REGIONAL DISTRICT OF NANAIMO

COMMUNITY ENERGY AND EMISSIONS PLAN

PARTNERS FOR CLIMATE PROTECTION MILESTONES 1–3

April 2013

Editorial + Design uncover

REGIONAL DISTRICT OF NANAIMO

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This Community Energy and Emissions Plan is the outcome of a long-term collaborative effort between the Regional District of Nanaimo and the municipalities of the City of Nanaimo, the District of Lantzville, the City of Parksville, and the Town of Qualicum Beach.

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EXECUTIVE SUMMARY

Greenhouse gas emissions in the Regional District of Nanaimo exceeded 913,000 tonnes CO_2e in 2007, as the population across the electoral areas[1] and the member municipalities (City of Nanaimo, City of Parksville, Town of Qualicum Beach, and District of Lantzville) approached 140,000 people.

The largest share of emissions in the region today comes from the transportation sector, with 63% of all emissions coming from personal and commercial vehicles. Residential, commercial, and small industrial buildings contribute a significant share with 24% of total emissions. Decomposition of solid waste contributes less than 2% of emissions, and emissions associated with deforestation and agriculture contribute the remaining 11%.

If business-as-usual trends prevail into the future, the region's population will increase to over 250,000 people in 2050, and emissions will surpass 1.2 million tonnes per year. Scientific consensus suggests that to avert the most adverse effects of climate change we require a dramatic altering of the business-as-usual trajectory, with future emissions necessarily falling to 80% below 2007 levels by 2050. Achieving this target means that emissions in the Regional District of Nanaimo in 2050 would be approximately 162,000 tonnes, representing a per capita reduction from today's measure of about 6 tonnes per person to 1.2 tonnes per person in 2050.

It is difficult to imagine the change necessary in our communities to reach this target, but that is what this plan provides. The plan acknowledges that this is an aspirational target and it may not be possible to achieve such dramatic reductions over the next generation. However, if the science surrounding climate change is correct, it is important for all residents to understand what is ultimately necessary if the Regional District of Nanaimo is to participate meaningfully in a global effort to reduce greenhouse gas emissions.

On a positive note, it is important to recognize that each emission reduction measure taken by governments and community members results in a range of other community co-benefits, ranging from financial savings on energy expenditures and reduced vulnerability to volatile energy process, to biodiversity conservation and better access to transit, local goods and services.

This plan has no regulatory force. It is simply a tool to arm the community with the knowledge of the sorts of actions that can make homes more efficient, vehicles less necessary, communities more compact, and rural areas more biologically diverse and productive.

No single level of government has the tools at its disposal to reach an 80% reduction target on its own. Success can only be had if all levels of government work in unison toward this common goal. For this to take effect, a groundswell of demand for action must rise from communities and residents. If this plan provides a better understanding of the level of effort required, and encourages residents to take action in their own lives and support decisions by elected representatives to reduce community emissions, then the likelihood of achieving a dramatic reduction in emissions increases enormously.

[1] Electoral areas include A, C, E, F, G and H. Electoral Area B (Gabriola, DeCourcy, and Mudge islands) is not included in the inventories and forecasts in this plan.

Ultimately, and most importantly, it is citizens—not just from the Regional District of Nanaimo, but from across Canada—who will determine whether the 80% reduction target is met.

1 / INTRODUCTION

1.1 WHAT IS A COMMUNITY ENERGY AND EMISSIONS PLAN?

This Community Energy and Emissions Plan (CEEP) provides an understanding of energy use and resulting greenhouse gas (GHG) emissions in the Regional District of Nanaimo. The plan responds to current scientific findings on climate change and sets an emissions reduction target consistent with international and provincial aspirations to reduce emissions by 80% below 2007 levels by 2050. The plan also describes the actions that will reach this target, providing strategic guidance for decision making now and into the future.

In addition to reducing the region's contribution to global environmental change, managing energy use and reducing GHG emissions provides many community benefits, including:

- Reduced energy costs: Ongoing energy expenditures can be reduced with investment in efficiency and alternative sources.
- Reduced vulnerability to energy markets: Reduced dependence on fossil fuels lessens exposure to volatile energy supplies and prices.
- Economic development: Meeting energy needs with efficiency improvements and renewable sources, and applying mitigation measures that feature innovative approaches to land management, will spur innovation, investment, employment, and business opportunities.
- More resilient communities: Activities that support energy conservation align with other community objectives, such as building compact and complete communities, more efficient infrastructure, walkable neighbourhoods, and protection of farmland and natural areas.

1.2 STAKEHOLDER PARTICIPATION

The development of this CEEP began in 2005. In the initial years of development, considerable discussions took place between the RDN and member municipalities, particularly concerning appropriate targets for future community emissions. At that time, proposed actions were targeting a 14% increase in emissions over 2002 levels by 2012, with no target for emissions beyond that time frame.

This direction presented several challenges. Closing in on 2008, there were not enough years to implement the actions recommended in early drafts of the plan. At the same time, the scientific community grew increasingly emphatic about the need for much deeper reductions over a more prolonged period of time: an 80% reduction below 2000–2007 levels by 2050 was considered necessary to avoid some of the more severe effects of climate change. As a result, the provincial government initiated its Climate Action Plan, which set those same aggressive targets for the Province of BC and required local governments to likewise establish targets in official community plans and regional growth strategies.

As a matter of expedience, and to acknowledge that targeting a lesser reduction may be inadequate from a scientific perspective, the Regional District of Nanaimo and member municipalities incorporated the 80% reduction target into the region's various OCPs and the RDN Regional Growth Strategy. Given the magnitude of action needed to reach these targets, they were considered aspirational in nature, and the RDN and member municipalities felt it necessary to immediately turn their attention to whatever opportunities were available to implement projects in the building, transportation, and solid waste sectors.

This turn to action delayed completion of this CEEP, but has led to significant success on the ground, all with considerable public and local government involvement and support.

Most notably, in the building sector, the RDN implemented a green building action plan, which includes research into alternative building types and residential energy sources and provides information and inspiration to residents on how energy use and emissions in the home can be reduced or eliminated. The plan also provides for a popular green building incentive program.

Related to the building sector, since 2005 the RDN has updated the Regional Growth Strategy and several Official Community Plans. These are projects that very closely involve members of the public as well as other stakeholders. Addressing climate change has been a strong theme in these efforts, particularly through the revision of the Regional Growth Strategy that has as its first goal: *Prepare for Climate Change and Reduce Energy Consumption.*

In the transportation sector, the RDN has committed to major expansions in the public transit service it operates. If successful, by 2018 the regional transit network will have doubled its 2009 service levels. The planning for this expansion has involved the public, local elected officials, and BC Transit—a provincial organization responsible for coordinating transit across BC.

In addition to provision of public transit, the RDN and member municipalities have increasingly supported the deployment of electric vehicles in the region. Local governments have introduced electric vehicles into their corporate fleets, and recent planning and development initiatives will result in 24–30 publicly accessible Level 2 electric vehicle-charging stations in the region, with the greatest concentrations in the City of Nanaimo and the Town of Qualicum Beach. This planning process has closely involved each local government as well as private sector partners willing to host charging stations.

Finally, a program that results in thousands of tonnes of avoided annual emissions, and that involved comprehensive stakeholder engagement, is the region-wide curbside organic collection and diversion program. Through this program, every household in the region receives weekly collection of compostable organic waste, which is sent to a composting facility rather than the landfill. This virtually eliminates the production of methane

Stakeholders in the RDN are eager to take action and implement innovative projects if a broad range of benefits are evident.

through decomposition. Public support for the program is overwhelmingly positive, and has resulted in growth and diversification in the private waste management sector in the region.

Important from a stakeholder engagement perspective, the justification for these projects has focused more broadly on a full range of community co-benefits, rather than solely on the benefits of emissions reduction. This highlights a critical issue, namely that stakeholders in the RDN are eager to take action and implement innovative projects if a broad range of benefits are evident. Focusing narrowly on emissions reduction is less effective and ultimately less important than focusing on the numerous and often more tangible benefits that community members can see as these programs are developed. While it is important to highlight to our residents and businesses how the RDN and member municipalities are taking steps to reduce local vulnerability and contribution to climate change, this is often better received when it is featured as an additional benefit rather than a driving force.

1.3 PROJECT CONTEXT

1.3.1 National Context

The Federation of Canadian Municipalities (FCM) is the national voice of municipal government, representing almost 2,000 members. FCM's Partners for Climate Protection (PCP) program is a network of Canadian municipal governments that have committed to reducing greenhouse gases and acting on climate change. The Regional District of Nanaimo as well as the City of Nanaimo endorsed participation in the PCP in 2002, with the City of Parksville, the Town of Qualicum Beach, and the District of Lantzville joining in 2007.

The PCP program uses a framework of five milestones to guide municipalities to reduce greenhouse gas emissions. The milestone process is a performance-based model that provides opportunities for local government capacity building.

The five milestones are:

1. Creating a greenhouse gas emissions inventory and forecast
2. Setting an emissions reduction target
3. Developing a local action plan
4. Implementing the local action plan or a set of activities
5. Monitoring progress and reporting results

The overall objective is to reduce GHG emissions, resulting in the benefits of reducing the region's impact on climate change, developing more resilient and self-sufficient communities, saving money, and preparing for a low-carbon future.

1.3.2 Provincial Context

In 2007, the Province of BC set province-wide greenhouse gas reduction targets of 33% below 2007 levels by 2020, and 80% by 2050.[2] In addition, the Province amended the Local Government (Green Communities) Statutes Amendment Act (Bill 27, 2008) to read:

- LGA 850 - Required Content of a Regional Growth Strategy: (2)(d) to the extent that these are regional matters, targets for the reduction of greenhouse gas emissions in the Regional District, and policies and actions of the local government proposed for the Regional District with respect to achieving those targets.
- LGA 877 (3) - An official community plan must include targets for the reduction of greenhouse gas emissions in the area covered by the plan, and policies and actions of the local government proposed with respect to achieving those targets.

In May 2008, the Province of BC and the Union of BC Municipalities (UBCM) introduced the voluntary Climate Action Charter. Signatory local governments commit to measuring and reporting community greenhouse gas emissions, working to create compact, more energy-efficient communities, and to make progress toward becoming carbon neutral with respect to their operations by 2012. The RDN signed the Charter in 2008.

In response, the RDN and member municipalities have worked collaboratively to develop this Community Energy and Emissions Plan and have incorporated the province-wide emissions reduction targets into Electoral Area Official Community Plans (OCPs) and the Regional Growth Strategy (RGS).

[2] This target is defined in the Greenhouse Gas Reduction Targets Act (Bill 44, 2007).

We recognize that significant emission reductions are possible if local governments work together on policies and programs that link land use, transportation, and energy use.

1.3.3 Regional Context

Up to half of Canada's GHG emissions are under the direct or indirect control of local governments. The RDN and its municipal partners recognize that significant emission reductions are possible if local governments work together on policies and programs that link land use, transportation, and energy use, that inform residents on the benefits of undertaking emission reduction measures, and that provide assistance implementing those measures. This reflects an integrated approach to collaboration across the region that will help ensure success in each community.

The RDN's role in directly reducing energy use and emissions across the region is largely focused on managing growth and development in Electoral Areas, providing regional transportation services, and incorporating alternative energy production into solid and liquid waste management.

The RDN also builds consensus around growth and development in urban areas through the Regional Growth Strategy, though the member municipalities make all land use decisions within their boundaries.

Actions taken by senior levels of government are crucial to realizing regional emissions reduction since jurisdiction over factors such as building codes, the emission intensity of our energy supply, and vehicle fuel efficiency standards are provincial and federal responsibilities.

Ultimately, and most importantly, it is citizens—not just from the Regional District of Nanaimo, but from across Canada—who will determine whether the 80% reduction target is met. As grassroots support grows from within our communities, governments at all levels will have the mandate to implement a full suite of emission reduction measures.

In the meantime, the Regional District of Nanaimo will continue to collaborate with member municipalities and senior levels of government and use the tools at its disposal, including outreach and communications to build awareness, incentives to encourage action, and, where appropriate, regulations to guide change toward more energy-efficient and independent regional communities.

1.4 COMMUNITY PROFILE

The Regional District of Nanaimo is situated within the traditional territory of several First Nations, including three that have villages and other lands under their jurisdiction: Snuneymuxw, Snaw-Naw-As, and Qualicum First Nation.

As a Local Government, the Regional District of Nanaimo is a regional federation of four municipalities and seven electoral areas. The municipalities are the City of Nanaimo, the City of Parksville, the Town of Qualicum Beach, and the District of Lantzville.

The electoral areas are:

- A: Cedar, South Wellington, Yellowpoint, Cassidy
- B: Gabriola, DeCourcy, Mudge Islands
- C: Extension, Nanaimo Lakes, East Wellington, Pleasant Valley
- E: Nanoose Bay
- F: Coombs, Hilliers, Errington, Whiskey Creek, Meadowood
- G: French Creek, San Pareil, Little Qualicum
- H: Bowser, Qualicum Bay, Deep Bay

Covering approximately 207,000 hectares on the central east coast of Vancouver Island, the Regional District of Nanaimo sits within an ecologically diverse and globally significant bioregion containing interconnected habitats ranging from marine, coastal, river, stream, lake, wetland, and estuary ecosystems to fertile forests and mountainous alpine and sub-alpine ecosystems. These habitats support an abundance of terrestrial, aquatic, and marine life.

A significant portion of the RDN lies within the Coastal Douglas Fir zone—one of the most rare ecosystem complexes in BC. The important values of this endangered ecosystem resulted in over a third of the RDN being designated as the Mount Arrowsmith Biosphere Reserve.

Approximately 10% of the RDN's land base is within the provincially designated Agricultural Land Reserve (ALR), with some additional lands being farmed outside the ALR. Most of the region is comprised of lands intended for agriculture, forestry, and other primary industries and activities conducted in a rural environment rich in natural resources.

The region's rural areas are characterized by large parcels, on-site servicing, and minimal access to public transit, with most goods and services provided in nearby rural village centres or the region's more urban communities.

One of the challenges the region faces in reducing energy use and emissions is that the rural nature of our communities tends to come with high use of

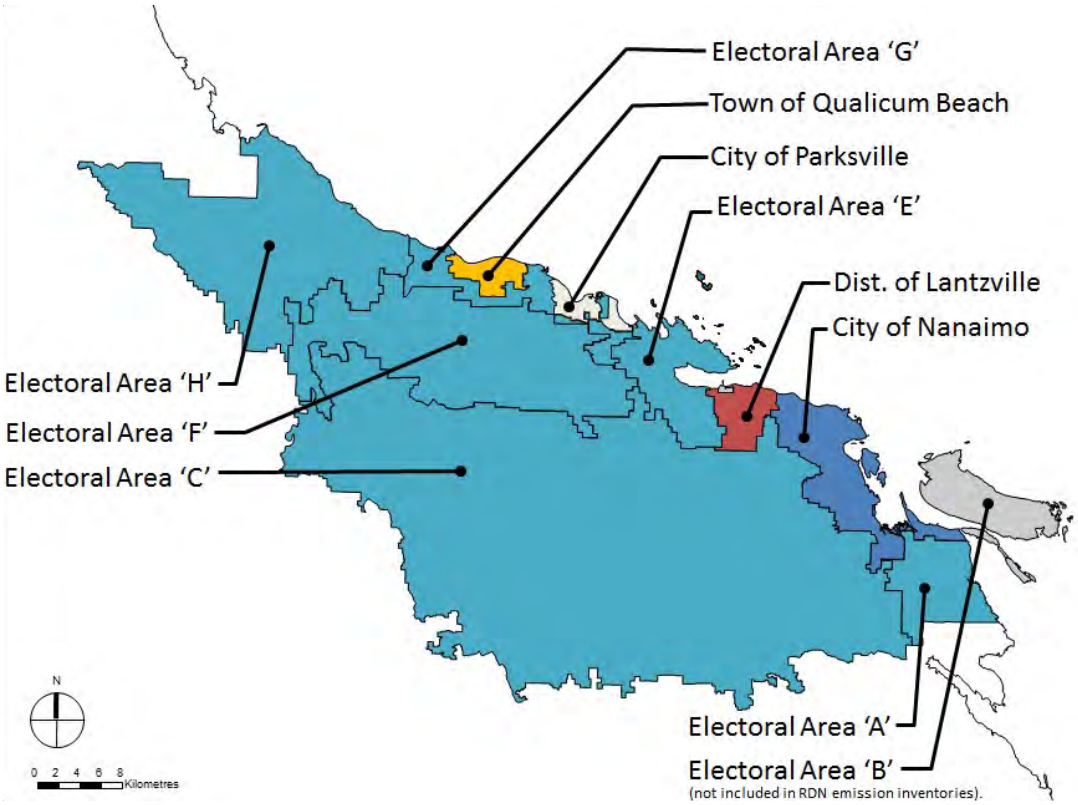


Figure 1: Regional District of Nanaimo

private automobiles. Addressing this challenge involves complementing traditional reduction measures with policies that have a uniquely rural focus:

- Enabling alternative forms of rural development that are compact, energy efficient, and that protect the forested ecosystems that remove carbon from the atmosphere
- Encouraging local, renewable energy production and use
- Providing transportation options to all residents of the region, including public transportation services, and facilitating the transition to low- or zero-emission vehicles
- Protecting the rural character of the region by focusing the majority of development in urban areas or designated village centres

With a population of approximately 140,000 people, the RDN is the second most populous regional district on Vancouver Island, accounting for 18% of the total population of the island. BC Stats[3] has projected the population in the RDN to increase 49% by 2031 (approximately 1.77% annually) to over 210,000 people.

[3] BC Stats periodically revises population forecasts, projections, and growth rates. For the most recent projections, visit the BC Stats website: www.bcstats.gov.bc.ca

2 / ENERGY AND EMISSIONS INVENTORY

2.1 SUMMARY OF RDN BASELINE INVENTORY (2007)

As part of its Climate Action Plan, the provincial government has produced Community Energy and Emission Inventory (CEEI) reports for every jurisdiction in BC. For the year 2007, this includes inventories for the Regional District as a whole, a consolidated inventory for the unincorporated electoral areas, and an inventory for each member municipality. Complete CEEI Reports for all jurisdictions in the RDN are included in Appendix 1.

In 2007, total GHG emissions in the Regional District of Nanaimo[4] were estimated at 919,900 tonnes[5] CO_2e.[6] With approximately 140,000 residents, this amounted to almost 6.6 tonnes of CO_2e per person. This inventory does not include emissions arising from some major industrial sources in the region that are withheld for privacy reasons, and is therefore a conservative estimate. This total does include emissions from land use change and agriculture, which is attributed to the region as a whole rather than to individual jurisdictions. Table 1 shows population and total emissions for each member municipality as well as the electoral areas, and regional emissions from land use change and agriculture for 2007.

To complement this work by the Province of BC, the Regional District of Nanaimo hired a consultant team to provide an emission inventory for each of the six electoral areas in the region, summarized in Table 2.

[4] Not including Electoral Area B and First Nation communities. The Islands Trust is responsible for planning for Electoral Area B.

[5] Data taken from 2007 Community Energy and Emissions Inventory (CEEI), BC Ministry of Environment, and includes over 6,000 tonnes of emissions attributed to industrial buildings not counted elsewhere. www.env.gov.bc.ca/cas/mitigation/ceei/reports.html

[6] CO_2e is carbon dioxide equivalent—the universal unit of measure for greenhouse gas emissions. Appendix 3 describes CO_2e in more detail and outlines how emissions are converted to tonnes of carbon dioxide equivalent.

TABLE 1: TOTAL EMISSIONS BY JURISDICTION IN THE REGIONAL DISTRICT OF NANAIMO (CEEI REPORTS)

Jurisdiction	Population Estimate (2007)*	Proportion of Total RDN Emissions	Emissions (tCO_2e)
City of Nanaimo	81,459 (59.3%)	 53%	480,421
City of Parksville	11,314 (8.2%)	 7%	65,760
Town of Qualicum Beach	8,618 (6.3%)	 5%	47,334
District Municipality of Lantzville	3,721 (2.7%)	 2%	19,986
Electoral Areas**	32,294 (23.5%)	 22%	198,645
Entire Region: Land Use Change and Agriculture	-	 11%	101,628
Total	**137,406**		**913,414*** **

* All population statistics from BC Stats 2006 Census Data.
** Does not include Electoral Area B. The Electoral Areas population is 2006 census data for Electoral Areas A, C, E, F, G and H, provided by BC Stats, with a growth factor of 1.24%.
*** The aggregated 2007 inventory for each jurisdiction does not match inventory for the region as a whole mainly due to a discrepancy in building-related energy use and emissions. The resulting difference equals 6,486 tonnes, or less than 1% of the total emissions for 2007.

