) and informed by a critical appreciation of related strategies in North America. Performance assumptions labelled as "outputs" are generated through this modeling process and are reflected in many of the maps and graphs, notably those projecting GHG implications.



These charts reflect annual emissions in Nelson under two possible emissions futures: the Low Carbon Path, and a "no action" scenario.

The top line represents potential GHG emissions if no additional policies or actions are undertaken after 2012. Existing building and vehicle stock are still replaced with more efficient units, but only to the point where they meet 2012 standards.

The Low Carbon Path Emissions line represents projected emissions if all policies in this Plan are implemented at both local and senior government levels. Even if all policies are implemented, a significant amount of emissions remain.

The Greenhouse Gas Emissions Reduction Wedge Chart provides a more detailed analysis of emissions reductions in the Low Carbon Path. Each wedge represents a bundle of closely related policies and actions. Wedges are divided by local and senior government based on which has the most direct ability to influence outcomes.

Table of Contents

List of Figures

1. Context

Vision and Goals

Low Carbon 2040 Vision

Nelson has a long tradition of conscientious community building from the economic vitality of our downtown to our 100 year old hydro-electric utility and the vibrant diversity of community organizations.

Today, our community is vulnerable to the twin risks of global warming and steadily rising, volatile energy prices.

Low Carbon Path to 2040 is a Plan to reduce these threats. This Plan builds on the City's complete, compact, highly-liveable character and heritage building preservation. It is informed by and will help shape existing municipal priorities including implementation of the community's Path to 2040 sustainability strategy. Designing and implementing the Plan relies on the community's most critical resource – its enterprising residents, businesses, workforce, community organizations, municipal staff and Council. This path leads to more resilient land use, transportation, buildings, energy supply, and waste systems. It has also helped strengthen the vibrancy, prosperity, and liveability of Nelson.

Land Use & Transportation

The appeal of walking downtown has extended across most of the community with good sidewalks and tree-lined streets providing shade during the increasingly hot summers. An extensive bike network provides well connected and safe routes, increasing the allure of biking. Conveniently located grocery stores, cafes and parks across many neighbourhoods have contributed greatly to predominance of biking and walking for most local trips. A range of vans and electric buses on convenient routes allow residents, students and the regional workforce to move easily and rapidly around town and to neighbouring communities.

Nelson's ground-breaking ride share initiative uses high-tech, hand-held trip coordination and security features and old fashioned hitching posts to allow drivers and riders to easily coordinate safe trips for work, college, recreation and retail activity within the region.

Diverse travel modes are facilitated by an innovative multi-modal strategy that involves extensive collaboration amongst the City, Regional District, School Board, College, BC Transit, local non-profits and business groups, allowing residents, students, workers to move seamlessly from foot to bike to bus to car.

Buildings

A pioneering energy retrofit program led by Nelson Hydro with active engagement by FortisBC and many community partners and the local building industry has preserved the charm of the City's heritage buildings while transforming them into high efficiency, high comfort, state-of the art structures. New homes, businesses and institutional buildings reduce energy demand to absolute minimums with ultra high thermal performance, electricity and mechanical systems. A diversity of homes from low rises, row houses, single-detached, as well as small infill cottages provide options for the community's diverse incomes and ages, allowing citizens to live their entire lives in the community.

Energy Supply

New buildings and many older ones use renewable heating and cooling, including passive design. More compact, mixed use areas such as the early 21st century Waterfront, the historic Downtown, and Fairview are part of neighbourhood energy systems that distribute heating and cooling from renewable energy.

Solid Waste

The community diverts the vast majority of it waste from landfills and is on its way to realizing its zero waste goal. Material consumption has been reduced by senior government leadership on packaging and product design. Backyard and neighbourhood composts dot the community. Centralized composting is used for select businesses and institutions. Businesses and residents are dedicated users of convenient eco-depots and curbside programs. Several businesses have high efficiency, low emission furnaces that burn unusable wood from construction waste, trimmings and fire guards.

Agriculture

People across the region have responded proactively to changes in rainfall patterns, heat intensity, and weather predictability, growing a much larger share of their own food as well as processing it. This increased regional self reliance has reduced resident and business exposure to the rising cost of food.

Municipal Alignment

Amongst its many other priorities, the City has aligned its organization with taking action on climate and energy, notably in finance, planning and development, and operations.

Economy

Residents and businesses have avoided massive growth in energy spending through efficiency and conservation, despite skyrocketing prices for traditional forms of energy with gasoline leading the way. A large portion of these avoided costs have resulted in increased local spending. A much larger share of energy-related spending, including conservation, efficiency and renewable energy supply, is spent locally. Reliable, affordable heat, power, and mobility have attracted many entrepreneurs and knowledge based workers to the community who have the flexibility to perform their work wherever they chose.

A thriving local green building industry composed of trades people, young trainees, architects, engineers and technicians has been the heart of local building and renewable energy advances. They are also exporting their talent far beyond the community to build low carbon homes, offices and neighbourhoods.

Community

Programs and partnerships have provided residents, businesses, the building industry, public institutions with strategic guidance to advance sustainable energy and reduce greenhouse gases. People have been compelled to take action because of a knowledge that these programs are helping protect the climate upon which they depend and their commitment has helped strengthen the resolve of other communities and contributed to a country and world-wide climate protection movement.

We are also confident that the agenda we have participated in and shaped, along with our parents and grandparents has helped strengthen the vibrancy, liveability and resilience of Nelson.

Goals

The Plan's goals are several-fold:

- Provide a meaningful vision informed by the community's past and present experiences and future aspirations
- Map out the situational context for developing and implementing strategies, including the policy context and current community energy and emission profile
- Define a clear path that builds upon goals and principles of the City's Sustainability Strategy and integrates and makes recommendations to existing City policies and plans
- Outline clear strategies in key energy and emission sectors:
    - Land use
    - Transportation
    - Buildings
    - Energy Supply
    - Solid Waste
- Establish defensible greenhouse gas reduction targets and policies and actions to achieve them that meet the BC government's Official Community Plan requirements in section 877 of the Local Government Act
- Delineate a near term implementation and monitoring strategy with guidance on funding and partnerships
- Provide guidance on delivering strategies to promote low carbon lifestyles and local businesses.

Report Structure

Report Outline

This plan is organized into three major sections, in addition to a set of appendices.

Section 1: Context

This section sets the scene for the action plan.

- The Vision and Goals for the Plan are introduced
- The Methodology for developing the Plan is described, including an overview of the modeling and mapping, use of indicators and targets, and synergies with Nelson`s Path to 2040 sustainability strategy
- Climate, Energy and our Community provides an overview of these twin challenges and their relevance to community, along with a discussion of the local opportunity and current activities in Nelson that complement this agenda
- Nelson's Energy and Emissions Profile is described

Section 2: Taking Action

This is the essence of the Plan.

- An overview includes a description of the major strategies and the modeled energy and emissions results from implementing the strategies
- This is followed by a sector by sector delineation of objectives, strategies, targets, performance indicators, and priority actions covering:
    - Land Use
    - Transportation
    - Buildings
    - Energy Supply
    - Solid Waste
    - Community-Wide Measures

Section 3: Implementation, Funding & Monitoring

This section provides implementation and monitoring guidance.

- An implementation framework that contains lead players, partners, marginal costs and funding opportunities for priority actions
- A list of potential funds for further planning and implementation
- A monitoring strategy that emphasizes key indicators and performance metrics, and the integration of key actions into existing Nelson activities

Section 4: Appendices

The following appendices provide reference material

- Appendix A: Technical Modeling Methodology
- Appendix B: Modeling Performance Assumptions
- Appendix C: Climate Protection Pledge
- Appendix D: Sustainability Checklist Recommendations
- Appendix E: Draft OCP Amendment – Targets, Policies and Actions
- Appendix F: Engagement Event Attendees
- Appendix G: Building & Business Sectors – Key Comments
- Appendix H: Tools to Support Green Buildings
- Appendix I: Select Resources






Land Use **Transportation** **Buildings** **Energy Supply** **Waste** **Cross-Cutting**

General Methodology

This Plan was developed through active engagement, rigorous analysis, innovative policy and planning, including integration of best practices that are appropriate for the Nelson context. A description of the engagement streams, and modeling and mapping approach follow the five step general methodology.

1 Analyze Local Situation

Key Tasks
- Preliminarily examine existing related activity, community priorities, challenges and opportunities
- Generate community energy and emission profile, providing a baseline of current performance and understanding of major variables driving and constraining growth

Engagement
- Project Steering Committee
- Key City Staff

Deliverable
- Community Energy & Emission Situational Analysis

2 Explore Options

Tasks
- Identify preliminary strategies to inform development of a plan
- Foster stakeholder knowledge of climate change, sustainable energy and community

Engagement
- Public Open House
- Chamber of Commerce-City Business Workshop
- Development Sector Workshop
- Multi-Stakeholder Workshop

3 Develop Draft Strategies

Tasks
- Develop draft objectives, strategies and actions based on community and stakeholder input and knowledge of best practices
- Estimate performance changes based on the draft strategies and calculate the energy and emission implications

Engagement
- Project Steering Committee
- City Staff

Deliverables
- Sustainability "Test Run" Paper of Draft Objectives, Strategies and Actions
- Business Actions & Options Survey

4 Review Draft Strategies

Tasks
- Solicit feedback on draft strategies and actions and seek direction on additional analysis
- Further strengthen stakeholder knowledge of climate change, sustainable energy and community

Engagement
- Chamber of Commerce-City Business Consultation
- Development Sector Workshop
- Multi-Stakeholder Workshop

Tasks
- Update strategies and actions and reinforce with additional analysis
- Refine estimate of performance changes based on the updated strategies and re-calculate the energy and emission implications
- Develop implementation and monitoring strategy

Engagement
- Project Steering Committee
- Key City Staff

Deliverables
- Draft Final Plan
- Final Plan

Engagement Streams

The Plan's vision, strategies and actions have been strongly shaped by the input of Council, staff, community stakeholders and the broader public:

- **Project Steering Committee:** This steering committee provided direction and feedback on process and substance with representation from Council, Administration, Development Services, Nelson Hydro, FortisBC, and West Kootenay EcoSociety.
- **Council:** As well as Steering Committee representatives, other councilors and the Mayor participated in workshops, providing input on all sectors.
- **Staff:** Development Services staff managed the project. Key staff from Operations and Engineering, and Administration participated in workshops, providing input on strategies they would likely play a role implementing.
- **Business Community:** The City collaborated closely with the Chamber of Commerce to involve businesses in identifying relevant strategies pertaining to them and maximizing local economic benefit.
- **Development Sector:** Local builders, developers, architects, energy auditors, engineers and renewable energy experts provided input on buildings and energy supply strategies.
- **Community Stakeholders**: A wide diversity of public, private, and non-profit organizations covering social, environmental, economic and cultural interests offered input on all strategies.
- **Public:** An open house early on in the process was hosted to get feedback from additional, interested members of the community.

See *Appendix F: Engagement Event Attendees* for more details

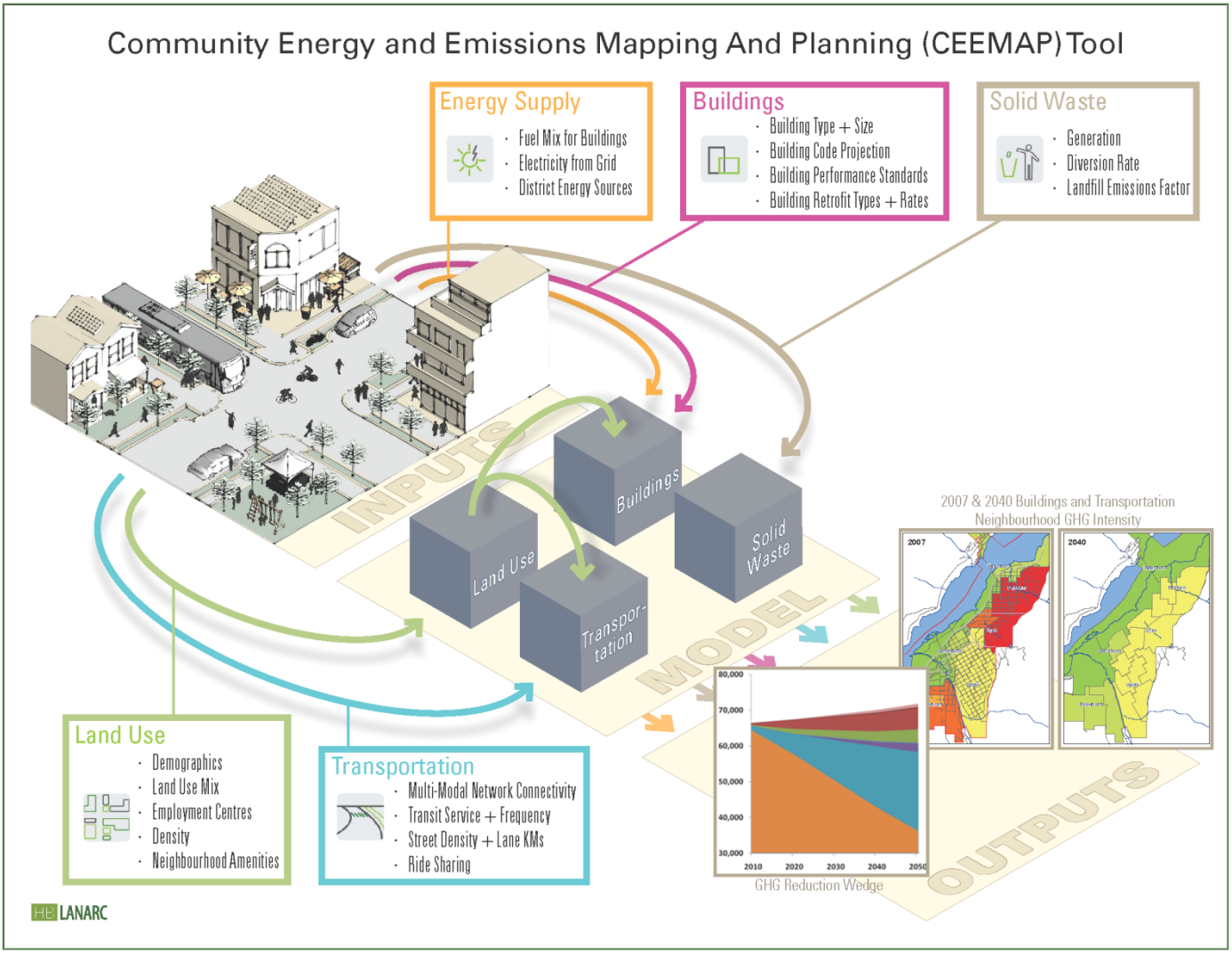
Modeling & Mapping Overview

Future energy and emissions have been calculated using the Community Energy and Emissions Modeling and Planning tool (CEEMAP). *See CEEMAP tool diagram on the following page.*

CEEMAP is based on several dynamic, interactive models that incorporate key indicators – ostensibly model inputs – that drive and constrain energy use and greenhouse gas emissions covering socio-economic considerations and all major community energy and emission sectors over which local governments have significant influence. CEEMAP uses the following indicators:

- Socio Economic Data, e.g. residential and employment population
- Land Use & Community Design, e.g. location and density of commercial and residential buildings
- Transportation Technology & Patterns, e.g. number and type of automobiles, transit routes and frequency
- Building Type & Performance, e.g. single detached or multi family home type, building energy rating, retrofit rate
- Heat & Electricity Supply, e.g. electricity from grid or other, specific district energy technology, building-scale
- Solid Waste Management, e.g. waste composition and mass, management practice

A baseline model is populated using values for the year for which the best data is available. In this case 2007 is used – also the year in which the BC government established its emission reduction targets.



Values for these indicators are then projected into the future based on the type and intensity of strategies Nelson is planning to implement. For example, a building retrofit strategy would change the energy performance of a specific number of existing buildings per year by a specific amount. A ride share strategy would change the number of vehicles travelling to specific destinations. CEEMAP also considers the impact of senior government policies on community activity. BC Building Code updates, for example, will change the energy rating of future buildings, and vehicle Tailpipe Standards will change the performance of future vehicle stock.

CEEMAP then uses empirically-derived knowledge of the relationship (i.e. function) between these indicators (i.e. model inputs) to calculate energy and emissions changes (i.e. model outputs) at future milestones (in this case at 2020 and 2040, the final horizon for Nelson's Sustainability Strategy).

As well as changes to energy use and greenhouse gas emissions, CEEMAP generates other outputs such as vehicle kilometers travelled by neighbourhood and across the community, and building energy consumption by neighbourhood. Additional outputs developed by the tool include illustrative charts and maps.

Because so many indicators influencing energy and emissions in transportation and buildings as well as energy supply are influenced by location, current and future conditions are graphically shown using maps generated through Geographic Information Systems (GIS).

See Appendix A: Technical Modeling Methodology for a more detailed description of the variables and their energy and emission relationships

Indicators, Targets, Implementation & Monitoring

At the end of each energy and emission sector in *Part II: Taking Action* is a table of *Indicator Highlights* with the values for key indicators used as *inputs* to model the energy and greenhouse gas implications of the strategies in that sector. These summary tables contain a subset of the full list of indicators that are in the Monitoring section. The following table explains the terminology used in the table.

Indicator Highlights Table

Indicator	Explanation	2007 Base Year	Low Carbon Path
Key variable influencing energy and/or emissions used in the model to map the community's energy and emissions future	*Significance of this indicator*	*Value in 2007*	*Variable value at future milestone years as a result of the implementation of sector specific strategies*
Example:			
Vehicle Kilometres Traveled (VKT) per household	A measure of how much residents drive in one year averaged at the household level.	24,415 kilometres	2020: 21,400 (-12% from 2007)

Implementation & Monitoring

These indicators will be used to assist with implementation, providing meaningful guidance for more detailed policy and program development, and support ongoing measurement and monitoring for staff, council, and the community. *See Section 3: Implementation, Funding & Monitoring*

Targets

Targets are values for strategically important values identified by an organization -- in this case the City of Nelson -- to help muster the intellectual, financial and social resources necessary to advance a strategy as well as monitor progress and, in turn, make coarse adjustments.

Requirements under the Local Government Act to include GHG reduction *targets, policies and actions* in Official Community Plans have given much greater stature to community GHG targets. At the same time, the urgency of our energy security and climate stabilization challenges will ultimately demand more defensible and strategic quantitative evaluation of strategies by all levels of government.

This planning process has generated targets and indicator values used in the modelling process. These targets and the associated indicator values should be refined and updated over time as more detailed planning and implementation work is undertaken for specific strategies.

Good targets are SMART:

- Specific
- Measureable
- Achievable
- Relevant, i.e. to Council, staff and/or the community
- Timebound, i.e. a timetable is associated with the target

Nelson Path to 2040 Sustainability Strategy Synergies

Path to 2040 icons are used at the beginning of each energy and emission sector in *Part II: Taking Action* to show the synergies between the strategies in this Plan and Nelson's broader Sustainability Strategy entitled *Path to 2040*[3]


Arts, Culture and Heritage


Local Economy


Energy and Climate Change


Natural Areas, Recreation and Leisure


Food, Food Security and Agriculture


Solid Waste


Healthy Living and Social Well-Being


Transportation and Mobility


Land Use


Water, Waste Water, Stormwater

Strategies, Actions, Priority Actions, Targets and the *Low Carbon Path*

The *Low Carbon Path* is divided by sector (land use, transportation, buildings energy supply, solid waste and Community Wide measures), with each sector comprised of several ***strategies*** that address the opportunities and challenges for reducing greenhouse gas emissions and energy use. Each strategy is made up of one or more ***actions*** that describe a specific next step that should be taken to advance the strategy. Within some of the strategies there are also ***priority actions***, which detail key next steps for advancing the strategy and emission reductions within Nelson.

Strategies, actions and priority actions were selected for inclusion in this Plan according to the following considerations:

- Interest from stakeholders, staff, Council and the community
- Greenhouse gas emission reduction potential
- Synergy with existing community priorities and initiatives
- Feasibility of implementation given local conditions and regional/provincial/national trends. Feasibility includes technological, economic and social considerations.

The name *Low Carbon Path* was chosen to describe the collection of strategies and actions, as one purpose of the Plan is to help the community understand both the direction Nelson should be heading in and how it can get there. The *strategies* are long term initiatives that encompass numerous activities within a sector. The a*ctions*, *priority actions* and policy/practice *vignettes* (that appear within text boxes) describe what should or could be done in the short term to advance the strategies. Because the focus is on near term next steps (2011–2020, with most likely taking place in 2011-2016), Nelson will need to identify additional actions and regularly revise and refine the strategies in order to achieve the emission reductions in 2040 that have been highlighted using CEEMAP. The graphs, charts and maps produced from CEEMAP illustrate the results of implementing the actions and priority actions and give snapshots of the *Low Carbon Path* at three key milestones: the 2007 baseline, 2020 and 2040.

[3] These icons were developed by Stantec Consulting s a part of the "Nelson Path to 2040 Sustainability Strategy" project. They are reproduced with permission.

Climate, Energy & Our Community

Challenge & Opportunity

Communities are particularly vulnerable to climate change due to the extensive infrastructure threatened by the increasing intensity of weather related disasters. They are vulnerable to rising and volatile energy prices because of the sheer amount of energy consumed. A growing number of policies by senior governments are increasing the importance of GHG reductions and sustainable energy.

Local governments have significant influence over community emissions. Moreover, taking action can strengthen the economic and social vitality of our community.

Climate Change Challenges

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 800,000 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.' [4]

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.5 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.

Changes expected in Nelson area during this century include:[6]

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

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.

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

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

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

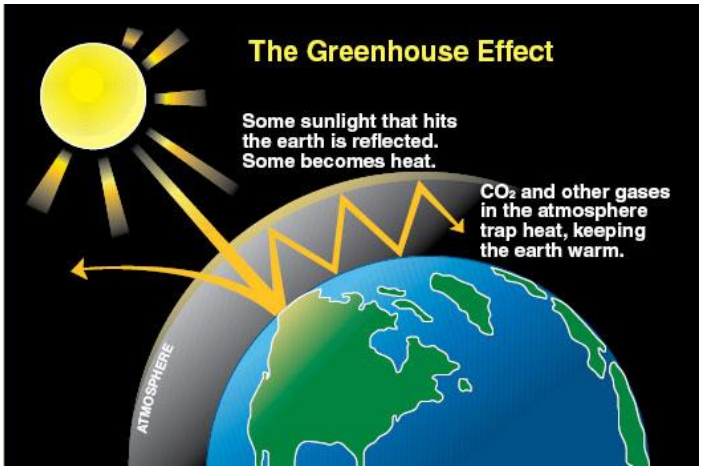


Figure 1: The Greenhouse Effect (University of Washington)

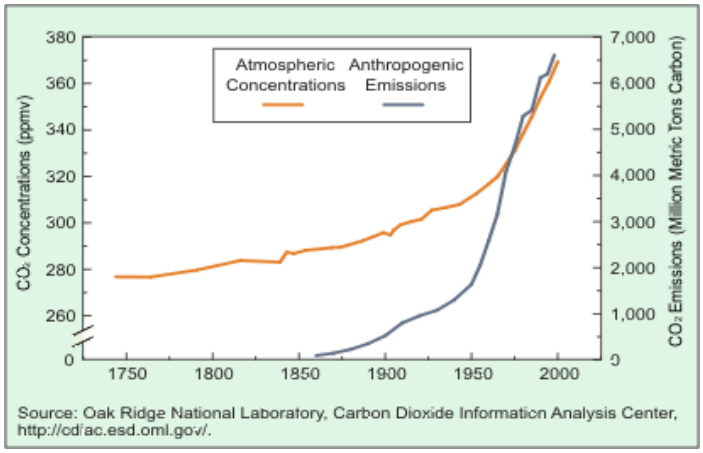


Figure 2: Trends in Atmospheric Concentrations and Anthropogenic (human generated) Emissions of Carbon Dioxide (Oak Ridge National Laboratory, US DoE)

The Greenhouse Effect & Climate Change

Greenhouse gases including carbon dioxide, methane and even water vapour occur naturally in the atmosphere maintaining a temperature that has been conducive for ecosystems and human civilization to flourish for 10,000 years. This is the natural greenhouse effect (Figure 1).

Burning oil, coal and gas for energy and clearing forests for cities and agricultural has released an additional 30% carbon dioxide into the atmosphere since the beginning of the industrial revolution (Figure 2). Methane emissions have also increased from livestock and decomposition of solid waste in landfills. The increased presence of these gases has created an enhanced greenhouse effect. This enhanced greenhouse effect has trapped more heat in the atmosphere leading to climatic changes, such as shifting precipitation patterns and intensifying storms leading to floods and droughts; reducing snow packs, glaciers and sea ice leading to rising sea levels, hydro-electric insecurity; changing ecosystems allowing pine bark beetles to endure warmer winters. Deep GHG reductions will allow us to avoid the most serious consequences of climate change.

Energy Security Challenges

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.[7]
- The US Energy Information Administration low cost estimate of oil is $115 per barrel by 2020. Their high estimate is $185.[8]
- Provincial electricity rates are forecasted to double by 2020.[9]
- Natural gas prices are expected to rise 13-85%, by 2020.[10]

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.

