Exploring Transformational Change

Local Government Climate Change Pathways to 2050

BRITISH COLUMBIA

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Executive Summary

The Intergovernmental Panel on Climate Change indicates that reductions of GHG emissions of between 50 to 85% by 2050 over 2000 levels are needed to avoid dangerous levels of climate change (IPCC, 2007).

Under the *Greenhouse Gas Reduction Targets Act*, the Province of B.C. has established two specific GHG reduction targets: 33% reduction in GHG emissions by 2020 over 2007 levels; and 80% reduction in GHG emissions by 2050 over 2007 levels. Municipalities and regional districts in B.C. are contributing to the Provincial goals by establishing GHG emission reduction targets as well as complementary policies and actions in their official community plans, and by making voluntary climate action commitments under the Climate Action Charter.

A number of local governments across British Columbia have adopted the GHG emission reduction targets established by the Province. Other local governments used the 2007 Community Energy and Emissions Inventories (CEEI) as a baseline measure of their community emissions and some also worked with community energy and emissions modellers to identify targets for their communities.

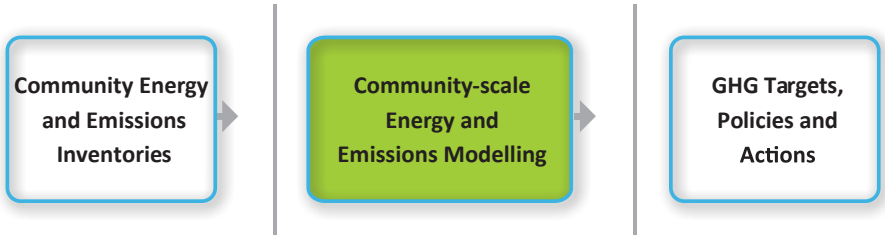


Figure 1: Generating GHG targets, policies and actions

The purpose of this paper is to highlight the actions some local governments in B.C. are undertaking to reduce GHG emissions, explore mapping pathways informed by community energy and emissions modelling, and provide further ideas related to becoming a low carbon community.

This paper begins with identifying a "vision" of a low carbon community and presents examples of how some European communities have already made significant progress towards becoming carbon neutral community-wide. By considering the systems and strategies employed by these communities, local governments in B.C. can develop a better understanding of what is required to become a low or zero-carbon community.

Based on the experience of European communities, supporting compact, complete communities that focus on the use of renewable energies and district energy systems can significantly contribute to ambitious GHG reduction. The review of those B.C. communities with long-term GHG emission reduction plans indicates that they have already identified a number of the key strategies required. These same communities have also identified a range of co-benefits directly in line with these strategies, including community economic development, energy security and energy cost control. A detailed analysis of the legal and financial conditions required to achieve the types of change identified was not included as part of this initial review.

Introduction and Purpose

The purpose of this paper – Exploring Transformational Change: Local Government Climate Action Pathways to 2050 – is to look at a sampling of well-established low carbon European communities, and to draw on the modelling experiences of a select number of B.C. communities targeting GHG reductions beyond 2040 in order to better understand the characteristics of a low carbon future for B.C. communities. To achieve this, answers to the following questions are sought:

- What would a vision look like for a community's low carbon future?
- What are transformational strategies and actions that can contribute to achieve a low carbon future?
- What further steps (research and analysis) will improve our knowledge of the kinds of transformational changes that could contribute to communities achieving a 'made-in-B.C.' low carbon future?

The paper starts by reviewing a small number of European communities that have already achieved significant GHG reductions (i.e., low or zero-carbon community). Next, it turns to a small number of B.C. communities that have undertaken longer-term (e.g., 2040, 2050, 2107) community energy and emissions modelling, exploring sets of proposed strategies and actions. Using network analysis software a preliminary analysis of common strategies and actions are identified for these communities. The paper concludes with identifying observations and potential opportunities for B.C. communities.

A Low Carbon Vision

Research of a number of European communities has shown that district energy is a key component of the low carbon vision (Figure 2), with heat provided by combined heat and power systems from biomass and biogas. Biomass is provided in the form of waste wood or agricultural products and biogas is generated from the anaerobic digestion of food waste, human waste, manure and other sources. The biogas is used in a combined heat and power system to generate electricity and heat and is also upgraded for use in the public transport system. The district energy system acts as an attractor to support the development of compact, complete communities with dwellings and destinations within walking and cycling distances. The district energy system is run by a local government-owned utility, sometimes in partnership with the private sector. Electricity is also generated by wind and photovoltaics, possibly incentivized by some form of feed-in-tariff, and additional residential or commercial solar hot water is fed into the district energy system for broader application.

The five B.C.-based community energy and emissions plans (CEEPs)[1] reviewed in this paper capture many of the elements of the above vision. The most apparent overlap is the district energy system, identified in almost every community plan, and commonplace among the European low carbon communities. B.C. communities are clearly beginning to understand the important links between district energy and compact, complete communities to achieving GHG emissions targets. More can be learned from communities that have had district energy systems in place for a longer period of time, as described below.

1 A community energy and emissions plan (CEEP) evaluates a community's existing energy use and greenhouse gas (GHG) emissions in order to reduce energy consumption and emissions, improve efficiency, and increase the local renewable energy supply.