TABLE 2: TOTAL EMISSIONS IN THE REGIONAL DISTRICT OF NANAIMO ELECTORAL AREAS*

Jurisdiction**	Population Estimate (2007)	Proportion of Electoral Area Emissions	Emissions (tCO_2e)
Electoral Area A: Cedar, Cassidy, South Wellington, Yellowpoint	6,835		42,042
Electoral Area C: Extension, Nanaimo Lakes, East Wellington, Pleasant Valley	2,539		15,619
Electoral Area E: Nanoose Bay	5,530		34,015
Electoral Area F: Coombs, Hilliers, Errington, Whiskey Creek, Meadowood	6,763		41,600
Electoral Area G: French Creek, San Pareil, Little Qualicum	7,110		43,700
Electoral Area H: Bowser, Qualicum Bay, Deep Bay	3,517		21,634
Total	**32,294**		**198,610*** **

* Data provided by the Sheltair Group (now Stantec).
** Does not include Electoral Area B.
*** The aggregated 2007 inventory for the Electoral Areas here differs from those provided in the provincial CEEI reports by 35 tonnes, an insignificant difference.

2.2 2007 BASELINE INVENTORY (DETAIL)

Delving into deeper detail, this section itemizes emissions by sector and source. The sectors include emissions from the operation of residential, commercial, and industrial buildings, on-road transportation, and the decomposition of solid waste generated within the community.

The sources refer to the different types of fuel used in each sector. The major sources of greenhouse gas emissions in the RDN are electricity, natural gas, heating oil, diesel fuel, and gasoline. Methane from the decomposition of waste in landfills and the agricultural sector is also a significant source of GHG emissions, and land use change that results in deforestation limits the ability of natural systems to draw CO_2 from the atmosphere.

Table 3 lists energy use and emissions for each sector and source for the RDN as a whole. Emissions from the transportation sector represent the largest share of emissions in the region, comprising almost two-thirds of all emissions. The building sector is a significant source of emissions, representing almost a quarter of regional emissions in 2007. The remaining emissions were generated by the decomposition of solid waste, land use change, and the agricultural sector.

It is revealing to examine these emissions in relation to total energy use by source. Table 3 illustrates that gasoline in the transportation sector and electricity in the building sector are almost equal in terms of use, but our consumption of gasoline produces more than ten times the emissions than electricity. More generally, a comparison of energy use and emissions in the building and transportation sectors reveals that while buildings require 18% more energy to operate than vehicles in the Regional District of Nanaimo (10.3 million GJ for buildings versus 8.5 million GJ for vehicles), our use of vehicles produces more than 2.5 times the emissions as our buildings.

This imbalance is due to the fact that buildings tend to rely on electricity and in some cases natural gas for operations and space heating, which are lower-emission energy sources compared to the gasoline and diesel we burn to run our vehicles. Figure 2 illustrates the total emissions generated in consuming one gigajoule of the most common fuel types. Importantly, this shows that residents of BC are fortunate to have most of our electricity generated by very clean hydro power. Wood is excluded from this comparison since it is considered a carbon neutral fuel—its use does not involve transferring ancient carbon once stored in geological reserves into the atmosphere.

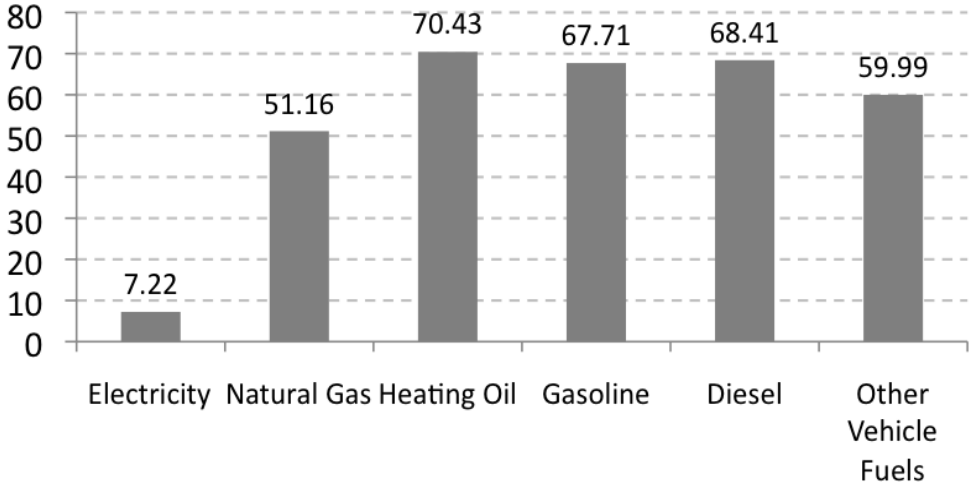


Figure 2: Emissions per Unit Energy (kg CO_2e/GJ)

TABLE 3: ENERGY USE AND EMISSIONS BY SECTOR AND SOURCE IN THE REGIONAL DISTRICT OF NANAIMO (2007)*

Sector	Source	Energy Use (GJ)	Emissions (tCO_2e)	Proportion of Total RDN Emissions	Emissions (tCO_2e)
On-Road Transportation	Gasoline	6,634,465	453,006	 63%	581,097
	Diesel	1,792,039	126,321		
	Other Fuel	44,258	1,770		
Buildings	Electricity	6,153,738	42,165	 24%	222,158
	Natural Gas	2,219,149	113,177		
	Propane	141,464	8,631		
	Heating Oil	820,187	57,815		
	Wood	999,861	370		
Solid Waste	Community Solid Waste	-	15,377	 <2%	15,377
Land Use Change and Agriculture	Deforestation - Settlement	-	83,158	 11%	101,268
	Deforestation - Agriculture	-	12,482		
	Enteric Fermentation	-	5,628		
Total		**18,805,161 GJ**			**919,000 tCO_2e**

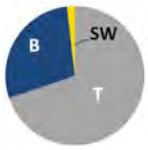
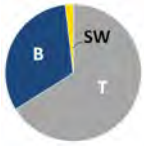
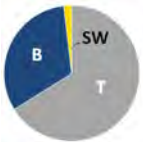
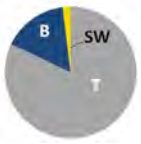
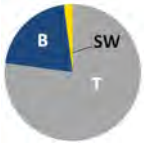
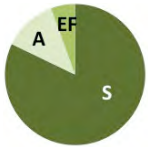
* Data provided by the Province of BC's Community Energy and Emissions Inventory (CEEI).

Looking at each jurisdiction, it is clear that total emissions relate very closely to population. This is reflected in Table 4. For example, with an estimated population of 81,459 in 2007, the City of Nanaimo is home to almost 60% of all RDN residents and is responsible for approximately 53% of regional emissions from all sources.[7] Total energy use and emissions are in relative proportion to population across the rest of the RDN.

Emissions associated with land use change and agriculture are not attributed to a single jurisdiction but are calculated for the region as a whole.

[7] Wood used as a fuel in buildings is excluded from this comparison in Table 4 and Table 5 since it is considered a carbon neutral fuel.

TABLE 4: EMISSIONS BY JURISDICTION AND SECTOR IN THE REGIONAL DISTRICT OF NANAIMO (2007)*

Jurisdiction and Population	Sector	Energy Use (GJ)	Emissions (tCO_2e)	Sector Emissions Proportional	Emissions (tCO_2e)
City of Nanaimo 81,459 pop. (59.3%)	On-Road Transportation	4,890,269	335,489		480,421 (53%)
	Buildings	5,429,887	136,228		
	Solid Waste	-	8,704		
City of Parksville 11,314 pop. (8.2%)	On-Road Transportation	636,443	43,492		65,760 (7%)
	Buildings	863,968	21,029		
	Solid Waste	-	1,239		
Town of Qualicum Beach 8,618 pop. (6.3%)	On-Road Transportation	476,154	32,487		47,334 (5%)
	Buildings	563,495	13,907		
	Solid Waste	-	940		
District Muni. of Lantzville 3,721 pop. (2.7%)	On-Road Transportation	238,718	16,399		19,986 (2%)
	Buildings	171,441	3,202		
	Solid Waste	-	385		
Electoral Areas** 32,294 pop. (23.5%)	On-Road Transportation	2,228,731	153,230		198,645 (22%)
	Buildings	2,320,195	41,306		
	Solid Waste	-	4,109		
Entire Region: Land Use Change and Agriculture***	Deforestation - Settlement	-	83,158		101,268 (11%)
	Deforestation - Agriculture	-	12,482		
	Enteric Fermentation	-	5,628		
Total		**17,819,301**			**913,414****

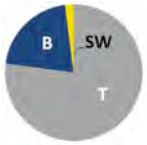
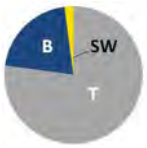
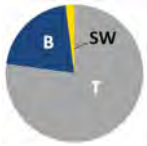
* Sector energy use and emissions data provided by the Province of BC's Community Energy and Emissions Inventory (CEEI).
** Does not include Electoral Area B. The total differs by 35 tonnes from the aggregated inventory provided in the CEEI report for the RDN's unincorporated areas, an insignificant amount.
*** Emissions attributed to land use change and agriculture are not apportioned to any individual jurisdiction.
**** The aggregated 2007 inventory for each jurisdiction does not match inventory for the region as a whole due mainly to a discrepancy in building-related energy use and emissions. The resulting difference equals 6,486 tonnes, or less than 1% of the total emissions for 2007.

For Table 5, this same level of detail is applied to the Region's electoral areas.

It is clear that in all RDN jurisdictions the majority of emissions is generated by our use of vehicles. This reflects a region where a significant portion of the population lives in rural areas, and where lower-density single-family-detached neighbourhoods characterize even the urbanized areas, which are organized linearly along a major island transportation spine.

This reality highlights the challenge we face in reigning in emissions, and necessarily shapes the approach to implementing policies, programs, and other actions aimed at reaching a community-wide emissions reduction target.

TABLE 5: EMISSIONS BY JURISDICTION AND SECTOR IN THE REGIONAL DISTRICT OF NANAIMO ELECTORAL AREAS*

Jurisdiction*	Sector	Energy Use (GJ)	Emissions (tCO_2e)	Sector Emissions Proportional	Emissions (tCO_2e)
Electoral Area A	On-Road Transportation	471,791	32,430		42,042
	Buildings	499,279	8,742		
	Solid Waste	-	870		
Electoral Area C	On-Road Transportation	175,271	12,048		15,619
	Buildings	185,482	3,248		
	Solid Waste	-	323		
Electoral Area E	On-Road Transportation	381,710	26,238		34,015
	Buildings	403,949	7,073		
	Solid Waste	-	704		
Electoral Area F	On-Road Transportation	466,829	32,090		41,600
	Buildings	494,028	8,650		
	Solid Waste	-	860		
Electoral Area G	On-Road Transportation	490,799	33,700		43,700
	Buildings	519,395	9,095		
	Solid Waste	-	905		
Electoral Area H	On-Road Transportation	242,779	16,688		21,634
	Buildings	256,924	4,498		
	Solid Waste	-	448		
Total		**4,588,236**			**198,610****

* Data provided by the Sheltair Group (now Stantec).
** Does not include Electoral Area B.
*** The aggregated 2007 inventory for the Electoral Areas here differs from those provided in the CEEI reports by 35 tonnes, an insignificant difference.

3 / ENERGY AND GHG EMISSIONS FORECAST

3.1 RDN BUSINESS-AS-USUAL FORECAST

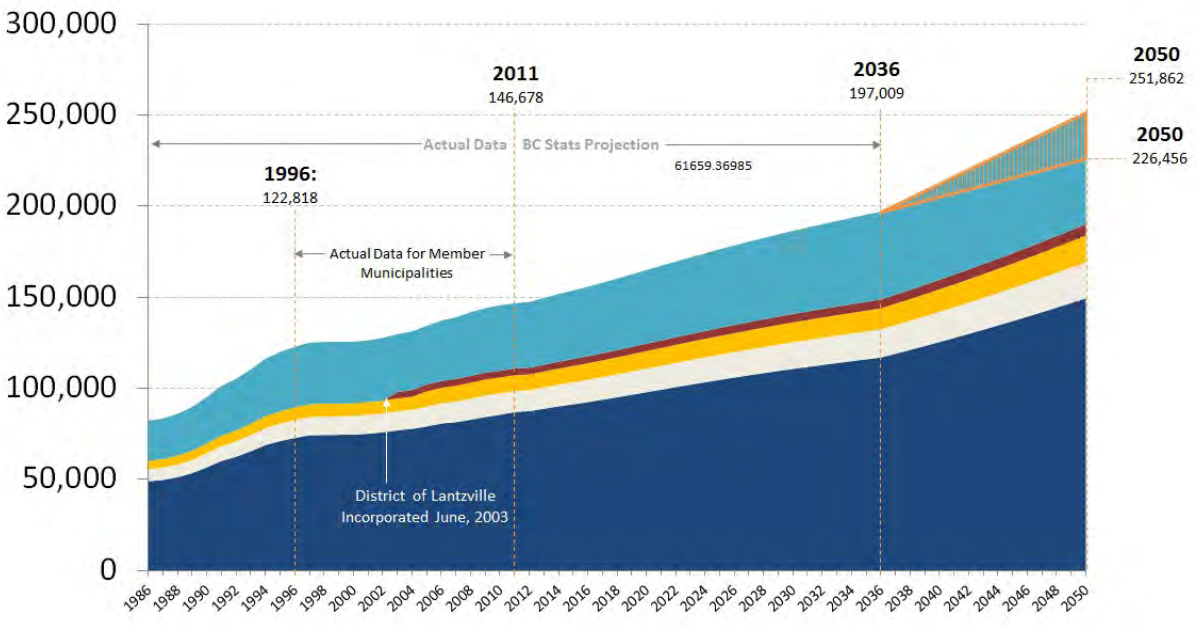
With an emissions inventory established for a base year, it is possible to estimate future emissions over time. This is because emissions will come from the same general sectors and sources in the future as they do today. The challenge in establishing a forecast lies in projecting broader changes within our communities, particularly population change, evolution in building codes and land-use regulations, and technological improvements in buildings, appliances, equipment, and vehicles.

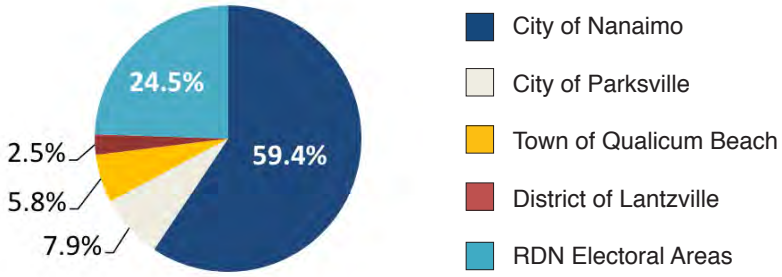
The business-as-usual forecast shown here begins with a reasonable population projection, using publicly available data from BC Stats.[8] For the building and transportation sectors, future energy use and emissions are estimated from known policy direction, most particularly the increasing energy efficiency requirements in the BC Building Code, and mileage standards for future vehicles. By 2025, the most significant effects of these policies will be apparent, after which more gradual impacts will reflect market response to price signals and the historic trend toward efficiency improvements over time. The important aspect of a business-as-usual forecast is that it is built around doing no more than what is presently anticipated. New policies intended to reduce energy use and emissions are excluded, as are local government opportunities to build more compact and efficient urban and rural communities.

3.1.1 Population Projection

The population projection is the foundation of a future emissions forecast. As population changes, the total number of buildings and vehicles also change. Inevitably, this impacts total energy use and emissions. Population estimates for all jurisdictions in the RDN, based on data from BC Stats, are illustrated in Figure 3. Since planning responsibility for RDN Electoral Area 'B' is the responsibility of the Islands Trust, population estimates for this area (based on census data from 1996, 2001, and 2006) have been subtracted from the total.

[8] BC Stats periodically revises population forecasts, projections, and growth rates. This section relies on data available between September 2012 and February 2013. For the most recent projections, visit the BC Stats website: www.bcstats.gov.bc.ca





(Top) Figure 3: RDN Population Projection (1986–2050)
(Above) Figure 4: Population Proportion by RDN Jurisdiction

For the period 1996–2011, actual population statistics are available for each member municipality as well as the RDN's unincorporated electoral areas. Prior to 1996 and after 2011, only regional population statistics are available. Therefore, the population for each jurisdiction during these periods is a best estimate.

Over the 1996–2011 period, the proportion of the total population in each jurisdiction remained remarkably constant with 59.4% of the regional population residing in the City of Nanaimo, 7.9% in the City of Parksville, 5.8% in the Town of Qualicum Beach, and almost 24.5% in the electoral areas. With the incorporation of the District of Lantzville in 2003, 2.5% of the regional population shifted from the electoral areas to that new municipality (Figure 4). Since a business-as-usual forecast is based on maintaining the status quo, these same proportions are applied to the total regional population for the 1986–1995 and 2012–2036 periods.

Beyond 2036, no population projections are available; however, this plan contemplates actions that are necessary to reduce emissions to 80% below 2007 levels by 2050. To estimate population after 2036, two scenarios were examined. The first is a modest growth rate scenario using a growth trend of 1% from 2036 to 2050. At this rate, the regional population reaches 226,456 in 2050. The second scenario projects regional growth to accelerate slightly after 2036. Increasing at a rate of 1.77% per year after 2036, the population reaches 251,862 in 2050. Erring on the side of caution, the RDN has used this accelerated growth scenario to anticipate future energy consumption and emissions, which therefore serves as the basis for the business-as-usual energy use and emission forecast that follows.

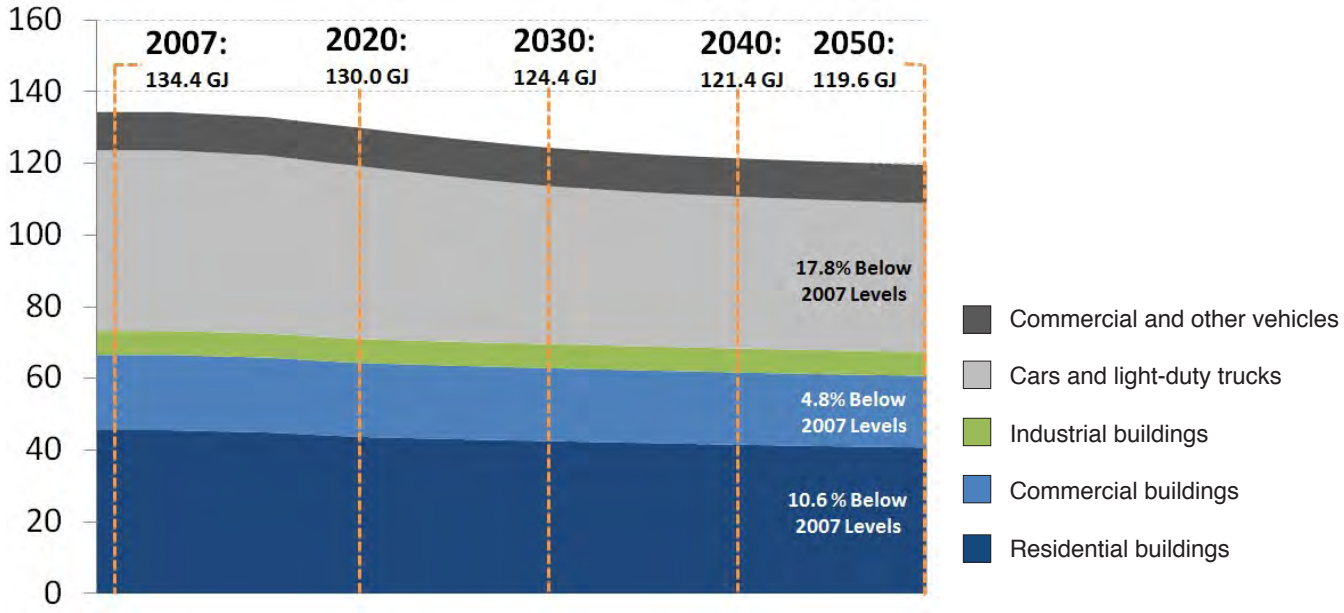


Figure 5: Per Capita Energy Use in the RDN (2006–2050)

3.1.2 Regional Energy Use and Emission Forecast

To generate a business-as-usual emission forecast to 2050, the Regional District of Nanaimo enlisted the services of a consultant team with expertise in the field. While the consultants' assumptions about energy use and emissions were reasonable, the population data in that study predicted the region to expand beyond 300,000 people by 2050. Since the study indicated much higher growth rates than those indicated by BC Stats, the RDN has instead used the BC Stats population estimate—applying it to the consultant team's per capita rates of energy use and emissions to forecast to 2050.