[7] International Energy Association. World Energy Outlook 2008 Fact Sheet: Global Energy Trends.
[8] Energy Information Administration 2009. Annual Energy Outlook, p. 161.
[9] 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.
[10] Energy Information Administration 2009. Annual Energy Outlook.

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.

The BC Government is developing policies that will require and support all sectors to contribute to these commitments. Many of these policies reinforce complementary efforts to reduce energy consumption and promote low carbon energy supply – another important provincial agenda. Developments that pertain to local governments include:

- **Green Communities Act:** Amongst other changes, Bill 27 required new content in Official Community Plans and Regional Growth Strategies, specifically: "…targets for the reduction of GHGs… and policies and actions... [for] achieving those targets"
- **Climate Action Charter:** The BC Government and the vast majority of local governments, including the City of Nelson, signed a voluntary commitment to:
    - Measure and report community GHG emissions
    - Create complete, compact, energy-efficient communities
    - Become carbon neutral in local government operations by 2012
- **GHG Reduction Targets Act:** Bill 44 added rigour to the provincial targets, specifically:
    - Province-wide emissions 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 *legislatively required* to be carbon neutral
- **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:** 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 2030, net zero energy homes may be required, standards for larger (part 3) buildings may be 43% more efficient than current regulations.[11]
- **Nelson Hydro and FortisBC:** 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 operates energy conservation and efficiency programs for residential, commercial and industrial customers.

Climate Protection: Convenient Opportunity

Climate Change is not *just* an inconvenient truth. It is a convenient opportunity!

Strategies to reduce greenhouse gases and advance sustainable energy can advance core priorities that that deeply resonate with Council, staff and the community. The best emission reduction plans are as much about these other core priorities as they are about climate protection. Priorities that complement a low carbon agenda that have shaped this Plan are:

- Strengthening the local economy by re-directing energy spending through avoided energy costs to local businesses, and efficiency and renewable energy and Nelson`s budding green building sector
- Improving affordability by increasing housing choice, improving energy performance, and reducing transportation costs.
- Reducing business and resident financial risk from rising and volatile energy prices, notably gasoline.
- Strengthening the City's asset management regime by building lighter, more strategic infrastructure.
- Encouraging healthy lifestyles, liveability and safety by enhancing neighbourhood design with support for viable micro commercial activity, parks and extending walking and bicycling infrastructure

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

Local governments also have significant capacity to manage community emissions. Local government decisions *influence* approximately 50% of greenhouse gases.[12] They have significant influence over local land use, transportation patterns, building energy use and solid waste management — all large emission sources.

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.

Current Community Actions

The City of Nelson and the broader community is already actively involved in a wide range of activities that promote sustainable energy and manage emissions, including:

Transportation

- Transportation Planning Review and Project Implementation Strategy (2007): Phased strategy for implementation of prioritized 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.
- Public Transit Exchange: Establish a multi-modal downtown transit hub, improve public transit, and 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

Buildings

- 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 FortisBC (ongoing) – Fire Department personnel are working with FortisBC 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 be in duplex form or secondary-suite ready
- 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.

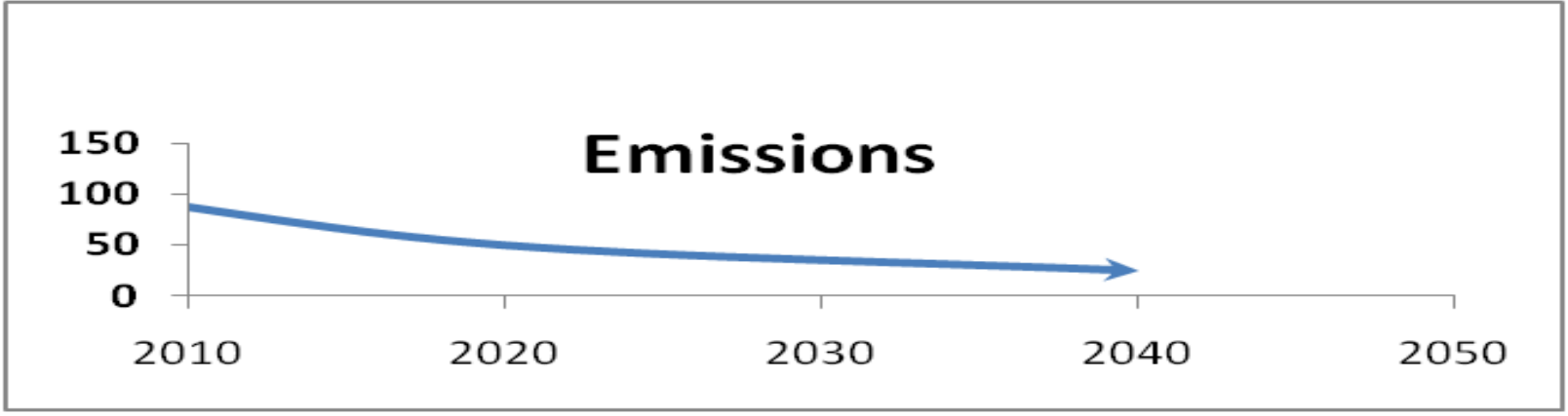
Local Energy Supply

- 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

Solid Waste

- 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.
- The traditional sustainable waste management hierarchy (i.e. reduce, re-use, recycle) is similar in its prioritization to a low carbon management framework. This is elaborated upon in the *Taking Action: Waste* section.
- 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.
- Zero Waste Action Plan (2003).

[12] 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).



Deep Reductions: Local & Senior Government Action

The BC Government's emission reductions targets are roughly in line with the balance of scientific evidence on the reductions necessary to avoid dangerous, run-away climate change.

Thirty-three percent emission reduction by 2020 and 80% emission reductions by mid-century will require active engagement by all levels of government and the broad diversity of actors over which they have influence – commercial, institutional, non-profit and individuals. To foster local government efforts, the BC Governments established the Green Communities Act (Bill 27) requiring municipalities to establish GHG reduction targets, policies and actions in their Official Community Plans – indeed a major driver for this plan.

The intensity and focus of effort by municipalities should be informed by an appreciation of the spheres of influence of different levels of government. There are many instances where influence is shared with senior governments and in many cases where senior governments have pre-eminent influence, e.g.:

- **Regulatory authority** over ***building codes*** and ***automobile efficiency standards*** which has huge influence over energy and emission activity.
- **Financial authority** ***is greater provincially and federally*** and is critical in sectors like public transit and community energy supply development.

This should not suggest action should not be taken in these aforementioned sectors. However, it should be explicitly acknowledged, for example, that provincial and senior levels of government drive the most change on building codes and municipal governments can take a leadership role at the margins, preparing the local development sector for change, facilitating market transformation, and ensuring steadily rising standards are being met.

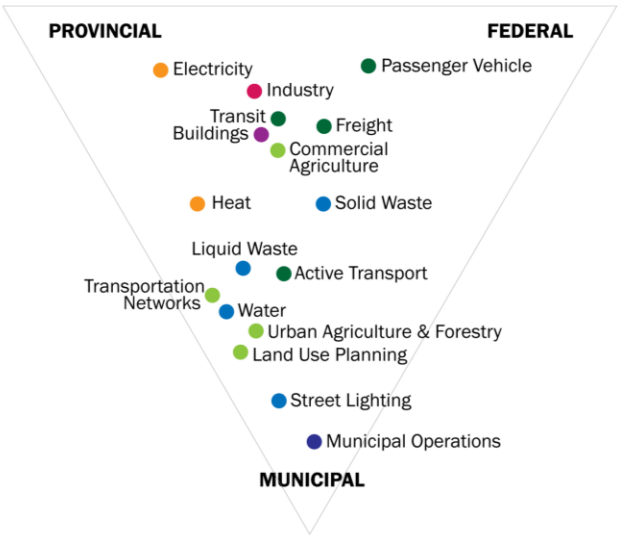


Figure 3: Government Spheres of Influence: Different levels of government share influence over energy and emission activity. One level typically has greater influence over some sectors. This figure makes generalizations that do not hold true in all contexts. For instance, because Nelson operates its own electric utility, it has greater influence over its electricity emissions.

Municipal Role

Municipal decisions *influence* almost half of GHG emissions in Canada[13]. This influence is pre-eminent in land use planning including location and density of growth and commercial, residential and institutional buildings and green space, building types, as well as street design and network, and urban design. These decisions powerfully shape transportation, building, and energy supply opportunities. Transportation infrastructure, waste

[13] Several sources arrive at similar values: Torrie, Ralph. (1998) Municipalities Issue Table Foundation Paper prepared for the Federal National Climate Change Process; BC Ministry of Environment, BC Ministry of Community Development (2008).

management practices, and other infrastructure decisions also shape emissions.

Local governments can also facilitate change by raising awareness and facilitating action by businesses, developers, individuals and other community actors.[14] Of all levels of government, municipalities have the most direct relationship with citizens through the services they deliver. If personal carbon footprints are going to change, it is in large part because local governments will help individuals and households step more lightly.

Influence, Control and Burden Sharing

While 80% emission reductions globally and potentially more in Canada by mid-century are appropriate levels to aim for, this target may not necessarily be the level a community should be striving for. [15]

Control vs. Influence: While municipalities have considerable *influence*, they have limited *control* over most emissions within their boundaries. The City of Nelson's 67,000 tonnes of GHGs emitted annually are widely distributed across hundreds of businesses and 10,000 residents using cars and powering and heating their homes.

While the City can carry out land use planning that supports efficient and effective public transit, ultimately individuals will decide whether they drive or take the bus.

Almost 40% of the Province's emissions are from industry. The vast majority are from less than 100 point sources, over which a single company has direct *control*. Many emit more annually than the combined commercial and residential emissions of the entire Kootenays Region. For instance, Duke Energy has several gas plants in NE BC that each generate over 1 million tonnes of GHGs annually. The Rio Tinto Alcan plant in Kitimat and a Lehigh Cement Plant in Delta also generate more than 1 million tonnes annually.[16]

Deep emission reductions from a large single point source over which there is direct *control* are – not always – but often easier and more cost effective than smaller, more widely distributed emissions where an actor only has modest *influence*.

While the City acknowledges its dependence and prosperity on many of these industrial outputs –e.g. cement, aluminum, and oil and gas – it is committed to forging a low carbon path, and notably reducing oil and gas dependence. It aims to do this by establishing a more liveable, safe community.

Burden Sharing: In the long run, it will be important for the BC Government and Government of Canada to consult with municipalities, industrial actors and others to establish an efficient and equitable approach to sharing the responsibility of deep emission reductions between and across sectors and provinces in a manner that strengthens the long term economic, social and environmental sustainability of province and country.

Net emissions and growth rate, reduction costs, transition opportunities, economic and social co-benefits are some of the criteria that should determine provincial, municipal and sector emission reduction responsibilities.

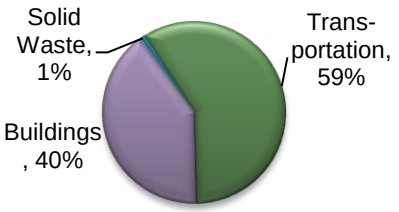
[14] REN21, ISEP and ICLEI 2009. Global Status Report on Local Renewable Energy Policies – Working Draft, 12 June 2009.
[15] This is an approximation based on extending the 2007 total of 6.7 million tonnes. The figure was calculated through a combination of actual and modeled emission data.
[16] BC Ministry of Environment, 2007

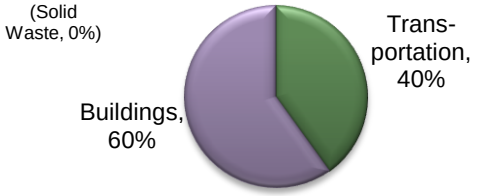
Nelson's Community Energy & Emission Profile

The energy and emission profile for Nelson looks similar to most communities in British Columbia, with transportation and buildings comprising the largest shares of energy use and greenhouse gas emissions (see figures on right). 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).

Two obvious differences stand out when comparing energy use and emissions. 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 generate electricity does not produce GHG emissions (hydroelectric power generation).

Nelson Community GHG Emissions by Sector





Nelson Community Energy Use by Sector

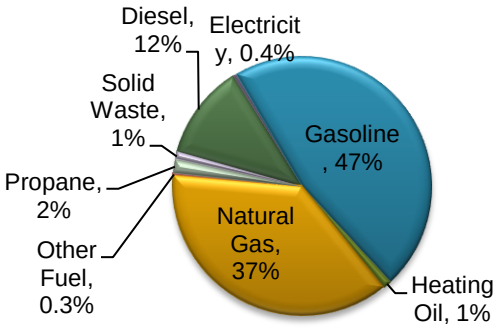
Table 1: Nelson Energy and GHG Emission Summary, 2007

		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%	*59%*
	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%	*40%*
	Large Industrial (UNKNOWN)	-	-		-	0.0%	
	Solid Waste	0	0.0%	*0%*	604	0.9%	*1%*
	TOTAL	1,421,072		*100%*	66,573		*100%*

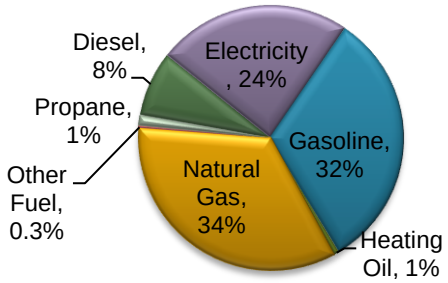
The majority of emissions come from the combustion of fossil fuels (i.e. natural gas, gasoline, diesel, and heating oil) that emit carbon dioxide into the atmosphere. The primary type of *energy use* in the waste sector is for the collection and transport of waste from homes and businesses to transfer 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.

The pie charts below illustrate these two points and show that gasoline accounts for the largest amount of energy consumed and a majority of the greenhouse gas emissions.

Community GHG Emissions by Fuel Type



Community Energy Consumption by Fuel Type



Energy Expenditures

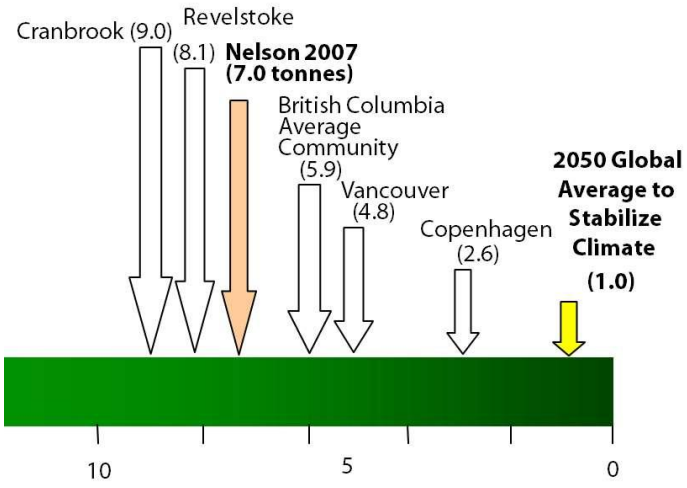
In 2007, Nelson **residents and businesses spent a combined $30.4 million on energy** or approximately **$3,200 per person per year.**[17] The $21.4 million in residential energy expenditures works out to an average of **$5,150 per household**. Energy expenditures for small and medium sized business 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**--among small communities in Interior British Columbia, this ranks quite well.

[17] 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 4: Comparison of per capita emissions (tonnes CO2e per person)



Energy and Emission Excluded in the Profile

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:

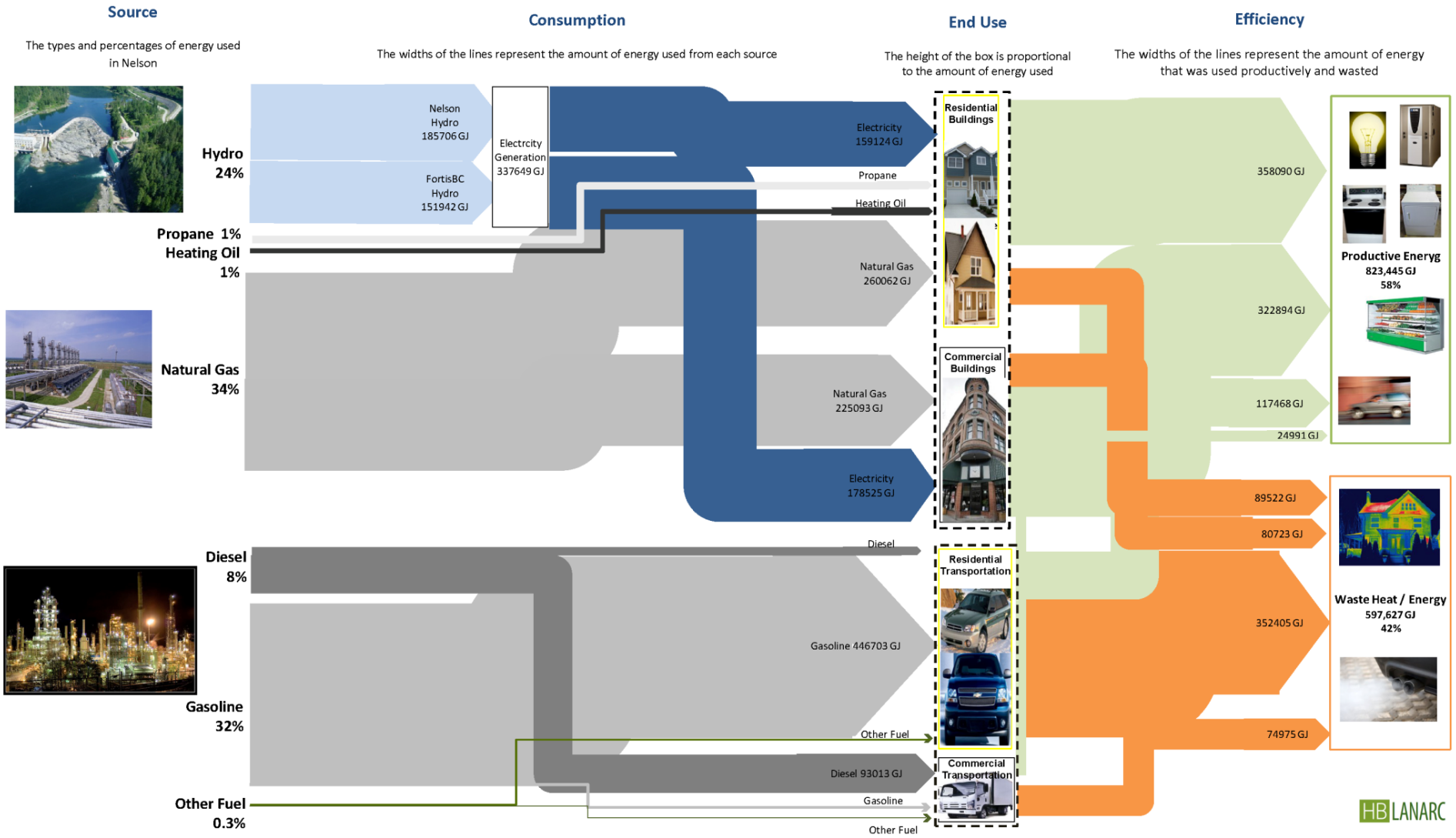
- large industry
- boats
- airports (planes and ground transportation)
- off-road vehicles
- construction equipment and yard/maintenance equipment
- agriculture (vehicles and livestock)
- "upstream" emissions from extraction, processing and transportation of goods consumed locally

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.

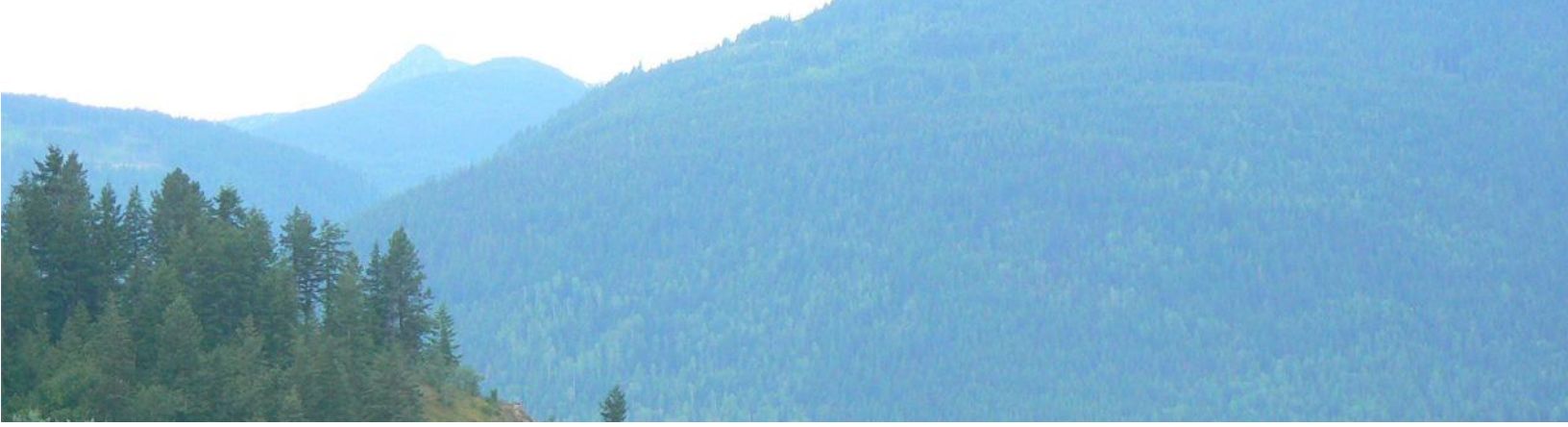
Energy Flow Chart - Baseline

Energy use in Nelson, as represented in Figure 5 below, can be traced from the generation activity (Source), to the type of energy (Consumption), the sectors it is used in and how it is used within each sector (End Use), all the way to the amount that is put to productive use, versus loss through inefficiencies (Efficiency). The "Sankey[*] " diagram below shows the flow of energy through these stages. At each stage, the width of the line is proportional to the amount of energy. Figure 5 shows a large dependence on fossil fuels (under Source and Consumption) and approximately 40% of the energy in the community being wasted through inefficiencies (under Efficiency [**]). When selecting the greenhouse gas emission reduction strategies in the Taking Action section of this Plan, key criteria were strategies that will reduce the use of fossil fuels, decrease the demand for energy and use energy more efficiently. [*] Sankey diagrams are named after Irish Captain Matthew Henry Phineas Riall Sankey, who is considered to have been the first to use this type of diagram in 1898 in a publication on the energy efficiency of a steam engine. [**]Efficiency was calculated using data from Natural Resources Canada on BC average energy use in buildings and vehicles.

Figure 5 – Nelson Energy Sankey Diagram - 2007



2. Taking Action



Overview

The Low Carbon Path is comprised of sector-specific objectives, strategies and priority actions that will result in significant GHG emission reductions and strengthen local energy sustainability. To ensure the strategies result in an emissions path that is both achievable and ambitious, modeling techniques were used to forecast future energy and emissions levels based on assumptions developed through consultations with staff, Council and community stakeholders (see Appendix A for more details) and informed by a critical appreciation of related strategies in North America. Performance assumptions labelled as "outputs" are generated through this modeling process and are reflected in many of the maps and graphs, notably those projecting GHG implications.

The Low Carbon Path is organized into the following sub-sections:

- **Analysis Overview:** This section provides a summary of the impact of the strategies across all sectors.
- **Land Use:** Land use planning and design are closely connected to emissions in the transportation and buildings sectors. The strategies in this sector have significant co-benefits in the areas of housing affordability, active transportation and enhancing community liveability.
- **Transportation:** Transportation sector strategies seek to reduce vehicle emissions through programs and policies that will make it comfortable, safe and convenient to walk, cycle and rideshare and use public transit.
- **Buildings**: Emissions from Nelson's buildings will be reduced primarily through an innovative retrofit strategy that focuses on the city's heritage building stock and a diverse portfolio of policy mechanisms that makes it easier for builders and home owners to construct efficient buildings that use renewable energy.
- **Energy Supply:** District energy implementation is the major area of focus for the energy supply sector.
- **Solid Waste:** Close partnership with regional and provincial government agencies to increase recycling and composting rates will have the biggest impact on reducing solid waste sector emissions.
- **Community-Wide Measures:** The final sector contains strategies that are non-sectoral in nature; involving aligning municipal finance with energy and emissions, capacity building, and education and outreach.

This low carbon path reflects a realistic, ambitious effort that will require significant engagement by the City. Successfully implementing the low carbon path depends on close collaboration with residents, businesses, public sector organizations and non profits, as well as neighbouring local governments, and senior levels of government, utilities and transportation authorities. The Low Carbon Path is also underpinned by a strong commitment to strengthen the local economy, citizen health, and community liveability.

Community-Wide Energy & Emissions Analysis

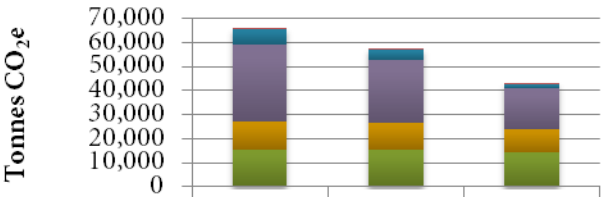
Implementing the Low Carbon Path would steadily decrease greenhouse gas emissions, on a sector-by-sector basis, through the year 2040, with total emissions decreasing 43% below the 2007 baseline. When emissions are normalized by population, the reductions are greater, starting at 7 tonnes per person in 2007 and decreasing to 3 tonnes per person in 2040 (a 57% reduction).