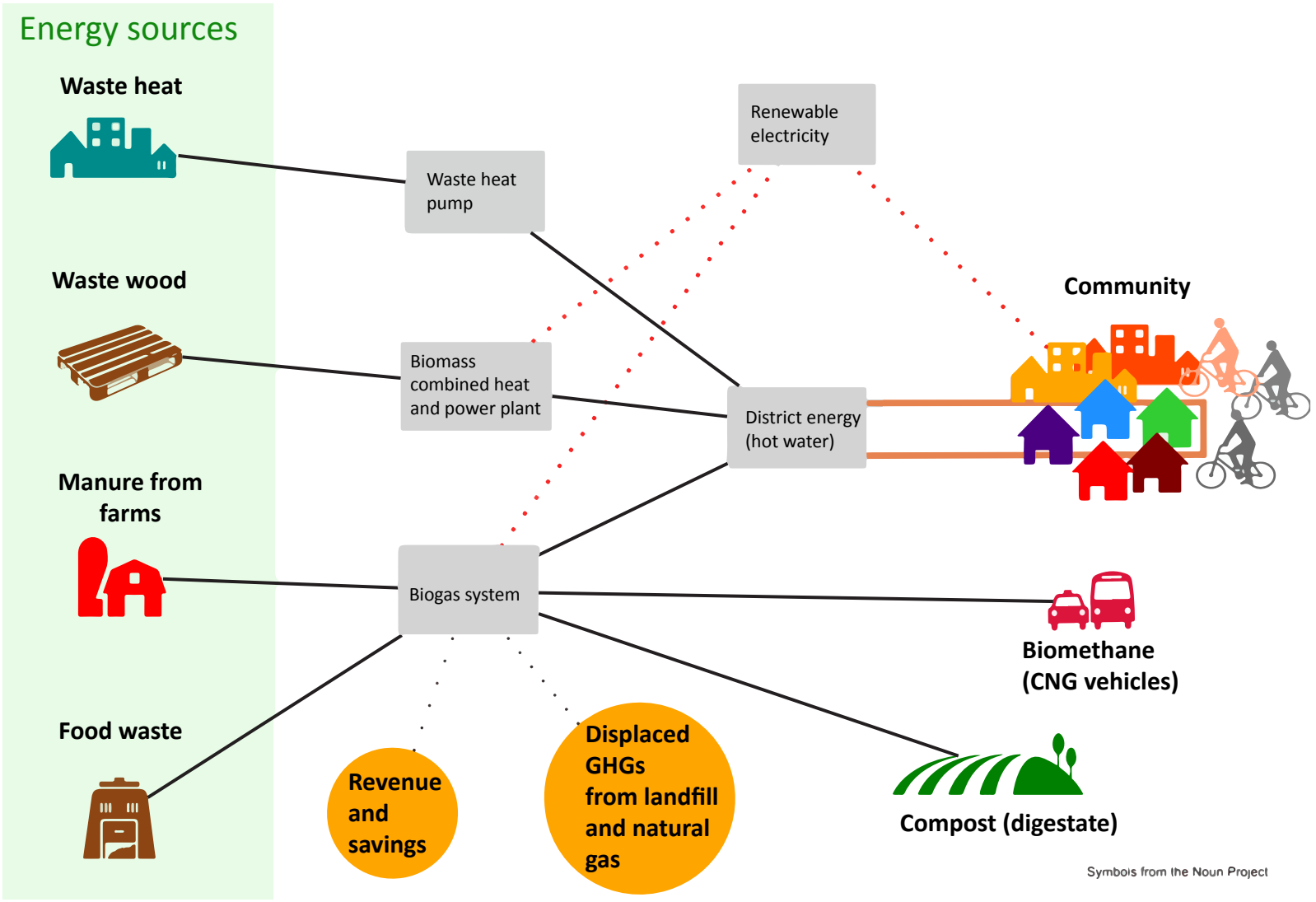


Figure 2: Low carbon communities

A Snapshot on the Future

In order to gain a better understanding of what a low carbon community could look like, six European communities that are well on their way towards carbon neutrality were investigated[2]. The following section provides a snap shot of each community and highlights some of the "key ingredients" that have helped these communities to lower their carbon footprints.

Figure 3: Locations of low carbon communities

1) Ludwigsburg: Medium-Sized Town with an Ambitious Energy Strategy[3]

Key ingredients: Community engagement, municipally-owned energy supply, district energy, integrated energy plan

Ludwigsburg is a town of 86,000 people near Stuttgart in Germany. Ludwigsburg has had an active strategy to target development in the inner city. The town employs 17 people in the Department of Sustainable Urban Development. A citizens' committee emerged out of Agenda 21[4] activities, and a comprehensive community engagement process emerged from this committee's work. A municipally-owned energy supply company provides electricity, water/ sewerage and district heating. The utility owns ten cogeneration plants and twelve heating plants, one wood chip heating plant, a gas fuelling station, a waste gas plant, six public swimming pools, a skating rink and an inner city car park. With the Sustainable Urban Development Strategy, the Citywide Energy Strategy and the consequent restructuring of administration, Ludwigsburg chose an exceptionally comprehensive and integrated approach to energy, especially when compared to other German medium-sized cities.

2 Several factors differentiate Europe from British Columbia, complicating direct comparisons. These include Europe's higher fossil fuel costs and an urban form (e.g., higher density) well-established before the coming of the car.

3 International Energy Association (2011). Case Study: Energy Efficient City Ludwigsburg. Available at: http://www.eneff-stadt.info/fileadmin/media/Projektbilder/Internationale_Projekte/Dokumente_IEA_Annex_51/Subtask_C_final_report-Ludwigsburg_2012.pdf.

4 Agenda 21 is a non-binding, voluntarily implemented action plan of the United Nations with regard to sustainable development. It is an action agenda for the UN, other multilateral organizations, and individual governments around the world that can be executed at local, national and global levels.

2) Feldheim: A Small Village that is Carbon Neutral[5]

Key ingredients: Renewable energy, district energy, own electricity grid, energy security

Feldheim's journey reaches back to 1994 when a renewable-energy entrepreneur installed a wind turbine in the area to take advantage of the wind regime. More wind development followed as residents found that they could earn revenue by renting their land to energy companies for wind turbines. Four years ago, with the help of European Union funding, the village established a €1.7m biogas heat plant powered by slurry made from corn and manure obtained from its 700-sow pig farm and 1,700 acres of arable farmland. To make up for possible energy shortfalls caused by fluctuations in wind power and biogas supplies during cold weather, the village also installed a wood chip furnace fuelled from the remains of trees felled in the surrounding forests. While all of Feldheim's energy is produced using renewably energy, it faced challenges from the company which ran the electrical grid. As a result, Feldheim partnered with a German renewable energy company, Energiequelle, to construct its own electricity grid, which was completed in October 2010. The project cost each resident €3,000, but their energy costs are 31 per cent less than the standard rate for electricity and around 10 per cent less for their heating. The project has also created about 30 jobs.

3) Samso: A Self-Sufficient Island[6]

Key ingredients: Wind energy, cooperatives, biomass energy

Samso has successfully completed a 10-year experiment to see whether its population of 4,000 could become energy self-sufficient. The islanders established 21 wind turbines, four district energy systems running on straw, an Energy Academy and many privately-owned installations based on geothermal heating, solar heating and wood pellet boilers. Five offshore wind turbines have also been installed by a municipally-owned utility and a portion of the profits from the wind turbines goes to support the Energy Academy[7]. Nine of the wind turbines are owned by local farmers, and the remaining wind turbines are owned by a local wind turbine association. These turbines are divided into about 5,400 shares, owned by 450 people, using a cooperative model.

Wind energy on Samso Island

5 CBC provided coverage of Feldheim: Pauls, K. (2013). Tiny German village a model in the country's energy revolution. Available at: http://www.cbc.ca/news/world/story/2013/03/07/pauls-berlin-energy.html.

6 A detailed article on Samso was written by the New Yorker. Kolbert, E. (2008). The Island in the Wind. The New Yorker. Available here: http://www.newyorker.com/reporting/2008/07/07/080707fa_fact_kolbert/?currentPage=all.

7 The Energy Academy Europe provides education, conducts research and fosters innovation in the field of energy while working towards the transition to a sustainable energy future http://www.energyacademy.org/.

4) Boras: A Medium Sized Town on a Path to Carbon Neutrality[8]

Key ingredients: combined heat and power, biogas, renewable energy, municipally-owned utility

Borås is Sweden's 13th largest municipality. Approximately 64,000 people live in Borås City with over 100,000 throughout the municipality. Borås Energi och Miljö AB (BEM) is a municipally-owned company that manages waste and the production of district heating, cooling and electricity in the municipality. The company's vision is a city free from fossil fuels and BEM has established several different district heating plants. The main unit, Ryaverket, is a combined heat and power plant with two biofuel boilers, two waste boilers and two generators. The two Ryaverket generators are driven by steam produced from the combustion of biofuel and waste. Electricity is also generated using four different hydropower plants. The generators were built in 1965, but were rebuilt and renovated in 2008 to obtain a higher electricity/heat ratio. Biodegradable household waste is mixed with biodegradable waste from non-domestic sources in an anaerobic digester to produce biogas. Biogas is distributed at four different transportation filling stations in Borås, two of which are open to the public.

5) Kristianstad: A Fossil Fuel-Free Municipality[9]

Key ingredients: Municipally-owned utility, combined heat and power, biogas, district energy

Kristianstad is the capital of a region in Sweden with a population of about 78,000. In 1999, the Executive Committee of Kristianstad unanimously decided to become a 'Fossil Fuel Free' municipality. The reduction of fossil fuels is achieved primarily by the use of bio-fuels, both biomass as a fuel for heating and production of electricity and biogas as a fuel for local buses and other vehicles. Since the middle of the 1980s, Kristianstad Energy Ltd, C4 Energi, has worked towards replacing oil with renewable energy sources, and developing a combined power and heating plant. Major parts of the City are served by district heating and new areas are continually added. In 1997, the local municipal waste company (Renhållningen Kristianstad) established a biogas production plan, doubling capacity. In 1999, biogas produced at the sewage treatment plant was upgraded and used as fuel for buses and other vehicles. The public transport company, Skånetrafiken, has introduced 30 buses fuelled by biogas in the public transport system. Approximately 250 vehicles were running on biogas in Kristianstad in 2008.