A gradual decline in the business-as-usual forecast for per capita energy use is shown in Figure 5. The most pronounced reductions occur in the cars and light-duty trucks sector (17.8% below 2007 levels by 2050); the commercial building sector (4.8% below 2007 levels by 2050); and the residential building sector (10.6% below 2007 levels by 2050). Changes in commercial vehicles and industrial buildings are negligible.

The impact on per capita emissions over time parallels reductions in energy use (Figure 6), though in the building sector the reduction in emissions is more pronounced than the reduction in energy use, with a 23% reduction in emissions below 2007 levels in commercial buildings and a 26.2% reduction in per capita emissions in residential buildings. Data is not readily available for industrial buildings in the region. In the transportation sector, following business-as-usual until 2050 produces a 17% decline in per capita emissions from cars and light-duty trucks compared to 2007 levels, and a 4.1% reduction in per capita emissions in commercial and other vehicles.

For both the transportation and building sectors, business-as-usual reductions are the combined effect of price signals (as the price of conventional energy sources rise, alternatives become more attractive and widespread), senior government mandates, and the gradual, incremental improvement in efficiency over time.

More specifically, in the transportation sector, reductions in energy use and emissions are attributable to an increasing share of smaller, hybrid, alternative fuel and electric vehicles in the general vehicle population. This shift is the result of a market-wide trend driven by increasing gasoline and diesel prices influencing consumer demand, as well as sector-wide improvements in mileage as a result of federal mandates.

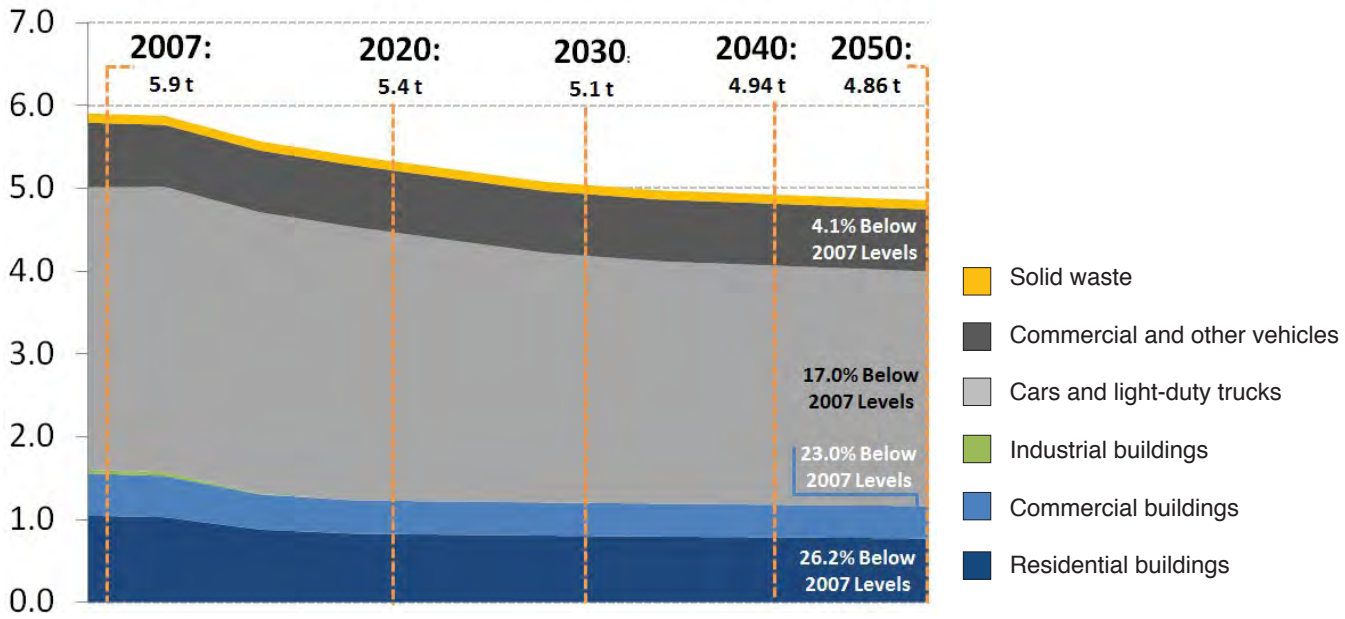


Figure 6: Per Capita Emissions in the RDN (tCO2e) (2006–2050)

Similarly, reductions in per capita energy use and emissions in the building sector are the result of rising prices for energy, which encourages investment in whole-building efficiency, as well as policy changes that demand higher levels of building efficiency through provincial building codes. The impact of local government policies to increase density, focus development in growth concentration areas, or encourage a diversity of housing types (including a greater share of smaller, multi-family residences) is not considered in the business-as-usual forecast.

Overall, from 2007 to 2050, per capita energy use is forecasted to decline by about 11%, from 134.4 GJ per person in 2007, to 119.6 GJ per person in 2050. Over the same period, emissions (excluding emissions from agriculture and land use change) are set to diminish by 17.6% from 5.9 tonnes CO_2e per person region-wide in 2007, to 4.9 tonnes per person in 2050. Unfortunately, these per capita reductions are easily overwhelmed by the forecasted increase in population to 2050. The result is a significant rise in community-wide energy use and emissions in the Regional District of Nanaimo, as illustrated in Figure 7 and Figure 8.

Unfortunately, these per capita reductions are easily overwhelmed by the forecasted increase in population to 2050.

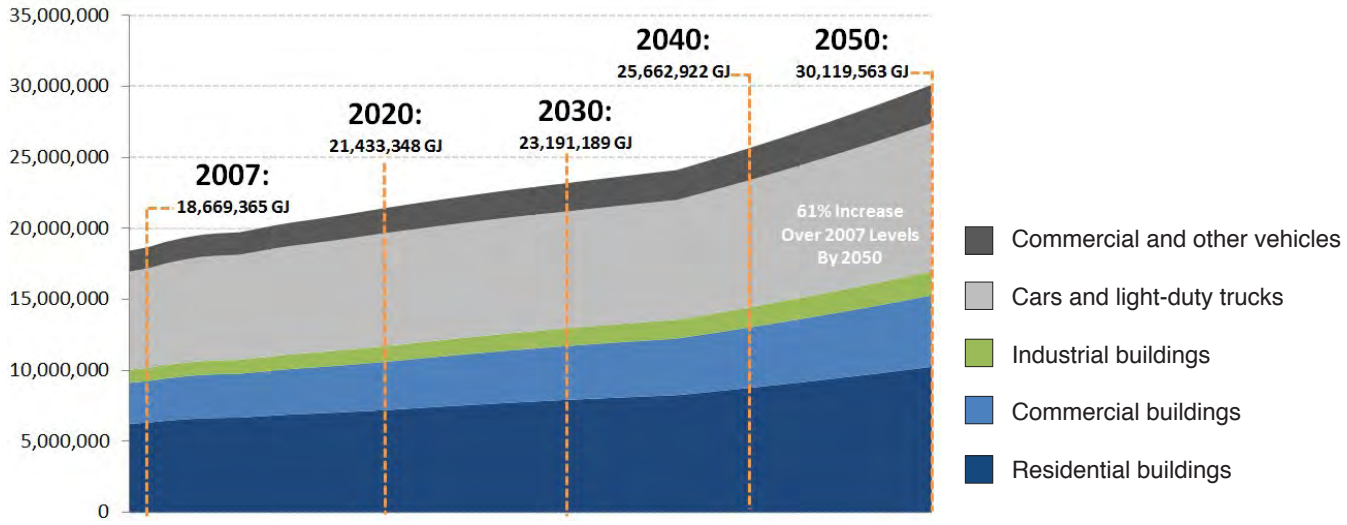


Figure 7: Forecasted Energy Use in the RDN (2006–2050)

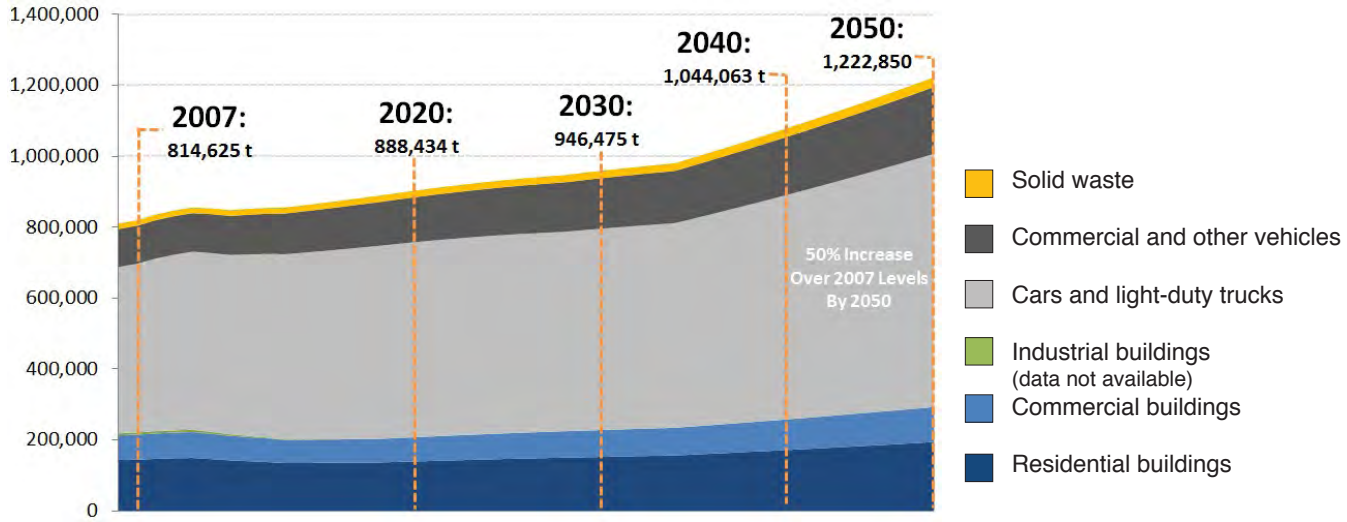


Figure 8: Forecasted Emissions in the RDN (tCO2e) (2006–2050)

For buildings and transportation sectors, energy consumption in the RDN is projected to increase by approximately 61%, from under 19 million GJ in 2007 to more than 30 million GJ in 2050 (Figure 7). Over that same period, GHG emissions from buildings, transportation and waste are projected to increase by 50% from almost 815,000 tonnes[9] to over 1.2 million tonnes CO_2e by 2050 (Figure 8).

The greater increase in energy use compared to emissions predicted in these figures reflects a gradual transition toward cleaner fuels as a result of consumer response to rising and volatile prices for conventional fossil fuels, as well as the general improvements in energy efficiency of virtually all products over time.

[9] Emissions from land use change and agriculture are not included in this baseline or forecast, and data for large industrial emitters were not available; therefore, these are considered low estimates.

4 / TARGETED REDUCTIONS

4.1 TARGET

The RDN has endorsed the province-wide greenhouse gas reduction targets of:

- 33% below 2007 levels by 2020
- 80% below 2007 levels by 2050

This target is consistent with the BC Climate Action Plan and the Provincial Greenhouse Gas Reduction Targets Act.

The origin of this target lies in the research that suggests atmospheric CO_2 should be held to 500 ± 50 parts per million (ppm), or less than double the pre-industrial level of 280 ppm. This is regarded as the threshold likely to limit average global temperature increase to two degrees Celsius, and sea level rise to less than 1.2 metres, by the year 2100.

REDUCTION TARGET

33% below 2007 levels by 2020, and

80% below 2007 levels by 2050

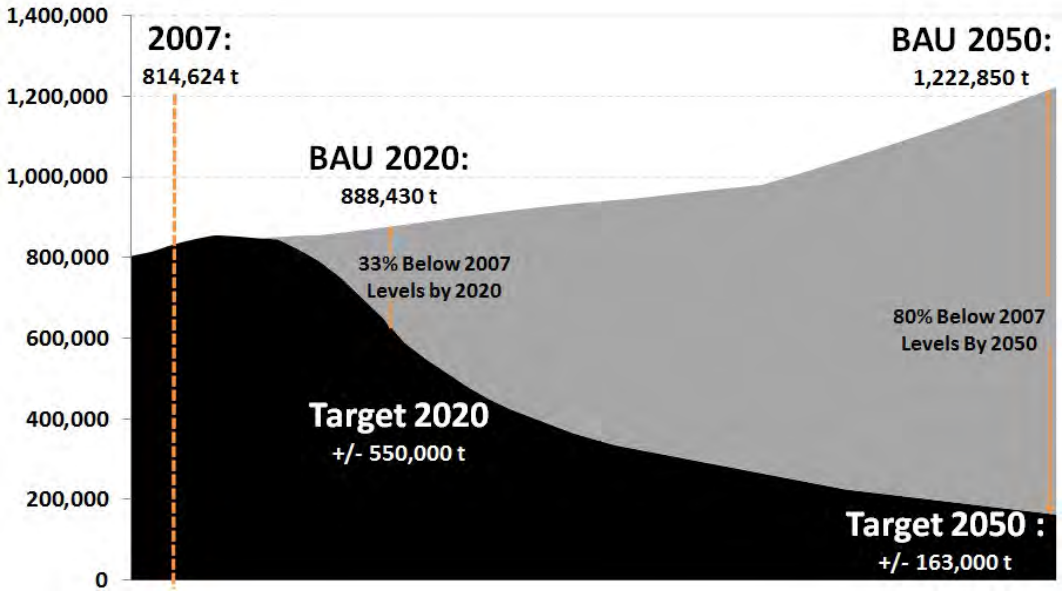


Figure 9: Simplified Emissions Reduction Pathway (2006–2050)

We acknowledge the importance of doing our part in a global effort to avoid the most severe predicted effects of climate change.

For relatively wealthy, industrialized nations like Canada, this translates to an 80% reduction in greenhouse gas emissions below 2007 levels by 2050. Figure 9 illustrates a simplified emission pathway for reaching that target over time. The intent of adopting this target at the regional level is to acknowledge the importance of doing our part in a global effort to avoid the most severe predicted effects of climate change, and to provide clarity on what "doing our part" actually looks like.

With this pathway in mind, the remainder of this plan explores two interrelated questions:

1. **What measures must be taken if emissions are to be reduced to 80% below 2007 levels by 2050?**

2. **What policy instruments can be used to implement these measures?**

TABLE 6: EMISSIONS BY JURISDICTION AND TARGET

Jurisdiction	2007 Emissions	2020 Emissions (33% below 2007)	2050 Emissions (80% below 2007)
City of Nanaimo	480,421	321,882	96,084
City of Parksville	65,760	44,059	13,152
Town of Qualicum Beach	47,334	31,714	9,467
District Municipality of Lantzville	19,986	13,391	3,997
Electoral Areas	198,645	133,092	39,729
Total *	**812,146**	**544,138**	**162,429**

*Totals do not include emissions from land use change and agriculture.

Table 6 shows the emission reductions needed in each RDN jurisdiction to meet the 30% and 80% reduction targets.

This jurisdictional analysis is for illustrative purposes only. Showing an 80% reduction in every jurisdiction reveals the significant size of reductions needed. If the region as a whole is to reach the 80% reduction target, this direct, linear approach would likely not apply. More realistically, since residents concentrate in more developed areas (municipalities) it is likely that emissions would decline more slowly in these places. In addition, if increased renewable energy production and carbon sequestration projects on rural parcels prove to be viable approaches, and low- and zero-emission vehicles become common, more dramatic reductions could be realized in the region's electoral areas.

Applying this same reduction on a per capita basis across the region requires emissions dropping from approximately 6 tonnes per capita to 3.9 tonnes in 2020, and down to 1.2 tonnes in 2050 (Figure 10).[10] Looking at the magnitude of the reductions on a per capita basis needed to achieve the reduction target, it is clear that a dramatic change is necessary in how we source the energy we use and the amount of energy we use—in all facets of our lives but particularly for transportation.

To complement aggressive measures to reduce emissions, actions aimed at protecting productive ecosystems that sequester atmospheric carbon are also necessary, particularly in more rural communities. Ensuring that nature's ability to absorb carbon dioxide remains intact by minimizing deforestation associated with land use change will provide a buffer; actual reduction measures may be slow to take hold.

Perhaps the most important point about this reduction target is that no level of government has the tools at its disposal to achieve an 80% reduction target on its own. All levels of government must work together, enacting policies and programs that will facilitate reductions across all sectors. This is more dependent on a grassroots demand for action rising from members of the public than top down initiatives from senior government.

[10] This does not include emissions from land use change and agriculture.

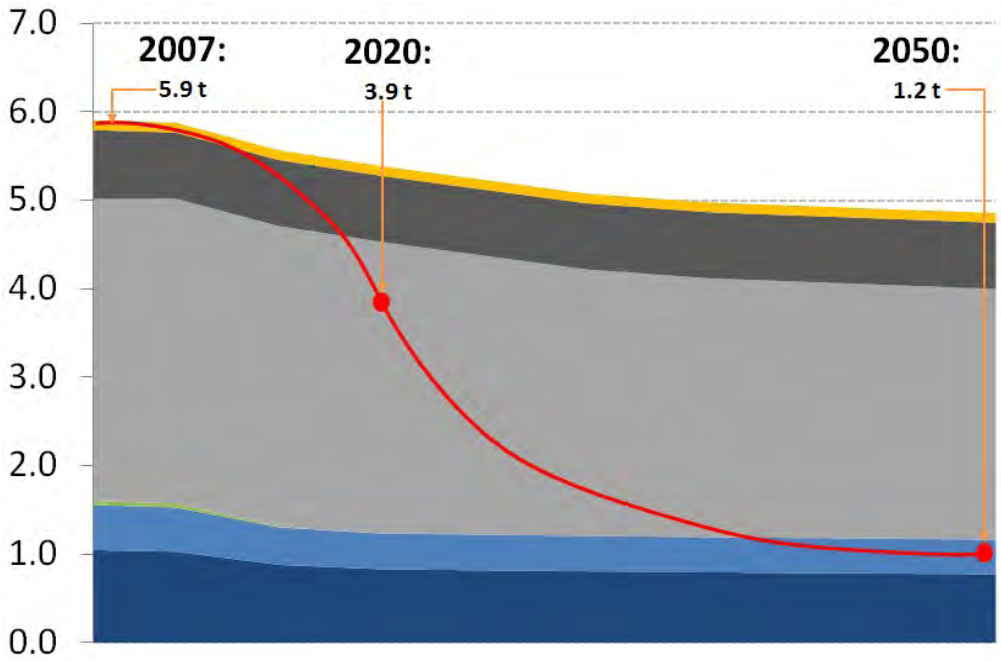


Figure 10: Per Capita Emission Reduction Pathway (tCO2e) (2006–2050)

PER CAPITA EMISSION TARGET

from 6 to 1 tCO_2e

4.2 80% REDUCTION SCENARIO

This scenario identifies a broad set of measures needed to reach an 80% reduction target by 2050. Its purpose is to visualize what the future could look like if these measures are pursued, and highlight the level of effort required to achieve deep reductions in energy consumption and emissions.

Measures taken in the areas of residential buildings, commercial and industrial buildings, land use and transportation, and solid waste together bring us to about a 65% reduction in emissions, leaving about 15% of the needed reductions undetermined. For this reason, additional measures relating to land use change and agriculture are proposed.

Regarding these additional measures, potential reductions are the subject of future research for the Regional District of Nanaimo. The assumption is that for every hectare of land protected from deforestation, a measurable amount of atmospheric carbon dioxide will be sequestered in the form of biomass. This offers the opportunity for community members living on large parcels in more rural areas or on agricultural properties to participate meaningfully and significantly in climate action initiatives.