Reductions for residential and commercial buildings are more modest than the other sectors largely due to the 2% annual population growth rate that was used for the years 2010-2020.

Transportation emissions decrease by the largest amount, going from 38,000 tonnes CO_2e in 2007 to 19,000 tonnes in 2040. Community-wide vehicle kilometres traveled increases over this time period due to population growth, but decrease on a household basis due to the implementation of land use and sustainable transportation strategies. The most important policy change in this sector is the steady improvement in vehicle fuel efficiency that will be mandated by the BC provincial government. In the Low Carbon Path, the average fuel efficiency of a vehicle in Nelson will improve, from 14.5 litres per 100 km in 2007 to 5.5 litres per 100 km in 2040.

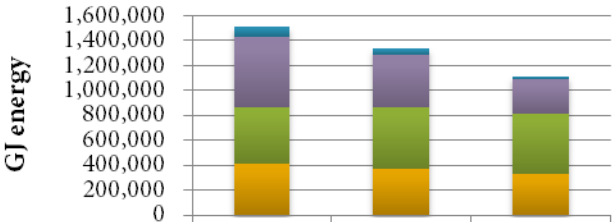
Emissions from solid waste also decrease significantly, reducing from 608 tonnes CO_2e in 2007 to 90 tonnes in 2040. These reductions are primarily driven by a large increase in the rate of organic waste that is composted and the installation of a landfill gas capture system at the landfill post 2020.

Annual GHG Emissions by Sector



	2007	2020	2040
Solid waste	610	600	90
Commercial Transportation	6,300	4,500	1,600
Personal Transportation	32,100	26,200	17,000
Commercial buildings	11,700	10,800	9,600
Residential buildings	15,300	15,500	14,500

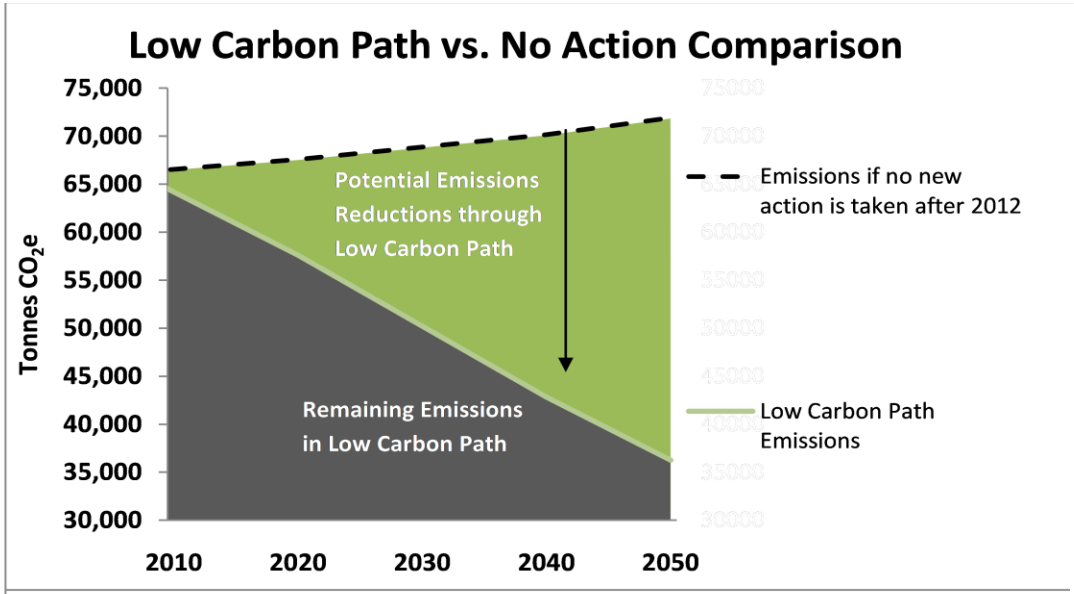
Annual Energy Use by Sector (Gigajoules)

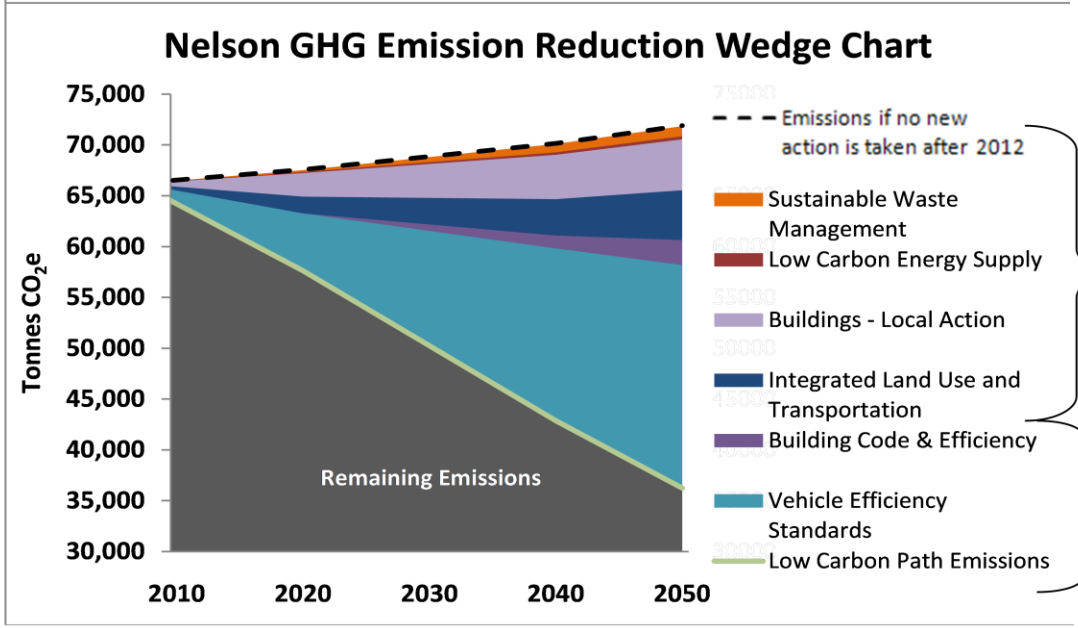


	2007	2020	2040
Commercial Transportation	87,000	54,000	21,000
Personal Transportation	568,000	419,000	270,000
Residential buildings	451,000	487,000	483,000
Commercial buildings	409,000	377,000	335,000

Annual Energy Use by Sector

As with emissions, energy use in Nelson will decrease steadily in Nelson in the Low Carbon Path. Transportation energy use decreases because residents and businesses drive less and use more fuel efficient vehicles. The reduction in residential and commercial buildings energy use will result from new buildings that are more energy efficient, the incorporation of building scale renewable energy technologies and the retrofit of existing buildings to be more energy efficient.





These charts reflect annual emissions in Nelson under two possible emission futures: the "Low Carbon Path" and a "No Action" scenario.

The top line represents potential GHG emissions if no additional policies or actions are undertaken after 2012. Existing building and vehicle stock are still replaced with more efficient units, but only to the point where they meet 2012 standards.

The Low Carbon Path Emissions line represents projected emissions if all policies in this Plan are implemented at both local and Senior Government levels. Even if all policies are implemented, a significant amount of emissions remain.

The Greenhouse Gas Emissions Reduction Wedge Chart below provides a more detailed analysis of emissions reductions in the Low Carbon Path. Each wedge represents a bundle of closely related policies and actions. Wedges are divided by local and senior government based on which has the most direct ability to influence outcomes.

Primary Responsibility:

Local Government

Senior Government

While municipalities have considerable influence, they have limited control over most emissions within their boundaries. Municipal decisions influence almost half of GHG emissions in Canada, predominantly in land use planning, including location and density of growth, green space, building types, street design and urban design. These decisions powerfully shape transportation, building and energy supply opportunities. As illustrated in the wedge diagram, senior levels of government have influence and control over a significant proportion of GHG emissions.

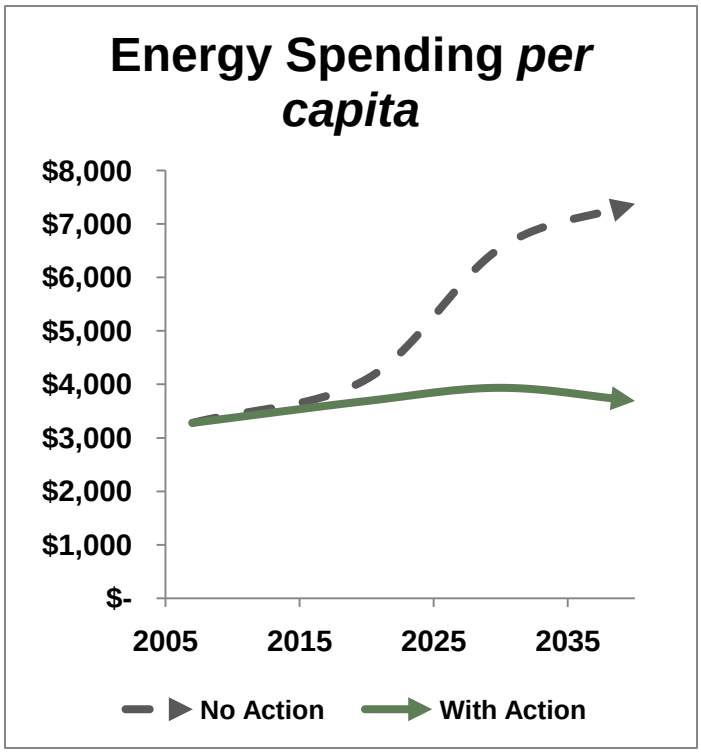
The Wedge Chart above estimates the potential contribution of categories of strategies and actions to the overall Low Carbon Path. Senior governments (Provincial and Federal) are the primary regulator of several initiatives, such as vehicle fuel efficiency standards and improvements to the Building Code. Others are largely within the influence of local governments, primarily the City but also the RDCK.

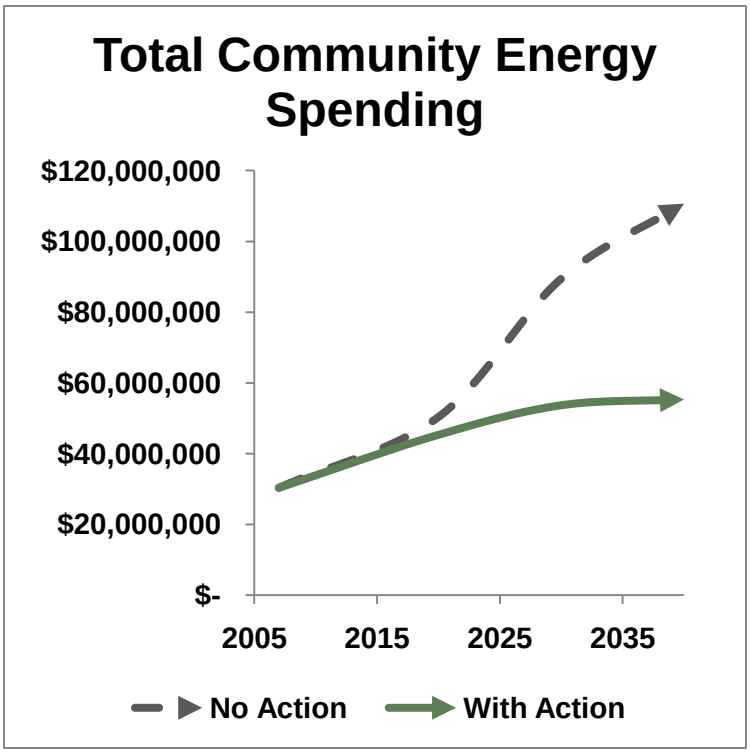
Wedge or Policy Bundle	Description	Primary Level of Government
Sustainable Waste Management	Waste Management includes two major policies: a substantial reduction in the amount of organic waste sent to landfill, and eventual landfill gas capture. This has a relatively small effect on community-wide emissions, however.	Nelson and RDCK
Energy Supply	Energy Supply is driven largely by the implementation of District Energy, and assumes a renewable energy supply for connected buildings. A small fraction of this wedge is from local electricity generation.	Nelson
Buildings – Local Action	This wedge represents measures that Nelson can undertake within the Building sector. A large share of this wedge assumes a robust and innovative retrofit program managed by Nelson Hydro and assisted by FortisBC. In addition, education and incentives to promote green new construction play a significant role.	Nelson
Integrated Land use and Transportation	Land Use and Transportation allows a strong role for local governments. Land-use, urban design, and infrastructure decrease distances travelled by single-occupant vehicle, while promoting trips using rideshares, public transit, bicycle, and foot.	Nelson
Building Code and Efficiency	Assumes that a new Building Code is put in force by 2013, after which no improvements to the Code are made. This is primarily a senior government initiative, although Nelson plays a critical role in enforcement of these standards. By 2013, it is expected that the Building Code will require significantly more efficient buildings than those we are constructing today. However, the wedge only has a significant effect once a substantial number of new buildings have been constructed.	Provincial Government
Vehicle Efficiency Standards	The second wedge shows the effect of vehicle efficiency standards. This is almost entirely a senior-government initiative, although local personal and commercial vehicle choice can also play a role	Provincial and Federal Governments
Remaining Emissions	The bottom wedge represents estimated remaining emissions if all Low Carbon path strategies are implemented	All

Effect of Actions on Energy Costs

Future energy prices are difficult to predict. Most long-term energy price projections show large increases in the cost of fuel and electricity, likely doubling by 2030.[18] Future total community spending on energy is driven by a combination of increasing total population, changes in demand *per capita*, and increasing energy costs. Without action,[19] energy spending would double along with energy prices and further with population, likely reaching more than $100 million in annual total community spending by 2040. Annual household energy costs could reach an average of $15,000 per household during this period.[20]

Under the Low Carbon Path, energy consumption *per capita* (and per household) is expected to decrease by approximately half from 2007 levels by 2040. This could reduce total energy spending by at least 50% below what it would in a "no action" scenario.





[18] Based on Energy Information Administration Annual Energy Outlook 2011, BC Hydro Long Term Acquisition Plan, discussions with Nelson Hydro, and original analysis by HB Lanarc.

[19] Under the "no action" scenario, currently energy use patterns and intensities are projected forward based on population.

[20] Note that total energy spending for utilities (Hydro and Natural Gas) include some fixed costs that are independent of energy prices. These would be unlikely to decrease based on reduced demand. Therefore total energy spending, which includes these fixed costs, doesn't entirely reflect changes in the price per unit of energy (per gigajoule for natural gas or per kilowatt-hour for electricity).

Land Use

Land use is intimately connected to transportation and buildings. Land use determines where we live, work, shop, and play, and influences how we get there. Building type and form allows more efficient buildings with access to renewable energy. Thoughtful land use strategies that acknowledge these connections can have transformative impacts. Nelson has strong influence over this sector relative to senior government.

The Path to 2040 Sustainability Strategy provides a framework that can be used to evaluate land-use and development decisions. The Strategy, along with specific strategies and actions provided below, can inform the Downtown and Waterfront planning processes.

Primary Objective

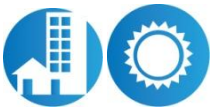
- Create sustainable land uses that maximize opportunities for diverse, low-carbon transportation options, green buildings and low carbon energy supply.

Complementary Objectives

- Buffer residents and businesses from energy price volatility and overall expenditures.
- Increase community liveability and sustain downtown vitality using for safety, mobility, economic security, and health.
- Support long term City fiscal performance by lowering demand for additional infrastructure

Nelson Path to 2040 Synergies

Direct



Related

Strategies

A. Build on the Community's Complete, Compact and Centered Form to maximize low carbon transportation options and district energy

1. Mixed-use development will be expanded to **brownfields** within the municipal boundary. There is no Greenfield development
2. **Infill and redevelopment** will occur in Waterfront & around Mt. St Francis Hospital and downtown
3. **Downtown is maintained as the central business district**.
4. **Mixed use nodes are encouraged** in Mt. St Francis redevelopment, East and West Waterfront according to the Waterfront Development Plan, and to Granite Point area.
5. **Micro mixed-use development** is encouraged in select neighbourhoods, e.g. Fairview and Rosemont

Priority Action

Integrate land use strategies into an OCP Update and new Land Use Regulation Bylaw

B. Encourage Secondary Suites and Infill Cottages for their inherent superior energy performance.

Small homes, such as secondary suites and infill cottages, have shared walls and less space to heat than a conventional home, lowering energy use and emissions from heating. Small homes can increase population density, supporting low-carbon transportation, and can also improve housing affordability for both renters and buyers.

1. **Infill cabins/cottages** encouraged in strategic locations, e.g. heritage single family, through land-use policies and capacity building for residents and construction sector
2. Support innovative work-live arrangements, such as lofts in commercial buildings, to reduce transportation emissions and promote affordability.
3. Recognize **telecommuting** as an effective low carbon strategy and remove barriers for home office creation, including creating financial incentives.

Neighbourhood Grocery Stores

Neighbourhood grocery stores are on the front line of defence against climate change. One in five trips is for shopping. One of the top contributors to the steady increase in distances people travel is the shift to large, car-oriented retail outlets in low density areas. A large body of literature shows people who live near small stores walk more for errands and, when they do drive, their trips are shorter. Moreover, the presence of small retailers influences the likelihood that people take public transit because they are able to chain errands on their commute home. Living close to grocery stores and even fast food outlets also lowers the likelihood of obesity. A small, but growing number of jurisdictions are establishing policies to promote neighbourhood grocery stores for the wide variety of social economic and environmental gains.

Sources

Obesity linked to fewer neighbourhood food options http://www.unews.utah.edu/p/?r=102609-2

Neighbourhood Grocery Stores and the Fight Against Global Warming http://www.newrules.org/retail/article/neighborhood-stores-overlooked-strategy-fighting-global-warming

Priority Actions

Infill Home Pilot Project: Conduct a pilot to build 10 small format residential homes on existing lots. Such homes can support ultra low per-capita building and transportation energy consumption, facilitate affordable home ownership opportunities and rental units. The intention of the pilot project is to learn how a policy could be applied more broadly and infill housing could be appropriately accommodated in Nelson. Conditions for the pilot project could include:

- Corner lot
- 500 meters (walking distance) from diverse commercial activity
- Units could be new or conversions of existing building.
- The City could wave building and development permit fees.

The City may be interested in facilitating stratification or subdivision to enable the units to be sold as affordable housing. Issues the City is interested in exploring through the pilot include: servicing, aesthetics, views, neighbourhood character, safety, parking, future development opportunity costs, staff administrative burden, affordability, staff/builder capacity building needs.

Infill Housing OCP and Land Use Regulation Bylaw Update: Learning from the Infill Home Pilot Project, and the City's ongoing work on secondary suites could be applied to developing further small format housing opportunities, such as enhancing work-live arrangements, and expanding the Infill Home pilot.

- **Street design will be enhanced** to maximize walking and cycling enjoyment.
- **Engage Nelson's arts community** to create art bike racks
- **Enhance connectivity** between the Waterfront Trail and downtown; **increase amenities** along the waterfront trail

Priority Action

Climate Protection Design Guidelines: both community-wide and neighbourhood-specific Guidelines encompassing both public and private realms. In particular, the Waterfront development provides an opportunity to implement and pilot these Guidelines.

The following components should be included in the development process:

- ***Technical Analysis and Review*** of best practices and precedents, and identification of opportunities and site characteristics to promote low carbon buildings and transportation
- ***Public Engagement*** to gather local knowledge, identify local opportunities and challenges, and to build education and awareness regarding low carbon buildings and transportation

See Appendix H: Select Resources for reference material

C. Climate Protection Design Guidelines to encourage buildings, landscapes and activity patterns that are both low-carbon and resilient to climate change

Local governments can establish Development Permit Areas (DPA's) to influence the form and character of private development, the conservation of energy and water, and the reduction of green house gas (GHG) emissions. Local governments are also responsible for developing, implementing and maintaining public streetscape and open space standards. This gives Nelson measureable influence to promote low carbon infrastructure and transportation.

1. Establish Development Permit Area Guidelines that promote energy efficiency, renewable energy, low carbon transport, and adaptation to climate change. Use Guidelines that respond to Nelson's unique context including its rich architectural heritage, arts culture and winter climate.

Case Study: Infill Housing

This converted garage is now a small (290 square ft.) home. Like conventional secondary suites, such small-format housing can maintain existing character and scale of the neighbourhood while allowing increased density and high building efficiency. Approximately 50 potential sites for garage conversions exist in Nelson, according to David Dobie and Rod Taylor.

Source
Rod Taylor & David Dobie

Design Guidelines for Climate Protection

Urban Design plays a significant role in low carbon transportation, buildings, and infrastructure. Design strongly influences how people get around, where they go, where they gather, and how they feel about their community, their neighbourhoods, and themselves. Design guidelines can influence green and open spaces, create a sense of safety, and ensure "human-scale" design.

The appeal of walking and cycling is strongly influenced by design. Design guidelines can promote energy efficiency through landscaping, building materials, and building orientation that promotes passive solar heating and cooling.

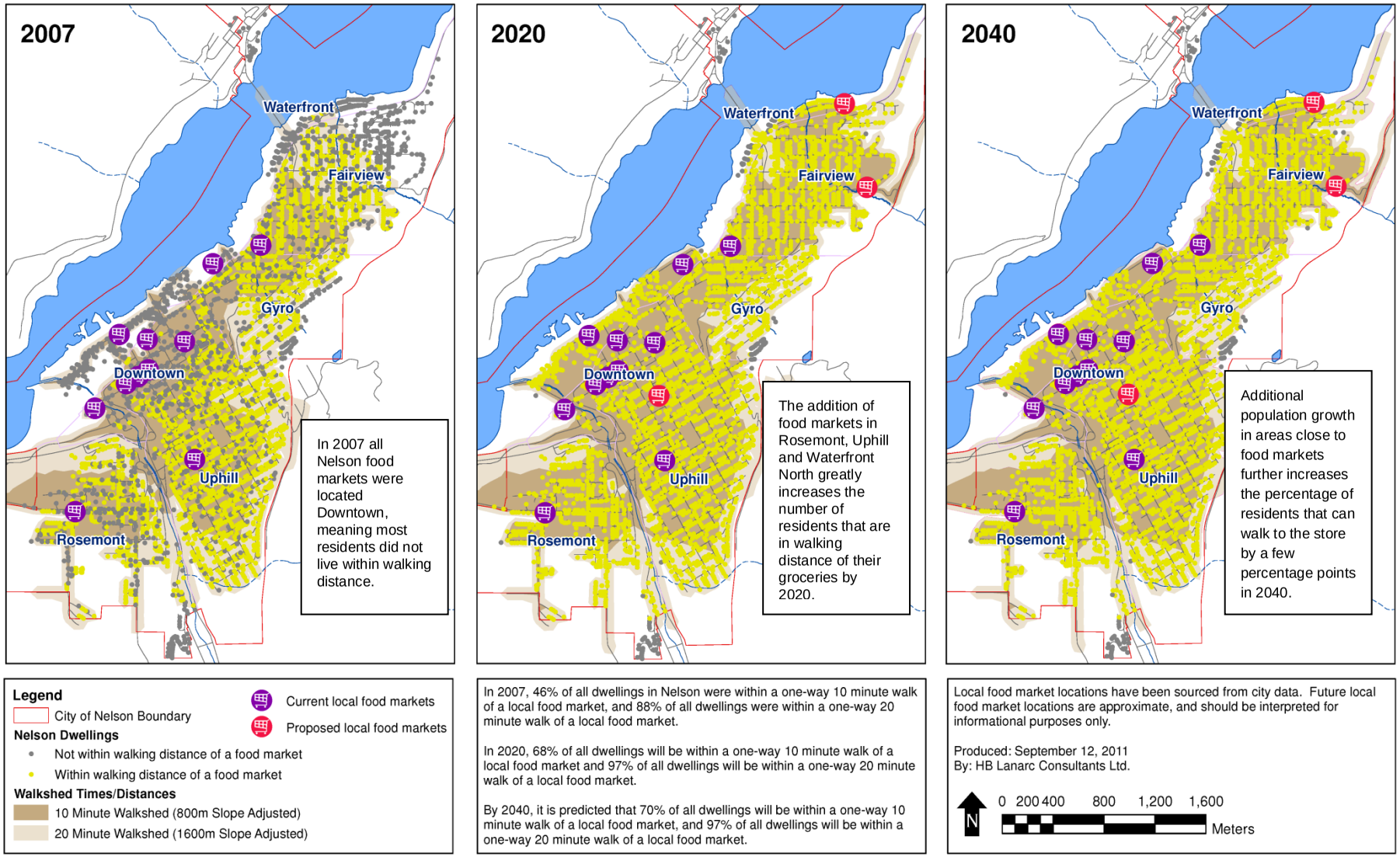
Design guidelines can cover the private realm shaping the activity of developers and builders, encouraged through the permitting process. Guidelines can also cover the public realm, shaping the way Cities design a wide variety of systems and infrastructure. Low Carbon Design Guidelines can address the following elements:

Building form and site design, including building orientation, layout, size, materials, and character. These can include green roofs and walls.