6) City of Copenhagen: Carbon Neutral by 2025[10]

Key ingredients: Municipally-owned utility, district energy, land-use planning, cycling infrastructure

Developed in 1947, Copenhagen's Finger Plan is a comprehensive growth strategy that continues to direct urban development today. Under the plan, central Copenhagen represents the palm

8 A case study of Boras is available here: http://www.districtenergy.org/assets/CDEA/Case-Studies/Boras-Sweden-District-Energy-Climate-Award.pdf.

9 European Commission (n.d.). Fossil Fuel Free Kristianstad- Case study 254. Directorate-General for Energy and Transport. Available here: http://www.managenergy.net/download/nr254.pdf.

10 Copenhagen's official plan is available here: http://subsite.kk.dk/sitecore/content/Subsites/CityOfCopenhagen/SubsiteFrontpage/Business/Growth_and_partnerships/Strategy/~/media/E9CC623FEEA6485582EEA7BDEEFE066B.ashx.

of a hand and five transportation and development 'fingers' extend outwards. By concentrating growth along designated highway and train routes, and by locating shops, schools, services and dense housing near the stations, people have easy access to essential services without needing cars. In between the "fingers", green space and agricultural land is protected with the objective of being easily accessible for everyone. A district energy system supplies 97% of the city with clean, reliable and affordable heating through a 1,500 km double pipe network. Established in the 1980s as a partnership between municipalities in the metropolitan area, the system uses combined heat and power plants, waste incinerators and boiler plants. An offshore wind farm with 80 turbines produces energy for 150,000 homes. Thirty-seven percent of people in Copenhagen cycle to work or school and the goal is to increase this to 50% by 2015. Infrastructure includes 350 km of separate bike lanes, with approximately $18.4 million spent on bicycle infrastructure in 2010.

Bus powered by biogas in Uppsala

The B.C. Context

The 2007 International Panel on Climate Change report concluded that global emissions need to peak before 2015, and the trend needs to bend down toward 50-85 percent reductions below 2000 levels by 2050, in order to avoid tipping points that will cause dangerous disruptions such as severe agricultural collapses, water shortages, drought and sea level rise.[11]

Since 2007, the Province of British Columbia has taken a number of steps to address climate change including: developing the 2008 Climate Action Plan, enacting legislation including the changes to British Columbia's *Local Government Act*, strengthening relationships with key stakeholders province-wide to begin to better understand potential greenhouse gas emissions (GHG) reductions in each sector, and supporting the development of key GHG targets, policies and actions by those sectors including B.C. local governments.

British Columbia's *Local Government Act*[12] requires local governments to establish GHG emission reduction targets, policies and actions in their Regional Growth Strategies (RGS) and Official Community Plans (OCP). One hundred and eighty-two of 190 local governments, have signed the Climate Action Charter,[13] which includes a commitment to create complete, compact, more energy-efficient rural and urban communities. By the end of 2012, approximately 90 local governments had established community energy and emissions plans (CEEPs), with integrated climate action and sustainability planning objectives incorporated into OCPS and other planning documents.

Examples of specific tools and incentives available to local government include the following:

- B.C. Climate Action Toolkit - The Toolkit website[14] is hosted by the Province of B.C. and the Union of B.C. Municipalities (Green Communities Committee), and administered by Fraser Basin Council. It is a comprehensive resource to support local governments in taking climate action. It provides the latest news, best practices and practical advice so that local governments can take steps to reduce emissions and create more complete, compact communities.
- Community Energy and Emissions Inventories (CEEIs) – The Province has generated 2007 and 2010 CEEI reports for all 190 local governments (27 regional districts; 162 member municipalities; Islands Trust). The CEEI reports (www.Toolkit.bc.ca/ceei) cover both primary (transportation, buildings, solid waste) and supporting indicators (housing type, residential density, commuting distance, etc.), and local governments have the discretion to use and/or modify their CEEI reports as they see fit.
- Community-scale Energy and Emissions Modelling (CEEM) - Used by a number of local governments in B.C., CEEM builds on the community energy and emissions inventories to help local government establish GHG reduction targets. CEEM assists local governments

11 IPCC (2007). Climate Change 2007 Synthesis Report: http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf.

12 Links available at: http://www.cscd.gov.bc.ca/lgd/greencommunities/targets.htm.

13 List of communities that have signed the Charter available here: http://www.cscd.gov.bc..ca/lgd/greencommunities/climate_action_charter.htm.

14 The Toolkit website – http://www.toolkit.bc.ca.

in assessing the impact of their policies and actions, such as land use regulation, on future energy use and GHG emissions. The B.C. Climate Action Toolkit (www.Toolkit.bc.ca/ceem) includes a comparison of greenhouse gas modelling and/or approaches being used to support local governments across B.C.. The models and services provided by the organizations identified vary widely: covering one to a number of community sectors (e.g. buildings, transportation, solid waste); from parcel-level to region-wide applications for both small and large communities; from simple excel spreadsheets and user-friendly 'guides' to sophisticated geospatial models with interconnected land use and transportation policy implications; and with recommendations for local governments that range from a small listing of off-the-shelf policies to comprehensive, quantitative, customized reports.

- Community Energy and Emissions Planning (CEEPs) – Approximately 90 local governments in B.C. have developed CEEPs that provide a comprehensive strategy for climate action and energy conservation.[15]
- Climate Action Revenue Incentive Program (CARIP) – Most local governments in B.C. report annually through the CARIP on their corporate-level and community-wide activities. The B.C. Ministry of Community, Sport and Cultural Development posts summaries of these results on its website.[16]

As with the B.C. provincial government, a number of communities have set targets to 2050. While only a small subset of B.C. communities have undertaken community energy and emissions modelling to set longer-term targets (i.e., 2040, 2050), initial modelling results indicate that significant action in communities across B.C. is required to achieve aggressive greenhouse gas emissions reductions by 2050.

15 "Province of B.C. Integrated Community Energy Systems Progress Report" (August 2013) sponsored by the Province of British Columbia.

16 MCSCD's CARIP home page - http://www.cscd.gov.bc.ca/lgd/greencommunities/carip.htm.

Examples of Community Energy and Emissions Plans in B.C.

At least four communities in B.C. have undertaken a comprehensive effort to model long-term (2040, 2050, 2107) GHG emission reductions. The following is a very general view of their efforts. While the City of Vancouver has not used a longer-term comprehensive modelling process, it has been included in this paper because of the City's aggressive plan, the 2020 Greenest City Action Plan. The communities reviewed are:

- City of Vancouver
- City of Nelson
- District of North Cowichan
- City of North Vancouver
- City of Nanaimo

City of Vancouver: Greenest City 2020 Action Plan[17]

Today, the City of Vancouver has the smallest per capita carbon footprint of any city in North America, although Vancouver residents have an ecological footprint three times larger than the Earth can sustain.[18] So, although Vancouver is considered one of the world's most livable cities, and in early 2013 won the World Wildlife Federation's (WWF's) Earth Hour City Challenge competition,[19] the City is seeking to advance its efforts through decisive action and innovation that will involve every resident and business, and numerous other stakeholders inside and outside of its jurisdiction.

17 See http://vancouver.ca/files/cov/Greenest-city-action-plan.pdf.

18 The City of Vancouver: Greenest City 2020 Action Plan http://vancouver.ca/files/cov/Greenest-city-action-plan.pdf.

19 http://www.wwf.ca/events/earthhour/challenge/.