MEASURES NEEDED TO ACHIEVE AN 80% REDUCTION IN EMISSIONS

Residential Buildings

- 50% of all existing residential homes built prior to 2030 have been retrofitted to achieve an EnerGuide rating of 80 or better
- 90% of all new residential construction achieves an EnerGuide rating of 85 or better
- 50% of all new residential construction takes the form of multi-family development
- 50% of all residential dwellings are supplied with renewable, non-fossil fuel energy to meet home energy demand

Commercial and Industrial Buildings

- 50% of all existing commercial and industrial buildings built prior to 2030 are retrofitted to meet the ASHRAE 90.1 (2010) Standard
- 90% of new commercial and industrial buildings meet the ASHRAE 90.1 (2010) Standard

Land Use and Transportation

- 75% of residents in the region choose to live in more compact communities, resulting in a reduction in annual vehicle kilometres travelled per household
- 90% of all drivers stop unnecessary idling
- 50% of all commutes occur in alternatives to the single-passenger vehicle (carpooling, transit, walking, or cycling)
- 50% of drivers use low- or zero-emission vehicles (electric vehicles)

Solid Waste

- 90% of organic waste is diverted from the landfill
- 65% of landfill gas is captured and flared or used for alternative energy

Land Use Change and Agriculture

- 80% of land on rural residential parcels is protected from deforestation in perpetuity
- Carbon sequestration and emission reduction projects are implemented on agricultural land

4.3 POLICY INSTRUMENTS

There are four broad policy instruments available to governments to effect these changes: outreach and communication, non-financial incentives, direct financial incentives, and regulation. Each has a differing level of impact.

1. Outreach and communication includes providing homeowners with information on emission reduction opportunities ranging from energy efficiency programs, green building strategies, the availability of renewable energy, and transportation alternatives. It is assumed to result in approximately 5% of potential participants taking action.

2. Non-financial incentives include such strategies as fast-tracking building permits for development that attain a higher standard of energy performance. It is assumed to result in approximately 25% of potential participants taking action.

3. Financial incentives include building permit rebates for homes that can demonstrate higher standards of energy performance, or direct incentives for homeowners who implement emission reduction strategies. It is assumed to increase the rate of participation to 50%.

4. Regulations include requiring new homes to achieve specific energy performance standards, or altering land use regulations in a way that directs the majority of development into more compact communities. It is assumed to result in a participation rate of 90% or better.

To realize the measures that achieve the 80% reduction target, the necessary policy instruments are those that result in the greatest possible uptake in the community, namely financial incentives and regulation. Therefore, as time marches forward, reaching this target will require a gradual shift from softer, more voluntary approaches oriented around outreach and non-financial incentives, to direct financial incentives and ultimately to an emphasis on regulatory approaches.

In order for a shift toward greater regulation to be successful, the demand for increased regulation must be driven by a significant share of the residents affected. This is dependent on residents recognizing the urgency for action, and the availability and economic viability of alternatives that reduce emissions.

4.4 REDUCTION MEASURES, REDUCTION POTENTIAL, AND OVERALL SECTOR IMPACT

In this section, additional detail is provided for each of the reduction measures outlined in the 80% reduction scenario. Specifically, the tables that follow identify the reduction potential for each of the reduction measures, and the overall impact on the buildings, transportation, or solid waste sectors.

Here, reduction potential identifies the total reduction that can be achieved by each end user who participates in the reduction measure. For example, a homeowner can expect to reduce home energy consumption by up to 40% through efficiency upgrades that boost the home's EnerGuide rating to 80 or beyond. The overall sector impact is the reduction potential of the measure multiplied by the rate of uptake of the measure, and is expressed as a percent of the total sector emissions. Using the same example, if the rate of uptake for reducing household emissions by 40% equaled half (50%) of all households, the overall impact on emissions from residential buildings would be a 20% reduction.

4.4.1 Sector: Buildings

Baseline (2007): Buildings account for 24% of the RDN's emissions (222,158 tCO_2e)

Goal 1: Improve the energy efficiency of existing buildings

Reduction Measures	Uptake	Reduction Potential	Overall Impact on Buildings Sector
Residential buildings retrofitted to meet EnerGuide 80	50%	40%	20%
Commercial / industrial buildings retrofitted to meet ASHRAE 90.1 (2010)	50%	30%	15%
Existing residential dwellings use alternative energy technologies (solar panels or high-efficiency wood stoves)	50%	50% solar 65% wood	25% solar 33% wood

Goal 2: Ensure new construction attains the highest energy performance standard practicable

Reduction Measures	Uptake	Reduction Potential	Overall Impact on Buildings Sector
New residential construction meets EnerGuide 85	90%	30%	27%
New commercial / industrial construction meets ASHRAE 90.1 (2010)	90%	30%	27%
New residential construction as multi-family units	50%	50%	25%

4.4.2 Sector: Land Use and Transportation

Baseline (2007): Transportation accounts for 63% of the RDN's emissions (581,097 tCO_2e)

Goal 3: Create compact, complete communities

Reduction Measures	Uptake	Reduction Potential	Overall Impact on Land Use and Transportation Sectors
RDN population resides in more compact neighbourhoods (resulting in decreased GHG emissions from personal transportation)	75%	32%	24%

Goal 4: Reduce personal vehicle transportation emissions

Reduction Measures	Uptake	Reduction Potential	Overall Impact on Land Use and Transportation Sectors
Drivers stop unnecessary idling	90%	15%	14%
Commuters use alternatives to single-occupant vehicles	50%	10%	5%
Drivers use low- or zero-emission vehicles	50%	100% electric vehicles	50%

4.4.3 Sector: Solid Waste

Baseline (2007): Solid waste accounts for <2% of the RDN's emissions (15,377 tCO_2e)

Goal 5: Increase waste diversion opportunities and use waste as a resource

Reduction Measures	Uptake	Reduction Potential	Overall Impact on Solid Waste Sector
Organics diverted from landfill	90%	20%	18%
Landfill methane emissions captured	65%	30%	20%

4.4.4 Sector: Land Use Change and Agriculture

Baseline (2007): Land use change and agriculture account for 11% of the RDN's emissions (101,268 tCO_2e)

Goal 6: Protect productive forest ecosystems from deforestation associated with land use changes to accommodate development

Reduction Measures	Uptake	Reduction Potential	Overall Impact on Land Use and Agriculture Sector
Sequester carbon on rural parcels by encouraging alternative forms of rural development that protect forest land	50%	not measured	not measured

Goal 7: Encourage agricultural practices that enhance on-farm biological productivity, reduce emissions associated with agriculture, or sequester carbon

Reduction Measures	Uptake	Reduction Potential	Overall Impact on Land Use and Agriculture Sector
Carbon sequestration and emission reduction projects on agricultural land	50%	not measured	not measured

5 / LOCAL ACTION PLAN

What does “doing our part” to combat global climate change and reach an 80% reduction in emissions actually look like?

This section outlines a series of actions that are underway, under consideration, or ultimately necessary to implement the 80% reduction scenario, and are generally within the legislated authority of local governments.

TABLE 7: LOCAL ACTION PLAN GOALS AND ACTIONS

GOAL 1: IMPROVE THE ENERGY EFFICIENCY OF EXISTING HOMES

Action 1.1	Provide energy efficiency information to homeowners and businesses.
Action 1.2	Develop energy retrofit incentives for homeowners and businesses.
Action 1.3	Create a Revitalization Tax Exemption Bylaw that reduces property taxes for homeowners who successfully undertake energy efficiency retrofits to a defined level (i.e. EnerGuide for Homes 80, EGH 80), or install alternative energy systems.
Action 1.4	Establish an incentive program for residential homes to encourage the installation of alternative energy supply technologies (e.g. solar panels for domestic hot water or high-efficiency wood stoves).

GOAL 2: ENSURE NEW CONSTRUCTION ATTAINS THE HIGHEST ENERGY PERFORMANCE STANDARD PRACTICABLE

Action 2.1	Establish regulations to ensure that residential buildings are built to high energy-performance standards (i.e. beyond the building code to EGH 85) and establish regulations to ensure that commercial buildings are built to a higher standard than ASHRAE 90.1 (2010).
Action 2.2	Update or develop development permit area guidelines to include energy and water conservation considerations.

GOAL 3: CREATE COMPACT, COMPLETE COMMUNITIES

Action 3.1	Encourage a variety of housing types, including multi-family units, secondary suites and cottages through density and amenity bonusing, or targeted reductions to development cost charges.
Action 3.2	Support the transformation of underutilized lands by accommodating new growth and development through infill of existing lots in areas designated for growth, and encourage commercial infill and mixed-use development by reducing existing surface parking requirements.
Action 3.3	Retain large rural landholdings by establishing large minimum parcel sizes in zoning bylaws.

GOAL 4: REDUCE PERSONAL VEHICLE TRANSPORTATION EMISSIONS

Action 4.1 Provide incentives to encourage the purchase of low- or zero-emission vehicles.

Action 4.2 Establish financial incentives that encourage alternative transportation or result in fewer commuter trips by single-occupant vehicle (SOV).

Action 4.3 Increase the use of slow-speed neighbourhood zero-emission vehicles (NZEVs) in the region by reducing speed limits in targeted areas.

Action 4.4 Establish and enforce idling reduction bylaws in the RDN and municipalities; create a social marketing campaign to further encourage idling reduction.

GOAL 5: INCREASE WASTE DIVERSION OPPORTUNITIES AND USE WASTE AS A RESOURCE

Action 5.1 Increase residential participation in curbside organic collection program.

Action 5.2 Enhance landfill gas capture.

Action 5.3 Convert non-diverted, residual waste to energy.

GOAL 6: PRODUCTIVE FOREST ECOSYSTEMS ARE PROTECTED FROM DEFORESTATION ASSOCIATED WITH LAND USE CHANGES TO ACCOMMODATE DEVELOPMENT

Action 6.1 Prevent conversion of productive forest land to non-forested ecosystems on all rural lands.

GOAL 7: ENCOURAGE AGRICULTURAL PRACTICES THAT ENHANCE ON-FARM BIOLOGICAL PRODUCTIVITY, REDUCE EMISSIONS ASSOCIATED WITH AGRICULTURE, OR SEQUESTER CARBON

Action 7.1 Implement carbon sequestration and emission reduction programs on agricultural land.

5.1 SECTOR: BUILDINGS

Goal 1: Improve the energy efficiency of existing homes.

Action 1.1: Provide energy efficiency information to homeowners and businesses.

Policy Instrument: Outreach and Communication

Status: Underway: Annual RDN Green Building Speaker Series and Open House Tour

Barriers: No barriers to implementation.

Timeline: Maintain outreach and communication practices over foreseeable future. Gradually incorporate discussion of potential regulatory approaches into communications.

Outreach and communication are the first steps before exploring financial incentives and ultimately developing policies and regulations. This will make sure that property owners are well informed before any energy efficiency requirements are imposed.

Presently, the RDN provides a regionally coordinated outreach and communication program, including materials and online tools about green buildings, and will continue delivering these activities for residents. The purpose of these activities is to inspire residents to take action. The RDN will continue to solicit ideas from the public on local green building priorities to ensure that regional direction meets the needs, desires, and expectations of regional residents.

The RDN will also produce educational materials and online tools, and continue communications about green buildings for the local building industry. The purpose of the educational activities is to provide technical information and practical assistance to interested building professionals. As well, the RDN will develop plans, training materials, and tools on management of green buildings for RDN staff.

Action 1.2: Develop energy retrofit incentives for homeowners and businesses.

Policy Instrument: Financial Incentives

Status: Underway: Pre- and Post-Renovation Home Energy Assessment Incentives are available to residents of the RDN.

Barriers: No barriers to implementation for households within established service areas. Funding for incentives is dependent on a robust local construction economy. Local governments are prohibited from providing direct financial incentives to commercial developers.

Timeline: Gradually increase incentives for homeowners who complete energy efficiency retrofits through successive annual budget cycles; reconsider incentives biannually.

Older buildings represent a significant opportunity to improve energy efficiency and reduce emissions. Undertaking energy efficiency and renewable energy upgrades can be difficult for some homeowners as these upgrades often require significant up-front costs and lengthy payback periods. This measure provides a financial incentive to homeowners, landlords, commercial building owners, and property managers to retrofit their buildings so that they perform at a higher standard, consuming less energy and producing fewer emissions.

The current financial incentive program enhances awareness of the incentives available for retrofitting existing buildings while reducing duplication of effort between local governments and other levels of government. Strengthening the incentive program would involve committing a stable source of funding for a pre-determined number of years. Implementing the financial incentive program on a regional scale would enable all jurisdictions within the region to access these benefits.

The RDN will take an incremental approach to developing a green building incentive program to encourage the construction of new green buildings and the renovation of existing buildings to a green building standard. Incentives include free green building consultations with staff for development permit applicants, financial incentives for owner-developers who achieve high scores on an RDN development checklist, and rebates for home energy

assessments and the purchase of various renewable energy technologies. Future incentives to be considered include expedited permitting to "fast track" green buildings, adjusted fees and charges that create financial incentives to develop green buildings, and density bonuses for green building developments.

Action 1.3: Create a Revitalization Tax Exemption Bylaw that reduces property taxes for homeowners who successfully undertake energy efficiency retrofits to a defined level (i.e. EnerGuide 80), or install alternative energy systems.

Policy Instrument: Financial Incentive

Status: Preliminary exploratory research initiated. Not in immediate work plan.

Barriers: Possible in municipalities. Not applicable to regional districts.

Timeline: Consider a regional coordination role during cyclic Regional Service Reviews (date to be determined).

A Revitalization Tax Exemption (RTE) program can be designed to encourage energy-efficient development in a small area or throughout a jurisdiction. It allows a property owner to make energy improvements to a property and apply for a tax exemption. This tool offers a financial incentive to implement green building technology and ensures the tax exemption stays with the property, passing from developer or existing homeowner to the next buyer.

Action 1.4: Establish an incentive program for residential homes to encourage the installation of alternative energy supply technologies (e.g. solar panels for domestic hot water or high-efficiency wood stoves).

Policy Instrument: Financial Incentive

Status: Underway: RDN Green Building Incentive Program provides rebates to homeowners who install solar domestic hot-water systems and exchange older wood stoves for newer, clean-burning stoves.

Barriers: No barriers to implementation. Barrier to widespread uptake is due to the low cost of conventional technology and fuels, and perceived unproven nature of renewable energy technologies.

Timeline: Expand incentive program to provide rebates for additional renewable energy systems (2013–2014).

Using alternative energy technologies in residential buildings will reduce the use of fossil fuel energy sources and reduce emissions. Diversifying energy sources can also lead to a more resilient community. In addition to solar, wind, and geo-exchange, local sources of energy may include methane capture from waste and the use of biomass.

Goal 2: Ensure new construction attains the highest energy performance standard practicable.

Action 2.1: Establish regulations to ensure that residential buildings are built to high energy-performance standards (i.e. beyond the building code to EGH 85) and establish regulations to ensure that commercial buildings are built to a higher standard than ASHRAE 90.1 (2010).

Policy Instrument: Regulation

Status: Not underway. Continue collaboration with the Province of BC on the evolution of the BC Building Code.

Barriers: Provincial jurisdiction over the BC Building Code; concurrently challenging the authority of the Province of BC and administering a region-specific building code is complex.

Timeline: Maintain existing relationship with provincial and federal counterparts, and advocate for increasing efficiency requirements for new homes. Develop alternate solutions to the building code to encourage local innovation in efficient building (2015–2020).

The energy used in buildings accounts for a large portion of the RDN's community energy use and emissions. Encouraging higher standards of energy performance and fewer emissions in renovations and new construction

can reduce the contribution of this sector to climate change while also reducing long-term operating costs. Recent improvements to the BC Building Code will result in significant reductions in energy demand for both residential and commercial buildings. These measures are intended to improve the energy efficiency of buildings above the code standards. Creating local building code-equivalent regulations is legally and technically possible, but unreasonable from a practical standpoint.

Instead, RDN staff will explore collaboration with the Province of BC and other jurisdictions to develop other solutions to the BC Building Code in order to remove barriers to the application of green building alternatives ranging from straw bale construction to newer technologies not currently considered in the code. RDN staff will also review existing RDN building bylaws and planning regulations and adapt best practices from elsewhere to streamline the development process and reduce regulatory barriers to green building in the region.

Action 2.2: Update or develop development permit area guidelines to include energy and water conservation considerations.

Policy Instrument: Regulation

Status: Underway. RDN has crafted development permit guidelines for water conservation in Electoral Areas A, G and H.

Barriers: Resident and developer concern over increasing regulation in the development sector.

Timeline: Ongoing. To be considered in Official Community Plan updates over the medium term.

The "Green Communities" amendment to the Local Government Act (Bill 27, 2008) gives local governments the authority to designate a development permit area (DPA) for the purpose of reducing greenhouse gas emissions and conserving water and energy. DPAs can specify requirements for the conditions attached to such development permits, such as: landscaping; siting, form, and exterior design of buildings and other structures; specific features in the development; and machinery, equipment and systems external to buildings and other structures. DPAs can also establish restrictions on the type and placement of trees and other vegetation in proximity to the buildings and other structures in order to provide for the conservation of energy or the reduction of greenhouse gas emissions. DPAs must be designated in the OCP, and DPA guidelines must be included either in the OCP or in a zoning bylaw in order for the DPA to be rendered effective.[11]

[11] DPA powers: www.toolkit.bc.ca/resource/bill-27-opportunities-and-strategies-green-action, p.7.

Encouraging higher standards of energy performance and fewer emissions in renovations and new construction can reduce the contribution of the buildings sector to climate change while also reducing long-term operating costs.

5.2 SECTOR: LAND USE AND TRANSPORTATION

Goal 3: Create compact, complete communities.

Action 3.1: Encourage a variety of housing types, including multi-family units, secondary suites and cottages through density and amenity bonusing, or targeted reductions to development cost charges.

Policy Instrument: Financial Incentive

Status: Currently possible through implementation of Official Community Plans and Regional Growth Strategy, as well as ongoing projects to encourage mixed-use development, alternative forms of rural development, and secondary suites.

Barriers: Limited market demand for additional density and attached dwelling forms. Extensive areas pre-zoned for low-density, single-family detached housing.

Timeline: Ongoing.

Achieving compact, complete communities increases overall housing density and reduces personal vehicle use. In addition to being more efficient for energy and water use, higher residential densities support public transportation and alternative transportation modes like cycling and walking. Increasing housing density also provides a wider range of housing choices and greater housing affordability. This strategy is closely linked to the Regional Growth Strategy, which designates where growth is supported in the region and promotes compact, complete development practices across the region.

Density and amenity bonuses are already available and could be provided in conjunction with energy efficiency retrofits in town centres and growth concentration areas. Density bonuses are typically used to implement upgrades in the community and achieve public benefits. This incentive allows developers to construct more floor space on a given parcel of land in exchange for community amenities that meet community needs, such as a waterfront walkway, open space, daycare facility, affordable housing, and more.

Development cost charges are monies charged to a developer by a local government, used to pay for upgrades needed as a result of increased demand on services by new development. The funds generated are used to finance capital projects such as infrastructure upgrades to roads, sewers, water and drainage systems, as well as parkland acquisition. Reductions in development cost charges could be used to encourage developers, particularly in more urbanized areas, to build higher-density developments, though this approach would need to be balanced with other measures that ensure needed capital projects get funded.

Action 3.2: Support the transformation of underutilized lands by accommodating new growth and development through infill of existing lots in areas designated for growth, and encourage commercial infill and mixed-use development by reducing existing surface parking requirements.

Policy Instrument: Regulation

Status: A land capacity analysis for the Regional District of Nanaimo has been completed.

Barriers: Market demand for infill, but comparatively inexpensive to develop in rural areas.

Timeline: Consider implementation of regulatory approaches to encourage infill through periodic Official Community Plan updates.

Using an infill approach to new development concentrates growth in previously developed areas. This provides more residences in neighbourhoods that are already serviced with infrastructure and amenities, or provides additional spaces for amenities in neighbourhoods that need more. The overall effect is an increase in density, which in turn contributes to a reduction in transportation-related emissions.

A regulatory approach to concentrating growth on already developed land begins with the Regional Growth Strategy. The RDN Regional Growth Strategy includes among its goals the intent to concentrate housing and jobs in rural village and urban growth centres and to provide services efficiently. Implementation of these policies requires changes to zoning and land use regulations. To be effective, these policies must transfer from the

Regional Growth Strategy to Official Community Plans and eventually to land use and zoning regulations where on-the-ground implementation is initiated.

Action 3.3: Retain large rural landholdings by establishing large minimum parcel sizes in zoning bylaws.

Policy Instrument: Regulation

Status: Higher-level policies established; widespread implementation yet to take effect.

Barriers: Public resistance to down-zoning.

Timeline: Propose minimum parcel sizes during periodic Official Community Plan reviews for electoral areas.

Using zoning to establish larger minimum parcel sizes in rural areas prevents the subdivision of land that enables extensive development in rural areas.

Maintaining large landholdings in rural areas helps to prevent the conversion of forest land into land for non-forest uses like roads, residences, or commercial projects. Healthy, productive forests sequester atmospheric carbon dioxide, providing a natural sink for emissions.

Goal 4: Reduce personal vehicle transportation emissions.

Action 4.1: Provide incentives to encourage the purchase of low- or zero-emission vehicles.