Outdoor spaces and public infrastructure, including streetscape, landscape, stormwater, and transportation infrastructure, street trees, sidewalk aesthetics, landscaping, public art, and even edible landscapes.

A "local Food Market" is a retail store that sells some produce or other minimally processed food.

Access to Local Food Markets



Legend

- City of Nelson Boundary
- Current local food markets
- Proposed local food markets

Nelson Dwellings

- Not within walking distance of a food market
- Within walking distance of a food market

Walkshed Times/Distances

- 10 Minute Walkshed (800m Slope Adjusted)
- 20 Minute Walkshed (1600m Slope Adjusted)

In 2007, 46% of all dwellings in Nelson were within a one-way 10 minute walk of a local food market, and 88% of all dwellings were within a one-way 20 minute walk of a local food market.

In 2020, 68% of all dwellings will be within a one-way 10 minute walk of a local food market and 97% of all dwellings will be within a one-way 20 minute walk of a local food market.

By 2040, it is predicted that 70% of all dwellings will be within a one-way 10 minute walk of a local food market, and 97% of all dwellings will be within a one-way 20 minute walk of a local food market.

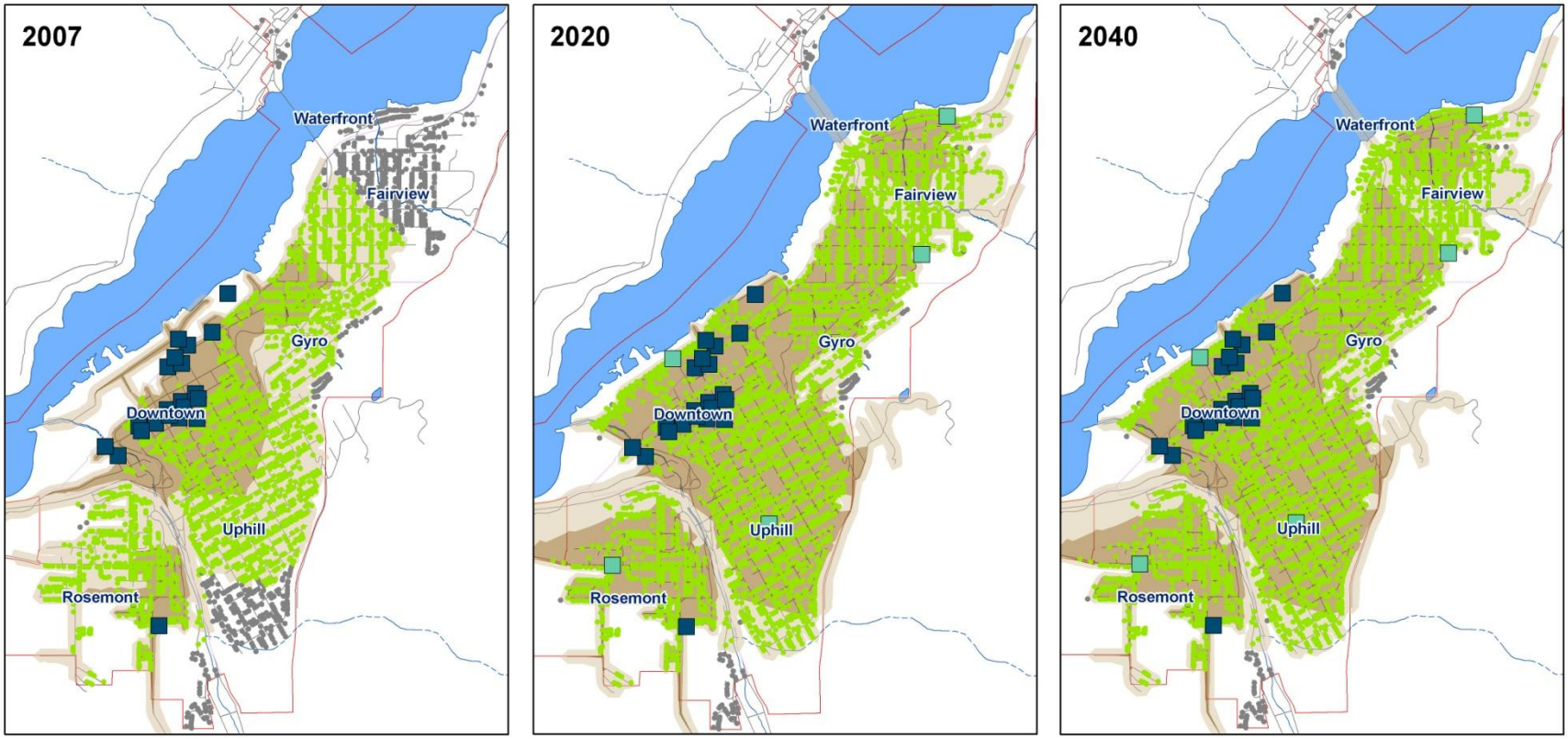
Local food market locations have been sourced from city data. Future local food market locations are approximate, and should be interpreted for informational purposes only.

Produced: September 12, 2011
By: HB Lanarc Consultants Ltd.

N

0 200 400 800 1,200 1,600
Meters

Access to Local Serving Retail



Legend

- City of Nelson Boundary
- Local serving retail
- Proposed local serving retail

Nelson Dwellings

- Not within walking distance of retail
- Within walking distance of retail

Walkshed Times/Distances

- 10 Minute Walkshed (800m Slope Adjusted)
- 20 Minute Walkshed (1600m Slope Adjusted)

In 2007, 33% of all dwellings in Nelson were within a 10 minute walk of local retail, and 75% of all dwellings were within a 20 minute walk of local retail.

In 2020, 72% of all dwellings will be within a 10 minute walk of local retail, and 97% of all dwellings will be within a 20 minute walk of local retail.

By 2040, it is predicted that 73% of all dwellings will be within a 10 minute walk of local retail, and 97% of all dwellings will be within a 20 minute walk of local retail.

Local retail locations have been sourced from city data. Future retail locations are approximate, and should be interpreted for informational purposes only.

Produced: April 14th, 2011
By: HB Lanarc Consultants Ltd.

N

0 200 400 800 1,200 1,600
Meters

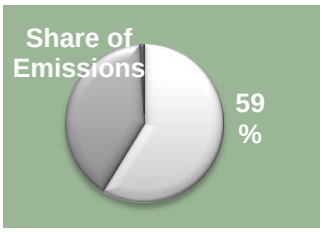
Indicator Highlights: Land Use Sector

At the core of "creating sustainable land uses that maximize opportunities for diverse, low-carbon transportation options…"—one of the objectives of the Land Use sector strategies—is co-locating key destinations and where people live. The four indicators that are highlighted below illustrate the impact of land use changes that are proposed in Nelson, through the Waterfront and Downtown planning processes. By centering future growth in the Downtown and Waterfront areas, a larger percentage of residents will be located close to food stores, shops and services, and other amenities. This development pattern will also enable residents to walk, bike and use transit for a larger percentage of the weekly trips.

Indicator	Description	2007 (Base Year)	Low Carbon Path
Dwellings within a 10 minute walk to local services such as banks or government offices	*See description above*	50%	80% in 2040
Dwellings within a 10 minute walk to local food store		50%	75% in 2040
Dwellings within a 10 minute walk of the Downtown area		35%	53% in 2040
Dwellings within a 10 minute walk of neighbourhood retail		37%	88% in 2040

Please also refer to the future Neighbourhood Retail, Food and Parks Walkshed maps.

Transportation



Transportation produces a majority of Nelson's emissions. Nelson has an older, less efficient vehicle stock than the BC average, and its steep terrain demands innovative approaches for cycling and walking breakthroughs. Despite these challenges, Nelson is already a leader in British Columbia and Canada in low carbon transportation with 31% of residents primarily walking or biking to work.[21] Its compact land form and unique character make it possible to further increase this percentage, as well as increase the number of residents who share rides and take public transit. The strategies in this sector and the Land Use sector will complement those that have already been identified in the Nelson Active Transportation Plan. Nelson is also a major origin and destination for work and college related trips in the region. Progress in reducing the number of single passenger trips will require collaboration between the City, Regional District, School Board, BC Transit, Selkirk College, local business, and non-profits.

Objectives

- Enhance the convenience and comfort of active and low carbon transportation modes
- Active transportation becomes the largest share of *local* trips

Complementary Objectives

- Residents lead healthier lives because walking and cycling becomes a larger share of regular transportation activity
- Increase the amount of money re-invested locally, instead of spent on fuel and vehicles from outside the Province

Nelson Path to 2040 Synergies

Direct

Related

[21] Based on Census data.

Strategies

A. Mainstream Low Carbon Transportation throughout the community

1. Develop a City **Low Carbon Transportation Policy** that guides planning and design, infrastructure spending, traffic management, and parking policies of the city
2. **Optimize parking regulations** to support low carbon transportation objectives, including number and location of spaces, pricing, and priority parking for low carbon, ride share and car share vehicles
    - Explore creation of a visitor park-and-ride with a shuttle bus running frequent loops to downtown.
    - Reduce parking requirements in exchange for active transportation infrastructure and car share for new and re-development
3. Require all new large (BC Building Code, part 9) buildings to have **covered, secure bike parking and showers** for residents, employees; and covered/accessible bike parking for customers
4. Develop a program and **bylaws to reduce idling**
5. **Electric vehicle parking incentives**:
    - Create development permit areas that require bicycle parking and electric vehicle charging in parking spaces
    - Require new mixed use, multi-unit residential and parking buildings to have electric vehicle charging infrastructure; Create parking requirements for new and re-development that support the City's goals to reduce transportation emissions
6. **Explore car sharing** promotion through priority parking, reduced parking requirements in new developments, and/or City use of car share to replace a portion of its vehicle fleet

Priority Actions

Adopt a **Low Carbon Transportation Policy**, update parking bylaws, and design guidelines to achieve these objectives. The policy should be based on a transportation mode hierarchy that addresses the needs of

- First: pedestrians
- Second: bicyclists
- Third: public transit, and car pooling / ride sharing / car sharing
- Fourth: low carbon vehicles (including hybrids, next generation of plug-in electric and hybrid vehicles)
- Fifth: standard internal combustion engine vehicles

Parking Bylaws – Update existing bylaws so that parking priority is given to low carbon modes of transportation.

Design Guidelines – Review existing neighbourhood and community wide design guidelines to ensure that pedestrian access is prioritized and safe and convenient bicycle parking is required for businesses.

Transportation Plan requirement for all new commercial developments and redevelopment to address employee commuting and business related transportation.

B. Build Kootenay Rideshare Capacity through technology, coordination and social marketing.

Nelson is a major transportation hub in the Kootenays and a community with trust and cooperation among residents. These factors created the preconditions for the formation of Kootenay Rideshare, and also make it possible for ride sharing to become an even more important form of transportation in Nelson. The recommended actions that comprise this strategy could make ride-sharing more convenient, safer, economical and attractive to a wider cross-section of residents, for a greater variety of trip types.

Priority Action

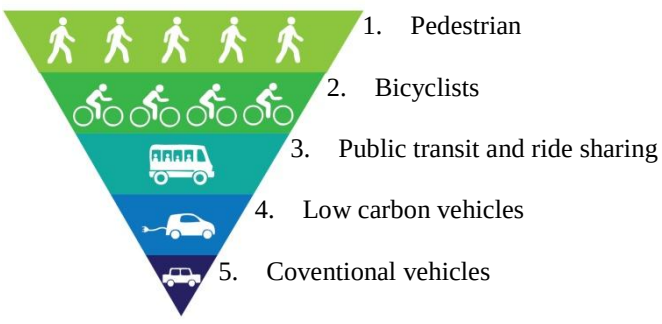
Kootenay Rideshare Capacity Building:
Collaborate with Kootenay Rideshare to explore the following enhancements to ridesharing service in Nelson and the region:

- Create designated **"hitching posts" for rider pick-up**
- Put in place an **incentive structure for drivers**
- Integrate **safety, security, communications and navigation** with new technologies

Key steps:

- Identify funding to update the Kootenay Rideshare business plan and to implement the identified service improvements.
- Conduct research and engage public on potential service improvements, including the identification of barriers and benefits to ride sharing
- Create a business and implementation plan

Figure 7 - Transportation Mode Hierarchy



Community Ride Share Success Stories

By some measures Kootenay Ride Share is one of the most successful ride-share programs in Canada, given the large number of users and the small population of the central Kootenays. There is, nevertheless, significant untapped potential. Its greatest strength is single long distance excursions. There is limited activity associated with regular commuting to work and college in the region, despite that every 5 minutes during the day single passenger automobiles leave Nelson for communities like Trail and Castlegar, and the vice versa.

Some of the challenges that would have to be overcome include: making it easier to find and offer a ride; and reducing risks for riders and drivers. Success stories from other jurisdictions can point to opportunities for strengthening Kootenay Ride Share, requiring some capacity building resources and collaboration with other community partners.

Designated "Hitching" Posts – Informal commute ride sharing systems in the Washington DC metro[1] and San Francisco Bay area[2] use designated pickup points for passengers seeking a ride to specific destinations. The City of Nelson could seek to establish such a system in order to facilitate commute ride sharing for Nelson residents who work in neighbouring communities.

Technology and Service Enhancements for Ride-Matching – Rideshare services across North America are turning to advancements in communication technology to improve the ease and efficiency of matching drivers with riders, as well as reducing risk. In Prince William County, Virginia the OmniMatch ride matching service uses a regional database and a simple online or telephone questionnaire to connect commuters that are looking to share a ride.[3] PickupPal uses social networking-like profiles, a Google-Maps integrated search engine and smartphone apps to assist riders and drivers to connect.[4]

Sources
(1): http://www.slug-lines.com
(2): http://www.ridenow.org/carpool
(3): http://www.prtctransit.org/ridesharing/index.php
(4): http://www.pickuppal.com

Small Town Transit Solutions

Small towns typically struggle with identifying public transit options that are convenient and frequent enough to attract ridership. Nelson is not a typical small town, however, with a vibrant downtown and relatively compact urban form—both which create the opportunity for a variety of transit solutions.

Restaurant/Pub Ride-Home Shuttle – Enjoying a drink with dinner is a part of eating out for many Nelson residents at the numerous restaurants and eateries concentrated in Downtown. With a shuttle service that provides a guaranteed ride home, the number of drunk drivers on the road would likely decrease and restaurant patronage would increase as those who live Uphill and further from Downtown would have a convenient option to get home. There are several successful examples of single restaurants/pubs offering ride-home services, including the Hummingbird Pub Bus on Galiano Island[1] and the Bier Craft shuttle in Vancouver. [2]

Employer Funded Commuter Transit Service – In York, Pennsylvania, a partnership between area employers and the transit company has created an all-day transit service, called Rabbit Transit, which connects workers to their jobs, in addition to serving the broader community. The majority of the costs of the service are paid by the employers, but the general public provides a diversified revenue base.[3]

Flexible Route Bus Service – PRTC Transit in Prince William County Virginia offers an on-demand flexible route option for its riders, called OmniLink. Off-route pickup and drop-off can be scheduled by riders from 2 days to 2 hours in advance and costs $1.00.[4] A flexible route option in Nelson could provide residents with more options to get where they need to go and to access transit from home.

Bicycles on Buses – A number of Nelsonites use bicycles as a regular means of transportation, but for most the steep hills are a major deterrent for daily trips. Some communities with similar geography have equipped their buses with higher capacity bike racks to accommodate cyclists that want to get up the hills. Several different designs have been developed that can accommodate more bikes than the typical 2-3 bike front-loading system.[5]

Sources
(1): http://www3.telus.net/hummingbirdpub/index.html
(2):http://www.cityfood.com/drink/beer/local_companies_promise_beer_without_fear?tpid=265
(3): http://www.rabbittransit.org/
(4): http://www.prtctransit.org/local-bus/howtouse.php
(5): www.lbl.gov/Workplace/Facilities/Support/Busses/bicyclists.html

C. Enhance Public Transit Locally and Regionally to make it a comfortable and convenient option for residents, workers and visitors

1. Work with BC Transit, regional communities, businesses and other key partners for **more effective routes (for example, Stanley St. Express), cost effective buses** and **social marketing** for local and regional routes
2. Implement **intra-Nelson transit services** to give residents desirable options to get to work, go downtown and return home

Priority Action

Integrated Low Carbon Transportation Study: Undertake a study to explore and advance local and regional low carbon transportation. The study would minimally entail:

- **Partnerships**: work with BC Transit, Regional District, School Board, Chamber of Commerce, Interior Health Authority, Selkirk College and non-profits to undertake this project.
- **Multi Criteria Analysis**: Infrastructure costs, operation & maintenance costs, GHG reductions, ridership
- **Transportation Options** local and inter-community route adjustments including peak/off peak scheduling, optimizing existing infrastructure alternative infrastructure and route options (including micro buses, unscheduled buses/share taxis, and Kootenay ride share), multi-modal capacity building
- **Funding Options** including BC Government/BC Transit, local businesses, and major employer/school volume discounts.
- **Social Marketing** program development

See Small Town Transit Solutions above

D. Implement the Nelson Active Transportation Plan to improve public health, safety and liveability

1. Strengthen **pedestrian and cycle routes, infrastructure and services**

Priority Action

Active Transportation Plan Implementation: Identify and address barriers to implementing the *Active Transportation Plan* and create an implementation timeline.

E. Low Carbon Transportation Education and Outreach to strengthen citizen and employer action

Social marketing & education to promote low carbon transportation in schools/colleges, businesses, and the general public

1. Businesses: Promote walking, ride share/car share/car pool, parking policies, bike facilities, employee transit pass discounts/benefits, and green fleet advising.
2. Schools/colleges: Create partnerships and promote discount passes, car/ride share promotion, intensification of walking school bus, improve connectivity/infrastructure to schools, reduce idling, use health (air pollution and obesity) to reduce parent drop offs, U Pass, cycling clubs
3. Low Carbon Vehicle Education Campaign: Many Nelson residents pride themselves on their low environmental impact lifestyles and make a conscious effort to do little things that will, for example, reduce consumption of material goods, walk and cycle when possible, buy local foods and support local businesses. The cars that Nelsonites drive tell a different story, however, as they are 12% less fuel efficient than the BC average. A campaign could be developed likely focussing on fuel costs and human health to compel local residents to purchase more efficient cars, or trade in the clunker for a lower carbon vehicle, a bike and take advantage of the incentives offered by the BC Scrap-It program

High Volume Bus Bicycle Rack.[22]

[22] Source http://www.lbl.gov/Workplace/Facilities/Support/Busses/bicyclists.html

Key Senior Government Policies

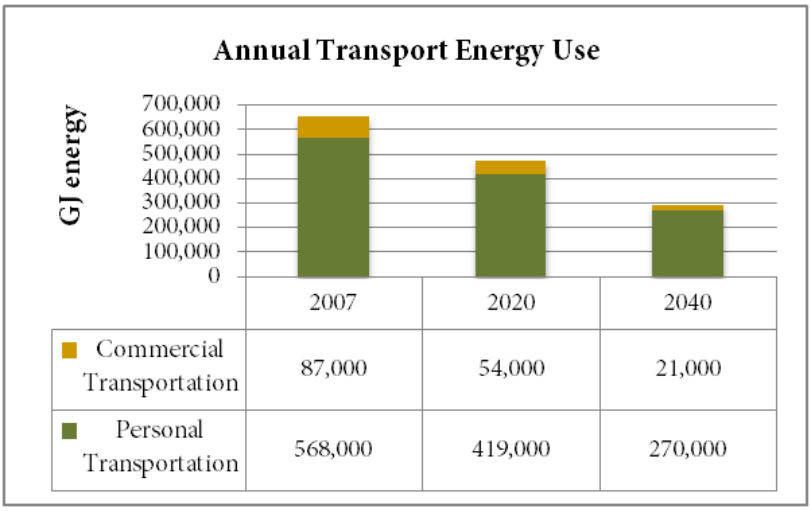
Bill 39: Vehicle Emissions Standards Act (2008) - The Act enables the BC government to set vehicle greenhouse gas (GHG) emission standards equivalent to those laid out in California's 2004 regulation. The Act will be brought into force by regulation – enacted when the equivalent California regulation and standards are implemented. As shown in the *Community Wide Emissions Analysis*, above, this measure would have a significant impact on transportation emissions in the future.

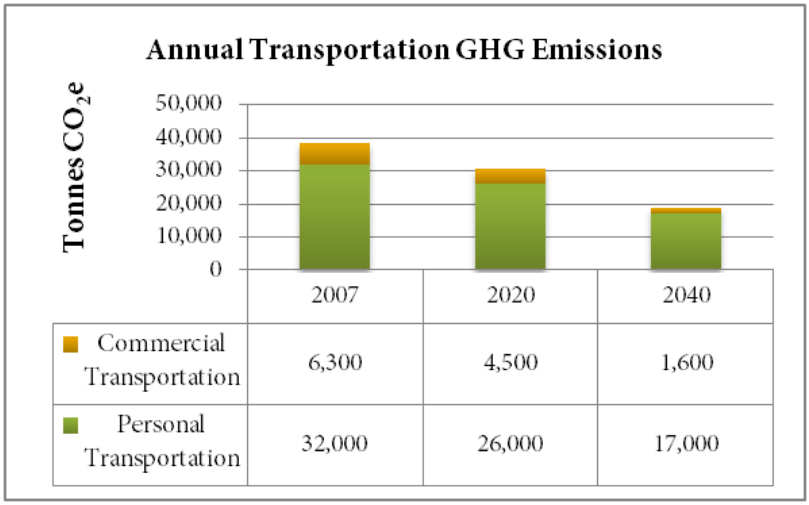
Indicator Highlights for Transportation Sector

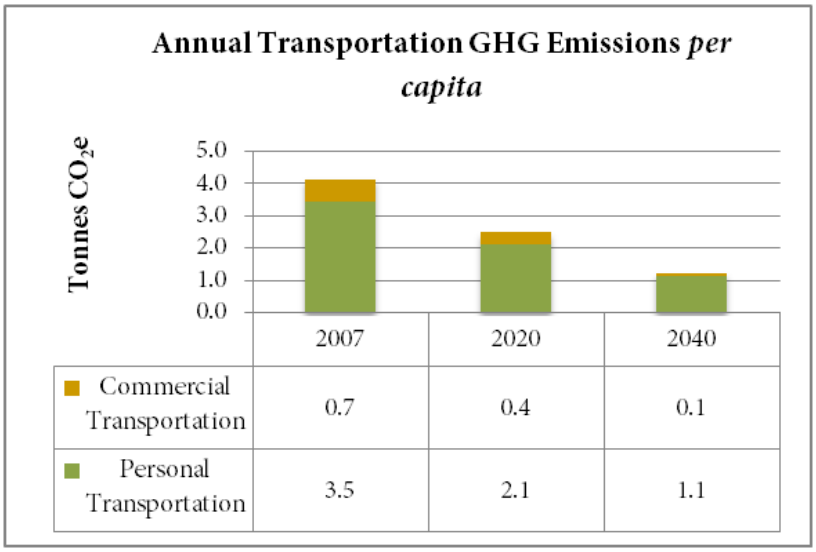
The indicators described below were selected to illustrate the reduction in vehicle kilometres traveled, the shift in how residents get to work, and the GHG emissions emitted at a household level.

Indicator	Description	2007 Base Year	Low Carbon Path
Vehicle Kilometres Traveled (VKT) per household	A measure of how much residents drive in one year averaged at the household level.	Household VKT 2007 = 24,415 [23]	Household VKT 2020 = 21,400 (-12% from 2007) Household VKT 2040 = 16,763 (-33% from 2007)
Commute to Work Mode Shift	One measure of transportation mode split is how people get to work. For the Low Carbon Path this has been estimated based on modeled shifts in VKT.	2007 (StatsCan) Auto-Driver: 57% Auto-Passenger: 8% Public Transit: 2% Walking and Cycling: 31%	2040 (estimate) Auto-Driver: 27% Auto-Passenger: 13% Public Transit: 9% Walking and Cycling: 52%
GHG emissions per household resulting from personal vehicle travel	Total residential transportation emissions are averaged at the household level and reported in tonnes of carbon dioxide-equivalent units. This indicator is a reflection of annual VKT, mode split, and the efficiency of vehicles.	7.8 tonnes CO_2e per household [24]	2.3 Tonnes of CO_2e/ household in 2040

[23] 2007 CEEI report for Nelson. See the Land Use – Transportation modeling method description for more details.
[24] *Ibid*





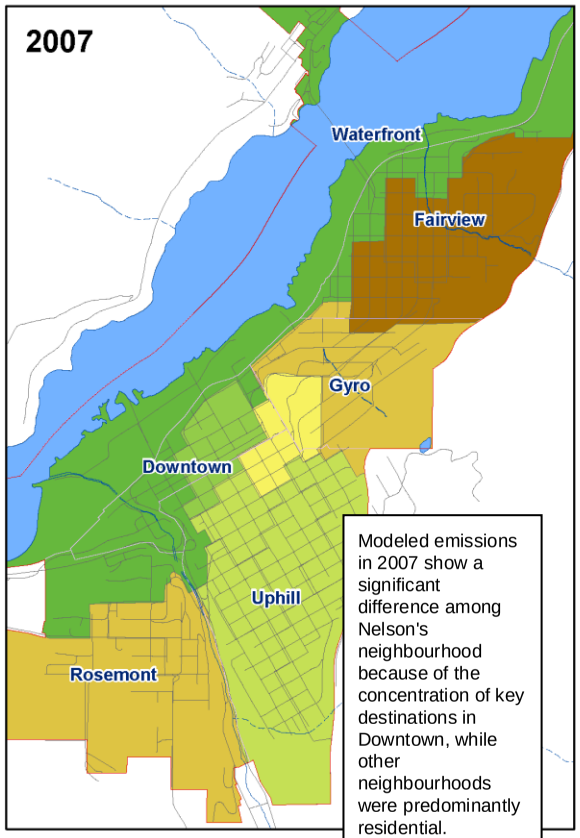


Within the Transportation sector, emissions are expected to decrease substantially on a *per capita* basis, to approximately one third of 2007 levels.