The City of Vancouver has established an ambitious and measurable action plan to be achieved by 2020. Four key ingredients are: vision, leadership, action and partnerships. With involvement from over 60 City staff and 120 organizations, and thousands of individuals, the Greenest City Action Plan (GCAP) was created. The Greenest City Action Plan Team researched best practices from leading green cities around the world, and established goals and targets intended to make Vancouver the world's Greenest City.[20] The Greenest City 2020 Action Plan is divided into 10 smaller plans, each with a long-term (year 2050) goal and medium-term (year 2020) targets. The plan identified more than 75 'quick-start actions' that could be implemented immediately. The following is a small sampling of priority actions or key strategies that the City is commited to put in place moving forward.

- **Green Economy** – Double green jobs between 2010 and 2020; one action will be to establish a Green Enterprise Zone, focusing green companies and organizations, green infrastructure, as well as innovations in building design and land use planning in one location.
- **Climate Leadership** – Build new neighbourhood-scale renewable energy systems, following on from its 'City-wide District Energy Strategy'.
- **Green Buildings** – Reward energy efficiency by putting price signals in permit fees for both new construction and renovations. Buildings that use electricity and natural gas make up 55 percent of Vancouver's GHGs (the City's first net zero residential building was built in 2010).
- **Green Transportation** – Refine land use policies that directly enable the City to meet its mobility and transportation targets. An 'Open Streets' policy enables the demonstration of different street uses.
- **Zero Waste** – Advocate to the Regional District and the Province for more Extended Producer Responsibility programs for packaging and other materials, to foster a 'zero waste' culture throughout the City.
- **Local Food** – Encourage the growth of more food locally, and ensure that Vancouver's neighbourhoods have access to local healthy food sources. Contribute to the development of food infrastructure, green production, processing, storage, distribution, and waste management.

City of Nelson: Low Carbon Path to 2040- Community Energy and Emissions Action Plan, 2011[21]

The *Low Carbon Path to 2040: Community Energy and Emissions Action Plan* (Plan) was implemented in 2011 and is intended to build on the City's complete, compact, highly livable character, heritage building preservation, and historical commitment to energy security that began more than 100 years ago with the establishment of its own hydroelectric utility. The plan is informed by the *Path to 2040 Sustainability Strategy* and is intended to complement the corporate greenhouse gas reduction plan completed in 2010.

The City established a 2007 baseline in the Plan and set out a series of targets to be achieved by 2040. These include:

- 57% reduction in per capita GHG emissions (from seven to three tonnes per year);
- 43% reduction in community-wide GHG emissions; and
- 26% reduction in community-wide energy use.

20 http://www.wwf.ca/events/earthhour/challenge/.

21 See http://www.nelson.ca/EN/main/services/planning-building-services/sustainability/community-climate-action-and-energy-plan.html.

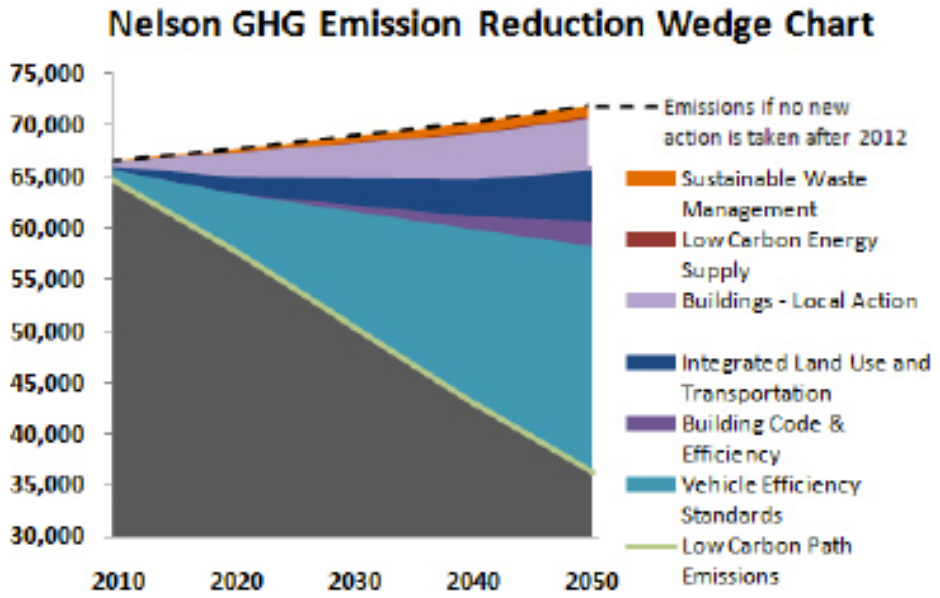


Figure 4: GHG emission reduction chart from Nelson Plan

Samples of the key 2040 targets for each sector:

- **Land Use** – By 2040, 80% of dwellings are within a 10 minute walk from local services
  Action: Update OCP and Land Use Regulation Bylaw with infill home provisions
- **Transportation** – By 2040, household VKT is reduced 33% from 2007
  Action: Require Transportation Master Plan for new commercial developments
- **Buildings** – Renewable energy is installed in 75% of buildings constructed annually by 2020
  Action: Put in place one or more policy tools that will move developers to construct buildings that exceed B.C. Building Code energy performance requirement
- **Energy Supply** – Connect 70,000 square metres of floor space to district energy by 2040
  Action: Establish a strategic plan for district energy
- **Solid Waste** – By 2040, increase organics diversion rate to 80%
  Action: Letter of support to provincial and federal governments to extend producer responsibility
- **Community-wide** – By 2015, all City departments have integrated qualitative assessments of greenhouse gas emissions into their planning and budgeting processes
  Action: Integrate an energy and emissions lens into the Economic Development Partnership.

Municipality of North Cowichan: Climate Action and Energy Plan, 2012[22]

The District of North Cowichan drew on extensive community participation to develop their Climate Action and Energy Plan (CAEP). The CAEP identifies trends and opportunities to reduce energy consumption and emissions through policy and other municipal mechanisms. North Cowichan's climate change plan is one of the first in B.C. to take an integrated approach to climate change mitigation and climate change adaptation from both the broader community and municipal corporate operations perspective.