Policy Instrument: Financial Incentive

Status: Underway: Incentives are available to residents who install residential electric-vehicle charging stations; 24–30 Level 2 charging stations to be installed across the region in 2013 (in partnership with the Province of BC through the Community Charging Infrastructure program).

Barriers: Temporary in nature: slow penetration of electric vehicles into the private vehicle fleet due to high initial cost, ongoing concerns over range and long-term vehicle performance, and low cost of conventional fuels.

Timeline: Presently available and ongoing.

Technological innovation is simultaneously improving the energy efficiency of fossil-fuel-powered vehicles and introducing vehicles that use alternative power sources to reduce emissions to zero. Such technological change is an important component of reducing transportation emissions.

To encourage more widespread use of low- and zero-emission vehicles, direct financial incentives can be provided to residents who purchase electric vehicles and the associated charging infrastructure, and free access can be provided to publicly available charging infrastructure across the region. These incentives are intended to reduce the up-front cost of electric vehicle ownership and alleviate concerns over range.

Reducing the need to commute and lowering the number of trips made will help to reduce emissions.

Action 4.2: Establish financial incentives that encourage alternative transportation or result in fewer commuter trips by single-occupant vehicle (SOV).

Policy Instrument: Financial Incentive

Status: Partially underway. RDN is currently working with local academic institutions to implement a UPass program, and with large employers to implement a PROpass program.

Barriers: Inadequate financial incentive to induce widespread support; fuel costs remain below the observed threshold to alter transportation behavior. Regional districts do not have jurisdiction over transportation infrastructure, relying on parks and trails infrastructure for walking and cycling.

Timeline: Ongoing.

Most commuting trips in the region are made in single-occupant vehicles. Alternative transportation options, including transit, walking, cycling, and shared vehicles, need to be made more attractive to residents in order to reduce personal vehicle use and associated emissions. As well, reducing the need to commute and lowering the number of trips made will help to reduce emissions.

The RDN can work with large employers to promote or implement commute trip-reduction programs. Examples of such programs include transit allowances, parking cash-out, rideshare, end-of-trip facilities, compressed or flexible work weeks, and telecommuting.

Action 4.3: Increase the use of slow-speed neighbourhood zero-emission vehicles (NZEVs) in the region by reducing speed limits in targeted areas.

Policy Instrument: Regulation

Status: Partially implemented. Periodically review opportunities for expansion.

Barriers: Provincial jurisdiction over speed limits outside incorporated areas; some public resistance to lowering speed limits.

Timeline: Ongoing.

As the name suggests, neighbourhood zero-emission vehicles (NZEVs) produce no emissions. They are typically electric-drive vehicles, and are often characterized as "souped-up golf carts." NZEVs are a specific vehicle class designed to have a top speed of 50–60 kilometres per hour, and are only permitted on streets with speed limits of 60 kilometres per hour or less.

As communities increasingly take aim at transportation-related emissions, promoting NZEVs will become more common, particularly as our population ages and the use of conventional vehicles get restricted. NZEVs are lower-cost electric vehicles that can safely provide mobility for individuals living within a compact, urban area such as Qualicum Beach, though widespread use may require reducing speed limits throughout a community.

Action 4.4: Establish and enforce idling reduction bylaws in the RDN and municipalities; create a social marketing campaign to further encourage idling reduction.

Policy Instrument: Outreach and Communication; Regulation

Status: Not considered.

Barriers: Enforcement capacity.

Timeline: Develop outreach and communication as opportunity arises (target 2014–2015).

Vehicle emissions from idling contribute unnecessary emissions and represent a wasted use of energy resources. A region-wide campaign to reduce vehicle emissions could include a social marketing campaign to educate drivers about the effects of idling and promote better driving habits. Building on this campaign, the RDN could establish a bylaw prohibiting idling. To be effective, this bylaw would need to be adopted across the region. Each local government would need to dedicate some bylaw enforcement and education resources to ensure the bylaw is upheld and emission reductions are achieved.

5.3 SECTOR: SOLID WASTE

Goal 5: Increase waste diversion opportunities and use waste as a resource.

Action 5.1: Increase residential participation in curbside organic collection program.

Policy Instrument: Outreach and Communication; Regulation

Status: Outreach and communication is ongoing.

Barriers: Some homeowners continue to dispose of organic waste with other garbage.

Timeline: Continue community outreach. Consider regulatory approaches in conjunction with the development of an updated Solid Waste Management Plan (next update to begin in 2013).

Initiated in 2010, the Green Bin Program is a curbside organics collection program that is helping the RDN to extend the life of the region's only landfill, reduce greenhouse gas emissions, convert waste into fertilizer and compost, and create local jobs and support a local green economy. The program diverts an estimated 6,000 tonnes of material annually from the landfill, which can then be processed into compost and eventually into renewable fuels.

Weekly green bin food and kitchen waste collection is now underway for all single-family homes in the electoral areas, Lantzville, Parksville, Qualicum Beach, and Nanaimo.

Anecdotal evidence suggests that up to 40% of homes are not using curbside organic collection to its fullest. Reasons for this vary, and include a desire to continue backyard composting or the convenience of throwing organic material into the garbage. This latter issue can be gradually addressed with communications that stigmatize the behaviour in the same manner as littering or the disposal of recyclables. More positive information about the benefits of organic diversion will also diminish this behaviour over time.

To bring multi-family units and apartments into the organic diversion program would likely require a firmer, regulatory approach. This could include banning organics form the regional landfill altogether. With a ban in place, the private sector would fill the gap by providing collection services to multi-family developments. Contemplating a ban on organics from the regional landfill would form part of the discussion when the RDN Solid Waste Management Plan is updated.

Action 5.2: Enhance landfill gas capture.

Policy Instrument: Regulation

Status: Landfill gas capture is currently at approximately 45%.

Barriers: Incremental additional capital cost of improving landfill capture. Upper limit to gas capture efficiency on an operational landfill.

Timeline: Maintain existing landfill gas capture system. Continuously improve system over time, as resources permit. Strengthen partnerships with private sector energy producers over short to medium term.

Landfill gas (LFG) is produced when microbes decompose garbage in a landfill, most of which occurs in the absence of oxygen. This process generates roughly equal amounts of methane and carbon dioxide. Methane is a powerful greenhouse gas, with a global warming effect 21 times greater than carbon dioxide. The RDN has introduced several innovative technologies to collect, monitor, reduce, and ultimately utilize LFG emissions at the Regional Landfill through its LFG Management Plan. This has resulted in reducing annual greenhouse emissions from the landfill by roughly 21,600 tonnes of CO_2e.

Methane collected at the Regional Landfill is currently burned at an on-site flare station to reduce greenhouse gas emissions and nuisance odours. The RDN has entered into an agreement with Cedar Road LFG Inc., which operates a facility at the Regional Landfill, to use the landfill gas collected to produce electricity. The electricity generated at the Regional Landfill is sold into the BC Hydro power grid. At peak power the plant operated by Cedar Road LFG Inc. produces 1.5 megawatts of green power, sufficient to supply up to 1,200 homes.

Action 5.3: Convert non-diverted, residual waste to energy.

Policy Instrument: Regulation

Status: Preliminary research underway.

Barriers: The Regional Landfill has an estimated 25 years of capacity, reducing the urgency to consider waste-to-energy technology. Current waste-to-energy technology is not economically feasible for the quantity of waste generated in the region.

Timeline: Continue developing partnerships and researching technical opportunities. Prepare for implementation in 15–20 years, unless favourable economic conditions arise earlier or urgency for action becomes more immediate.

The Regional District of Nanaimo achieves exceptional rates of waste diversion. This has prolonged the life of the landfill to the 2035–2040 period. Upon landfill closure, an alternative will be needed to manage the residual waste that regional residents do not divert. Producing energy from that waste is an attractive option. Presently, waste-to-energy technology requires a greater volume of waste than is produced in the RDN, thus the economic realities prohibit close consideration of the option. As technological improvements and the limits of the landfill capacity converge, more detailed analysis will determine whether waste-to-energy actions will proceed in the region.

5.4 SECTOR: LAND USE CHANGE AND AGRICULTURE

Goal 6: Productive forest ecosystems are protected from deforestation associated with land use changes to accommodate development.

Action 6.1: Prevent conversion of productive forest land to non-forested ecosystems on all rural lands.

Policy Instrument: Financial Incentive; Regulation

Status: Preliminary research underway. Archetypes for alternative forms of rural development have been developed.

Barriers: Economic disincentive to protect forest land. Ease of breach of covenant and corresponding lack of penalty.

Timeline: Build on preliminary research to develop a program for rural landowners to benefit financially from establishing a protective covenant on privately owned land, or for implementing alternative forms of rural development. Initial program development in 2013.

Establishing a legal mechanism that protects rural residential land from deforestation presents an opportunity to engage rural landowners in taking action on climate change. Such an opportunity would link the legal attributes of a protective covenant with the financial benefits of a carbon offset program. In such a scenario, a rural landowner who establishes a protective covenant for the purpose of sequestering carbon would receive a financial contribution from a local government in exchange for the ownership of the sequestered carbon. The presence of a protective covenant on a parcel could result in a reduced assessed value of that property. This can translate into a reduction in assessment-based property taxes, producing a further financial benefit for the landowner. This benefit has to be weighed against the potential reduction in actual property value as determined by a prospective future buyer.

The Regional District of Nanaimo has committed to achieving carbon neutral operations, which includes

investing in regional emission reduction projects to neutralize corporate emissions. As long as this commitment is intact, the opportunity to establish a program of this sort is viable.

Goal 7: Encourage agricultural practices that enhance on-farm biological productivity, reduce emissions associated with agriculture, or sequester carbon.

Action 7.1: Implement carbon sequestration and emission reduction programs on agricultural land.

Policy Instrument: Financial Incentive; Regulation

Status: Preliminary opportunities outlined in RDN Area Agricultural Plan.

Barriers: Diminishing economic viability of traditional agriculture in the region. Lack of knowledge of potential project types.

Timeline: Develop an implementation plan for through the RDN Agricultural Advisory Committee (2013).

Agricultural emissions include methane gas released by animals as they digest food and the decomposition of manure. These emissions can be reduced through effective manure management. Factors that affect GHG emissions from manure include temperature, oxygen level (aeration), moisture, and sources of nutrients. The RDN can work with the local agriculture community to develop carbon offset programs for effective manure management.

Opportunities to reduce emissions in the agriculture sector also come from agricultural waste reduction, including wood chipping, use of wood waste for alternative products (firewood, furniture, food smokers), composting of agricultural waste products, and biomass production. The Regional District will play an ongoing role in building awareness of the potential for energy recovery from agricultural waste.

6 / IMPLEMENTATION PLAN

6.1 IMPLEMENTING THE PLAN

Developing the 80% emission reduction scenario confirmed that though many types of reduction measures can be undertaken, certain types of policy instruments are needed to achieve the ultimate target. Specifically, voluntary programs will have to give way to increased financial incentives, pricing, and regulation if significant emission reductions are to be achieved.

As a local government, the ability of the RDN to reduce emissions within its jurisdiction is limited by a lack of authority in several critical areas—such as the building code and vehicle emission standards. These are not authorities that should lie with a local government, but they are fundamental to achieving deep reductions over time. Therefore, the RDN must work within its sphere of influence to initiate change at senior levels of government, and to implement financial incentives in advance of higher-level regulatory change.

The RDN must also continue to create opportunities for local residents who wish to lead, by enabling innovation in the construction and development sectors and sharing information on energy, emissions, and other opportunities for action as widely as possible. A groundswell of support from residents is ultimately necessary to facilitate significant change at all levels of government.

The RDN can also take bold action in using the wastes it manages as resources to create renewable, low-emission energy.

The RDN and member municipalities have incorporated the province-wide GHG emissions reduction target into Electoral Area Official Community Plans and the Regional Growth Strategy (RGS). The over-arching purpose of the RGS is to direct growth in the region to encourage investment and development in designated growth containment areas in order to keep communities compact, protect the integrity of rural and resource areas, protect the environment, increase servicing efficiency, and enhance mobility options within the region. Managing energy consumption and GHG emissions goes hand in hand with Regional Growth Strategy goals. The RGS already has many relevant policies to assist in reducing energy and emissions. To focus activities, the RDN has created a section in the RGS to clearly outline specific policies and actions pertaining to energy and emissions reduction and discuss links to other policies in the RGS.

We will continue to foster a culture of collaboration with member municipalities to achieve regional priorities and reduce energy use and emissions.

Both public support and financial investment are required for the RDN to achieve the emissions reductions expressed within the Regional Growth Strategy. Sustained effort in energy efficiency and a concerted effort to intensify urban areas within the region will be required in order to meet the emissions reduction target. As well, since transportation-related emissions dominate the emission forecast in the region, programs that foster a mode shift to public transit and active transportation or that support energy-efficient vehicle choices are critical for the region to achieve its target. Importantly, the RDN has considerable control over regional transit expansions, as well as significant influence through land use decisions, infrastructure investment, and, for member municipalities, parking pricing. Exploring the use of these policy instruments to shape transportation choices in the region will be an increasingly important success factor.

Policies and actions to reduce emissions take time to establish and even longer to show results. Achieving emission reductions in the short term will be difficult. As well, many reduction measures may first need to undertake a series of actions focused on communication and education before the incentive- or regulation-based approach can be implemented. However, maintaining a focus on the reduction measures and associated targets allows the RDN to keep sector-based targets in sight and remain flexible in the specific actions required to ultimately achieve the long-term target of an 80% reduction in emissions.

6.2 ADMINISTRATION OBJECTIVES

The RDN Board develops a new Strategic Plan for each term of office to set regional priorities and align those priorities with RDN activities. The current Strategic Plan identifies the need to become increasingly self-sufficient within the region, taking responsibility for regional energy use and emissions. With the Strategic Plan providing overall direction to the activities of RDN departments and staff, working towards self-sufficiency is the responsibility of everyone in the organization.

Implementing this Community Energy and Emissions Plan requires internal efforts at the RDN as well as external coordination and cooperation with member municipalities. The RDN will continue to foster a culture of collaboration with its member municipalities to achieve regional priorities and reduce energy use and emissions. As an example of such collaboration, in 2012 the RDN executed an agreement with member municipalities to identify and implement regional emissions reduction projects for the purpose of achieving carbon neutral operations. Such an agreement ensures ongoing investment in emissions reduction projects in the region, and the collaborative nature of the work to create this tool is indicative of the RDN's commitment to regional and local action on energy and emissions.

6.3 SHORT-TERM ACTION, LONG-TERM RESULTS

The reduction measures and associated actions described in this plan reflect the importance of a broad suite of policy instruments in meeting the reduction targets while working within the constraints of jurisdiction and authority. The emphasis on regulation and the reliance on other levels of government in achieving long-term emission reductions are currently either out of reach for the RDN, or are beyond what most residents are willing to support.

For the buildings sector, the RDN can lobby the provincial government to set higher energy performance standards in the building code to effect substantial change. Similarly, much of the region's transportation infrastructure is controlled at the provincial level. Therefore, a focus on intergovernmental cooperation and collaboration will be needed to achieve local emissions reductions in the transportation sector.

It is useful to note that many long-term impacts depend on short-term actions. With a foundation of effective communication and outreach, and an ongoing commitment to reward those early to adopt emission-reducing technologies or practices, the RDN may gradually develop community-wide support for increased action to reduce emissions in the region.

In the immediate term, the RDN can continue to promote higher-density development in village centres and limit the subdivision of large lots in rural areas through land use policy and planning. The RDN can also establish a stable source of funding for the incentive programs that presently encourage energy efficiency in the community.

As described in the 80% reduction scenario, the RDN will need to undertake additional measures not yet determined in order to reach its community-wide reduction target. A key area of interest for the RDN is alternative energy development. Research is being undertaken to explore regionally appropriate options for advancing local sources of renewable energy. Research is underway to determine which energy sources and associated measures may best achieve the needed results in the most cost-efficient manner.

A second key area of interest relates to carbon sequestration on rural and agricultural parcels. As a rural region, it is imperative to create opportunities for rural residents to participate in emissions reduction initiatives. Protecting forested land on rural parcels generates multiple benefits beyond carbon sequestration, including habitat for biodiversity and protection of the hydrological cycle. Using a price on carbon to provide financial incentives to protect forest land and realize numerous other benefits can play an important role in the Regional District of Nanaimo, and will be explored in detail over the immediate term.

6.4 EMISSION REPORTING

Like all local governments in British Columbia, the Regional District of Nanaimo is fortunate to benefit from provincial leadership on climate action. For reporting purposes, the RDN will continue to rely on the provincial Community Energy and Emission Inventory reports to track community-wide emissions.

At the level of the corporate organization, the RDN will also continue to track and report emissions arising from the delivery of local government services, and pursue carbon neutral operations by investing in regional emissions reduction projects to offset those emissions.

6.5 COSTS AND FUNDING

Estimating the cost of implementing emissions reduction activities is a challenge. Investment in energy efficiency frequently results in higher up-front capital costs, lower operating costs, and an eventual return on investment. Incentives provided by the government to invest in energy efficiency reduces costs to businesses and consumers, but are derived from taxes. Furthermore, the flow of investment and savings occur over time. As a result, estimates of total investment required to achieve emissions reductions can be confusing or misleading.

As a general rule, implementing land-use bylaws that concentrate growth in urban and rural village centres tend to have the most significant impact in reducing community emissions while also generating the greatest financial savings for residents. In compact communities with small to mid-size homes and parcels, less energy is used for space heating and conditioning, travel distances to local amenities are shorter, and alternatives to the private automobile become more viable.

Other actions that reduce community emissions while saving money over time include simple residential retrofits like weatherproofing or improving insulation. Such actions make financial sense regardless of their ability to reduce emissions.

Actions that significantly reduce emissions but may not generate an economic return for an extended period of time include investments in transit and transit infrastructure (including active transportation infrastructure like trails and bikeways), and renewable energy systems. Though these particular forms of infrastructure may not generate direct financial returns over their lifespan, they will produce a wide range of other benefits, ranging from increased mobility and transportation options for all members of a community, to opportunities for active and healthy living, improved air quality, and long-term community resilience and self-sufficiency. In these examples, the rationale for the investment is supported beyond emission reductions by additional community benefits.

6.6 ALLOCATING RESOURCES

This section details several of the initiatives underway or planned in different RDN departments, and where appropriate, provides the total budgets for those departments. Incorporating energy efficiency and emissions reduction is integral to all departments in the RDN. This is not necessarily a driving force for all departments, but it is a clear co-benefit of the efficient delivery of services.

6.6.1 Corporate Administration

In order for a commitment to reduce community emissions to be a priority for the organization, it must be a priority for senior management and the Board of Directors. For more than a decade, the Regional District of Nanaimo Board of Directors has provided direction to senior staff to ensure that community-wide emission reductions are addressed through the RDN's work. This is articulated most formally in the Board Strategic Plan, the highest policy level for the organization, which is reviewed and revised by each successive Board. The current Strategic Plan prioritizes community resilience, economic viability and self-sufficiency, as well as regional collaboration. In the context of climate action, this translates to a focus on distributed, renewable energy and water systems, and cultivating local economic development opportunities in the green buildings and technology sector.

Examples of collaborative efforts led by the RDN to reduce emissions across the region include the development and execution of a Memorandum of Agreement to undertake regional emission projects for the purpose of achieving carbon neutral operations. As part of that agreement, the RDN and each of the member municipalities have agreed to internalize a price on carbon for all corporate emissions, set at $25 per tonne, and dedicate that money to community-wide offset or emission reduction projects within the region. With a combined annual corporate inventory of approximately 10,000 tonnes CO_2e, this commitment will result in up to $250,000 per year to implement regional emission reduction projects in the RDN.

This type of cooperation is common among the RDN and member municipalities. A second example is a regional planning initiative, sponsored by the Province of BC and the Fraser Basin Council, to identify strategic locations for 12 Level 2 electric-vehicle charging stations in the region's electoral areas, the City of Parksville and the Town of Qualicum Beach, and to coordinate installation of charging stations at those sites by March 31, 2013. As a result of this collaboration, and the success of similar projects in neighbouring jurisdictions, electric vehicle users will be able to travel across much of Vancouver Island with the knowledge that publicly accessible electric vehicle charging stations will be readily available.

6.6.2 Energy and Sustainability

The Energy and Sustainability Department at the Regional District of Nanaimo operates on an annual budget of approximately $250,000 per year, supported through the Corporate Administration, Long Range Planning, and Regional Growth functions. This includes staff wages for a Manager of Energy and Sustainability and a Sustainability Coordinator, as well as professional fees for research, development, and implementation projects.