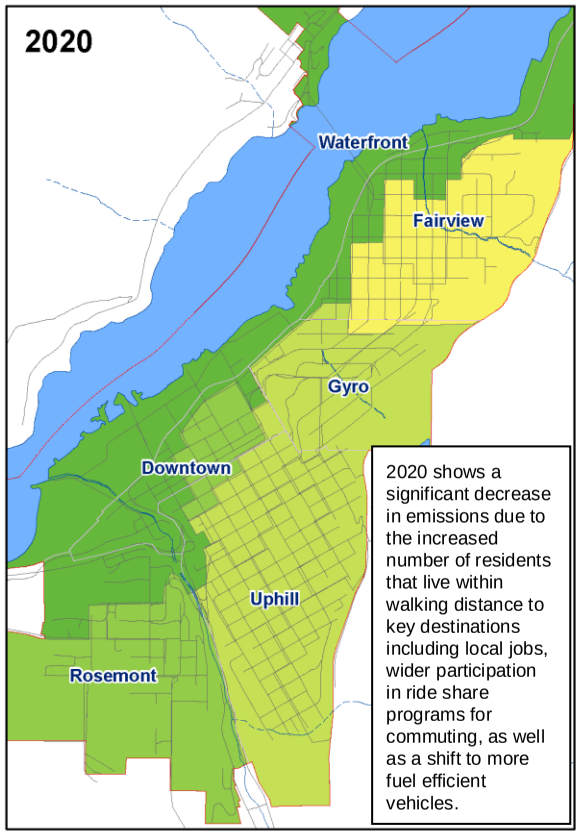
Personal transportation emissions reductions are likely to result from the combination of policies listed above, including stricter vehicle tailpipe standards and a reduction in the number of local and regional vehicle trips due to land use and transportation changes and programs.

The reduction in commercial transportation energy and emissions is largely outside of local government jurisdiction. This reduction was assumed to be driven by mode shift and technology advances due to transportation costs and increasing energy prices.

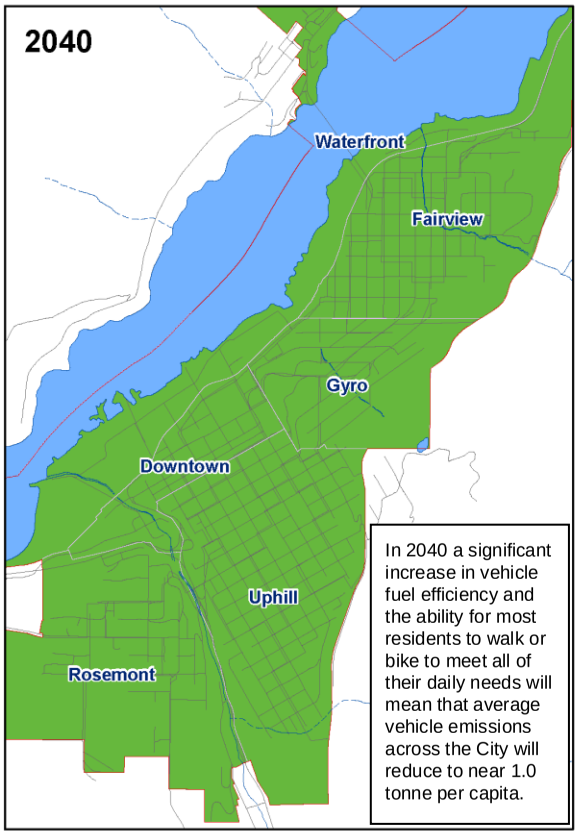
Residential Vehicle Emissions Per Capita



Modeled emissions in 2007 show a significant difference among Nelson's neighbourhood because of the concentration of key destinations in Downtown, while other neighbourhoods were predominantly residential.



2020 shows a significant decrease in emissions due to the increased number of residents that live within walking distance to key destinations including local jobs, wider participation in ride share programs for commuting, as well as a shift to more fuel efficient vehicles.



In 2040 a significant increase in vehicle fuel efficiency and the ability for most residents to walk or bike to meet all of their daily needs will mean that average vehicle emissions across the City will reduce to near 1.0 tonne per capita.

Legend

Residential Vehicle Emissions
Annual Tonnes CO2e per Capita

- 0.85 - 1.60
- 1.61 - 2.40
- 2.41 - 3.20
- 3.21 - 4.00
- 4.01 - 4.80
- 4.81 - 5.60
- 5.61 - 6.40
- City of Nelson Boundary

In 2007, average VKT per capita was 10,722 km/yr and average vehicle emissions per capita was 3.4 tonnes CO2/yr. Total emissions from residential transportation was 32,000 tonnes CO2e/yr.

In 2020, average VKT per capita will be 9,422 km/yr and average vehicle emissions per capita will be 2.1 tonnes CO2e/yr. Total emissions from residential transportation will be 26,000 tonnes CO2e/yr

By 2040, average VKT per capita will be 8,782 km/yr and average vehicle emissions per capita will be 1.1 tonnes CO2e/yr. Total emissions from residential transportation will be 17,000 tonnes CO2e/yr

VKT and vehicles emissions have been modeled by HB Lanarc and are influenced in part by walkshed analysis. Future population projections were developed in conjunction with the City of Nelson all data displayed is estimated, and should be interpreted for informational purposes only.

Produced: April 14th, 2011
By: HB Lanarc Consultants Ltd.

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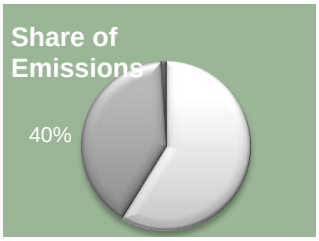
Meters

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 of these emissions result from natural gas used for space and water heating in homes and businesses.

Some of the most effective measures to reduce energy use and emissions in buildings include improvements in building envelopes (insulation), more efficient appliances, passive design, and building typology (smaller format buildings).

Older buildings will benefit the most from energy efficiency upgrades (insulation). Nelson has a high proportion of older buildings relative to most BC communities. This makes baseline emissions higher, but also provides large opportunities for improvement through retrofits.

Local governments in BC have limited control over efficiency in new buildings and moderate ability to promote efficiency in existing buildings. The Province has the most significant regulatory tool (the BC Building Code), and will require significantly more efficient buildings during a code update in 2012/2013. Local governments can moderately influence building energy consumption by influencing building typology: smaller format buildings use less total energy. Changing the energy supply – also a significant opportunity – is discussed in the next section.

Objective

- Strengthen the energy and emission performance of Nelson's current and future building stock

Complementary Objectives

- Reduce expenditures on energy for local businesses and residents, and keeps money in the region due to local re-spending
- Strengthen the local green building industry for local and external markets

Nelson Path to 2040 Synergies

Direct

Related

Strategies

A. Establish a Home and Business Energy Retrofit Program

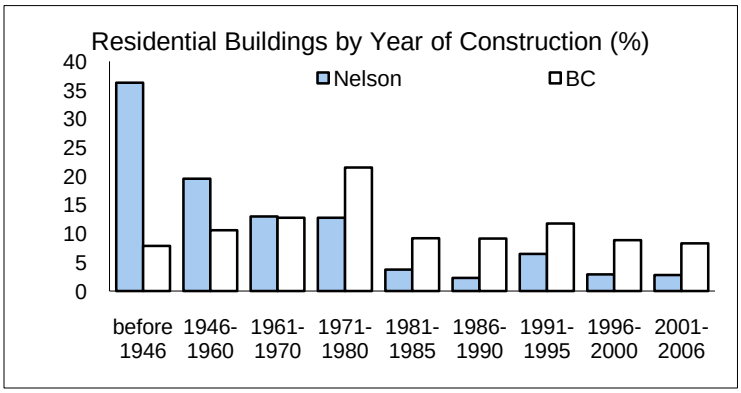
The greatest share of building energy consumption and greenhouse gas emissions will be from existing buildings. Many actions are cost-effective because of the long-term savings in energy expenditures. Nelson's heritage homes and businesses are one of the City's defining features, contributing to the character of downtown and its neighbourhoods. Decreasing the amount of energy used while maintaining this character is a challenge and leadership opportunity for the City.

1. Generate a coherent, efficiently administered program for cost effective home and business energy retrofits capitalized by Nelson Hydro and paid back through utility bills using energy savings
2. Integrate with existing programs and financial incentives through partnerships with LivesmartBC, FortisBC and the Federal EcoEnergy Retrofit program
3. Maximize local economic development by encouraging certification of local energy assessment professionals; local worker training on heritage building retrofits and renewable energy system installation; and maximizing locally sold materials
4. Explore the potential for establishing a heating oil phase-out program in partnership with FortisBC to provide financial incentives to replace old furnaces

Priority Action

Building Retrofit Pilot on a few local buildings. Document results and use as part of marketing and engagement strategy, and use to adjust incentive design; single detached, homeowners that pay utility bills, project funded through Nelson Hydro; establish a funding ceiling; etc; pilot used to help inform a much broader retrofit plan… the opportunities to explore could include:

- **Establish Partnerships** with local building industry, utility companies and local non-profit organizations
- **Compile Technical Challenges** specific to older buildings and heating systems found in Nelson using local experts and work in other jurisdictions
- **Financing and Incentive Design** including loans, grants, existing incentives from government and utilities, and provisions for low-income building owners and renters
- **Social Marketing and Engagement** to generate interest in the community
- **Heritage Building Training** in collaboration with strategic partners to advance building retrofit strategy
- **Human and Social Capital development** in partnership with Kootenay Career Development Society to advance Buildings sector strategies



Nelson's building stock by year of construction, compared to BC Average. Nelson has an exceptionally large number of pre-1960 homes. These older buildings drive up energy use relative to other communities.

Source

BC Stats, 2006 Census Profile for Nelson.

Case Study: Energy Efficient Retrofits

Retrofits for Homes:
Like Nelson, Quispamsis New Brunswick has a relatively old building stock. Through the Efficiency New Brunswick program, Quispamsis retrofitted around 400 of its 5,000 private dwellings (7%). Annual emissions were reduced by 1,600 tonnes, and program participants save an average $1,000 each year. That is a payback of approximately 10 years for homeowners. Although program costs and benefits will likely differ substantially in Nelson due to lower energy prices, there is still great potential for a locally focused residential building retrofit program to build on existing incentives, such as those offered by LiveSmart BC.

Commissioning for Large Buildings:
Regular maintenance is important to keep heating systems working properly. For large buildings, re-commissioning of the heating system can provide substantial energy and greenhouse gas savings.

During routine maintenance of the heating system in the Touchstones building, a technician noticed the 10 year old boiler was only firing at the highest setting. A more detailed investigation led to $3,000 of repairs to recommission the boiler. Annual fuel consumption for the building dropped 42%, from $14,000 to $8,000, and the recommissioning work paid for itself in less than a year. Nelson could promote heating system recommissioning as part of their building energy strategy.

The historic Touchstones building in Nelson

Sources

Personal interview, 2011, Best, L . http://www.touchstonesnelson.ca/
http://www.fcm.ca/cmfiles/SCC2011_presentations/ElizabethWeir.pdf

Retrofits Through Financing Innovations

Many older buildings can improve energy efficiency by 30% through upgrades to the walls, windows, and air tightness, as well as optimizing HVAC, mechanical and electrical systems of larger, more complex buildings. Retrofit payback periods range from 2 to 12 years.

The up-front cost of an energy retrofit is the major disincentive for most building owners. Many do not have the up-front capital to make the investment, or will not occupy the building long enough to see a financial return. Utilities and municipalities are significantly accelerating retrofit rates by offering low-interest loans which can be repaid through utility bills, largely offset by reduced energy consumption. The loan transfers to a new building owner at time of sale. It is common for these programs to offer assistance for low-income program participants. Two examples that use electric utility bills include.

City of Portland
Clean Energy Works Portland is a partnership driven by the City. Upfront financing is made available through the private sector at around 5% interest. A private utility uses its bill to collect the loan. The retrofit is delivered by a non-profit and involves skilled trades as well as unemployed and underemployed workers being trained for the construction sector. The successful program started in the single family residential sector and is being extended to commercial and multifamily buildings.

Manitoba Hydro
Manitoba Hydro has offered a residential loan program for energy efficiency retrofits since 2001. On average, loans are offered for a 5 year loan at around 5% interest.

Source

http://web.mit.edu/colab/resources/On-Bill_Repayment.pdf

Energy Retrofits for Heritage Homes

Older buildings can be more challenging to retrofit than newer homes. Older buildings are typically not insulated, making ceilings and walls the major source of heat loss. In this case, window replacement with higher-efficiency windows will provide few benefits as most heat will still be lost in other areas. This is nearly the opposite of retrofitting newer homes.

Retrofitting heritage homes provides more challenges: in official heritage homes, some "character defining elements" *must* be preserved, while others can be changed. Overall, older buildings may require additional training for construction workers and tradesmen.

Efficiency New Brunswick offers a two-day training course for local trades people and workers, focused on retrofitting older homes. Efficiency New Brunswick and Natural Resources Canada would be willing to share their training materials for local adaptation.

Sources

http://oee.nrcan.gc.ca/residential/personal/new-home-improvement/heritage.cfm?attr=4

http://www.gov.mb.ca/chc/hrb/pdf/green_guide_2010.pdf

Best Practices in New Building Energy Efficiency Policy

Nelson, like all BC municipalities, is limited in its ability to require energy efficiency or renewable energy beyond that laid out in the BC Building Code. A small number of municipalities are crafting policies and incentives to increase the energy efficiency of new construction.

- City of North Vancouver: a green building zoning bylaw that increases density allowance in exchange for performance-based higher efficiency in single detached homes and larger buildings
- The District of Saanich provides rebates on building permit fees and home energy assessments for new and renovated homes. Incentives for buildings and homeowners include fee exemptions and reductions for small homes, building retrofits, and solar hot water installations
- The Bowen Island Municipality developed a council policy whereby rezoning applicants are expected to achieve Built Green™ Gold and an EnerGuide for New Houses with a rating of 80
- Outside of BC, the Town of Canmore's Green Building Policy requires new buildings in need of a Building Permit or Development Permit to be built to a green building standard, such as LEED, EnerGuide, or equivalent

Sources

http://www.cnv.org/server.aspx?c=3&i=661

http://www.saanich.ca/living/natural/greenrebate.html

http://www.communityenergy.bc.ca/sites/default/files/Policy_Manual_final.pdf

http://gmf.fcm.ca/files/Municipal_Sustainable_Bylaw_Collection/Canmore_Green_Building_Policy.pdf

B. Increase Efficiency in New Buildings to ensure energy security and strengthen local green building sector

Increasing efficiency in *new* buildings can take advantage of technological innovations, and avoid unnecessary emission growth and energy consumption in the next generation of buildings. City efforts will help the local building industry respond to increasingly demanding requirements established by the province and support a vibrant local green building sector. This diverse sector includes builders, architects, engineers, inspectors and renewable energy technicians working locally, in surrounding communities, and beyond BC. With growing demand in green buildings, this sector can become an increasingly important part of the local economy.

Specific elements of this strategy could include the phasing in of some of these policies over time:

1. A **Rezoning Tool** that requires increased efficiency, such as an updated Sustainability Checklist or building bylaw
2. **Collaboration** with developers on major new developments such as Waterfront and Nelson Landing
3. **Financial incentives** including no and low cost municipal tools, such as development permit fastracking and permit fee waiver, as well as leveraging the private sector, such as support from FortisBC and Green Loans from banks and credit unions to reduce capital costs
4. **Regulations** introduced over time, such as energy audits and labelling of new buildings.
5. This Program would be developed in tandem with the ***Climate Protection Guidelines*** **(**below**)**, and maximize synergies with *Home and Business Retrofit Program* (above).
6. **Capacity Building** for staff, building sector and other key constituencies such as real estate agents and landlords. Programming could be delivered through the *Cool Community Hub* (see Community Wide sector) and in collaboration with partners such as the Kootenay Career Society and Selkirk College

See ***Appendix H: Tools to Support Energy Efficiency in New Buildings*** for a list of relevant policies and actions.

Priority Action

New Building Energy Efficiency Policy: To build on current efforts to encourage new building performance, the City could negotiate with builders and developers to voluntarily increase new building performance. This could be addressed at the development permit or building permit stage and could be done through an updated Sustainability Checklist.

- For single family homes and multi-family residents up to four storeys, the City could work to achieve an EnerGuide rating of 80. This should progressively move marginally beyond each BC Building Code update (e.g. EnerGuide 83 with the next Code update)
- For commercial buildings and multi-family residences over four storeys, the City could work with developers to build to ASHRAE 2007 standards. This should progressively increase with each BC Building Code update (e.g. ASHRAE 2010 with the next Code update)

During rezoning and with larger developments, there is a unique opportunity to work with developers and builders to maximize achieving these gains. In some communities, e.g. Ucluelet, Canmore and the City of North Vancouver, similar "policies," have eventually become more of a requirement. It is worthwhile working with developers and staff to build capacity to enable this to become more "regulatory."

This measure could be done independently or in tandem with other policy tools under Strategy B above.

See ***Appendix G: Buildings & Business Sector Comments*** for preliminary feedback on program opportunities.

C. Encourage Secondary Suites and Infill Cottages for their inherent superior energy performance

- (See *Land Use* section for strategy description)

D. Advance Building-Scale Renewable Heat for Homes and Businesses

1. Work with the regional district to enhance, extend and promote high efficiency wood-stove incentive program.

2. Work with local utilities to add building-scale renewable energy technology and passive heating and cooling design retrofits to existing or incentive programs.

3. Explore options for achieving City of Nelson corporate carbon neutrality through "offsets" from renewable energy retrofits, working in collaboration with the BC Climate Action Secretariat.

4. Phase in policies that encourage building scale renewable energy technologies and design:
   - Guidelines and information on heat pumps, with a focus on water-to-water or water-to-air pumps in Waterfront areas and neighbourhoods with District Energy potential
   - New single family homes meet a minimum percentage of heat through renewables by 2020
   - Passive Design Guidelines for select neighbourhoods with solar exposure, e.g. street orientation, solar access, vegetation, wind turbine height variation scaled to location

Priority Action

Design Guidelines for Climate Protection: for new Neighbourhood Area Plans, the *Sustainable Waterfront and Master Plan* and infill that cover public realm" and "private realm" (city active)

See Land Use sector strategies for more details

E. Create Capacity Building and Social Marketing Program to ensure success of Buildings sector strategies

Technical knowledge and skills related to financing, green building rating systems, and building practices will be critical to effective program implementation.

1. Community partnerships with developers, builders, real estate agents, landlords, building and homeowners

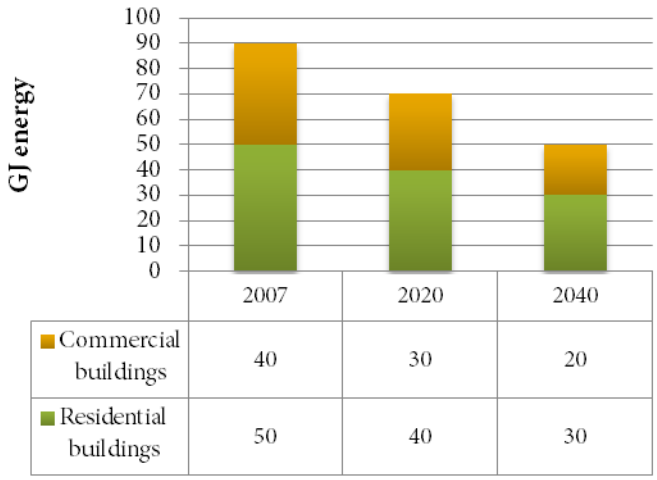
2. Internal capacity and training needs, including Council, senior management, engineers, planners, inspectors, and select clerks

3. Partners to develop education programs and add capacity
   - FortisBC is likely the main partner, as the PowerSense program has staff available for capacity training. They can also provide linkages to other communities in the region
   - Other potential partners include CHBA *Rockies/East Kootenays* and Kootenay Leaf of the Cascadia Green Building Council

4. Low Carbon College: collaborate with Selkirk College to advance green buildings, including new buildings, heritage retrofits, and building scale renewable energy. Programs would be linked to community priorities and focus on unique needs of different constituencies. Northern Lights College, for example, has a focussed program on Solar Thermal Systems Installation which is so popular it is being delivered across the province. A short heritage building energy retrofit program may be a program with both local and broader market opportunities.

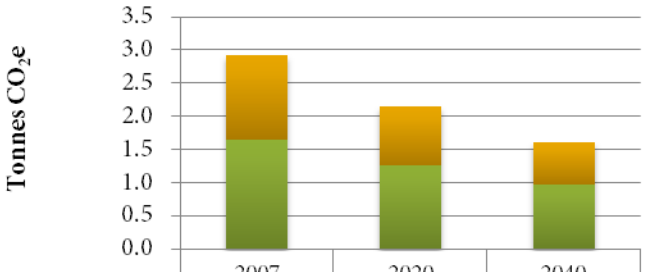
5. Large Building Partnership: Collaborate with major employers to strengthen strategies, achieve economies of scale for new and existing buildings, building manager training.

Annual Building Energy Use *per Capita*



	2007	2020	2040
Commercial buildings	40	30	20
Residential buildings	50	40	30

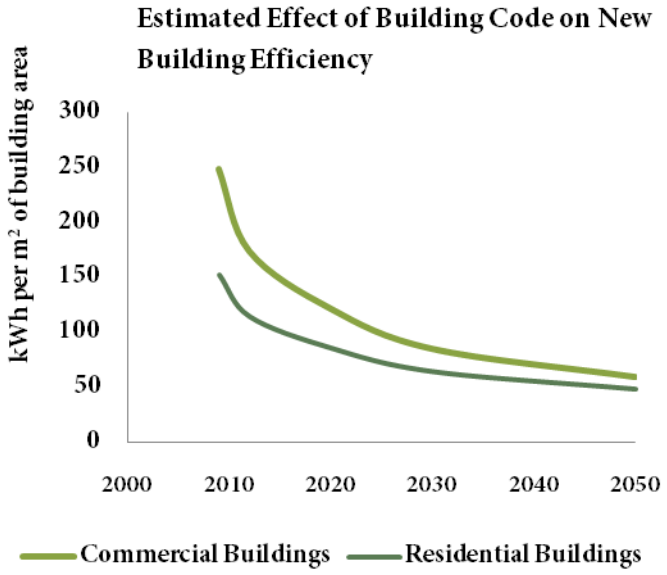
Annual Buildings GHG Emissions *Per Capita*



	2007	2020	2040
Commercial buildings	1.3	0.9	0.6
Residential buildings	1.7	1.3	1.0

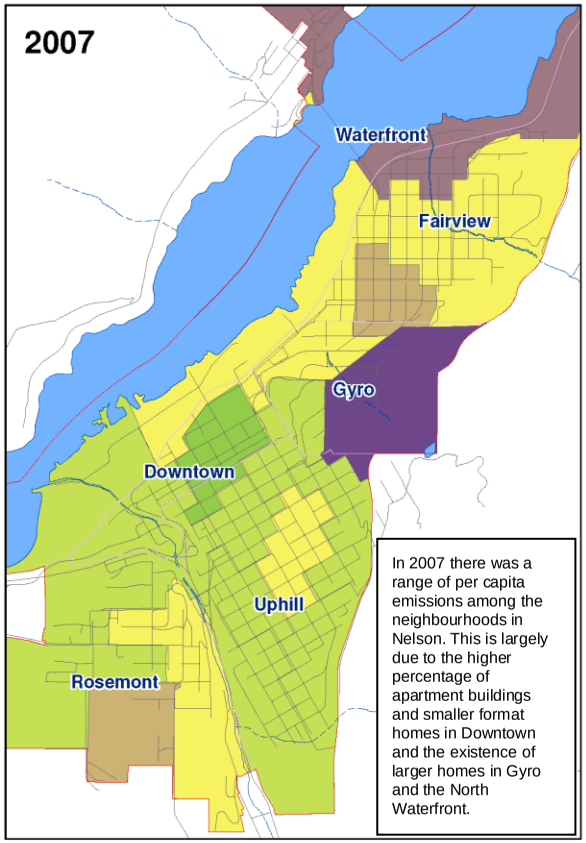
Building energy use is expected to decline substantially over time. These reductions in energy use are expected to result from a combination of a far-reaching retrofit program (existing buildings) and improvements to the Building Code

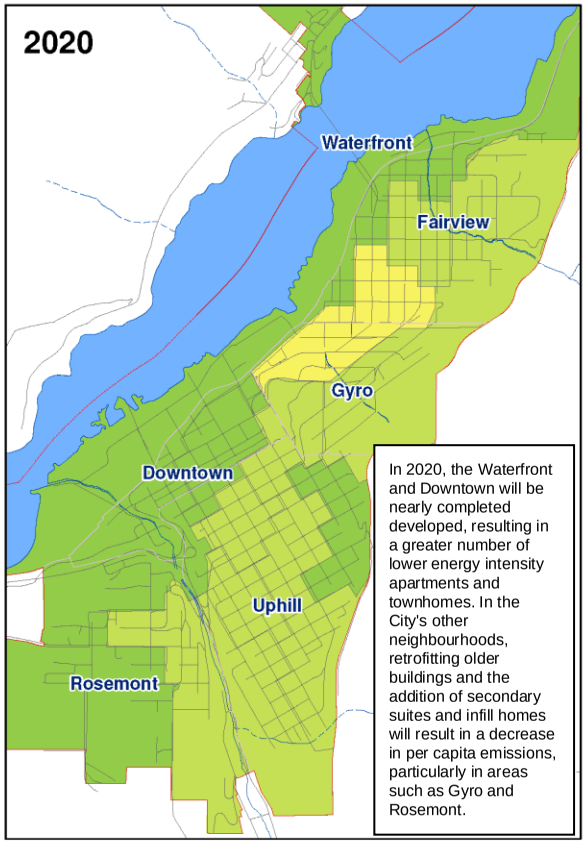
Similarly, building emissions are expected to decline by half on a per capita basis due to a combination of improved efficiency, the phasing out of heating oil, and increases in renewable heating supply.