22 See http://www.northcowichan.ca/Files/CAEPFinalReportAdoptedByCouncil.pdf.

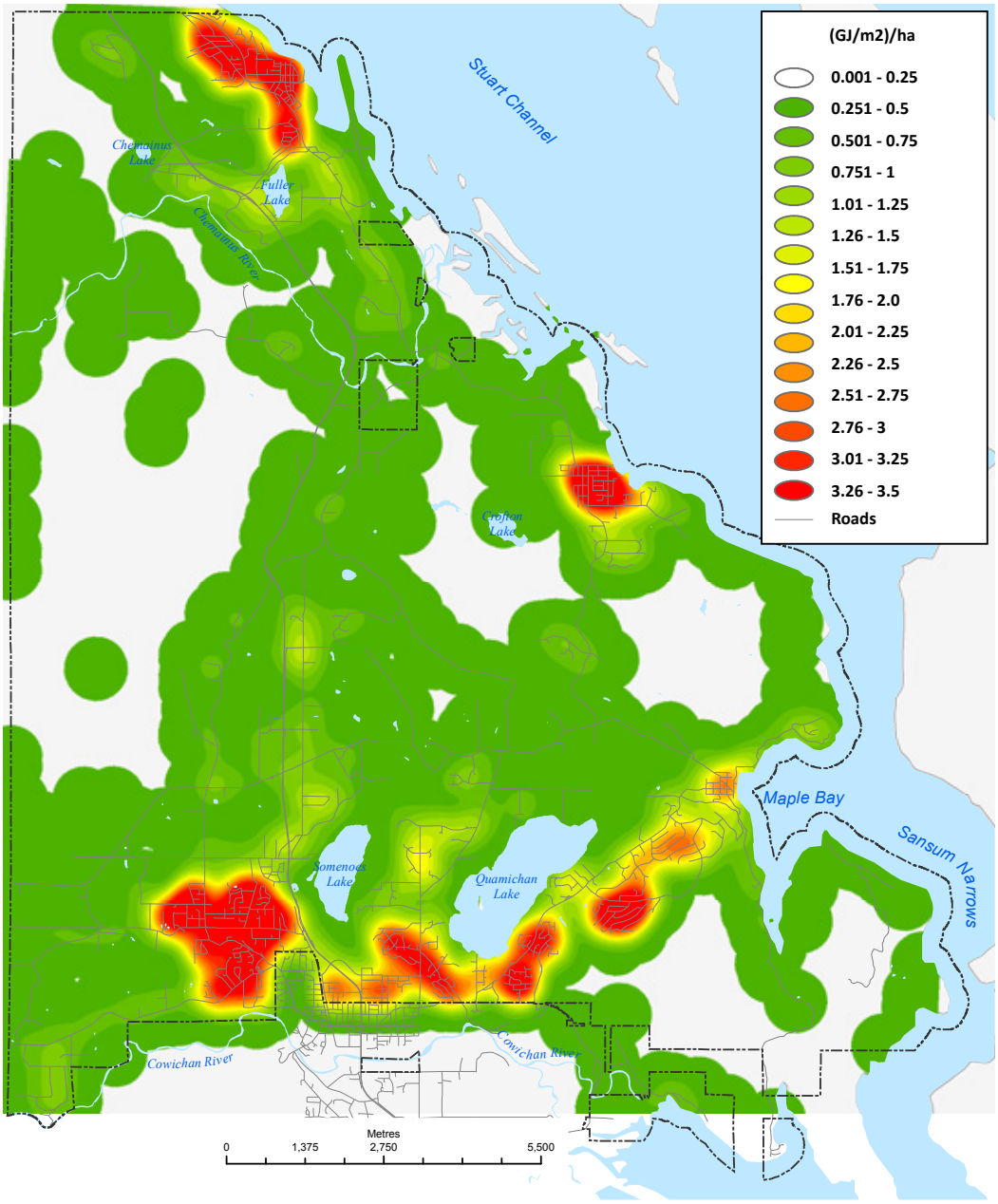


Figure 5: North Cowichan Energy Density Map

The three Climate Action and Energy Plan goals, as stated in the Official Community Plan, are:

- Achieving carbon neutrality as soon as possible;
- Achieving an 80% reduction in GHG emissions by 2050 (restated); and
- Sequestering more carbon than produced.

The District recommended a comprehensive number of actions in long-term projects that were selected based on the following three criteria: relevant to North Cowichan in terms of the geography and culture of the community; proven ability to deliver significant GHG emission reductions using a systematic approach; and proven ability to deliver co-benefits including employment, health benefits or ecological benefits. The nine action areas identified by the District are:

- **Create a Transportation Planning Program** – Use dedicated staff to implement a Smarter Travel Choices Program, establish a taxi-bus rural public transit system, encourage bio-diesel purchases, join Project Get Ready and transition the municipal fleet to electric vehicles.

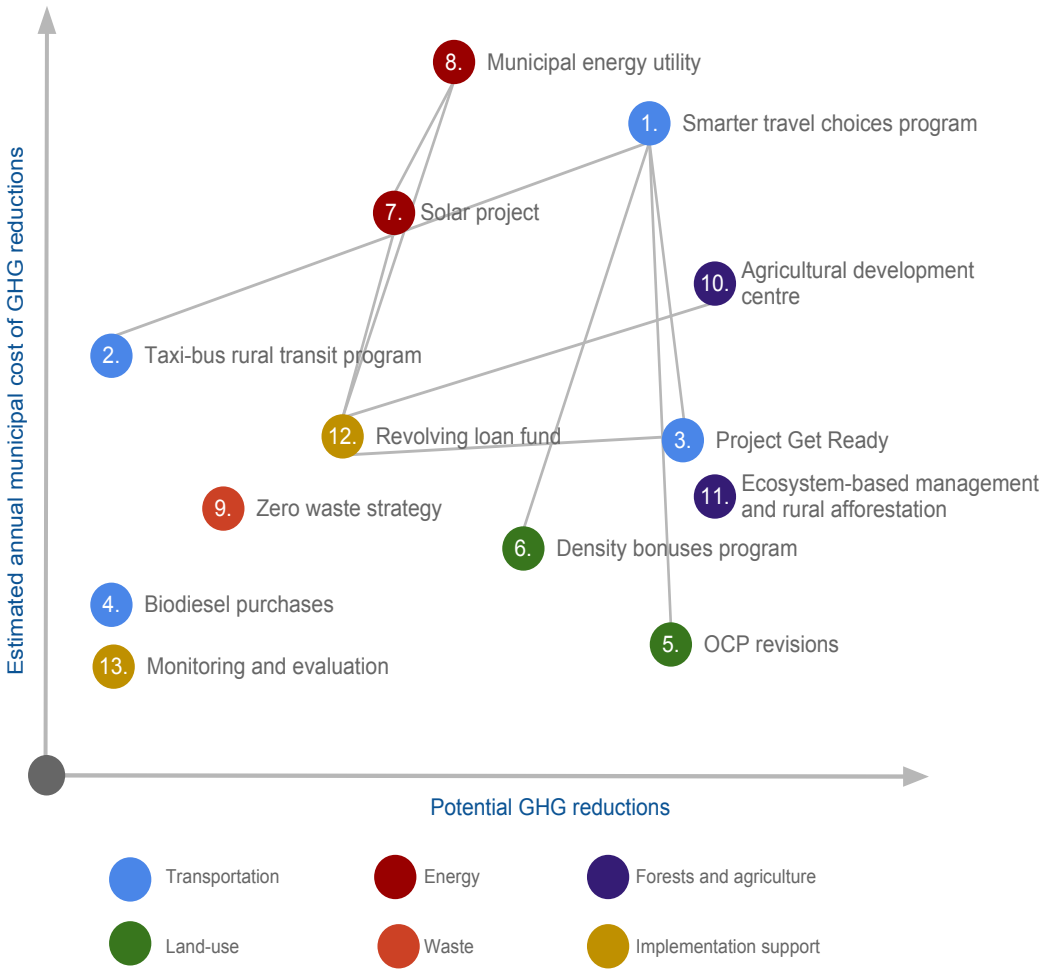


Figure 6: Analysis of actions for North Cowichan's Climate Action and Energy Plan

- **Implement OCP Development Guidelines** – Redirect growth towards commercial core areas.
- **Employ Municipal Energy Policy Mechanism** – Use tools such as density bonusing, Development Permit Areas and the Building Code to require renewable energy in new buildings and new developments.
- **Implement a Home Energy Program** – Provide a comprehensive and effective program offering education, audits and energy efficiency upgrades.
- **Establish a Community Energy Organization** – Draw on best practices related to district energy. These include Revelstoke Energy Corporation, Vancouver's Southeast False Creek Neighbourhood Utility and North Vancouver's Lonsdale Energy Corporation, each providing district energy and other services.
- **Reduce Municipal Building Energy Use** – Provide energy audits, energy use tracking and fuel switching opportunities as part of a comprehensive approach to building energy use reduction.
- **Create an Agricultural Development Centre** – Support greater local food and agricultural practices by establishing a Centre and related programs.
- **Increase North Cowichan's Forest Area** – Explore the use of carbon offsets in order to purchase new lands for parks.
- **Explore Establishing a Green Revolving Loan Fund (GRLF)** – Explore the potential for GRLFs as a way to support climate action objectives.