As part of daily departmental activities, the department is responsible for interdepartmental and organization-wide conservation initiatives, public outreach and communication on energy conservation, emissions reduction, and other sustainability initiatives including the coordination of those involving member municipalities.

Active programs include administration of the Green Building Action Plan, which involves the dissemination of research and information through best practices guidebooks, policy development to facilitate green building construction, and a financial incentive program to encourage deployment of renewable energy technologies and infrastructure to support community electric vehicles.

The department also accesses project funding through the Community Works Fund, which is intended for projects that result in cleaner air, cleaner water, and reduced greenhouse gas emissions. Historically, up to $50,000 per year has been made available to the Energy and Sustainability Department through the Community Works Fund, though this is entirely at the discretion of electoral area directors.

Connecting climate action to local economic development, the Energy and Sustainability Department is also responsible for administering the RDN's Northern Community Economic Development Program. This new program provides a total of $50,000 per year in grants for local economic development initiatives. Among the program's funding priorities are renewable energy and the green economy.

Finally, as a signatory to the Climate Action Charter, the Regional District of Nanaimo receives a provincial grant in an amount equal to the organization's annual expenditure on the provincial Carbon Tax. At present consumption and tax rates, this amounts to approximately $100,000 per year. This revenue is directed toward capital projects and other initiatives that result in reduced corporate emissions.

6.6.3 Regional Growth and Long Range Planning

Much of the focus on reigning in community emissions and achieving the 80% reduction target orients around moving toward more compact, complete communities in the region. The RDN's Long Range Planning Department is responsible for the policy aspect of this work, developing annual budgets and work plans geared towards implementation of Official Community Plans in the region's electoral areas, as well as related implementation projects intended to realize OCP direction on the ground. An example of projects of this type is the Alternative Forms of Rural Development project, which examines new development archetypes on rural parcels that promote compact forms and protection of forest land while maintaining landowners' abilities to realize the existing development potential of the properties they own.

A separate work plan and budget is developed each year to support regional growth and development planning, focusing on implementation of the Regional Growth Strategy. The Regional Growth Strategy and the six Electoral Area OCPs that the RDN is responsible for all include the target to reduce emissions to 80% below 2007 levels by 2050.

6.6.4 Solid Waste and Transportation Services

Together, solid waste and transportation services comprise approximately 40% of the RDN's total annual budget, and both contribute immensely to regional initiatives to reduce community-wide greenhouse gas emissions.

The Solid Waste Department operates on a budget of approximately $8 million per year. A flagship sustainability program for the Regional District of Nanaimo is its curbside organic collection and diversion program. Since its region-wide implementation in late 2010, approximately 10,000 tonnes of household organic waste have been diverted from the Regional Landfill. Using a calculation method developed by the Province of BC, this translates to over 6,000 tonnes of avoided emissions, and has allowed the RDN, the City of Parksville, the Town of Qualicum Beach, and the District of Lantzville to achieve carbon neutral operations.

In addition to curbside organic collection, the Solid Waste Department also operates the regional Cedar Road Landfill. At that facility, the RDN maintains a comprehensive landfill gas capture system that achieves a 35–45% collection efficiency. This captured methane is transported to Cedar Road LFG Inc., a private sector company operating on the site that uses the methane to produce electricity. It is considering diversifying into renewable, compressed natural gas for vehicles.

Delivery of the region's transportation service includes operation of a regional transit system. Presently, the annual budget for transportation is over $18 million, with a proposed 90,000 hours of expanded service planned and budgeted for the period between 2009 and 2018. Once complete, this 90,000-hour service expansion will represent roughly a doubling of the regional transit network, providing residents across the region with an increasingly viable alternative to private vehicle use.

6.6.5 Wastewater Services

The Regional District of Nanaimo Wastewater Service operates two major Pollution Control Centres and two minor centres, and undertakes liquid waste management planning for the region, with a budget of approximately $9 million per year for these activities.

The department is in the final stages of completing a treatment upgrade to the Greater Nanaimo Pollution Control Centre, which has incorporated a cogeneration facility to provide process heat for sewage treatment and electricity for sale into the conventional grid. The system has the potential to generate up to 2 GWh of electricity per year, complementing conventional electricity with enough locally produced, renewable electricity to provide for as many as 200 homes.

Over the medium term, the department will initiate a capacity expansion to the French Creek Pollution Control Centre in Parksville—a $30 million capital project. This expansion will take into consideration opportunities to generate renewable energy, as well as measures to prepare the system for increased frequency and intensity of precipitation and drought likely to occur as climate change proceeds.

6.6.6 Recreation and Parks Services

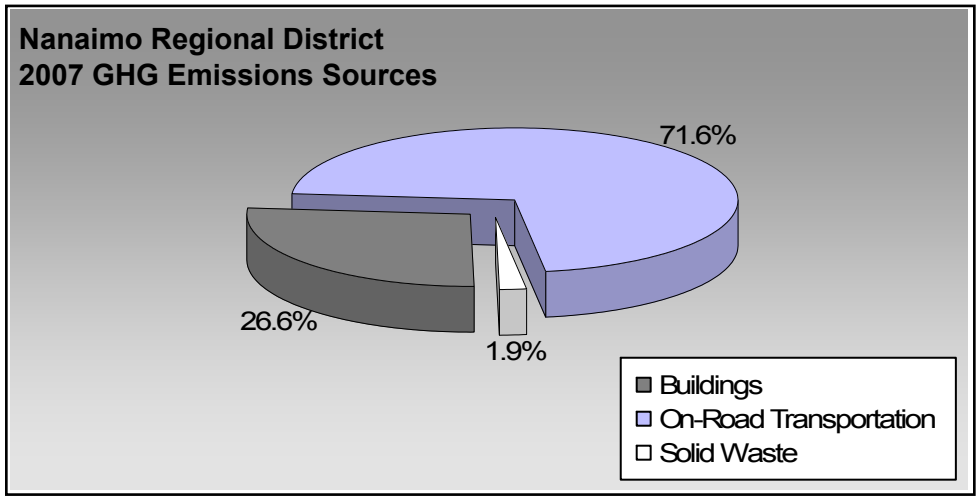
The Regional Parks program of the Recreation and Parks Service operates on a budget of approximately $1.8 million per year. An innovative direction that the RDN is exploring through the parks program is to combine carbon sequestration opportunities in regional parkland with efforts to promote complete, compact communities. As an example, when proposed developments exceed a certain size, developers are required to provide a portion of the area as parkland. To encourage developers to dedicate greater areas than required by law, the RDN is in a position to permit the same density of development on a smaller area resulting in a more compact community, and quantify the carbon benefits of the forest land left intact. If successful, this initiative will protect more forest land than initially required while enabling the developer to include emission reductions and environmental benefits as a selling feature of the development.

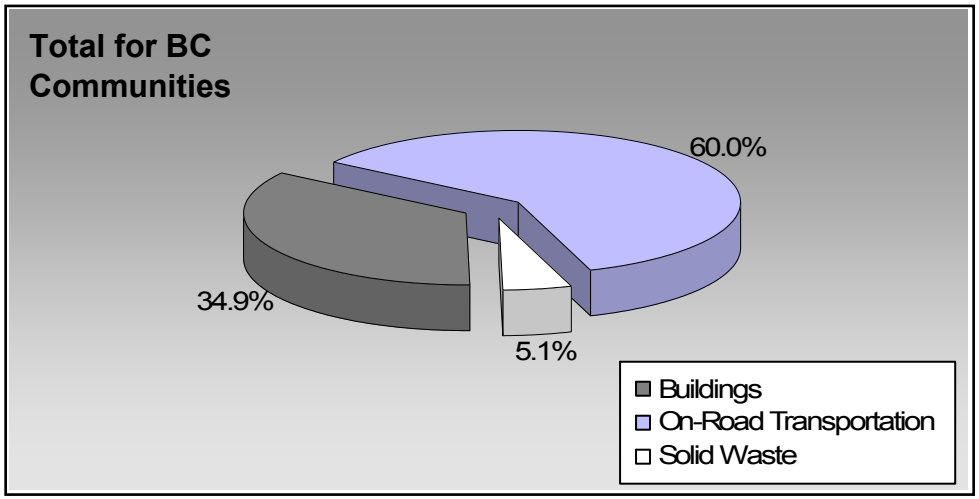
APPENDIX 1 / CEEI REPORTS

Nanaimo Regional District
Updated 2007 Community Energy and Emissions Inventory

BC's Community Energy and Emission Inventories...supporting efforts towards Complete, Compact, Energy-Efficient Communities

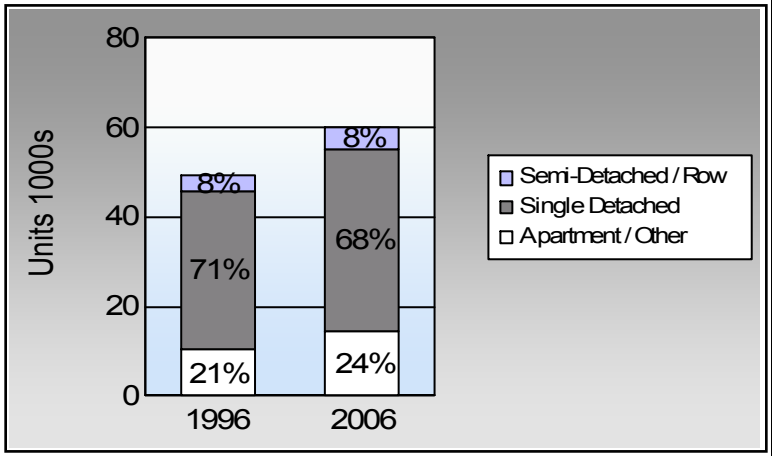
Where are the majority of our community's emissions coming from?





Are we living more compactly?

Housing Type



In BC, single family detached housing made up 49% of housing in 2006.

Are we driving less?

Commute To Work

	1996	2006
	80.3%	80.2%
	7.0%	7.1%
	2.3%	2.6%
	6.6%	6.6%
	1.8%	1.8%

In BC, 10% of people took transit, 7% walked, and 2% cycled to work in 2006.

Residential Density

This data is only available for municipalities.

BC municipal average: 7.4 people per net ha

Are we living closer to where we work?

Commute Distance

This data is currently unavailable in the CEEI 2007 Reports

In BC, 41% of people lived within 5km of their work in 2006.

For more information and to provide feedback on your Community Energy and Emissions Inventory (CEEI) Report see back page.

Sectors

On Road Transportation		Vehicles	Consumption	Measurement	Average-VKT(km)	Energy (GJ)	CO2e (t)
Small Passenger Cars	Gasoline	31,050	39,798,658	Litres	12,875	1,392,953	95,062
	Diesel Fuel	1,226	1,193,625	Litres	13,695	45,716	3,260
	Other Fuel	< 10	8,700	Litres	9,851	333	13
				Small Passenger Cars		**1,439,002**	**98,335**
Large Passenger Cars	Gasoline	18,260	35,054,475	Litres	15,863	1,226,907	83,295
	Diesel Fuel	472	999,107	Litres	16,516	38,266	2,727
	Other Fuel	51	114,321	Litres	12,681	4,378	175
				Large Passenger Cars		**1,269,551**	**86,197**
Light Trucks, Vans, SUVs	Gasoline	38,095	110,812,025	Litres	19,720	3,878,421	265,545
	Diesel Fuel	3,322	7,972,380	Litres	19,043	305,342	21,779
	Other Fuel	317	741,418	Litres	13,252	28,396	1,136
				Light Trucks, Vans, SUVs		**4,212,159**	**288,460**
Commercial Vehicles	Gasoline	272	1,223,626	Litres	15,114	42,827	2,862
	Diesel Fuel	1,038	4,769,095	Litres	21,812	182,656	12,834
	Other Fuel	46	166,501	Litres	11,805	6,377	255
				Commercial Vehicles		**231,860**	**15,951**
Tractor Trailer Trucks	Gasoline	14	91,344	Litres	17,013	3,197	214
	Diesel Fuel	947	29,125,969	Litres	80,324	1,115,525	78,377
	Other Fuel	< 10	11,056	Litres	8,226	423	17
				Tractor Trailer Trucks		**1,119,145**	**78,608**
Motorhomes	Gasoline	1,142	1,200,763	Litres	2,947	42,027	2,807
	Diesel Fuel	156	173,705	Litres	4,762	6,653	467
	Other Fuel	16	21,433	Litres	2,220	821	33
				Motorhomes		**49,501**	**3,307**
Motorcycles, Mopeds	Gasoline	1,840	718,130	Litres	5,354	25,135	1,677
				Motorcycles, Mopeds		**25,135**	**1,677**
Bus	Gasoline	81	657,082	Litres	19,651	22,998	1,544
	Diesel Fuel	131	2,555,627	Litres	36,211	97,881	6,877
	Other Fuel	14	92,170	Litres	15,902	3,530	141
				Bus		**124,409**	**8,562**

	Gasoline:	6,634,465	453,006
	Diesel:	1,792,039	126,321
	Other Fuel:	44,258	1,770
On Road Transportation Totals	**All Fuels:**	**8,470,762**	**581,097**

Buildings

	Type	Connections	Consumption	Measurement	Energy (GJ)	CO2e (t)
Residential	Electricity	65,997	940,238,806	Kilowatt Hours	3,384,857	23,193
	Natural Gas	18,162	1,081,582	GigaJoules	1,081,582	55,161
	Heating Oil		820,187	GigaJoules	820,187	57,815
	Propane		141,464	GigaJoules	141,464	8,631
	Wood		999,861	GigaJoules	999,861	370
			Residential		**6,427,951**	**145,170**
Commercial/Small-Medium Industrial	Electricity	7,477	506,203,158	Kilowatt Hours	1,822,330	12,486
	Natural Gas	2,211	1,137,567	GigaJoules	1,137,567	58,016
			Commercial/Small-Medium Industrial		**2,959,897**	**70,502**

	Electricity:	5,207,187	35,679
	Natural Gas:	2,219,149	113,177
	Propane:	141,464	8,631
	Wood:	999,861	370
	Heating Oil:	820,187	57,815
Buildings Totals	**Buildings:**	**9,387,848**	**215,672**

Solid Waste

		Mass (t)	CO2e (t)
	Community Solid Waste	75,000	15,377

Grand Total

	CONSUMPTION		ENERGY (GJ)	CO2e (t)
Diesel Fuel	46,789,508	L	1,792,039	126,321
Electricity	1,446,441,964	kWh	5,207,187	35,679
Gasoline	189,556,103	L	6,634,465	453,006
Heating Oil	820,187	GJ	820,187	57,815
Natural Gas	2,219,149	GJ	2,219,149	113,177
Other Fuel	1,155,599	L	44,258	1,770
Propane	141,464	GJ	141,464	8,631
Solid Waste	75,000	T	0	15,377
Wood	999,861	GJ	999,861	370
Total of Transportation / Buildings / Solid Waste:			**17,858,610** GJ	**812,146** tonnes

Memo Items

Buildings

	Type	Connections	Consumption	Measurement	Energy (GJ)	CO2e (t)
Large Industrial	Electricity	5	262,931,073	Kilowatt Hours	946,551	6,486
	Natural Gas	1	withheld	GigaJoules	-	-
				Large Industrial	**946,551**	**6,486**

Agriculture

		Number of Animals	Methane	CO2e (t)
	Enteric Fermentation	6,039	268	5,628

Land-Use Change

	Area (ha)	CO2e (t)
Deforestation from Settlement	95	83,158
Deforestation from Agriculture	18	12,482
Deforestation:	**113**	**95,640**

Nanaimo Regional District
Updated 2007 Community Energy and Emissions Inventory

Supporting Indicators

Below you will find supporting indicators for which data is provided. These are the first five supporting indicators for which data is provided as a part of the updated 2007 CEEI. Columns with all zeros indicate data unavailable in these CEEI reports. Thirteen additional supporting indicators are under consideration for future reports (see next page). Local government feedback is requested on all supporting indicators. Please take the time to complete the short CEEI Survey at http://www.env.gov.bc.ca/cas/mitigation/ceei/index.html or contact us directly at CEEIRPT@gov.bc.ca

Housing Type - Private dwellings by structural type

Housing type is important for reducing building-related GHG emissions and energy consumption. A trend toward fewer single family dwellings indicates an increase in residential density, which is known to reduce transportation-related GHG emissions.

	1996		2001		2006	
	Units	%	Units	%	Units	%
Single Detached House	35,135	42	38,015	70	40,720	68
Semi-Detached House	1,605	2	1,835	3	2,260	4
Row House	2,125	3	2,370	4	2,405	4
Apartment, Duplex	1,575	2	1,610	3	3,230	5
Apartment, 5 storeys or higher	800	1	850	2	1,050	2
Apartment, under 5 storeys	6,050	7	6,955	13	7,960	13
Other Single Attached House	90	0	200	0	165	0
Movable Dwelling	2,085	2	2,425	4	2,075	3

Residential Density

* Net of Crown land, parks, Indian Reserves, water features, airports, ALR,waste disposal sites.

Increasing residential densities is known to reduce vehicle use resulting in fewer transportation-related GHG emissions. There are many additional benefits from more compact development.

2009
This data is currently unavailable in the CEEI 2007 Reports.

Commute to Work - Employed labour force - by mode of commute

An increase in the number of people choosing to walk, cycle and use transit reduces GHG emissions. More compact, complete, connected communities should see an increase in the use of these transportation modes.

	1996		2001		2006	
	People	%	People	%	People	%
Car, Truck, Van as Driver	37,795	80	39,085	82	44,975	80
Car, Truck,Van as Passenge	3,300	7	2,950	6	3,960	7
Public Transit	1,100	2	1,055	2	1,475	3
Walked	3,110	7	3,045	6	3,690	7
Bicycle	825	2	885	2	1,020	2
Motorcycle	105	0	105	0	200	0
Taxicab	20	0	50	0	30	0
Other Method	830	2	575	1	715	1

Commute Distance

Shorter commute distances generally reduce GHG emissions by increasing the likelihood of people walking, cycling or using transit. Commute distance is also indicative of the 'completeness' of a community from an employment perspective.

2006	
People	%
This data is currently unavailable in the CEEI 2007 Reports.	

Parks and Protected Greenspace

* Total is net of Indian Reserves

** The quantity of parkland may be underestimated

Parks and protected greenspaces are important for the protection and enhancement of community carbon sinks.

	2009	
	Area (ha)	%
National Parks	0.0	0.0
Provincial Parks / Protected Areas	3,069.0	1.5
Local Parks	2,005.4	1.0
Agricultural Land Reserve	18,720.5	9.0
Other land use	184,312.2	88.6
Total Land Area	208,107.1	100.0

Supporting Indicators Under Consideration

The following supporting indicators are under consideration for inclusion in future CEEI reports. The 2007 CEEI reports provide these 'placeholder' indicators to give indication of data that may be provided in the future by the Province on an ongoing basis to assist in monitoring actions to reduce GHG emissions and energy consumption. Please submit feedback to CEEIRPT@gov.bc.ca (see survey on CEEI website).

On-Road Transportation (and Land Use)

Proximity to Transit	Persons, dwelling units (du) and employment within 400m of a quality transit stop/line
Proximity to Services	Persons and dwelling units (du) within 400m of services (e.g. grocery store, school, other retail etc.)
Transit Ridership	Annual per capita transit ridership

Buildings

Residential; Public Building Energy Intensity	Average energy use per person per square metre of floor space
Floor Space	Average residential dwelling unit size

Solid Waste (and Water)

Waste Diversion	Tonnes of waste diverted
Avoided Waste Emissions	Tonnes of CO2e of avoided future emissions due to reduced waste since 2007
Water Use	Per capita residential water use

Land-Use Change

Impervious Surface Cover	% change in impervious surface cover
Tree Canopy Cover	% change in tree canopy cover

Community and Renewable Energy Supply

District Energy	# and energy output (e.g. buildings connected, energy consumed in GJ or kWh) of district energy systems by energy type (e.g. renewable or non-renewable)
On-Site Renewable Energy	# and energy output (in GJ or kWh) from households producing and/or consuming on-site renewable heat (e.g. biomass, solar thermal, geo-exchange) and/or electrical (e.g. solar photovoltaic, small wind, small scale hydro) energy
Energy Recovery From Waste	Energy (GJ or kWh) recovered from waste (e.g. from landfill gas, sewage treatment, industrial operations, farm)

This is your local government's Updated 2007 Community Energy and Emissions Inventory (CEEI) Report

What is a CEEI Report?
CEEI Reports are a result of a multi-agency effort to provide a province-wide solution to assist local governments in BC to track and report on community-wide energy consumption and greenhouse gas (GHG) emissions every two years. CEEI Reports are one of the many resources available through the Climate Action Toolkit (<http://www.toolkit.bc.ca>), a web-based service provided through the ongoing collaboration between UBCM and the Province.