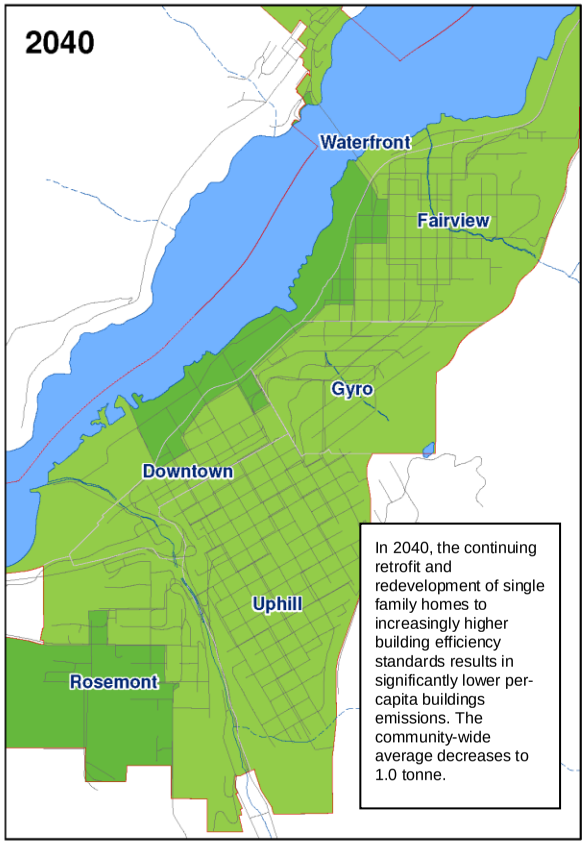


Due to improvements to the Building Code and Energy Efficiency Act, Nelson will still be able to have a large impact on new buildings over the next one or two decades. As code becomes more stringent, however, the marginal benefit of measures to improve efficiency beyond code will decrease.

Residential Building Emissions Per Capita







Legend

Residential Buildings

Annual Tonnes CO2 per Capita

- 0.86 - 1.00
- 1.01 - 1.30
- 1.31 - 1.60
- 1.61 - 1.90
- 1.91 - 2.20
- 2.21 - 2.50
- 2.51 - 3.15
- City of Nelson Boundary

In 2007, average residential buildings emissions per capita was 1.7 tonnes CO2/yr. Total emissions from residential buildings was 15,986 tonnes CO2/yr.

In 2020, average residential building emissions per capita will be 1.3 tonnes CO2/yr. Total emissions from residential buildings will be 15,981 tonnes CO2/yr

By 2040, average residential building emissions per capita will be 1.0 tonnes CO2/yr. Total emissions from residential transportation will be14,943 tonnes CO2/yr

Building emissions have been modeled by HB Lanarc. Future population projections were developed in conjunction with the City of Nelson. All data as displayed is estimated, and should be interpreted for informational purposes only.

Produced: July 8th, 2011
By: HB Lanarc Consultants Ltd.

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0 200 400 800 1,200 1,600
Meters

Key Senior Government Policies

BC Building Code - the Province is updating the BC Building Code to include some of North America's highest building energy efficiency standards. As shown in the *Community Wide Emissions Analysis*, this measure would have a significant impact on building emissions in the future.

Indicator Highlights: Buildings Sector

Indicator	Description	Performance in Baseline Year (2007)	Low Carbon Path Performance
Average Building size of New Single Family Homes* (square meters)	More compact housing uses less energy for heating	180 m^2	90% of 2007 levels by 2020
Performance Beyond BC Code (%)**	Building efficiency. E.g. increased insulation	unknown	3% by 2020 0% by 2040
Retrofit Rate (%, Annual)	% of existing buildings retrofitted each year to improve energy efficiency	0.5% or 20 buildings per year (estimated BC average)	2% by 2020 or 75 buildings per year
Building Scale Renewables: Existing Buildings (annual % or number of buildings)	% of existing buildings which install a renewable energy system (e.g. solar, geo-thermal)	unknown	All original buildings will be replaced, retrofitted, or include renewable energy by 2060 2% by 2020 1% by 2040 0.25% by 2060
Building Scale Renewables: New Buildings Phase in, 2020-2040 (% of new buildings, annual)***	% of newly constructed buildings which include a renewable energy system (e.g. solar, geo-thermal)	unknown	75% by 2020 80% by 2040 100% by 2060 *This is aggressive but with some reasonable local effort would be realistic on the short term. Medium and longer term efforts will be code driven.*

*Achieved primarily through secondary suites and small-format housing (infill housing)

** Includes space heat, water heat, and electricity (appliances)

*** Includes Heat Pumps (air-source, geo-exchange), solar thermal, etc., many of which are already more economical for homeowners than conventional heating technologies

Energy Supply

The source and type of energy supply determines emissions in other sectors, notably heat and power in buildings. Nelson residents and businesses already enjoy the cleanest (lowest carbon) electricity in North America due to dominance of hydro power from Nelson Hydro. Other parts of BC have some natural gas-fired power and import some coal-fired power. Growing demand requires new sources of clean electricity to be found, although the driving force behind increasing local supply is more likely energy security and economic development.

Heating buildings with natural gas is a more significant source of emissions, but can be more flexible than electric baseboard heating, potentially permitting integration with renewable sources in the future. Nelson is currently exploring the potential for District Energy and renewable heat at the community scale to reduce emissions, and has already completed a pre-feasibility study.

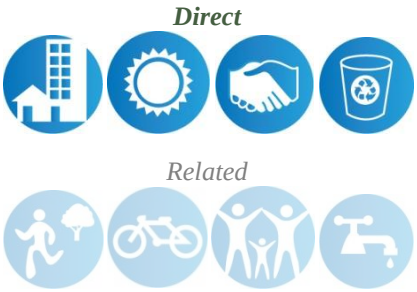
Objective

- Develop cost effective, local, reliable, low impact energy supply

Complementary Objectives

- Increase energy security and reduce emissions through local generation and lower natural gas consumption
- Increase local energy spending and create some local jobs
- Strengthen non-tax revenue streams for the Municipality to help reduce local taxation

Nelson Path to 2040 Synergies



Strategies

A. Establish District Energy Systems in Lakefront and Selkirk-Davies to increase energy efficiency and enable renewable heating technologies

District Energy Systems include a system of underground pipes to share energy. They provide efficiency benefits and economies of scale and can readily use renewable energy sources. They can provide reduced cost to users and new revenue streams for the City to reduce local taxation demands. The City has carried out pre-feasibility work in two neighbourhoods.

1. Conduct further feasibility work, including a business plan, to ensure the viability of the project and identify a path forward
2. Adjust land use plans and implement bylaws to encourage or require buildings to connect to the District Energy System, such as design guidelines, zoning, and phasing agreements

Priority Actions

Strategic Plan for District Energy: finalize decision on ownership and governance of District Energy System. The Strategic Plan should include the following components:

- **Governance and Ownership**: costs and benefits of different ownership models, which might or might not include private sector involvement. This should be done first as private sector partners are often able to carry out full feasibility and business planning at minimal cost or sharing cost with the Municipality
- **Critical Path**: identification of planning phases and key actions to proceed with in project development, including key decision and delivery dates for further feasibility work in relation to land use planning, funding applications, and preliminary engagement needs for community, with a focus on developers and builders
- **Other Elements**: include integration with the Waterfront Plan and exploration of the potential to include other renewables such as biomass

B. Maintain Near-Zero Emissions for Electricity Supply in Nelson

The vast majority of the electricity used in Nelson is from hydroelectric power generation. Due to Nelson's hilly geography, some streams may have sufficient hydro resources for small-scale power production. Wind is unlikely to be feasible in Nelson given low resource potential identified through Provincial-scale wind mapping.

1. Harness cost effective, local renewable power opportunities, focusing on immediate micro-hydro opportunities.

Priority Action

Micro-hydro from water system: monitor water pressure and flow at select Pressure Reducing Valve (PRV) sites and identify strategic opportunities for turbine integration, such as installing during regulator maintenance and replacement schedule

Run-of-river Micro-hydro: gather stream flow monitoring data; calculate power potential, environmental impacts (fish) and social impacts (visual, recreational)

District Energy Business Case Basics

Under the right conditions, district energy can provide cost effective energy services, high energy and environmental performance, and manage risk from energy commodity price volatility.

Good systems generate heat at a high efficiency central plant or a series of mini plants, replacing less advanced boilers and furnaces in multiple buildings. Heat is distributed through a network of pipes and is returned to be re-heated. Cooling can be similarly provided. Some systems can also generate electricity.

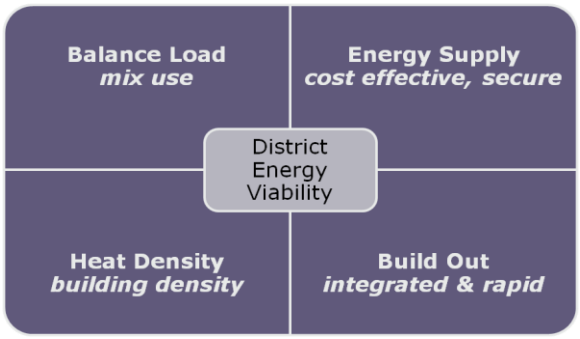
Many older District Energy systems are fuelled predominantly by natural gas. Newer systems often incorporate renewable fuels including waste heat from sewage or industrial activity, wood, biogas from agricultural waste, solar hot water, or ground or water heat pumps or a combination thereof, and may still use natural gas during periods of peak demand.

Four general criteria determine the viability of new District Energy Systems.

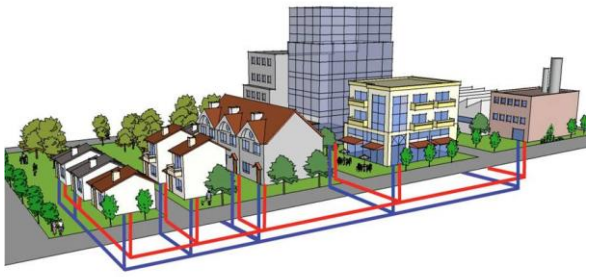
1. **High, concentrated heat demand,** typically from significant floor space or high building density or potentially a building that requires large heat demand like a brewery.
2. **Balanced load** based on different buildings requiring heat at different times of day to avoid peaks. This usually requires "mixed use" developments. Strategic co-location of buildings that require heat, e.g. swimming pools, and those that generate heat, e.g. ice rinks, can facilitate this opportunity.
3. **Integrated and rapid build out** normally starting with one large or several large new buildings with additional ones added quickly in succession, subsequently permitting HVAC system retrofits of some existing buildings. Infrastructure development should be timed to permit heat distribution piping deployment simultaneously with water infrastructure, roads and/or telephone lines.
4. **Cost effective, secure energy supply** to minimize long-term business risks. This could include a design that permits diverse feedstocks that are ideally renewable.

If some of these four criteria are strong, the strength of others is not as critical. On the other hand, if many or all of the criteria are only modestly met, other options may be preferable for improving energy and emission performance in a cost effective manner.

System ownership and design, land use planning, and permitting are other important priorities to include in business planning.



District Energy Viability Criteria


District Energy Schematic Diagram

C. Explore Sustainable Energy Options for High Efficiency Heating in the community

Biomass (wood) and solar energy can make an important contribution to reducing greenhouse gas emissions by displacing natural gas. The City and Regional District are in a unique position to secure enough sustainably sourced waste-biomass to supply a large commercial boiler or a District Energy System. This biomass could include an estimated 800 tonnes from Nelson's municipal waste stream, several times as much from regional fire protection (which is currently burned) and 60,000 dry tonnes per year from mill residues. And while the topography of Nelson makes some parcels unsuitable for building-scale solar hot water heating, there are other sites with more sun exposure that would be good candidates for such systems.

Priority Actions

Develop a Solar Ready Bylaw specific to the Nelson context

Explore development of Solar Ready Bylaw for solar hot water systems on new buildings that would allow developers to opt-out if a site does not have sufficient solar access. In the long run, this Bylaw could potentially be updated through development of a solar resource map that identifies zones in the City where new development requires Solar Ready building components.

Priority Actions

Incorporate Biomass Recommendations into District Energy Phase 2 Feasibility Study

In the recently released *Biomass Feedstock Assessment* report prepared for Nelson (B.A. Blackwell & Associates, 2011), several pragmatic recommendations are put forward for shaping the terms of reference for further district energy feasibility analysis in the City. These recommendations include:

- define the range of moisture content of biomass for the district energy boilers being considered
- define allowances for contaminants such as paint, nails, rocks, mud, and plastics
- consider all of the costs and required facilities for biomass feedstock management
- explore the engineering and economic feasibility of installing a suspension boiler dedicated to dry sawdust
- define the cost per GJ required to achieve economic viability of biomass relative to other fuel sources

In addition to these recommendations, a preliminary assessment of the human and environmental health impacts of a biomass fired boiler in Nelson should be included in the terms of reference for Phase 2.

Safeguarding Sustainability in Biomass Energy

Forest and agricultural fibre can be a sustainable, low impact feedstock for generating heat under some conditions. However, there are health, environmental and socio-economic considerations to safeguard sustainability.

Protecting food production: Energy crops should not displace food production. Marginal agricultural land can be an ideal location for some energy crops.

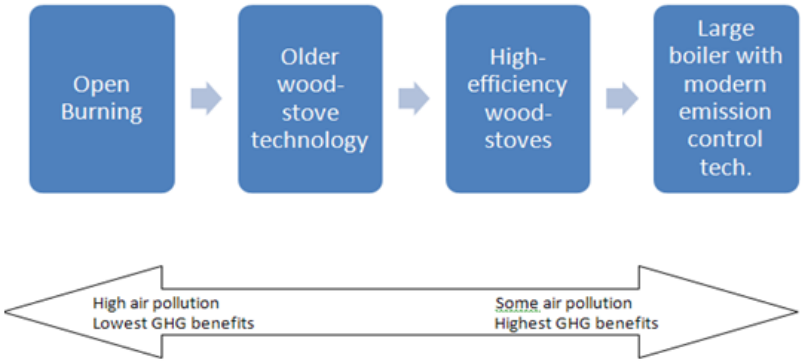
Sustainable harvest: Wood, in particular, must be harvested at a rate that permits replacement to be considered "carbon neutral." This will range from decades to well over a hundred years for some wood types. Therefore waste-wood, such as that from construction or the forestry sector, is often a more beneficial source of wood for biomass energy.

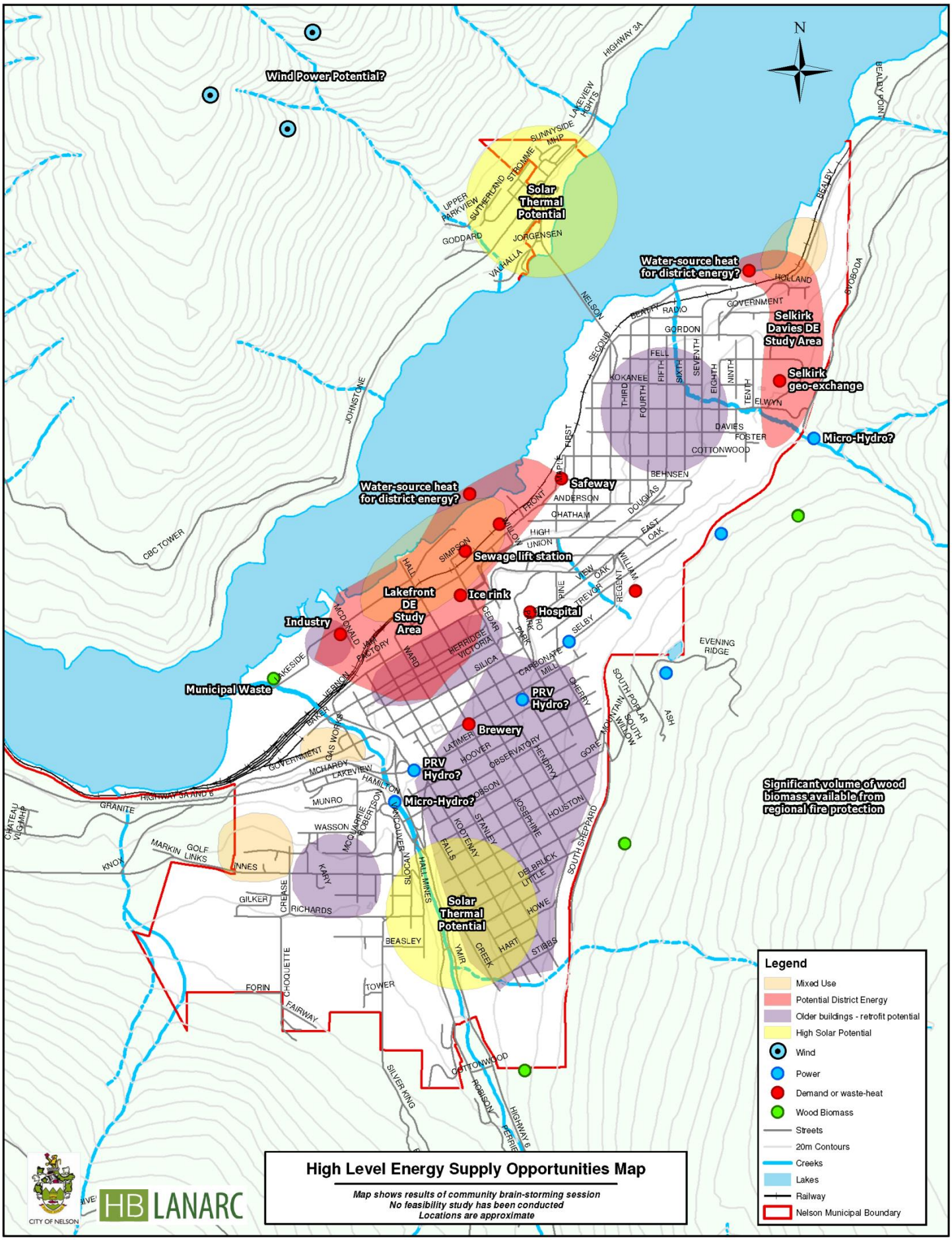
Life cycle analysis: A full life-cycle accounting of energy and carbon should be made, including transportation of wood and agricultural fibre and cultivation and harvesting of crops, to ensure net positive energy balances and net greenhouse gas emission reductions.

Maximizing energy value: Biomass combustion should take advantage of heat, not just power. Heat is the primary energy value derived from combustion. State of the art systems procure more energy than older systems. High efficiency wood stoves can make an important contribution in some smaller-scale contexts. Combined heat and power gasification boilers can be appropriate at a larger scale.

Health protection: Biomass combustion can release air pollutants like PM 2.5. The health impacts depend on the local environmental conditions, e.g. low lying areas, and the technology used: modern, larger-scale high-efficiency technologies have very minor air pollution impacts.
The full range of costs and benefits need to be evaluated to determine an optimal solution

Relationship of Biomass Combustion Systems to Air Quality and Greenhouse Gas Emissions

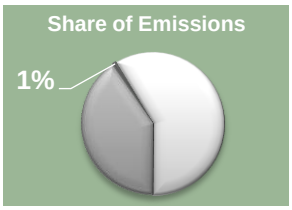



Wind Power Potential?
Solar Thermal Potential
Water-source heat for district energy?
Selkirk Davies DE Study Area
Selkirk geo-exchange
Micro-Hydro?
Safeway
Water-source heat for district energy?
Sewage lift station
Lakefront DE Study Area
Ice rink
Hospital
Industry
Municipal Waste
PRV Hydro?
Brewery
PRV Hydro?
Micro-Hydro?
Significant volume of wood biomass available from regional fire protection
Solar Thermal Potential
Legend
Mixed Use
Potential District Energy
Older buildings - retrofit potential
High Solar Potential
Wind
Power
Demand or waste-heat
Wood Biomass
Streets
20m Contours
Creeks
Lakes
Railway
Nelson Municipal Boundary
High Level Energy Supply Opportunities Map
Map shows results of community brain-storming session
No feasibility study has been conducted
Locations are approximate
CITY OF NELSON
HB LANARC

Indicator Highlights: Energy Supply

Indicator	Description	Performance in Baseline Year (2007)	Low Carbon Path Performance
District Energy connections (square meters)	Total floor area of buildings connected to a District Energy System	None	2020: 20,000 2040: 70,000 2050: 80,000
Electricity Emissions Factor (grams co_2e/kWh)	Amount of greenhouse gas emissions associated with electricity generation	3 grams	Maintain 3 grams Assumes some new supply from micro-hydro

Solid Waste



Emissions related to solid waste come largely from organic waste in the landfill, which forms greenhouse gases. Currently Nelson matches the provincial average for waste generation per person. There is substantial interest in using compost from organic waste in Nelson for gardening. Below highlights the opportunity for increased diversion of organic waste.

Authority and responsibility for waste management are split between the City of Nelson and the Regional District of Central Kootenay (RDCK). Waste planning must be closely aligned between Nelson and the RDCK. There is already considerable alignment between Nelson and RDCK priorities, demonstrated in Nelson's Zero Waste Action Plan (2004) and the RDCK's Zero Waste goal in the new Resource Recovery Plan for the region.

Objective

- Approach "zero waste" by maximizing resource reduction, reuse, recycling, and recovery for all waste types
- Eliminate organics from the landfill as soon as feasible

Complementary Objectives

- Support local businesses in the recycling and reuse industry, promoting economic development
- Reduce municipal spending on waste management and disposal

Nelson Path to 2040 Synergies

Direct

Related

Strategies

A. Advance Zero Waste Education through Collaboration with the Regional District

1. Work with the regional district to implement the strategies described in the new Regional District of the Central Kootenays (RDCK) *Resource Recovery Plan*, including composting seminars, school education through the Beyond Recycling program, and social media such as Facebook and Twitter

B. Increase Recycling and Organics Diversion with Improved Local Services

1. Increase recycling by including recycling for commercial buildings and additional drop-off sites for residents
2. Increase organics diversion & composting at both local and regional scales, including
   - significant backyard composting promotion, primarily through education, with bear awareness education
   - community gardens in public parks, and schools
   - targeted commercial composting from major sources, such as grocery stores, restaurants, and hospitals, through education
   - more frequent yard-waste pickups
3. Add additional wood drop-off points and transfer stations in Nelson. Use excess wood waste from the community and the region for future district energy systems (see Energy Supply Section strategies)
4. Explore programmatic changes to curbside pickup program that would increase diversion, such as a user pays system that charges for waste pickup by weight or mandating clear plastic bags.

Priority Actions

Additional drop-off sites should be explored in conjunction with RDCK as the new regional Draft Resource Recovery plan provides support for both education and demonstration projects, including community gardens

Community Carbon Offsets project development should be explored through the Climate Action Secretariat for organic waste diversion (see Community Wide sector strategies)

Case Study: Commercial Food Waste Composting

100% composting at the Hume Hotel Kitchen

Restaurants and grocery stores generate large volumes of food scraps and spoiled produce. Diverting this material from landfill to composting reduces GHGs and generates a useful agricultural resource, and can save money too.

Both the Hume Hotel and Best Western in Nelson have partnered with a local farmer to compost 100% of their kitchen food waste. The farmer collects the food waste twice a week for free. He gets the valuable organic material for his farm and keeps it out of the landfill, while the Hotels save about 30% on garbage collection and use this good news story in their marketing. The City of Nelson could explore opportunities to expand food waste composting in partnership with the Regional District, food retailers, and local farmers.