City of North Vancouver: Community Energy and Emissions Plan- Low Carbon Energy and Emissions Path, 2010[23]

The City of North Vancouver has developed a Low Carbon Energy and Emissions Path to guide the community towards its carbon neutral future as presented in its 100-Year Sustainability Vision. The City envisions being net zero in emissions by its 200th birthday (2107). The City's Low Carbon Path was shaped by the following three overarching goals:

- Intensification of major energy and emissions policies and actions undertaken by the City within its sphere of influence as a local government;
- Engagement with senior governments on realistic policies and measures within their sphere of influence; and
- Pursuit of the City's 100 Year Sustainability Vision of reducing carbon emissions to zero by 2107.

Overarching strategies and key actions:

- **Land Use Planning** – Increase density and integrate residential and commercial uses in key zones.
- **Buildings** – Construct and retrofit buildings to be more energy efficient while maximizing the opportunities for renewable energy sources and usage.
- **Transportation** – Introduce additional measures to reduce the distances driven by cars by, in part, making walking, bicycling and transit easier.
- **Energy Supply** – Decrease the carbon intensity of the energy supply through more efficient systems, expansion and decarbonisation of Lonsdale Energy Corporation's district energy systems, and pursue onsite renewable energy opportunities.
- **Solid Waste** – Reduce the volume of waste and recyclables that enter the waste stream and divert waste from disposal through composting and recycling.
- **Urban Agriculture and Landscape** – Expand community gardening and urban agriculture to reduce emissions associated with today's food supply, and expand urban forests and plant more trees to improve carbon sinks.
- **Education and Outreach** – Increase general awareness of climate change and sustainable energy, while encouraging and sustaining lifestyle and behavioural choices through education and outreach to support reduction policies.

The Community Energy and Emissions Plan (CEEP) is linked to work underway by the City's Energy Efficient Buildings Working Group, the regional Zero Waste Challenge, the ongoing efforts of the Lonsdale Energy Corporation and the guidance of the existing Long Term Transportation Plan.

City of Nanaimo: Community Sustainability Action Plan- Taking Action for our Climate, 2012[24]

The City of Nanaimo's Official Community Plan (planNanaimo) includes a number of energy and emissions policies. The Community Sustainability Action Plan, emerging from planNanaimo, identifies steps required to achieve the targets set out in the OCP. The *Community Sustainability Action Plan: Taking Action for our Climate* (CSAP) builds on the transportation and mobility and community building partnership strategic priorities described in planNanaimo. CSAP established three energy reduction scenarios that combined sets of specific action to support the City's GHG

23 See http://www.env.gov.bc.ca/cas/mitigation/ceei/pdf/GHGModelingTool_CNV2.pdf.

24 See http://www.nanaimo.ca/assets/Departments/Community~Planning/Environmental~Planning/Sustainable~City/CommunitySustainbilityActionPlan.pdf.

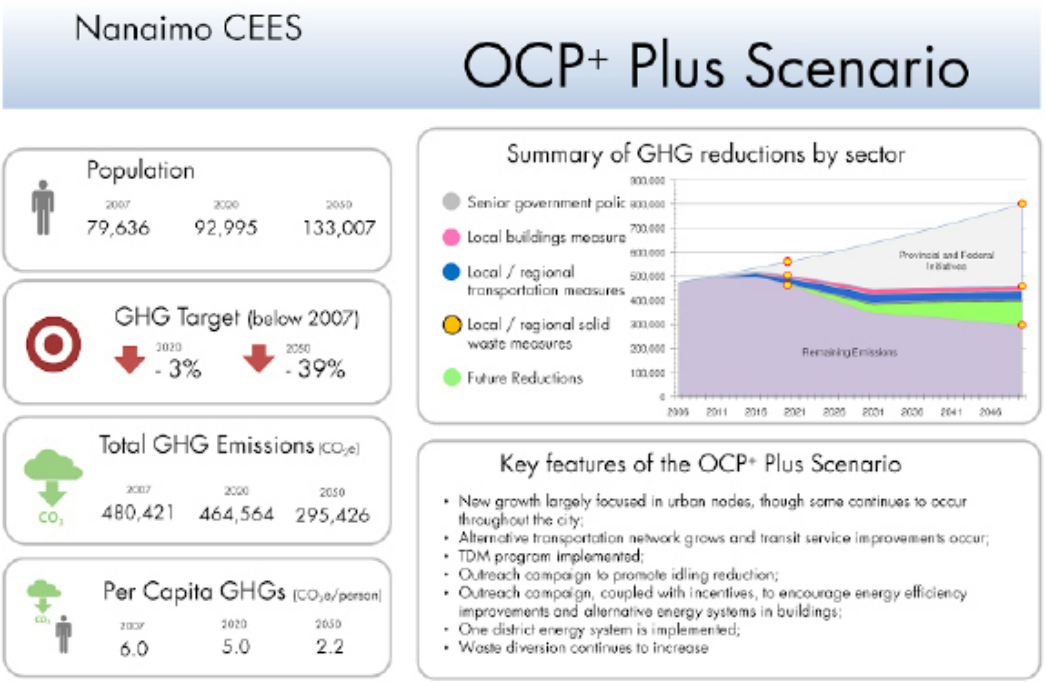


Figure 7: OCP Scenario for Nanaimo, B.C.

reduction efforts:

- **Business as Usual (BAU)** – Forecasted energy needs based on current growth and energy consumption and projected the amount of anticipated GHG emissions. Projected energy consumption and GHG emissions for 2020 and 2050.
- **Target Scenario** – Represented the current commitment to pursuing the province-wide GHG targets of a 33% reduction below 2007 levels by 2020 and an 80% reduction below 2007 levels by 2050. The scenario relies on a regulatory approach to GHG reduction that ultimately does not fully achieve province-wide energy and emissions reductions targets.
- **OCP Plus Scenario** – Based on energy and emissions reductions supported by planNanaimo and additional elements such as idling reduction and district energy. The scenario results in moderate reductions over the BAU scenario.

The City endorsed the OCP Plus Scenario given it was a realistic, measurable means to track progress in GHG emissions reduction. Key features include:

- New growth largely focused in urban nodes
- Alternative transportation network grows and transit service improvements occur
- TDM program implemented
- Outreach campaign to promote idling reduction
- Outreach campaign, coupled with incentives, to encourage energy efficiency improvements and alterative energy systems in buildings
- One district energy system implemented
- Waste diversion continues to increase

The CSAP also identifies five sectors: senior government policy; local buildings; local/regional transportation measures; local/regional solid waste measures; and, future reduction that required specific policy tools to support the community's shift toward sustainability. These policies and tolls include a combination of both financial (e.g. building permit fee rebates for homeowners that undertake energy efficiency retrofits) and non-financial (improving cycling infrastructure and amenities to make cycling safer), and more appealing incentives intended to bring about long-term change within the community.

Summary of Common Local Government CEEP Actions

Local governments are taking demonstrable steps to reduce GHGs in their communities. The City of Nelson, District of North Cowichan, City of North Vancouver, City of Nanaimo and the City of Vancouver CEEPs share a number of common actions that have the potential to support significant GHG reductions. The prominence of specific action areas is identified in the GEPHI diagram in Appendix 1. Below is a list of common actions that other local governments may find to be a useful reference when developing their own CEEPs.