Why does my local government need a CEEI Report?
A community energy and GHG emissions inventory can be a valuable tool that helps local governments plan and implement GHG and energy management strategies, while at the same time strengthening broader sustainability planning at the local level. CEEI reports fulfill local governments' Climate Action Charter commitment to measure and report their community's GHG emissions profile, establish a base year inventory for local governments to consider as they develop targets, policies, and actions related to BC's *Local Government Act* requirements, and fulfill Milestone One requirements for those local government members of the Federation of Canadian Municipalities' (FCM's) Partners in Climate Protection (PCP) program.

A first in North America!
CEEI is a first in North America and a first step for BC communities. The 2007 CEEI Reports are based on best available province-wide data. The accuracy and detail of CEEI reports will continue to improve to meet increasing local and provincial government information needs. Improvements have been made from the original draft 2007 CEEI Reports posted in Spring 2009. These include estimates for residential heating oil, propane and wood use, breaking out small and medium from large industrial buildings, including updated land-use change and new agricultural sectors as 'memo items', and the first of a suite of 'supporting indicators'. Following the 2010 CEEI Reports, inventories will be generated every two years, and will continue to improve as government information needs, international protocols and new data sources emerge.

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For More Information:

- The full list of all BC local government Updated 2007 CEEI Reports, CEEI Data Summary Report, Technical Methods and Guidance Document, and additional information on the Secondary Indicators are available at: <http://www.env.gov.bc.ca/cas/mitigation/ceei/index.html>.

- For guidance on target setting and community actions, go to <http://www.toolkit.bc.ca> and <http://www.cd.gov.bc.ca/lgd/greencommunities/targets.htm>.

We Need Your Feedback:

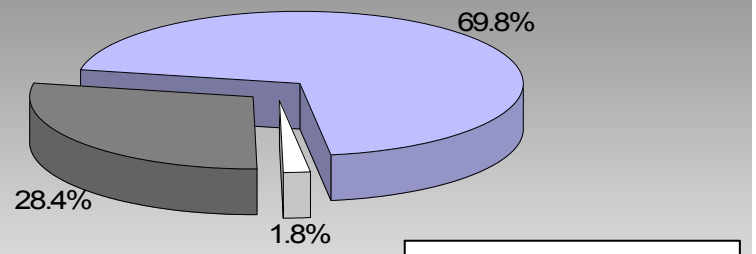
- To continue to guide us on CEEI, particularly now with the new Indicators. Please take the time to complete the short CEEI Survey at <http://www.env.gov.bc.ca/cas/mitigation/ceei/index.html> or contact us directly at CEEIRPT@gov.bc.ca

Nanaimo City
Updated 2007 Community Energy and Emissions Inventory

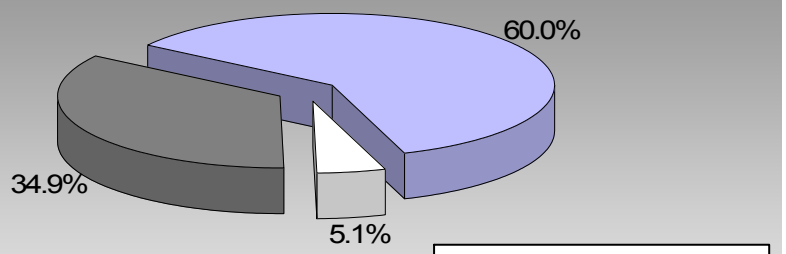
BC's Community Energy and Emission Inventories...supporting efforts towards Complete, Compact, Energy-Efficient Communities

Where are the majority of our community's emissions coming from?

Nanaimo City
2007 GHG Emissions Sources

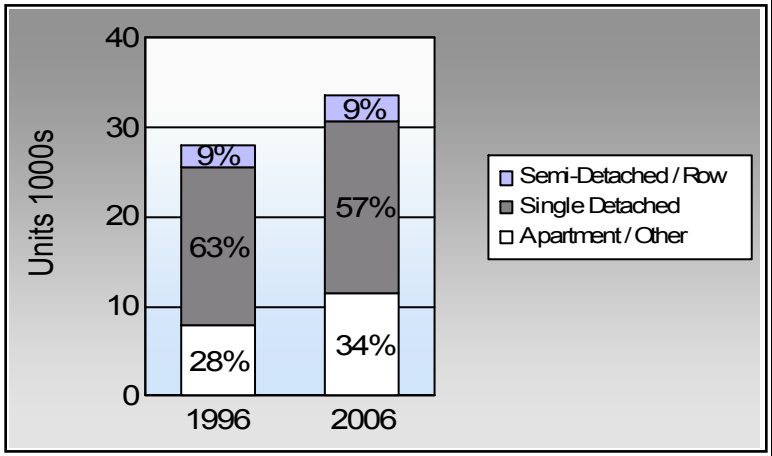


Total for BC Communities



Are we living more compactly?

Housing Type



In BC, single family detached housing made up 49% of housing in 2006.

Are we driving less?

Commute To Work

	1996	2006
	78.3%	78.7%
	7.7%	7.1%
	3.0%	3.4%
	7.2%	7.1%
	2.0%	2.0%

In BC, 10% of people took transit, 7% walked, and 2% cycled to work in 2006.

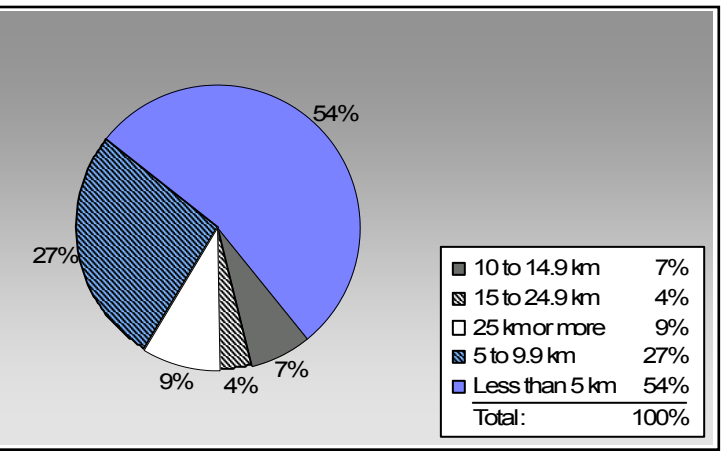
Residential Density

Nanaimo City: 11.5 people per net ha

BC municipal average: 7.4 people per net ha

Are we living closer to where we work?

Commute Distance



In BC, 41% of people lived within 5km of their work in 2006.

For more information and to provide feedback on your Community Energy and Emissions Inventory (CEEI) Report see back page.

Sectors

On Road Transportation		Vehicles	Consumption	Measurement	Average-VKT(km)	Energy (GJ)	CO2e (t)
Small Passenger Cars	Gasoline	19,119	24,296,049	Litres	12,885	850,362	58,012
	Diesel Fuel	631	627,032	Litres	13,775	24,015	1,712
	Other Fuel	< 10	4,227	Litres	9,839	162	6
				Small Passenger Cars		**874,539**	**59,730**
Large Passenger Cars	Gasoline	10,288	20,082,497	Litres	16,241	702,887	47,704
	Diesel Fuel	250	565,008	Litres	17,531	21,640	1,543
	Other Fuel	27	59,644	Litres	12,799	2,284	91
				Large Passenger Cars		**726,811**	**49,338**
Light Trucks, Vans, SUVs	Gasoline	21,435	62,842,996	Litres	20,037	2,199,505	150,500
	Diesel Fuel	1,497	3,619,403	Litres	19,758	138,623	9,888
	Other Fuel	161	372,105	Litres	13,493	14,252	570
				Light Trucks, Vans, SUVs		**2,352,380**	**160,958**
Commercial Vehicles	Gasoline	133	601,219	Litres	15,760	21,043	1,408
	Diesel Fuel	649	3,020,335	Litres	22,726	115,679	8,128
	Other Fuel	16	58,434	Litres	11,846	2,238	90
				Commercial Vehicles		**138,960**	**9,626**
Tractor Trailer Trucks	Gasoline	< 10	45,509	Litres	13,906	1,593	107
	Diesel Fuel	509	17,463,932	Litres	89,477	668,869	46,995
	Other Fuel	< 10	6,295	Litres	9,368	241	10
				Tractor Trailer Trucks		**670,703**	**47,112**
Motorhomes	Gasoline	560	576,632	Litres	2,932	20,182	1,348
	Diesel Fuel	92	108,621	Litres	5,357	4,160	292
	Other Fuel	< 10	11,491	Litres	2,189	440	18
				Motorhomes		**24,782**	**1,658**
Motorcycles, Mopeds	Gasoline	1,066	407,413	Litres	5,404	14,259	951
				Motorcycles, Mopeds		**14,259**	**951**
Bus	Gasoline	57	462,483	Litres	19,162	16,187	1,087
	Diesel Fuel	84	1,866,317	Litres	40,471	71,480	5,022
	Other Fuel	< 10	4,389	Litres		168	7
				Bus		**87,835**	**6,116**

	Gasoline:	3,826,018	261,117
	Diesel:	1,044,466	73,580
	Other Fuel:	19,785	792
On Road Transportation Totals	**All Fuels:**	**4,890,269**	**335,489**

Buildings

	Type	Connections	Consumption	Measurement	Energy (GJ)	CO2e (t)
Residential	Electricity	34,490	452,885,643	Kilowatt Hours	1,630,387	11,171
	Natural Gas	12,287	760,754	GigaJoules	760,754	38,798
	Heating Oil		364,441	GigaJoules	364,441	25,689
	Propane		62,913	GigaJoules	62,913	3,838
	Wood		443,817	GigaJoules	443,817	164
			Residential		**3,262,312**	**79,660**
Commercial/Small-Medium Industrial	Electricity	3,902	339,629,546	Kilowatt Hours	1,222,665	8,378
	Natural Gas	1,728	944,910	GigaJoules	944,910	48,190
			Commercial/Small-Medium Industrial		**2,167,575**	**56,568**

	Electricity:	2,853,052	19,549
	Natural Gas:	1,705,664	86,988
	Propane:	62,913	3,838
	Wood:	443,817	164
	Heating Oil:	364,441	25,689
Buildings Totals	**Buildings:**	**5,429,887**	**136,228**

Solid Waste

	Mass (t)	CO2e (t)
Community Solid Waste	42,455	8,704

Grand Total		CONSUMPTION		ENERGY (GJ)	CO2e (t)
	Diesel Fuel	27,270,648	L	1,044,466	73,580
	Electricity	792,515,189	kWh	2,853,052	19,549
	Gasoline	109,314,798	L	3,826,018	261,117
	Heating Oil	364,441	GJ	364,441	25,689
	Natural Gas	1,705,664	GJ	1,705,664	86,988
	Other Fuel	516,585	L	19,785	792
	Propane	62,913	GJ	62,913	3,838
	Solid Waste	42,455	T	0	8,704
	Wood	443,817	GJ	443,817	164
Total of Transportation / Buildings / Solid Waste:				**10,320,156** GJ	**480,421** tonnes

Memo Items

Buildings	Type	Connections	Consumption	Measurement	Energy (GJ)	CO2e (t)
Large Industrial	Electricity	5	withheld	Kilowatt Hours	-	-
	Natural Gas	1	withheld	GigaJoules	-	-
				Large Industrial	**-**	**-**

Nanaimo City
Updated 2007 Community Energy and Emissions Inventory

Supporting Indicators

Below you will find supporting indicators for which data is provided. These are the first five supporting indicators for which data is provided as a part of the updated 2007 CEEI. Columns with all zeros indicate data unavailable in these CEEI reports. Thirteen additional supporting indicators are under consideration for future reports (see next page). Local government feedback is requested on all supporting indicators. Please take the time to complete the short CEEI Survey at http://www.env.gov.bc.ca/cas/mitigation/ceei/index.html or contact us directly at CEEIRPT@gov.bc.ca

Housing Type - Private dwellings by structural type

Housing type is important for reducing building-related GHG emissions and energy consumption. A trend toward fewer single family dwellings indicates an increase in residential density, which is known to reduce transportation-related GHG emissions.

	1996		2001		2006	
	Units	%	Units	%	Units	%
Single Detached House	17,615	39	18,630	61	19,115	57
Semi-Detached House	1,165	3	1,215	4	1,475	4
Row House	1,360	3	1,485	5	1,430	4
Apartment, Duplex	1,410	3	1,350	4	2,775	8
Apartment, 5 storeys or higher	800	2	820	3	1,020	3
Apartment, under 5 storeys	4,970	11	5,845	19	6,735	20
Other Single Attached House	50	0	150	0	105	0
Movable Dwelling	660	1	1,180	4	870	3

Residential Density

* Net of Crown land, parks, Indian Reserves, water features, airports, ALR,waste disposal sites.

Increasing residential densities is known to reduce vehicle use resulting in fewer transportation-related GHG emissions. There are many additional benefits from more compact development.

	2009
Population	84,228.0
Net Land Area (ha) *	7,329.5
Residential Density (people per net ha)	11.5

Commute to Work - Employed labour force - by mode of commute

An increase in the number of people choosing to walk, cycle and use transit reduces GHG emissions. More compact, complete, connected communities should see an increase in the use of these transportation modes.

	1996		2001		2006	
	People	%	People	%	People	%
Car, Truck, Van as Driver	22,485	78	23,165	80	27,125	79
Car, Truck,Van as Passenge	2,220	8	1,885	7	2,460	7
Public Transit	860	3	865	3	1,160	3
Walked	2,065	7	2,045	7	2,445	7
Bicycle	560	2	570	2	695	2
Motorcycle	60	0	65	0	140	0
Taxicab	20	0	45	0	30	0
Other Method	465	2	285	1	415	1

Commute Distance

Shorter commute distances generally reduce GHG emissions by increasing the likelihood of people walking, cycling or using transit. Commute distance is also indicative of the 'completeness' of a community from an employment perspective.

	2006	
	People	%
Less than 5 km	15,560	54
5 to 9.9 km	7,855	27
10 to 14.9 km	2,005	7
15 to 24.9 km	1,040	4
25 km or more	2,575	9

Parks and Protected Greenspace

* Total is net of Indian Reserves

** The quantity of parkland may be underestimated

Parks and protected greenspaces are important for the protection and enhancement of community carbon sinks.

	2009	
	Area (ha)	%
National Parks	0.0	0.0
Provincial Parks / Protected Areas	334.3	3.7
Local Parks	743.8	8.3
Agricultural Land Reserve	417.8	4.7
Other land use	7,437.8	83.3
Total Land Area	8,933.7	100.0

Supporting Indicators Under Consideration

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On-Road Transportation (and Land Use)

Proximity to Transit	Persons, dwelling units (du) and employment within 400m of a quality transit stop/line
Proximity to Services	Persons and dwelling units (du) within 400m of services (e.g. grocery store, school, other retail etc.)
Transit Ridership	Annual per capita transit ridership

Buildings

Residential; Public Building Energy Intensity	Average energy use per person per square metre of floor space
Floor Space	Average residential dwelling unit size

Solid Waste (and Water)

Waste Diversion	Tonnes of waste diverted
Avoided Waste Emissions	Tonnes of CO2e of avoided future emissions due to reduced waste since 2007
Water Use	Per capita residential water use

Land-Use Change

Impervious Surface Cover	% change in impervious surface cover
Tree Canopy Cover	% change in tree canopy cover

Community and Renewable Energy Supply

District Energy	# and energy output (e.g. buildings connected, energy consumed in GJ or kWh) of district energy systems by energy type (e.g. renewable or non-renewable)
On-Site Renewable Energy	# and energy output (in GJ or kWh) from households producing and/or consuming on-site renewable heat (e.g. biomass, solar thermal, geo-exchange) and/or electrical (e.g. solar photovoltaic, small wind, small scale hydro) energy
Energy Recovery From Waste	Energy (GJ or kWh) recovered from waste (e.g. from landfill gas, sewage treatment, industrial operations, farm)

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What is a CEEI Report?
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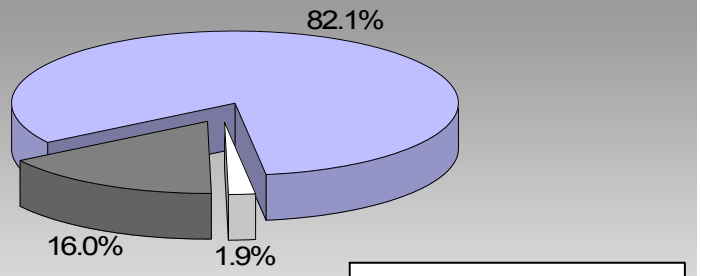
Lantzville District Municipality
Updated 2007 Community Energy and Emissions Inventory

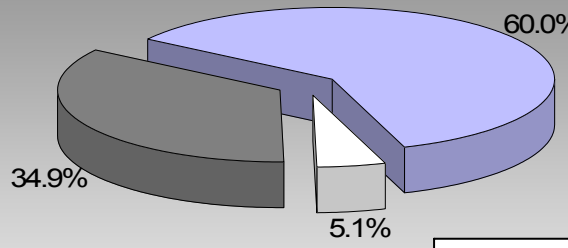
BC's Community Energy and Emission Inventories...supporting efforts towards Complete, Compact, Energy-Efficient Communities

Where are the majority of our community's emissions coming from?

Lantzville District Municipality 2007 GHG Emissions Sources

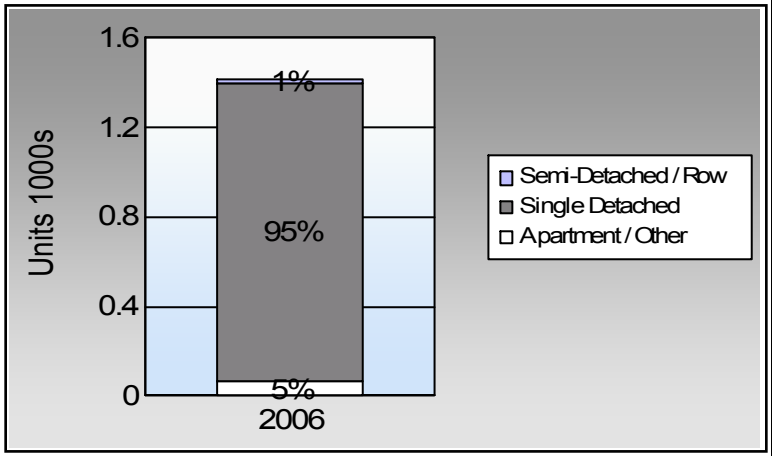


Total for BC Communities



Are we living more compactly?

Housing Type



In BC, single family detached housing made up 49% of housing in 2006.

Are we driving less?

Commute To Work

	1996	2006
	0.0%	87.3%
	0.0%	7.5%
	0.0%	0.9%
	0.0%	2.5%
	0.0%	0.6%

In BC, 10% of people took transit, 7% walked, and 2% cycled to work in 2006.

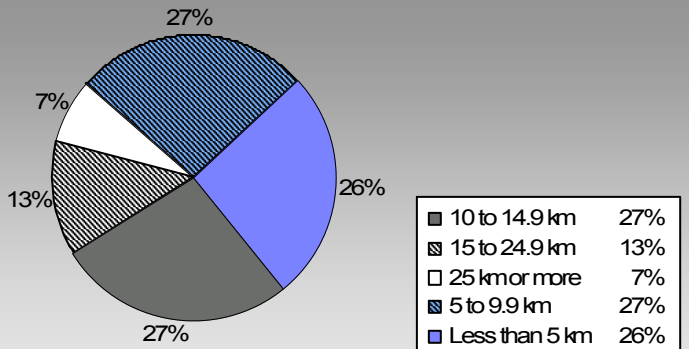
Residential Density

Lantzville District Municipality: 1.4 people per net ha

BC municipal average: 7.4 people per net ha

Are we living closer to where we work?

Commute Distance



In BC, 41% of people lived within 5km of their work in 2006.

For more information and to provide feedback on your Community Energy and Emissions Inventory (CEEI) Report see back page.