Source

Personal Interview, Martin, R., 2011,
http://www.humehotel.com/Menus/

Deconstruction & Waste Diversion

A home being deconstructed in Vancouver, BC. Photo courtesy of Justin Langille

Each home demolished using conventional practices send around 40 tonnes of waste to landfill. Some diversion programs require a portion of this waste to be separated out, but this occurs after a conventional demolition practice. By contrast, deconstruction focuses on salvage, re-use, and recycling, diverting over 90% of waste. Deconstruction is also more labour intensive than demolition, and therefore provides opportunities for job creation. The City of Vancouver, in partnership with a local non-profit, an industry partner, and funding from Service Canada, recently completed a pilot project aimed at training at-risk youth to deconstruct homes. Promoting deconstruction requires regulatory changes, education, and incentives, as well as a market for used building materials and equipment.

Source
Building jobs by tearing down houses the green way , Kimmett, C., 2011, http://thetyee.ca/News/2011/01/18/TearingDownHouses/

C. Implement a Comprehensive Building Demolition Waste Management Program to divert waste from landfill

1. Encourage innovative construction and demolition waste recycling and reuse through a program that promotes "Deconstruction." Include a combination of regulations, education, and incentives such as streamlined building permitting processes

Priority Action

Construction and Demolition Pilot Project with a focus on Deconstruction. A local building owner and contractor should be identified through a Call of Interest. Through the process of deconstructing the pilot building, the project should seek to estimate waste diversion potential and identify barriers, and incentives, capacity and training needs, market demand for used materials, and potential for job creation. Best practices from the US and emerging lessons from the City of Vancouver pilot program should also be considered.

Sustainable Waste Management Hierarchy

While reduction is the most sustainable management practice, it is rarely prominent. It is also a practice over which senior governments have greater influence.

The Three "R's" is often supplemented with two additional ones:

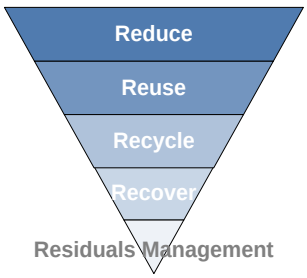
- Recover "Energy" in a sustainable manner
- Residuals Management – sustainably manage residual waste

D. Reduce Solid Waste Generation through targeted local and regional policy

1. Support senior government programs to reduce packaging and extend responsibility of waste reduction and management to producers (companies, manufacturers, retailers)

Priority Action

Senior Government Action on Waste Reduction. Write a letter to provincial and federal governments urging them to regain Canada's leadership position on waste management through minimizing packaging and strengthening extended producer responsibility. Amongst others, send carbon copies to UBCM, FCM, Recycling Council of BC and Metro Vancouver (the latter are initiating efforts to get senior government engagement in solid waste reduction).



Climate, Energy & Waste

There are different sources of GHGs associated with waste. Most commonly, emissions are associated with the practice of landfilling where anaerobic decomposition generates methane, a GHG 25 times more potent than carbon dioxide. Other waste management practices also result in emission increases or decreases. Waste type, shipping distance and mode of transport also influence a waste management practice. There are also significant emissions embedded in waste from extraction, processing and transport of products. ***A strong emission management plan for waste management can minimize GHGs by considering all of these emissions sources to determine 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 also waste types that are so valuable (due to immense embedded material inputs and GHGs) that they should be prioritized 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	0 t
Milled lumber	-2.5 t	+1 t	0 t
Plastic	-1.5 t	+0.1 t	+1 t

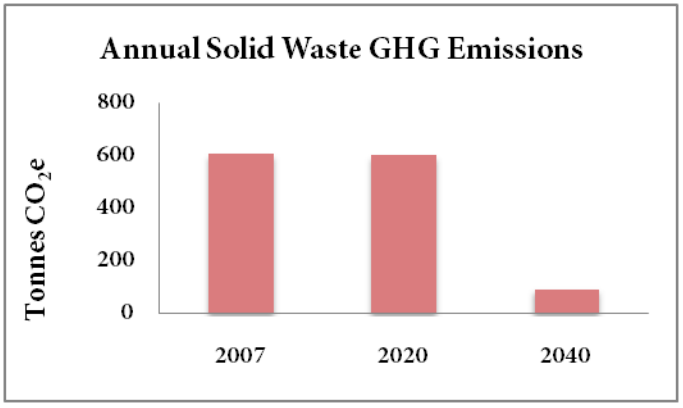
Numbers are rounded and include generic assumptions which are not specific to Nelson's context. However, they remain useful for relative comparisons across different waste management practices.

Source: US EPA: http://www.epa.gov/climatechange/wycd/waste/calculators/Warm_home.html .

Indicator Highlights: Waste Sector

Indicator	Description	Performance in Baseline Year (2007)	Low Carbon Path Performance
Total Waste Generated *per capita* per year (tonnes)	All solid waste generated, including all recyclable and compostable materials	0.75 tonnes / person *Historically, per capita waste generated has increased across BC*	Maintain till 2020 (instead of increase) 10% lower by 2040 Maintain to 2060
Organics Diversion Rate (%)	Amount of organic waste diverted from landfill	33%	2020: 50% 2040: 80% 2050: 85%
Wood diversion for energy (tonnes)	Amount of wood-waste diverted for fuel	None	2020: 110 homes equivalent (700 tonnes per year)
Regional Landfill Gas capture rate (%)	Amount of gas at landfill that is captured and flared or used for energy generation to reduce emissions	0%	2020: ~50% combustion*

* Based on study contracted by RDCK: SNC-Lavalin 2010. "RDCK Resource Recovery Plan -Landfill Consolidation and Waste Transfer System Financial modeling" http://www.rdck.bc.ca/publications/pdf/SNC%20Resource%20Recovery%20Plan-%20Phase%201%20rpt(FINAL).pdf



Over the short term (2011-2020), GHG emissions from solid waste are expected to remain constant. Although waste emissions improve on a *per capita* basis over this period, this improvement is balanced out by an increase in population. Over the longer time frame, a combination of high organic waste diversion and the capture of landfill gas substantially reduce greenhouse gas emissions to a small fraction those emitted in 2007.

Community Wide Measures

The following measures cut across traditional energy and emission sectors and municipal line departments and extend out into the community. They are designed to foster alignment within the municipality, and consolidate support for the Plan and action on the strategies internally within the City, stakeholders in the community and the broader public. These measures help ensure a municipality's ongoing business activity does not undermine a low carbon agenda, as is often the case and very easy to happen.

Objectives

- Strengthen the City's institutional capacity and mechanisms to support implementation
- Maximize local economic development opportunities
- Consolidate support for the Plan and action on the strategies
- Provide preliminary direction for reducing energy price shocks to local food security

Complementary Objectives

Nelson Path to 2040 Synergies

Direct

Related

Strategies

A. Build the City's Institutional Capacity to support low carbon community development

1. **Community Carbon Offsets Framework Development:** Develop a framework that enables the City to meet its corporate carbon neutral commitment and financially support high value, community emission reduction projects that can be used as offsets.
2. **Carbon & Municipal Financial Management:** Develop mechanisms enabling staff and council to be informed of the impact of municipal spending on increasing or decreasing community greenhouse gas decisions to facilitate decision making.
3. **Community Energy and Emission Manager:** Explore development of a staff position to support Plan implementation in partnership with other communities in the Central Kootenay Regional District. This position could potentially be supported financially by utilities as is the case with a small but growing number of BC communities.

Community Carbon Offsets

The City of Nelson is a signatory community to the BC Climate Action Charter[25], which includes a voluntary commitment to become carbon neutral in government operations by 2012. As administrator of the charter, the Green Communities Committee[26] has been exploring several options that would allow communities to meet their commitments in a flexible manner. One of these options, anticipated to be formally announced during the second half of 2011, is for local governments to support the development of greenhouse gas reduction projects in the broader community. The reductions that occur through these projects would then be subtracted from the government operations total. The mechanism through which this works is applying the same principles that are used for carbon credit projects certified through the Kyoto Protocol`s Clean Development Mechanism and the Voluntary Carbon Market, with a lesser emphasis on quantification and verification of emission reductions, reporting and monitoring.

Community Carbon Offsets are an alternative to purchasing carbon credits through the Pacific Carbon Trust or another vendor to achieve carbon neutrality. This should be an attractive opportunity for Nelson and many other communities because it would allow them to:

- Leverage spending for community emission reductions projects with significant community co-benefits
- Help achieve carbon neutrality in municipal operations while keeping expenditures local
- Contribute to advancing emission reduction efforts provincially and specifically for BC municipalities

Project Requirements

For a community project to be eligible, reductions must be:

- *Additional* to those that would be possible without the financial / technical / coordination contributions of the local government
- *Real and Permanent* The emission reductions need to meet minimum standards that prevent against leakage (activities shifting to a different locale or to occur in the future) and safeguards should be put in place to ensure that carbon emissions that are avoided or sequestered are not released during and after completion of the project
- *Measureable* and documented according to approved methodologies or methodology guidelines
- *Clearly owned* by the City of Nelson through documentation and written agreements when multiple parties are involved

Project Types

There are a number of different projects that have been identified in this Plan that have the potential to become community carbon offset projects, including:

- District energy
- Residential and commercial building retrofits
- Expansion of ride share programs
- Centralized organic waste composting
- Low carbon police vehicles

The BC Climate Action Secretariat is developing methodologies for some of these project types. Guidelines for the development of new GHG reduction quantification methodologies are also anticipated to be a part of the program launch.

Costs and Benefits

For the majority of projects that Nelson could consider for inclusion as a *community carbon offset project* the costs associated with implementation will be much greater than the cost of purchasing carbon credits from the Pacific Carbon Trust, which will be sold to local governments at $25 per tonne of CO_2 equivalent. When there are significant community co-benefits associated with a project, the comparatively greater costs associated with implementation—versus purchasing carbon credits—could very likely be justified.

Priority Action

Community Carbon Offset Framework: Develop a framework for offsetting the City of Nelson's corporate carbon emissions with high quality community projects that includes the first principles and general approach for such projects. Important actions to take include:

- Liaise with the BC Climate Action Secretariat and other leading local governments[27] to vet opportunities, share information and build capacity in Nelson.
- Identify projects and develop methodologies
- Explore development of a community carbon offset trust to retain money that would have been spent on offsets outside the community for local projects
- Put in place administrative systems to support project monitoring and reporting
- (Re)negotiation of City contracts to clarify and safeguard ownership of emission reductions when implementation involves other organizations and/or service providers. This will be important to demonstrate ownership of emission reductions.

[25] Summarized in the *Context* section of this Plan.

[26] A joint committee of the BC provincial government and the Union of British Columbia Municipalities

[27] Other local governments may develop methodologies that City of Nelson could use

Energy and Emissions and Finance

Different capital investments options have different long term cost implications for operation, maintenance and replacement. They can also drive or constrain greenhouse gas emission growth. Capital investments that are highly energy efficient or use renewable energy are often more costly than conventional investments but tend to be less expensive to operate and maintain. When life cycle costing is integrated into financial decisions, it often leads to lower long term municipal costs and lower emissions for the municipality as well as residents and businesses. Incorporating life cycle costing and carbon quantification into municipal finance allows richer decision-making. Key opportunities for such analysis include:

- Annual budget
- Capital planning
- Procurement

Priority Action

Managing Costs, Carbon and Municipal Finance: Integrate mechanisms into Council and staff decision making to understand and evaluate the life cycle costs and carbon implications of large capital expenditures. Options may include:

- **Capital Planning Carbon and Life Cycle Costing Analysis:** The capital planning process integrates life cycle cost and greenhouse gas implications of projects. These assessments could be qualitative in nature and eventually become high level quantitative assessments for large capital projects in the future.
- **Carbon and Life Cycle Costing Analysis for Procurement**: Procurement processes require carbon and life cycle costing analysis in RFPs and tendering for capital projects greater than a prescribed threshold.
- **Annual Budget Carbon and Life Cycle Costing Analysis:** Submissions assess the GHG implications and life cycle costs of budget proposals, starting with qualitative assessments.

It may be appropriate to couple these mechanisms with complementary ones to monitor and evaluate corporate greenhouse gas emissions.

B. Engage with Citizens, Businesses, Non-Profits, and Public Sector Organizations to move down the Low Carbon Path

1. **Energy & Emissions and Economic Development Lens:** Integrate climate and energy into local economic development efforts by reinforcing key energy and emission strategies and job retention and creation sectors
2. **Low Carbon Business Capacity Building:** Support local businesses in measuring and reducing energy and emissions
3. **Education and Outreach Program:** Develop a focussed and strategic program to consolidate support and maximize action on sectoral strategies.
    - Use community based social marketing to inform detailed planning of initiatives involving behavioural change.
    - Develop a brand for Low Carbon Path initiatives. Integrate broadly, e.g. "community climate champion" bumper stickers for ride share drivers, lawn signs on home retrofits, shop window stickers for businesses with carbon management plans, jean jacket badges for local green builders, etc.
    - Create a low carbon action hub to provide direction and support for action through online and face-to-face outreach, resourced by a staff person to develop and deliver the focussed support for initiatives. The program would involve extensive collaboration with private, public and non-profit partners.
4. **Low Carbon Community Pledge:** Work with stakeholder to develop a pledge that can be used with stakeholders and the public to kick start outreach, consolidate support for the Plan and provide direction for action. The Pledge could be deeply integrated into the Low Carbon Path hub.

Energy, Emissions and Economic Development:

Rising energy costs will increase economic vulnerability for residents and business. With upwards of $30 million (2007) spent annually on energy locally and steadily climbing, conservation, efficiency and renewable energy *can* be part of an economic development strategy focussed on keeping a larger percentage of this money locally. Investing in renewable energy creates twice as many jobs as equivalent investments in new supply; and investing in conservation and efficiency creates four times as many jobs.

Benefits of initiatives like the *Building Energy Retrofit Program* can be accrued directly through spending in local hardware and lumber or *green building jobs* for the construction trades, entry level employment in weatherization, and engineers in renewable energy system design.

An even greater portion of *reduced energy spending is redirected towards other local economic activity* such as recreation and leisure, retail and restaurants.

Source

Comparative Analysis of Employment from Air Emission Reduction Measures, Hornung, R., 1997

Priority Actions

Low Carbon Local Business Advising: Collaborate with ClimateSmart, FortisBC and local partners to encourage local businesses to participate in a capacity building program to enable them to measure and reduce their energy and emissions.

Low Carbon Community Pledge: Develop a Pledge that can be rolled out to citizens, businesses, non-profits and public sector organizations to consolidate support and provide direction for action. See Appendix C: Climate Protection Pledge

Education and Outreach Hub: Explore development of this hub through development of a phased high level plan, including financial support for a staff person and potential funding sources, notably utilities that share complementary demand side management priorities in the building sector, and philanthropic non-profits with climate action programs.

Priority Action

Energy and Emissions and Economic Development: Integrate an energy and emissions lens into the Economic Development Partnership.

Sectors that could be prioritized for job retention and creation, and strategies that could be reinforced include the following.

Job Retention and Creation	Relevance	Complementary Strategies
Local workforce commuting from surrounding communities	Reduce vulnerability to rising transportation costs and reduce GHGs.	Nelson Rideshare, Regional Transit
Local green building and renewable energy sector	This growth sector is disproportionately large locally. Includes entry level, trades, architects, technicians, engineers.	Home and Office Retrofit Program,
Knowledge Workers with the flexibility to work remotely	Can be attracted domestically and internationally	All energy security, mobility and liveability strategies
Nelson Businesses	Buying local services and locally made products can reduce GHGs	Integrate *Think Global. Shop Local.* into campaigns
Local and regional agriculture and food processing	Reduce local vulnerability to rising energy costs and reduce GHGs	Regional Food and Ag Strategy (Think Global. Eat Local.)

Education, Outreach and Social Marketing

A strong education and outreach program can *deepen*, *sustain* and *elicit* action. Effective programs are integrated into a suite of mutually reinforcing policies and actions. Moreover, the process of designing an effective educational program complements the design of good policies and measures, and collectively they should inform one another. For instance, identifying target audiences, their motivations and barriers to desired behaviours, and analyzing their situational context will not only shape effective education and outreach, it should also shape broader policy design, such as the type of bike safety and security infrastructure critical to increase the likelihood of cycling in a specific constituency. Building the right infrastructure will automatically get a certain response. This critical outreach approach is known as Community Based Social Marketing (CBSM). As more detailed *Low Carbon Path* planning work is undertaken CBSM can be incorporated.

Community Based Social Marketing Introduction

Most information and awareness programs aimed at changing tried and true behaviour, fail. Desired behaviour changes can best be supported by targeting specific populations and using customized strategies such as obtaining commitments, providing behavioural prompts, encouraging or seeding social diffusion, and establishing new norms with credible validators. Community-based social marketing is a methodology with well defined steps:

1. Identify the behaviour(s) you want to target, focusing on the impacts and probability of the adoption of each behaviour.
2. Uncover the benefits and barriers to the adoption of each behaviour, using a literature review, observation, focus groups and surveys.
3. Develop a strategy that will reduce the barriers and increase the benefits to the behaviour you are targeting (or if this is not possible develop a strategy to increase the barriers and reduce the benefits to the behaviour(s) you want to discourage). Strategic tools include: commitments, social diffusion, prompts, establishing norms, communications, incentive and convenience.
4. Pilot the strategy with a small sample. A staggered baseline design is effective for large programs that are best piloted more than once to sharpen their focus.
5. Implement broadly and evaluate, ensuring adequate long-term measuring.

RDCK Energy and Emissions Reduction Program

ClimateSmart, in partnership with FortisBC, the RDCK and LiveSmart BC, is offering a program to assist small businesses in cutting energy use and greenhouse gas (GHG) emissions. The program includes skills training, assistance in GHG measurement and developing business-specific energy reduction strategies, and funding for energy retrofits. Nelson businesses are invited to participate, with subsidies available from FortisBC and RDCK. Recruitment for the program is currently underway; sessions begin in June 2011

C. Support regional food and agriculture systems to reduce greenhouse gases and vulnerability to rising food prices.

Contemporary food production is energy and greenhouse gas intensive during every phase of activity: growing, processing, shipping and storage. As energy prices rise, the cost of growing, processing and transporting food will also rise. The risk of food crops being displaced with energy crops will also grow. Global food production is additionally projected to experience significant disruptions due to climate change.

Strategically focussed efforts can modestly increase the share of locally and regionally-grown and processed food, and can reduce greenhouse gases in certain cases. Moreover, it can strengthen the local economy, through job creation and by reducing some of the vulnerability to rising energy prices and global food production disruptions.

Nelson already has a solid foundation upon which to build with a well supported farmers` market, some food and beverage processing, and local as well as regional food growing.

1. Collaborate with the Regional District and local non-profits to advance this strategy.
2. Explore strategies to support connecting regional growers and food processors to local residents and businesses including enhancing the farmer`s market, networks connecting restaurants with regional and local producers.
3. Explore the potential for food production and processing in the City such as fruit trees and perennial food crops in parks and public spaces, community Gardens, etc.
4. Reinforce the waste management strategy and local nutrient recycling through community composting, potentially focussed in businesses and institutions with high centralized concentrations of food waste.
5. Encourage the sharing and growth of local gardening and food processing knowledge, potentially through the College or a master gardening group.

Local Food Does Not Necessarily Mean Lower GHGs

Local food production will not reduce Nelson`s local greenhouse gas emissions under current emissions accounting practices. While local food can reduce emissions in other communities, especially within the transportation sector, there may be higher embodied greenhouse gas emissions from other sources. For example, reduced transportation GHGs in locally grown fruit can be offset over a winter by increased energy and emissions from storage.

Local food production and processing can have other benefits not directly related to GHGs, including reduced vulnerability to rising food prices from more expensive oil and disruptions to global food production from climate change, or to provide local economic development benefits through new business opportunities.

Citizen and Business Action

This section highlights actions that citizens and businesses in Nelson can take to reduce greenhouse gas emissions and expenditures on energy, and help the City meet its climate protection and sustainability goals. The successful implementation of the Strategies and Priority Actions in this Plan require action on the part of businesses, schools, community groups and individuals. Six specific, tangible actions that people can do in support of the Plan's strategies are described below.

Transportation

Reducing dependence on automobiles and switching to more efficient vehicles are the two major areas of action for transportation.

1. Replace Some Car Trips with Walking, Bicycling, Car-Pooling and Transit

Each time you travel to work, school, the store, church, library, pub, park, ski hill, or beach, you make a choice about which mode of transportation to take. Each of these choices has an impact on your personal carbon footprint and the City's emissions as a whole. Strategies in the Plan that will support citizen and business action include:

- Build on the Community's Complete, Compact and Centered Form (Land Use - A).
- Climate Protection Design Guidelines (Land Use - C).
- Mainstream Low Carbon Transportation (Transportation - A), which includes:
    - Covered, secure bike parking and showers for residents, employees; and covered/accessible bike parking for customers
    - Exploration of new car share opportunities
- Build Kootenay Rideshare Capacity (Transportation - B).
- Enhance Public Transit Locally and Regionally (Transportation - C)
- Implement the Nelson Active Transportation Plan (Transportation - D)

✓Biking to work could save you $2,000/year compared to driving. Cyclists are the happiest commuters.

✓If you can eliminate one car, you could save about $9,000/year.

! Riding the bus produces less than 1/3 of the emissions per person as a trip alone in a car

2. If Purchasing a Car, Buy the Most Fuel-Efficient Possible

The residents of Nelson are leaders in BC and Canada in a number of areas of sustainability, but their choice of vehicle to drive is not one of them. In 2007, the average vehicle on the road in Nelson was 12% less efficient than the British Columbia average. Strategies in the Plan that will support citizen and business action include:

- Mainstream Low Carbon Transportation (Transportation - A), which includes:
    - Electric vehicle parking incentives
- Low Carbon Transportation Education and Outreach (Transportation - E)

✓You could save $1000 or more per year in fuel costs.

! SUVs use almost twice the fuel and release nearly twice the emissions as a car that seats the same number of people

3. Get an Energy Audit of Your Home / Business

The first step to making your home or business more energy efficient is hiring a professional to conduct an energy audit. An energy will identify and help you prioritise the improvements that could be made to reduce energy consumption and lower your electricity and heating bills. An energy audit can also give your home/business an energy rating score, which allows you to compare your building's performance with provincial and national standards. Strategies in the Plan that will support citizen and business action include:

- Home and Business Retrofit Program (Buildings – A)
- Capacity Building and Social Marketing (Buildings – E)

✓A more energy-efficient home will lower your utility bills and reduce greenhouse gas emissions

! The average Canadian house consumes twice as much energy as an average vehicle in one year

4. Turn Down Your Thermostat to 15°C at Night and When Not at Home

There are many simple things that residents and business owners can do to reduce energy use—among the simplest and most effective is turning down the heat when not at home and at night. An energy audit can help you identify other zero and low cost adjustments that you can make that to reduce your energy expenditures and greenhouse gas emissions. Strategies in the Plan that will support citizen and business action include:

- Capacity Building and Social Marketing (Buildings – E)

✓You'll save 10-15% of your energy bill

! Nearly 60% of energy used in Canadian homes is related to heating

Solid Waste

5. Compost and Recycle

When thrown in the garbage and sent to a landfill, yard and food waste produce large amounts of methane—a highly potent greenhouse gas. Putting a composting bin in your backyard and participating in future City and Regional District organic waste collection programs can help eliminate an easily avoidable source of greenhouse gas emissions. Recycling is easy and can have an even larger impact on global emissions, by reducing energy use and resource extraction for new goods and materials. Strategies in the Plan that will support citizen and business action include:

- Zero Waste Education (Solid Waste – A)
- Improved Local Services for Recycling and Composting (Solid Waste – B)
- Local and Regional Policies for Reducing Waste Generation (Solid Waste – D)

✓Composting and recycling takes pressure off our landfills and reduces energy use and the need for resource extraction for new materials

! Garbage buried in landfills produces methane, a potent greenhouse gas

Community Wide

6. Buy Local

When there are local alternatives of the food and products that you need, buying these is a good option for keeping money in the community and reducing greenhouse gas emissions from long range freight transport. Strategies in the Plan that will support citizen and business action include:

- Support for Regional Food and Agriculture Systems (Community Wide – C)

✓Buying locally produced goods reduces the transportation energy and supports local farmers and businesses

! Food travels an average of 2800 km from where it is produced to where it is consumed.

3. Implementation, Funding & Monitoring

Implementation Framework

Introduction

This Framework outlines the key components for implementing the Plan's priority actions. These actions will be implemented within the next 5 years to jump start action on the strategies over each of the Plan's sectors.

The sector-specific information in the tables that follow focus on estimates of the **Implementation Costs** for the City.

Many priority actions require time of existing Nelson **"City Staff**." **"Other Costs"** could be in the form of work completed by a consultant or a contractor with the City. The latter could be financed in whole or part by a by external financing.