Governance and Financing

- Establish cost effectiveness as a common parameter to justify action: the multiple dimensions of cost accounting, including simple payback, first costs and operation maintenance costs incurred by the local government, and the distribution of cost burden amongst stakeholders.
- Explore the potential of setting up a Green Revolving Loan Fund.
- Study the impacts of financial incentives on behaviour change.

Lead by Example

- Reduce local government building energy use.
- Transition the local government fleet to electric vehicles.

Land Use and Transportation

- Establish a benchmark for compact, complete neighbourhoods where dwellings are within a 10 minute walk from local services, and establish land use policies encouraging walking, bicycling and transit use.
- Implement OCP development guidelines that redirect growth towards core areas for increasing density, integrating residential and commercial uses in these key zones and requiring a dedicated neighbourhood transportation master plan.
- Identify key transportation targets, particularly for household vehicle kilometres travelled.
- Enable 'Open Streets', demonstrating residents' wide range of uses of neighbourhood streets.
- 'Mode split' target with a focus on transit use, carpooling, walking and cycling.
- Create a municipal sustainability/transportation planning program, to:
  - Implement a Smarter Travel Choices Program
  - Establish a taxi-bus rural public transit system
  - Encourage bio-diesel purchases

Buildings/Renewables/District Energy

- Put price signals in permit fees for both new construction and renovations.
- Incentivize "passivhaus" or near-net zero levels for most buildings.
- Decrease the carbon intensity of the energy supply through decarbonisation.
- Target district energy in clustered developments or neighbourhoods over a certain square footage.

- Phase renewable energy sources into both new and existing buildings – geo-exchange, ocean source, biomass, solar thermal, or liquid waste heat – with targets for all new developments as well as the existing community-wide building stock, and use planning tools such as development permit areas.
- Establish a community-wide district energy strategy, with neighbourhood-scale compact community planning. Draw on best practices from the Revelstoke Energy Corporation, Vancouver's Southeast False Creek Neighbourhood Utility and North Vancouver's Lonsdale Energy Corporation, each providing district energy and other services, to establish a community energy organization (e.g. utility).
- Account for the embodied energy and carbon in the construction of buildings and the manufacture and distribution of goods and services.

Solid Waste

- Reduce the volume of waste and recyclables that enter the waste stream, and divert waste from disposal through composting and recycling.
- Nurture a 'zero waste' culture throughout the community, fostering a broad zero waste ethic regarding consumption and management of materials over their full life cycles.

Agriculture/Food and Forestry

- Create an 'agricultural development centre', supporting greater local food production and agricultural practices. Ensure equal access to healthy, local food, and with the related food infrastructure and green jobs in production, processing, storage, distribution, and waste management.
- Strengthen the community's tree networks and forests as a way of sequestering carbon, enhancing the beauty of parks and streets, and building the community`s resiliency to heat waves and extreme precipitation events.

Public Education and Outreach

- Create a public education and outreach strategy.
- Create greater public awareness of local, regional and global climate change trends, including the causes of, anticipated impacts of, and recommended local responses to climate change.
- Increase general awareness of climate change and sustainable energy, and the many co-benefits of a sustaining lifestyle and related behavioural choices - priorities such as health and liveability, transportation efficiency and local job creation.
- Educate and support activities in each community that encourage lifestyle and behavioural changes by promoting healthy lifestyles, enhancing safety, building community, fostering resiliency, and reducing resident and business energy expenditures.

Partnerships and the Green Economy

- Encourage collaboration and partnership with the Province, the Federal Government, utilities, as well as businesses, non-governmental organizations and the broader community.
- Use an energy and emissions lens in economic development partnerships with business and industry.
- Target an increase in green jobs, including setting up 'green enterprise zones' in which to cluster green companies and organizations, and explore innovative building and landscape design.

Policy and Strategy Observations for B.C. Local Governments

Based on the initial scan of the selected European and B.C. communities in this paper, the path toward developing lower carbon communities can be challenging. There are also a number of opportunities for significant climate action. Emerging from the investigation of low carbon European communities and communities in B.C. that are actively working towards achieving greenhouse gas reductions targets, some of these opportunities include:

1. **Local and Senior Government Collaboration** – Senior governments play a key role in providing communities with supportive legislation and policies, encouraging compact, complete communities, supporting local governments in generating renewable energy projects, and encouraging collaboration and cooperation amongst local governments.

2. **Compact, Mixed-use Neighbourhoods** – Local governments have substantial influence and control over land use within their jurisdictional boundaries. Tools such as urban containment boundaries, development permit areas or green enterprise zones enable local governments to establish or direct new growth into mixed-use, compact neighbourhoods, enabling district energy systems and walking and cycling accessibility.

3. **Efficient, Effective Energy Systems** – Retrofitting existing buildings, establishing the business cases for district energy 'hubs' of complete neighbourhoods, and exploring community-wide applications of renewable energy (as well as integrated resource recovery) are well-established hallmarks of many European communities. District energy considerations include exploring the:
   - Potential for municipally-owned utilities;
   - Use of biomass or biogas-based energy systems in many of B.C.'s small, rural communities;
   - Sufficient scale to enable combined heat and power; and
   - Overall 'integrated' approach to energy solutions (i.e. QUEST – see Appendix 2)

4. **Integrated and Multi-modal Transportation Systems** – Consider a range of transportation modes for residents, and developmentary strategies to move goods and services more efficiently, enable pedestrian and cycling infrastructure, and develop efficient transportation corridors and a network of multi-modal transfer stations.

5. **The Green Economy** – B.C. communities continue to support the growth of the green economy. Examples include establishing green enterprise zones that support eco-friendly tourism, promote renewable energy resources, and generally support localized green economic development, including producing, distributing and consuming goods and services locally.

6. **Maintain the Integrity and Economic Productivity of Agricultural and Forest Lands** – Forests as a carbon sink, and the local 'farm gate to dinner plate' approach to food systems are strategies that have the potential to generate significant GHG emissions reductions while having many co-benefits.

Wind turbines

Conclusion

This paper has looked at a sampling of well-established low carbon European communities, and drawn on the modelling experiences of those B.C. communities to-date that have targeted GHG reductions beyond 2040. It has identified a simple community vision (figure 8) for a low carbon future, and made some observations on the kinds of progressive strategies and actions that could further assist communities in achieving a 'made-in-B.C.' low carbon future.

Planning for a low carbon future is the big step. At the writing of this paper, the majority of B.C. local governments had completed and started to implement integrated community sustainability planning (ICSP), climate action plans or community energy and emissions plans (CEEPs). Continued effort will be needed by communities as they work toward their own climate action targets and beyond. Lessons from other progressive communities both locally and internationally will support communities to conserve energy, reduce GHG emissions, and achieve a low carbon future.