"Total Costs" refers to the entire costs of a priority action. In some cases priority actions relate to existing "**Committed Work"** and may already be partially or fully funded. The **"Incremental Costs**" are the capital and human resource costs required to implement the priority action *beyond* what has already been committed or what would be normally done. For example, the Infill Home Pilot Project is only partially motivated by climate and energy objectives. There has been an interest in this work for other reasons such as housing affordability and some work has already happened in the community. City Staff and Other Costs associated with this Pilot Project would only partially be attributed to the Low Carbon Path, e.g. 80%. Other actions are completely new or beyond would normally be done – these costs are 100% incremental. Some priority actions simply provide some energy and emission management guidance to existing work with minor to 0% incremental costs.

These costs are rough estimates given uncertainty about the final policy and action design. The information is a starting point for preliminary planning purposes and should be updated and revised on an ongoing basis as actions are further defined, new budget and funding figures become available, and project timing is confirmed.

Land Use

Red = to commence, Yellow = in progress, Green = completed

		Priority Action Implementation Costs										
		Total Costs		Completed / Committed Work		Incremental Costs						
Status (% Complete)	**Priority Actions**	**City Staff**	**Other Costs**	**City Staff**	**Other Costs**	**City Staff**	**Other Costs**	**Funding Opportunities**	**Timeline**	**Lead Department**	**Key Stakeholders**	**Logistical Considerations**
	A. Build on the Community's Complete, Compact and Centered Form | P. 27											
25	Integrate land use strategies into an OCP Update and Land Use Regulation Bylaw								OCP 2011-2012, Land Use Regulation Bylaw - 2012	DS&S	Citizens	City Staff with Mapping Contractor
	B. Encourage Infill Homes and Innovative Live Work | P. 27											
5	Infill home pilot project	5% FTE							2013	DS&S	Housing Forum	
0	Update OCP and Land Use Regulation Bylaw with infill home provisions								2014	DS&S	citizens	
	C. Climate Protection Design Guidelines | P. 28											
0	Climate Protection Design Guidelines - Technical analysis and review of best practices and precedents	50 hours							2013	DS&S, Operations	Developers, FortisBC	
0	Climate Protection Design Guidelines - Public Engagement	40 hours							2013	DS&S, Operations	Developers, FortisBC	
0	Climate Protection Design Guidelines - OCP and Neighbourhood Plan Updates								2013	DS&S, Operations		

Transportation

		Priority Action Implementation Costs										
		Total Costs		Completed / Committed Work		Incremental Costs						
Status (% Complete)	**Priority Actions**	**City Staff**	**Other Costs**	**City Staff**	**Other Costs**	**City Staff**	**Other Costs**	**Funding Opportunities**	**Timeline**	**Lead Department**	**Key Stakeholders**	**Logistical Considerations**
	A. Mainstream Low Carbon Transportation throughout the community | p 34											
0	Low Carbon Transportation Policy - Update Parking Bylaws	50 hours								Operations, DS&S		
0	Low Carbon Transportation Policy - Review and Update Design Guidelines	80 hours								Operations, DS&S		
0	Requirement for Transportation Master Plan for new commercial developments	80 hours			Nil			Developers		DS&S		
	B. Build Kootenay Ride Share Capacity | p 34											
0	Collaborate with Kootenay Rideshare to explore enhancements to service				Nil					Operations, DS&S		
	C. Enhance Public Transit Locally and Regionally | p 36											
0	Integrated Low Carbon Transportation Study	40 hours	$25K - $50K		BEAT ($25,000)	40 hours		FCM, BC Transit, MoT		Operations, DS&S, Transit, Finance		ACT Completed - needs to be integrated
	D. Implement the Nelson Active Transportation Plan | p 36											
0	Identify and address barriers to implementing the Active Transportation Plan	40 hours			Nil					Operations, DS&S, Transit, Finance		
	E. Low Carbon Transportation Education and Outreach | p 36											
75	Social Marketing and Education	80 hours										

Buildings

		Priority Action Implementation Costs										
		Total Costs		Completed / Committed Work		Incremental Costs						
Status (% Complete)	**Priority Actions**	**City Staff**	**Other Costs**	**City Staff**	**Other Costs**	**City Staff**	**Other Costs**	**Funding Opportunities**	**Timeline**	**Lead Department**	**Key Stakeholders**	**Logistical Considerations**
	A. Establish a Home and Business Energy Retrofit Program | P. 41											
0	Building Retrofit Pilot	5% FTE	$200k						2013	Nelson Hydro, Finance, DS&S		
0	Establish Partnerships	1% FTE							2012			
0	Compile Technical Challenges	80 hours	(or $15k)						2012	Nelson Hydro, Finance, DS&S		
0	Financing and incentive program design and structuring	120 hours							2013	Nelson Hydro, Finance		
0	Social marketing and engagement								2014			
0	Heritage building training program	2.5% FTE							2013-2015	Nelson Hydro, Finance, DS&S		
0	Human and social capital development in partnership with Kootenay Career Development Society	1% FTE							2013-2015	Nelson Hydro, Finance, DS&S	Kootenay Career Development Society	
	B. Increase Efficiency and Renewable Energy Supply of New Buildings | P. 44											
0	Put in place one or more policy tool that will move developers to construct buildings that exceed BC Building Code energy performance reqirements	120 hours							2012	DS&S	developers, contractors, builders	

Energy Supply

Status (% Complete)	Priority Actions	Priority Action Implementation Costs: Total Costs – City Staff	Total Costs – Other Costs	Completed / Committed Work – City Staff	Completed / Committed Work – Other Costs	Incremental Costs – City Staff	Incremental Costs – Other Costs	Funding Opportunities	Timeline	Lead Department	Key Stakeholders	Logistical Considerations
	A. Establish District Heating in Lakefront and Selkirk-Davies | P. 51											
50	Strategic Plan for District Energy	120 hours	$25,000						2012-2013	Nelson Hydro	Waterfront / Downtown Developers, existing businesses and property owners, consultant	
	B. Maintain Near-Zero Electricity Emissions | P. 51											
0	Pressure Reducing Valve Micro-Hydro monitoring / assessment	2% FTE							2013-2015	Nelson Hydro, Operations		
0	Run-of-river Micro-Hydro monitoring / assessment	2% FTE							2013-2015	Nelson Hydro, Operations		
	C. Explore Sustainable Wood | P. 53											
0	Incorporate Biomass Recommendations into DE Phase 2 Study											
0	Develop a Solar Ready Bylaw											

Solid Waste

		Priority Action Implementation Costs										
		Total Costs		Completed / Committed Work		Incremental Costs						
Status (% Complete)	**Priority Actions**	**City Staff**	**Other Costs**	**City Staff**	**Other Costs**	**City Staff**	**Other Costs**	**Funding Opportunities**	**Timeline**	**Lead Department**	**Key Stakeholders**	**Logistical Considerations**
	B. Increase Recycling and Organics Diversion | P. 58											
0	Additional recycling and composting drop-off sites							Operations			RDCK	
0	Reduction of corporate carbon liability through community composting							Operations			RDCK, Citizen Groups	
	C. Implement a Comprehensive Building Demolition Waste Management Program | P. 59											
0	Construction, deconstruction and demolition pilot project	1% FTE	$15,000 - $40,000					Operations	2013		Building Owner, Contractor, RDCK	
	D. Reduce Solid Waste Generation through targeted local and regional policy | P. 59											
0	Letter of support to provincial and federal government to extend producer responsibility							Operations, Admin	2012		RDCK	

Community Wide

		Priority Action Implementation Costs										
		Total Costs		Completed / Committed Work		Incremental Costs						
Status (% Complete)	**Priority Actions**	**City Staff**	**Other Costs**	**City Staff**	**Other Costs**	**City Staff**	**Other Costs**	**Funding Opportunities**	**Timeline**	**Lead Department**	**Key Stakeholders**	**Logistical Considerations**
	A. Build the City's Institutional Capacity to support low carbon community development | P. 62											
0	Put in place a Community Carbon Offset Framework	120 hours							2012	Finance, Public Works, City Manager	Consultant, BC Climate Action Secretariat	
0	Municipal Finance Carbon Accounting Analysis Policy	120 hours (setup / initiation requirements) + ongoing reporting requirements for department heads							2012 - 2013	Finance and all departments		
	B. Engage with Citizens, Businesses, Non-Profits, and Public Sector Organizations to move down the Low Carbon Path | P. 64											
0	Low Carbon Local Business Advising	1% FTE							2011-2012	Admin, DS&S	ClimateSmart	ClimateSmart begun holding training sessions in Nelson in summer 2011
0	Low Carbon Community Pledge	1% FTE							2011-2012	Admin, DS&S		
0	Education and Outreach Hub	25-50% FTE							2012 - 2015	Admin, DS&S		
0	Energy and Emissions Economic Development	25-50% FTE							2012 - 2015	Admin	Kootenay Career Development Society, Nelson Chamber of Commerce, Regional District economic development organization(s)	

Priority Action Ranking

In order to preliminarily prioritize the priority actions, a simple scoring matrix was utilised. Each priority action was qualitatively evaluated according to GHG reduction potential, cost, its potential for public interest (profile) and ease of implementation. A ranking for these four categories was then applied. For each of the categories in the table below, Green represents High Impact/Low Cost/Easy Implementation, Yellow represents Average, and Red represents Modest Impact/ High Cost/Challenging Implementation. This ranking has resulted in an evaluation for the Overall Opportunity each Priority Action represents and this is visually represented using a colour gradient.

	Priority Action	GHG Reduction Potential[a]	Cost	Profile[b]	Ease of Impleme-ntation[c]	Overall Opportunity
Land Use	**A. Build on the Community's Complete, Compact and Centered Form**					
	Integrate land use strategies into an OCP Update and Land Use Regulation Bylaw					
	B. Encourage Laneway Cottages and Innovative Live Work					
	Infill home pilot project					
	Update OCP and Land Use Regulation Bylaw with infill home provisions					
	C. Climate Protection Design Guidelines					
	Climate Protection Design Guidelines - Technical analysis and review of best practices and precedents					
	Climate Protection Design Guidelines - Public Engagement					
	Climate Protection Design Guidelines - OCP and Neighbourhood Plan Updates					

[a]GHG Reduction: Potential for greenhouse gas reductions relative to other priority actions.
[b]Profile: Potential for exposure in community and public interest
[c]Ease of implementation: staff hours, coordination, partnership involvement

	Priority Action	GHG Reduction Potential[a]	Cost	Profile[b]	Ease of Implementation[c]	Overall Opportunity
Transportation	**A. Mainstream Low Carbon Transportation throughout the community**					
	Low Carbon Transportation Policy - Update Parking Bylaws					
	Low Carbon Transportation Policy - Review and Update Design Guidelines					
	Requirement for Transportation Master Plan for new commercial developments					
	B. Build Kootenay Ride Share Capacity					
	Collaborate with Kootenay Rideshare to explore enhancements to service					
	C. Implement the Nelson Active Transportation Plan					
	Integrated Low Carbon Transportation Study					
	D. Implement the Nelson Active Transportation Plan					
	Identify and address barriers to implementing the Active Transportation Plan					
	E. Low Carbon Transportation Education and Outreach					
	Social Marketing and Education					

[a]GHG Reduction: Potential for greenhouse gas reductions relative to other priority actions.
[b]Profile: Potential for exposure in community and public interest
[c]Ease of implementation: staff hours, coordination, partnership involvement

	Priority Action	GHG Reduction Potential[a]	Cost	Profile[b]	Ease of Implementation[c]	Overall Opportunity
Buildings	**A. Establish a Home and Business Energy Retrofit Program**					
	Building Retrofit Pilot (overall score)					
	Establish Partnerships					
	Compile Technical Challenges					
	Financing and incentive program design and structuring					
	Social marketing and engagement					
	Heritage building training program					
	Human and social capital development in partnership with Kootenay Career Development Society					
	B. Increase Efficiency and Renewable Energy Supply of New Buildings					
	Put in place one or more policy tool that will move developers to construct buildings that exceed BC Building Code energy performance requirements					
Energy Supply	**A. Establish District Heating in Lakefront and Selkirk-Davies**					
	Strategic Plan for District Energy					
	B. Maintain Near-Zero Electricity Emissions					
	Pressure Reducing Valve Micro-Hydro monitoring / assessment					
	Run-of-river Micro-Hydro monitoring / assessment					
	C. Explore Sustainable Wood					
	Incorporate Biomass Recommendations into DE Phase 2 Study					
	Develop a Solar Ready Bylaw					

[a]GHG Reduction: Potential for greenhouse gas reductions relative to other priority actions.
[b]Profile: Potential for exposure in community and public interest
[c]Ease of implementation: staff hours, coordination, partnership involvement

	Priority Action	GHG Reduction Potential[a]	Cost	Profile[b]	Ease of Implementation[c]	Overall Opportunity
Solid Waste	**B. Increase Recycling and Organics Diversion**					
	Additional recycling and composting drop-off sites					
	Reduction of corporate carbon liability through community composting					
	C. Implement a Comprehensive Building Demolition Waste Management Program					
	Construction, deconstruction and demolition pilot project					
	D. Reduce Solid Waste Generation through targeted local and regional policy					
	Letter of support to provincial and federal government to extend producer responsibility					
Community Wide	**A. Build the City's Institutional Capacity to support low carbon community development**					
	Put in place a Community Carbon Offset Framework					
	Municipal Finance Carbon Accounting Analysis Policy					
	B. Engage with Citizens, Businesses, Non-Profits, and Public Sector Organizations					
	Low Carbon Local Business Advising					
	Low Carbon Community Pledge					
	Education and Outreach Hub					
	Energy and Emissions Economic Development					

[a]GHG Reduction: Potential for greenhouse gas reductions relative to other priority actions.
[b]Profile: Potential for exposure in community and public interest
[c]Ease of implementation: staff hours, coordination, partnership involvement

Funding

Some planning and implementation funding may be available to Nelson for some of the strategies outlined in this document. The first table below lists funds currently available at time of writing. As funding opportunities change frequently, a second table is provided which contains frequently maintained lists of funds.

Fund	Priority Actions	Primary Funding Purpose	Description	Maximum Amount	Funding Availability (intake)	More Info
Community Wide (three or more sectors)						
BC Local Government Infrastructure Planning Grant Program	Multiple	Plan, Study	For feasibility studies of infrastructure related to energy and climate action.	$10,000	Ongoing	www.cscd.gov.bc.ca
Build Canada Fund - Communities Component	Multiple	Implement	Transport, air, and water-related projects may be eligible	Variable	Limited	www.bcbuildingcanadafundcommunities.ca
Community Development Program (Columbia Basin Trust)	Multiple	Plan, study, implement	Funds available for projects related to environmental, social, or economic development within the Trust area	Variable	Ongoing	www.cbt.org/
Community Action on Energy and Emissions (CAEE)	Multiple	Plan, Study	Financial and research support to local governments for energy efficiency, energy conservation and emissions reductions measures.	Variable	Limited	www.bcclimateexchange.ca
Gas Tax Agreement - Innovations Fund, Community Works fund, and Strategic Priorities Fund	Multiple	Plan, study, implement	Substantial funds available for projects that reduce greenhouse gases. Some funding available for local government capacity building.	Tied to population	Limited	www.ubcm.ca

Fund	Priority Actions	Primary Funding Purpose	Description	Maximum Amount	Funding Availability (intake)	More Info
Community Wide (three or more sectors)						
Green Municipal Fund	Multiple	Plan, study, implement	Funds and low-interest loans available for projects related to energy generation and efficiency, waste diversion, and transportation	Variable	Ongoing	www.fcm.ca/gmf
Towns for Tomorrow	Multiple	Plan, study, implement	Wide range of energy, transport, and wastewater projects have been funded.	$375,000	Ongoing	www.townsfortomorrow.gov.bc.ca/
Buildings						
FortisBC PowerSense	Retrofit Financing	Implement	FortisBC provides financial assistance to residential and commercial building owners. Opportunities for funding energy studies.	Up to $5,000	Ongoing	www.fortisbc.com
LiveSmart BC & ecoENERGY incentives	Retrofit Financing	Implement	Incentives available for energy efficiency and renewable energy upgrades to homes and businesses	Variable	Some limited, some ongoing	www.livesmartbc.ca
Solar BC Incentive	Other	Implement	Funds are available for the installation of solar hot water systems. Some areas of Nelson may receive enough direct sunlight for this to be a worthwhile option.	$2,000	Ongoing	www.solarbc.ca/
Vancity/Real Estate Foundation Green Building Grant Program	Retrofit Financing	Plan, study, implement	Funding related to building renovations, regulatory change to advance green building and development, or education to increase understanding of green building strategies. Partnerships (government, business, and non-profit) encouraged.	$50,000	Ongoing	www.vancity.com/MyCommunity

Fund	Priority Actions	Primary Funding Purpose	Description	Maximum Amount	Funding Availability (intake)	More Info
Energy Supply						
Innovative Clean Energy Fund	All energy supply	Implement	Funds pre-commercial technologies that produce or transmit clean and renewable energy	Variable	Limited	www.tted.gov.bc.ca
Federal Tax Exemptions	Other	Implement	Energy generating equipment is often eligible for an accelerated tax write-off under the Income Tax Act	Tax reduction		www.cra-arc.gc.ca
Efficient Boiler Program	Other	Implement	Funding available for the purchase of high-efficiency boilers.	$6,000	Ongoing	
Cycling Infrastructure Partnership Program (CIPP)	Other	Implement	Construction of new cycling transportation infrastructure	$100,000	Ongoing	www.th.gov.bc.ca
			Land Use			
Affordability and Choice Today (ACT) Program	Infill Cabin Study & Secondary Suite Study & retrofit financing	Plan, Study	Funding available to address regulatory barriers to innovative housing.	$5,000	Ongoing	www.actprogram.com

Fund	Priority Actions	Primary Funding Purpose	Description	Maximum Amount	Funding Availability (intake)	More Info
			Waste			
Regional District of Central Kootenays	Increase share of organic waste diversion	Plan, study, implement	RDCK support for public education and community gardening projects. May not include funding	May not include funding	Some limited, some ongoing	www.rdck.bc.ca
Regional District of Central Kootenays	Wood-waste	Implement	Funding already allocated to Nelson for wood-storage bins, but grinding is to be done at Ootischenia		Some limited, some ongoing	www.rdck.bc.ca

Table 2 - Regularly Updated Lists of Funding Opportunities

Source	Sectoral Focus	Notes	Link
Civic Info BC (UBCM)	Various	Updated frequently	http://www.civicinfo.bc.ca/18.asp
Community Energy Association	Various	Last updated mid-2010	http://www.communityenergy.bc.ca/news/funding-your-community-energy-and-climate-change-initiatives-2010-update
Lighthouse	Buildings	Updated frequently	http://www.sustainablebuildingcentre.com/resourcecentre/grants_incentives
LiveSmart BC	Buildings	Updated frequently	http://www.livesmartbc.ca/homes/incentives.html#primary
Natural Resources Canada Cross-Canada Database	Various	Updated occasionally	http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/policy_e/programs.cfm?attr=20
Natural Resources Canada Financial Assistance for Commercial & Organizations	Various	Updated occasionally	http://oee.nrcan.gc.ca/commercial/financial-assistance/index.cfm?attr=20
Ministry of Community, Sport and Cultural Development (MCD): **Local Government Department**	Various	Updated occasionally	http://www.cscd.gov.bc.ca/lgd/

Monitoring and Indicators

Monitoring the change in key indicators over time is one of the most effective mechanisms to track Nelson's progress towards meeting its emission reduction targets. By tracking these indicators the City can also identify successes and shortfalls of specific actions, providing information that can be used to make adjustments in implementation. The indicators in this table were selected based on the following criteria: 1) data can be gathered/monitored by the city and 2) they have a significant impact on energy use and emissions. Some of this data is not available on an annual basis, e.g. Statistics Canada data, so reporting intervals may be different for different indicators.

A monitoring program is most successful if data is regularly gathered and there are reporting mechanisms that integrate results into evaluation and course correction processes.

Land Use

Indicator	2007 (Base Year)	Proposed Target - Low Carbon Path	2011	2012	2013	…	Recent Trend	Data Sources	Notes/Comments
Density: New growth	n/a	20 UPH In Existing Residential 60 UPH In New Residential Areas						Development Services	
Infill Growth Pattern	n/a	4% Single Detached / 48% Townhouse / 48% Low Rise						Development Services	
Dwellings to Jobs ratio	0.6	1:1 by 2040						Development Services, Chamber of Commerce	Potential to partner with Chamber of Commerce
Dwellings within a 10 minute walk to local services such as banks or government offices	50%	80% in 2040						Development Services	
Dwellings within a 10 minute walk to local food store	50%	75% in 2040						Development Services	
Number of Food Stores								Development Services	
Dwellings within a 10 minute walk of the Downtown area	35%	53% in 2040						Development Services	
Dwellings within a 10 minute walk of neighbourhood retail	37%	88% in 2040						Development Services	

Indicator	2007 (Base Year)	Proposed Target - Low Carbon Path	2011	2012	2013	…	Recent Trend	Data Sources	Notes/Comments
Number of secondary suites								Building permit applications	
Number of infill homes	at least two							Building permit applications	

Transportation

Indicator	2007 (Base Year)	Proposed Target - Low Carbon Path	2011	2012	2013	…	Recent Trend	Data Sources	Notes/Comments
Vehicle Kilometres Traveled	Household VKT 2007 = 24,415	Household VKT 2020 = 21,400 (-12% from 2007) Household VKT 2040 = 16,763 (-33% from 2007)						CEEI report	
Commute to Work Mode Split	2007 (StatsCan) Auto-Driver: 57% Auto-Passenger: 8% Public Transit: 2% Walking and Cycling: 31%	2040 (estimate) Auto-Driver: 27% Auto-Passenger: 13% Public Transit: 9% Walking and Cycling: 52%						Census; Bi-Annual Community Survey	
GHGs resulting from personal vehicle travel	7.8 tonnes CO_2e / household	2.3 Tonnes of CO_2e/ household in 2040						CEEI report	

Indicator	2007 (Base Year)	Proposed Target - Low Carbon Path	2011	2012	2013	…	Recent Trend	Data Sources	Notes/Comments
Bike lane kilometres								Public Works Department	
Number of Annual Kootenay Ride Share trips originating from Nelson								Kootenay Ride Share	
kWh per year used recharging cars at public charging points								Public Works Department and Nelson Hydro	
Number of transit trips in Nelson								BC Transit	
The most common mode of transport used for work trips	Auto-Driver	Walking and Cycling						Bi-Annual Community Survey	
The most common mode of transport used for non-work trips		Walking and Cycling						Bi-Annual Community Survey	

Buildings

Indicator	2007 (Base Year)	Proposed Target - Low Carbon Path	2011	2012	2013	…	Recent Trend	Data Sources	Notes/Comments
Average Building size of New Single Family Homes*	180 m^2	160 m^2 in 2020						Building permit applications; BC Assessment reports	
Average energy demand intensity (kWh/ m^2/ year) **Residential**	198	136 in 2040						Nelson Hydro, FortisBC; BC Assessment	
Commercial	355	263 in 2040							
Annual Building Energy Retrofits performed	0.5% or 20 buildings per year	2% by 2020 or 90 buildings per year						Building permit applications; Development Services	
Residential (excluding apartments)	17 buildings	80 buildings							
Commercial	3 buildings	10 buildings							
Building Scale	<1%	2% by 2020						Building permits	
Renewables:		1% by 2040							
Existing Buildings		0.25% by 2060							
(annual % or number of buildings)		*All original buildings will be replaced, retrofitted, or include renewable energy by 2060*							

Building Scale Renewables: New Buildings **Phase in, 2020-2040** **(% of new buildings, annual)*****	<1%	75% by 2020 80% by 2040 100% by 2060						Building permits	
See also, Land Use Indicators									

*Achieved primarily through secondary suites and small-format housing (infill housing)

** Includes space heat, water heat, and electricity (appliances)

*** Includes Heat Pumps (air-source, geo-exchange), solar thermal, etc., many of which are already more economical for homeowners than conventional heating technologies

Energy Supply

Indicator	2007 (Base Year)	Proposed Target - Low Carbon Path	2011	2012	2013	…	Recent Trend	Data Sources	Notes/Comments
District Energy Connections	0 units	2020: 20 units 2040: 60 units 2050: 100 units						Development Services, Building permits	
Electricity Emissions Factor*	3 grams CO_2e/kWh	Maintain 3 grams CO_2e/kWh						Nelson Hydro	
Number of heating oil connections	unknown	2020: 0 connections						Nelson Hydro or City Survey	

Solid Waste

Indicator	2007 (Base Year)	Proposed Target - Low Carbon Path	2011	2012	2013	…	Recent Trend	Data Sources	Notes/Comments
Total Waste Generated *per capita* **(tonnes / person / year)** ***Total* includes waste and recyclables.**	0.75 *Historically, per capita waste generated has increased across BC*	Maintain till 2020 (instead of increase) 10% lower by 2040 Maintain to 2060						RDCK, City waste services	
Recycling and Composting Rate	X %	2020: X % 2040: X %						RDCK, City waste services	
Organics Diversion **(% diverted from landfill)**	33%	2020: 50% lower 2040: 80% lower 2050: 85% lower						RDCK, City waste services	
Wood diversion for energy	0	2020: 700 tonnes per year						RDCK, City waste services	
Solid waste GHG emissions *per capita* (tonnes/person/year)	0.06	2020: 50% 2040: 80% 2050: 85%						CEEI report	