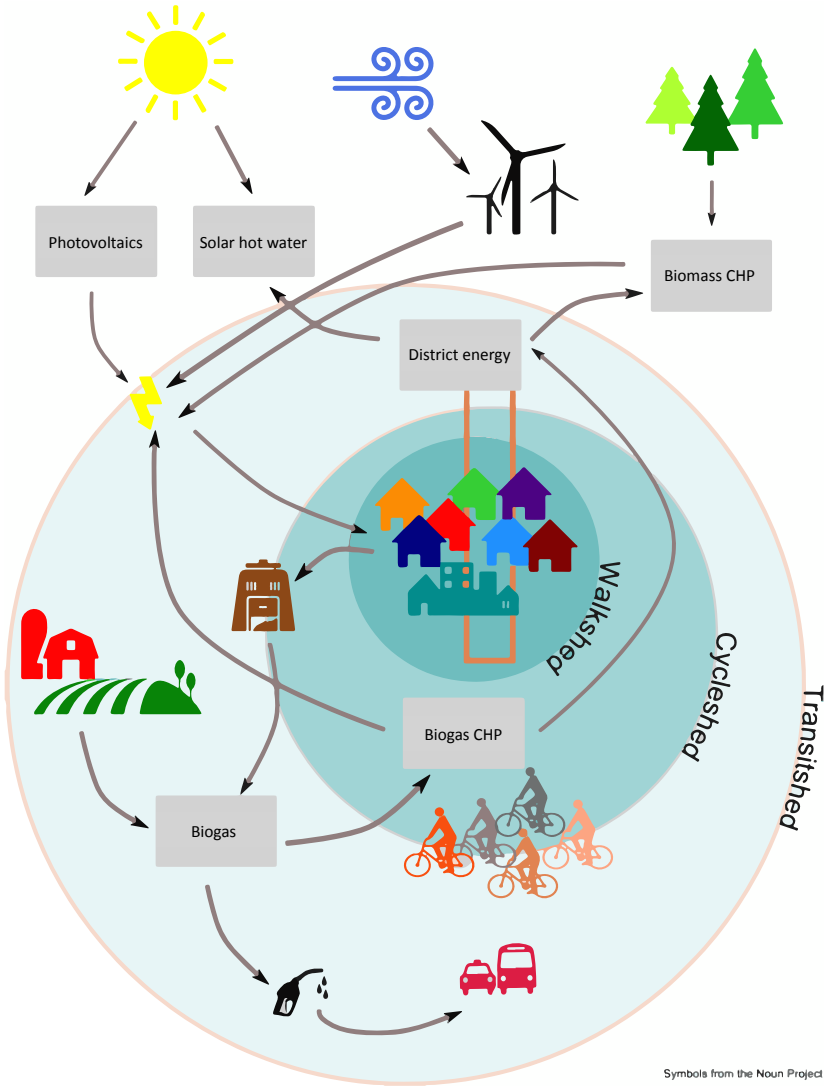


Figure 8: A low carbon vision

Appendix 1: Common Actions Using GEPHI

Key actions for North Cowichan, Nelson, North Vancouver and Vancouver were entered into a GEPHI database, a software program designed for analysing relationships. Some liberty was taken to classify actions into common groupings. As long as the intent of an action appeared similar from one municipality to the next, the same term was used. For example, "VKT reduction" was described in different ways in the different plans. GEPHI generates an analysis of the most common terms or nodes, represented by size. Notably, district energy had the most references (5), followed by renewable energy and VKT reduction (4 each), while support for infill development, cycling and walking infrastructure, residential energy efficiency, and local food each had 3 references.

Figure 9: Illustration of common actions between municipalities

Appendix 2: Related Initiatives

Quality Urban Energy Systems of Tomorrow (QUEST)

In 2010, QUEST National commissioned the **Potential Study: The capacity for Integrated Community Energy Solutions policies to reduce urban greenhouse gas emissions** (http://www.questcanada.org/potential-study). This report presents an analysis of policies that encourage integrated community energy solutions (ICES), and have impact on all urban sectors of the economy: residential, commercial, urban and intercity personal transportation, freight transportation, waste and water. The study also used community archetypes to model the impact of ICES policies on Canada as a whole.

The cities selected as archetypes were used to analyze the different impact of the policies on small, medium, large, and emerging cities across Canada. It was estimated that Canada's urban greenhouse gas (GHG) emissions could be reduced 5-12% by 2050 through the application of policies that encourage integrated urban energy solutions (ICES).

In early 2013, the QUEST B.C. Caucus commissioned the **B.C. Integrated Community Energy Solutions (ICES) Progress Report** (http://questcanada.org/sites/default/files/publications/ICES%20Progress%20Report%20-%20Province%20of%20bc.pdf). The report showcases the legislation, policies, tools, resourcefulness and best practices that B.C. communities are involved in as they work to fulfill their many climate action and energy-related commitments.

Meeting the Climate Change Challenge (MC3)

Also in early 2013, **Meeting the Climate Change Challenge (MC3)** (http://www.mc-3.ca/) brought together researchers, practitioners and policy-makers from non-governmental organizations, provincial ministries, and three of B.C.'s universities to research some of the best practices and innovations in community climate change responses from eleven (11) of British Columbia's leading local governments, all to facilitate peer-to-peer learning exchanges, and stimulate the widespread knowledge mobilization needed to move communities beyond the changes required by current legislation and policies. Twelve forward-looking recommendations were made to support communities in their climate action efforts.

Sustainable Cities Strategic Review

The Province of B.C. and key stakeholder organizations, including academia, have looked to other countries for examples of best practices. One such study is **Sustainable Cities Strategic Review** (http://www.sustainabilitysolutions.ca/projects/sustainable-cities-strategic-review/203): a joint partnership between Sustainability Solutions Group and Royal Roads University, with support from the Capital Regional District and the City of Calgary. A scan of international best practices was completed that included Copenhagen, Sydney, Portland, Vaxjo, Malmo and London. Case studies were developed for each of the six international cities.

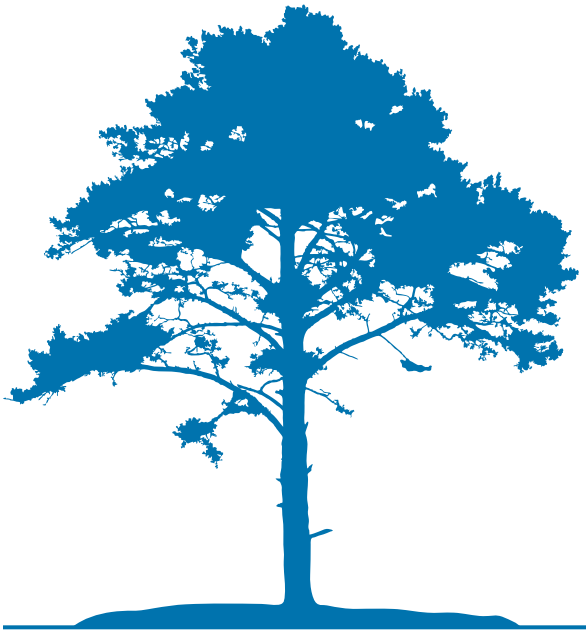
Illustrated Guide to Community Energy

The Illustrated Guide to Community Energy (http://web.forestry.ubc.ca/calp/CALP_CommunityEnergyGuide_highRes.pdf) is a tool created by the University of British Columbia's (UBC's) Collaborative for Advanced Landscape Planning (CALP) for facilitating an exploration of sustainable energy systems at four different levels, including the block, neighbourhood,

municipality and region. Using compelling graphics, maps and innovative research the guide addresses some of the most commonly considered aspects of community energy, including GHG emissions, cost and energy supply and demand. The guide visually demonstrates the “how, what and why” of community energy systems and includes two case study models for neighbourhoods in the cities of Richmond and Surrey, B.C..

CEEP Research Summary

Community Energy and Emission Planning is a relatively recent activity by local governments in Canada, with the majority of active plans today having been initiated since 2008. The Community Energy Association (CEA) analyzed and compared 30 urban, rural and First Nations Community Energy and Emissions Plans (CEEPs) that have been completed in Canada - http://www.communityenergy.bc.ca/sites/default/files/CEEP%20Research%20Summary%2020130807.pdf - using this information to better understand the critical attributes of these plans, to inform policies and actions being contemplated by current and future CEEP processes and to help ensure their successful implementation.



Exploring Transformational Change

Local Government Climate Change Pathways to 2050

Biomass district energy system

BRITISH COLUMBIA