Lantzville District Municipality
Updated 2007 Community Energy and Emissions Inventory

Sectors

On Road Transportation		Vehicles	Consumption	Measurement	Average-VKT(km)	Energy (GJ)	CO2e (t)
Small Passenger Cars	Gasoline	805	1,021,038	Litres	12,928	35,736	2,441
	Diesel Fuel	44	42,009	Litres	13,972	1,609	115
				Small Passenger Cars		**37,345**	**2,556**
Large Passenger Cars	Gasoline	471	897,394	Litres	15,913	31,409	2,135
	Diesel Fuel	15	26,289	Litres	15,253	1,007	72
	Other Fuel	< 10	7,266	Litres	14,404	278	11
				Large Passenger Cars		**32,694**	**2,218**
Light Trucks, Vans, SUVs	Gasoline	1,115	3,233,064	Litres	19,735	113,157	7,758
	Diesel Fuel	144	358,010	Litres	19,730	13,712	978
	Other Fuel	15	29,493	Litres	13,705	1,130	45
				Light Trucks, Vans, SUVs		**127,999**	**8,781**
Commercial Vehicles	Gasoline	< 10	22,099	Litres	12,083	773	51
	Diesel Fuel	33	157,520	Litres	23,581	6,033	424
				Commercial Vehicles		**6,806**	**475**
Tractor Trailer Trucks	Diesel Fuel	25	728,709	Litres	73,583	27,910	1,961
				Tractor Trailer Trucks		**27,910**	**1,961**
Motorhomes	Gasoline	45	46,557	Litres	3,005	1,629	109
	Diesel Fuel	< 10	7,608	Litres	4,263	291	20
	Other Fuel	< 10	138	Litres		5	-
				Motorhomes		**1,925**	**129**
Motorcycles, Mopeds	Gasoline	52	28,059	Litres	6,179	982	65
				Motorcycles, Mopeds		**982**	**65**
Bus	Gasoline	< 10	5,852	Litres	15,902	205	14
	Diesel Fuel	< 10	74,467	Litres	52,764	2,852	200
				Bus		**3,057**	**214**
				Gasoline:		183,891	12,573
				Diesel:		53,414	3,770
				Other Fuel:		1,413	56
On Road Transportation Totals				**All Fuels:**		**238,718**	**16,399**

Lantzville District Municipality
Updated 2007 Community Energy and Emissions Inventory

Buildings

Buildings	Type	Connections	Consumption	Measurement	Energy (GJ)	CO2e (t)
Residential	Electricity	1,520	28,297,028	Kilowatt Hours	101,869	698
	Natural Gas	352	23,570	GigaJoules	23,570	1,202
	Heating Oil		11,028	GigaJoules	11,028	777
	Propane		1,900	GigaJoules	1,900	116
	Wood		13,462	GigaJoules	13,462	5
			Residential		**151,829**	**2,798**
Commercial/Small-Medium Industrial	Electricity	118	3,749,236	Kilowatt Hours	13,497	92
	Natural Gas	41	6,115	GigaJoules	6,115	312
			Commercial/Small-Medium Industrial		**19,612**	**404**

Electricity:	115,366	790
Natural Gas:	29,685	1,514
Propane:	1,900	116
Wood:	13,462	5
Heating Oil:	11,028	777
Buildings:	**171,441**	**3,202**

Buildings Totals

Solid Waste

	Mass (t)	CO2e (t)
Community Solid Waste	1,879	385

Grand Total		CONSUMPTION		ENERGY (GJ)	CO2e (t)
	Diesel Fuel	1,394,612	L	53,414	3,770
	Electricity	32,046,264	kWh	115,366	790
	Gasoline	5,254,063	L	183,891	12,573
	Heating Oil	11,028	GJ	11,028	777
	Natural Gas	29,685	GJ	29,685	1,514
	Other Fuel	36,897	L	1,413	56
	Propane	1,900	GJ	1,900	116
	Solid Waste	1,879	T	0	385
	Wood	13,462	GJ	13,462	5
Total of Transportation / Buildings / Solid Waste:				**410,159** GJ	**19,986** tonnes

Memo Items

Buildings	Type	Connections	Consumption	Measurement	Energy (GJ)	CO2e (t)
Large Industrial	Electricity	0	0	Kilowatt Hours	-	-
				Large Industrial	**-**	**-**

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Housing Type - Private dwellings by structural type

Housing type is important for reducing building-related GHG emissions and energy consumption. A trend toward fewer single family dwellings indicates an increase in residential density, which is known to reduce transportation-related GHG emissions.

	1996		2001		2006	
	Units	%	Units	%	Units	%
Single Detached House					1,335	95
Semi-Detached House					10	1
Row House					0	0
Apartment, Duplex					45	3
Apartment, 5 storeys or higher					0	0
Apartment, under 5 storeys					10	1
Other Single Attached House					5	0
Movable Dwelling					5	0

Residential Density

* Net of Crown land, parks, Indian Reserves, water features, airports, ALR,waste disposal sites.

Increasing residential densities is known to reduce vehicle use resulting in fewer transportation-related GHG emissions. There are many additional benefits from more compact development.

	2009
Population	3,701.0
Net Land Area (ha) *	2,655.0
Residential Density (people per net ha)	1.4

Commute to Work - Employed labour force - by mode of commute

An increase in the number of people choosing to walk, cycle and use transit reduces GHG emissions. More compact, complete, connected communities should see an increase in the use of these transportation modes.

	1996		2001		2006	
	People	%	People	%	People	%
Car, Truck, Van as Driver	0	0	0	0	1,405	87
Car, Truck,Van as Passenge	0	0	0	0	120	7
Public Transit	0	0	0	0	15	1
Walked	0	0	0	0	40	2
Bicycle	0	0	0	0	10	1
Motorcycle	0	0	0	0	0	0
Taxicab	0	0	0	0	0	0
Other Method	0	0	0	0	20	1

Commute Distance

Shorter commute distances generally reduce GHG emissions by increasing the likelihood of people walking, cycling or using transit. Commute distance is also indicative of the 'completeness' of a community from an employment perspective.

	2006	
	People	%
Less than 5 km	345	26
5 to 9.9 km	350	27
10 to 14.9 km	355	27
15 to 24.9 km	170	13
25 km or more	95	7

Parks and Protected Greenspace

* Total is net of Indian Reserves

** The quantity of parkland may be underestimated

Parks and protected greenspaces are important for the protection and enhancement of community carbon sinks.

	2009	
	Area (ha)	%
National Parks	0.0	0.0
Provincial Parks / Protected Areas	0.0	0.0
Local Parks	0.0	0.0
Agricultural Land Reserve	141.2	5.0
Other land use	2,656.8	95.0
Total Land Area	2,797.9	100.0

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Waste Diversion	Tonnes of waste diverted
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Land-Use Change

Impervious Surface Cover	% change in impervious surface cover
Tree Canopy Cover	% change in tree canopy cover

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District Energy	# and energy output (e.g. buildings connected, energy consumed in GJ or kWh) of district energy systems by energy type (e.g. renewable or non-renewable)
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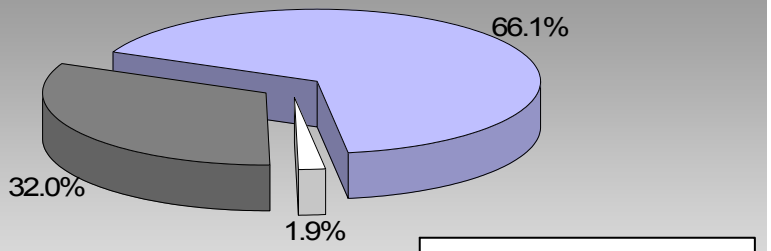

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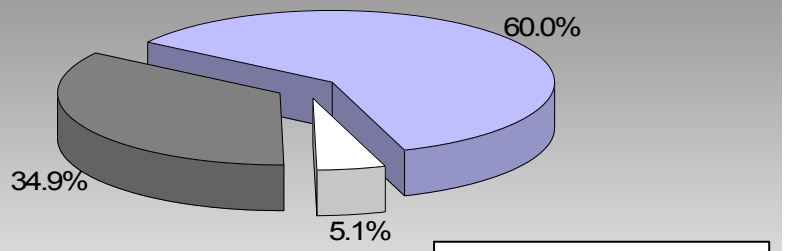
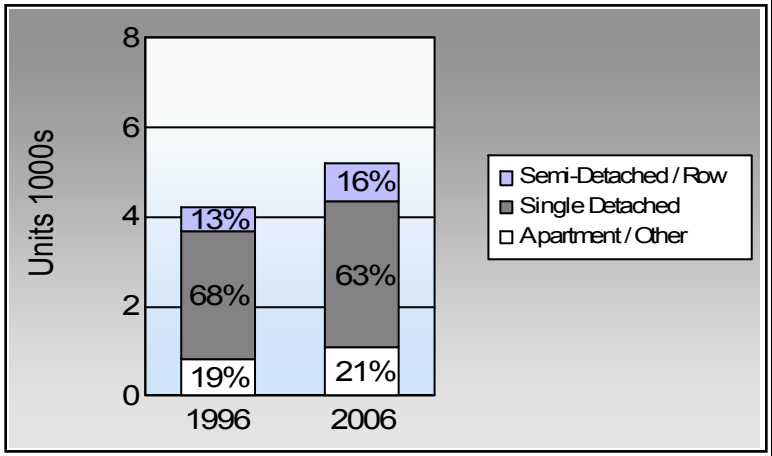


Are we living more compactly?

Housing Type



In BC, single family detached housing made up 49% of housing in 2006.

Are we driving less?

Commute To Work

	1996	2006
	79.1%	80.1%
	7.2%	6.3%
	0.8%	1.4%
	9.2%	9.8%
	2.2%	1.7%

In BC, 10% of people took transit, 7% walked, and 2% cycled to work in 2006.

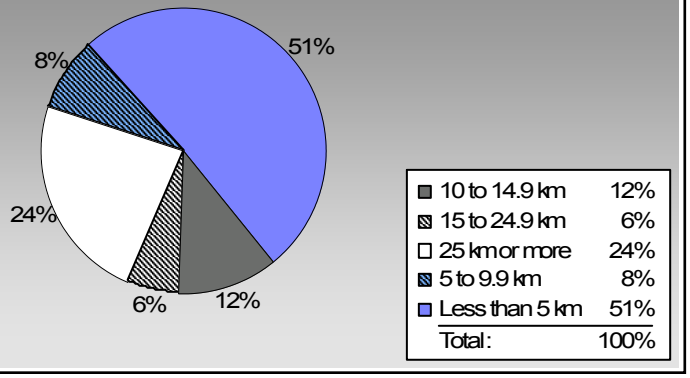
Residential Density

Parksville City: 11.0 people per net ha

BC municipal average: 7.4 people per net ha

Are we living closer to where we work?

Commute Distance



In BC, 41% of people lived within 5km of their work in 2006.

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Sectors

On Road Transportation		Vehicles	Consumption	Measurement	Average-VKT(km)	Energy (GJ)	CO2e (t)
Small Passenger Cars	Gasoline	2,637	3,380,577	Litres	12,952	118,320	8,072
	Diesel Fuel	77	75,528	Litres	13,701	2,893	206
	Other Fuel	< 10	1,754	Litres	10,911	67	3
				Small Passenger Cars		**121,280**	**8,281**
Large Passenger Cars	Gasoline	1,733	3,241,765	Litres	15,372	113,462	7,703
	Diesel Fuel	29	57,748	Litres	14,854	2,212	158
	Other Fuel	< 10	8,298	Litres	12,115	318	13
				Large Passenger Cars		**115,992**	**7,874**
Light Trucks, Vans, SUVs	Gasoline	2,939	8,487,016	Litres	19,400	297,046	20,332
	Diesel Fuel	222	530,970	Litres	18,677	20,336	1,451
	Other Fuel	20	45,975	Litres	12,748	1,761	70
				Light Trucks, Vans, SUVs		**319,143**	**21,853**
Commercial Vehicles	Gasoline	19	85,424	Litres	14,514	2,990	200
	Diesel Fuel	45	196,733	Litres	20,512	7,535	529
	Other Fuel	< 10	16,520	Litres	11,356	633	25
				Commercial Vehicles		**11,158**	**754**
Tractor Trailer Trucks	Diesel Fuel	55	1,325,917	Litres	64,909	50,783	3,568
				Tractor Trailer Trucks		**50,783**	**3,568**
Motorhomes	Gasoline	111	115,248	Litres	2,946	4,034	269
	Diesel Fuel	10	10,824	Litres	4,522	415	29
	Other Fuel	< 10	2,077	Litres	2,189	80	3
				Motorhomes		**4,529**	**301**
Motorcycles, Mopeds	Gasoline	123	47,869	Litres	5,430	1,675	112
				Motorcycles, Mopeds		**1,675**	**112**
Bus	Gasoline	< 10	26,265	Litres	23,079	919	62
	Diesel Fuel	31	214,580	Litres	16,953	8,218	577
	Other Fuel	12	71,688	Litres	15,902	2,746	110
				Bus		**11,883**	**749**

	Gasoline:	538,446	36,750
	Diesel:	92,392	6,518
	Other Fuel:	5,605	224
On Road Transportation Totals	**All Fuels:**	**636,443**	**43,492**

Buildings

	Type	Connections	Consumption	Measurement	Energy (GJ)	CO2e (t)
Residential	Electricity	6,274	73,278,233	Kilowatt Hours	263,801	1,808
	Natural Gas	2,912	142,347	GigaJoules	142,347	7,260
	Heating Oil		59,960	GigaJoules	59,960	4,227
	Propane		10,344	GigaJoules	10,344	631
	Wood		73,075	GigaJoules	73,075	27
			Residential		**549,527**	**13,953**
Commercial/Small-Medium Industrial	Electricity	865	56,381,795	Kilowatt Hours	202,974	1,391
	Natural Gas	287	111,467	GigaJoules	111,467	5,685
			Commercial/Small-Medium Industrial		**314,441**	**7,076**

	Electricity:	466,775	3,199
	Natural Gas:	253,814	12,945
	Propane:	10,344	631
	Wood:	73,075	27
	Heating Oil:	59,960	4,227
Buildings Totals	**Buildings:**	**863,968**	**21,029**

Solid Waste

		Mass (t)	CO2e (t)
	Community Solid Waste	6,042	1,239

Grand Total		CONSUMPTION		ENERGY (GJ)	CO2e (t)
	Diesel Fuel	2,412,300	L	92,392	6,518
	Electricity	129,660,028	kWh	466,775	3,199
	Gasoline	15,384,164	L	538,446	36,750
	Heating Oil	59,960	GJ	59,960	4,227
	Natural Gas	253,814	GJ	253,814	12,945
	Other Fuel	146,312	L	5,605	224
	Propane	10,344	GJ	10,344	631
	Solid Waste	6,042	T	0	1,239
	Wood	73,075	GJ	73,075	27
Total of Transportation / Buildings / Solid Waste:				**1,500,411** GJ	**65,760** tonnes

Memo Items

Buildings	Type	Connections	Consumption	Measurement	Energy (GJ)	CO2e (t)
Large Industrial	Electricity	0	0	Kilowatt Hours	-	-
				Large Industrial	**-**	**-**

Parksville City
Updated 2007 Community Energy and Emissions Inventory

Supporting Indicators

Below you will find supporting indicators for which data is provided. These are the first five supporting indicators for which data is provided as a part of the updated 2007 CEEI. Columns with all zeros indicate data unavailable in these CEEI reports. Thirteen additional supporting indicators are under consideration for future reports (see next page). Local government feedback is requested on all supporting indicators. Please take the time to complete the short CEEI Survey at http://www.env.gov.bc.ca/cas/mitigation/ceei/index.html or contact us directly at CEEIRPT@gov.bc.ca

Housing Type - Private dwellings by structural type

Housing type is important for reducing building-related GHG emissions and energy consumption. A trend toward fewer single family dwellings indicates an increase in residential density, which is known to reduce transportation-related GHG emissions.

	1996		2001		2006	
	Units	%	Units	%	Units	%
Single Detached House	2,860	40	3,200	67	3,275	63
Semi-Detached House	110	2	160	3	285	5
Row House	435	6	545	11	570	11
Apartment, Duplex	25	0	90	2	90	2
Apartment, 5 storeys or higher	0	0	5	0	0	0
Apartment, under 5 storeys	680	10	665	14	735	14
Other Single Attached House	0	0	10	0	5	0
Movable Dwelling	115	2	85	2	245	5

Residential Density

* Net of Crown land, parks, Indian Reserves, water features, airports, ALR,waste disposal sites.

Increasing residential densities is known to reduce vehicle use resulting in fewer transportation-related GHG emissions. There are many additional benefits from more compact development.

	2009
Population	11,783.0
Net Land Area (ha) *	1,074.2
Residential Density (people per net ha)	11.0

Commute to Work - Employed labour force - by mode of commute

An increase in the number of people choosing to walk, cycle and use transit reduces GHG emissions. More compact, complete, connected communities should see an increase in the use of these transportation modes.

	1996		2001		2006	
	People	%	People	%	People	%
Car, Truck, Van as Driver	2,530	79	2,675	81	2,780	80
Car, Truck,Van as Passenge	230	7	230	7	220	6
Public Transit	25	1	20	1	50	1
Walked	295	9	250	8	340	10
Bicycle	70	2	80	2	60	2
Motorcycle	10	0	0	0	0	0
Taxicab	0	0	10	0	0	0
Other Method	40	1	45	1	20	1

Commute Distance

Shorter commute distances generally reduce GHG emissions by increasing the likelihood of people walking, cycling or using transit. Commute distance is also indicative of the 'completeness' of a community from an employment perspective.

	2006	
	People	%
Less than 5 km	1,455	51
5 to 9.9 km	240	8
10 to 14.9 km	330	12
15 to 24.9 km	165	6
25 km or more	680	24

Parks and Protected Greenspace

* Total is net of Indian Reserves

** The quantity of parkland may be underestimated

Parks and protected greenspaces are important for the protection and enhancement of community carbon sinks.

	2009	
	Area (ha)	%
National Parks	0.0	0.0
Provincial Parks / Protected Areas	134.4	9.4
Local Parks	77.0	5.4
Agricultural Land Reserve	100.6	7.0
Other land use	1,119.6	78.2
Total Land Area	1,431.6	100.0

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On-Road Transportation (and Land Use)

Proximity to Transit	Persons, dwelling units (du) and employment within 400m of a quality transit stop/line
Proximity to Services	Persons and dwelling units (du) within 400m of services (e.g. grocery store, school, other retail etc.)
Transit Ridership	Annual per capita transit ridership

Buildings

Residential; Public Building Energy Intensity	Average energy use per person per square metre of floor space
Floor Space	Average residential dwelling unit size

Solid Waste (and Water)

Waste Diversion	Tonnes of waste diverted
Avoided Waste Emissions	Tonnes of CO_2e of avoided future emissions due to reduced waste since 2007
Water Use	Per capita residential water use

Land-Use Change

Impervious Surface Cover	% change in impervious surface cover
Tree Canopy Cover	% change in tree canopy cover

Community and Renewable Energy Supply

District Energy	# and energy output (e.g. buildings connected, energy consumed in GJ or kWh) of district energy systems by energy type (e.g. renewable or non-renewable)
On-Site Renewable Energy	# and energy output (in GJ or kWh) from households producing and/or consuming on-site renewable heat (e.g. biomass, solar thermal, geo-exchange) and/or electrical (e.g. solar photovoltaic, small wind, small scale hydro) energy
Energy Recovery From Waste	Energy (GJ or kWh) recovered from waste (e.g. from landfill gas, sewage treatment, industrial operations, farm)

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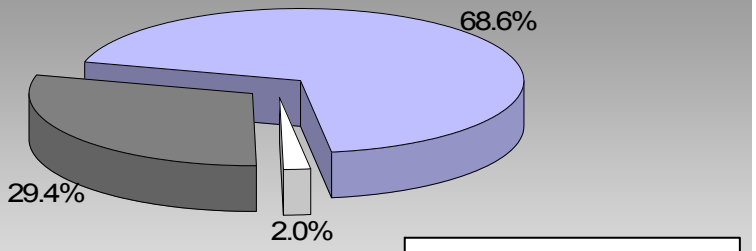
Qualicum Beach Town
Updated 2007 Community Energy and Emissions Inventory

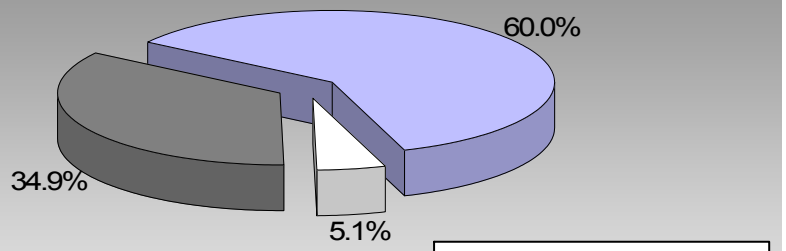
BC's Community Energy and Emission Inventories...supporting efforts towards Complete, Compact, Energy-Efficient Communities

Where are the majority of our community's emissions coming from?

Qualicum Beach Town
2007 GHG Emissions Sources

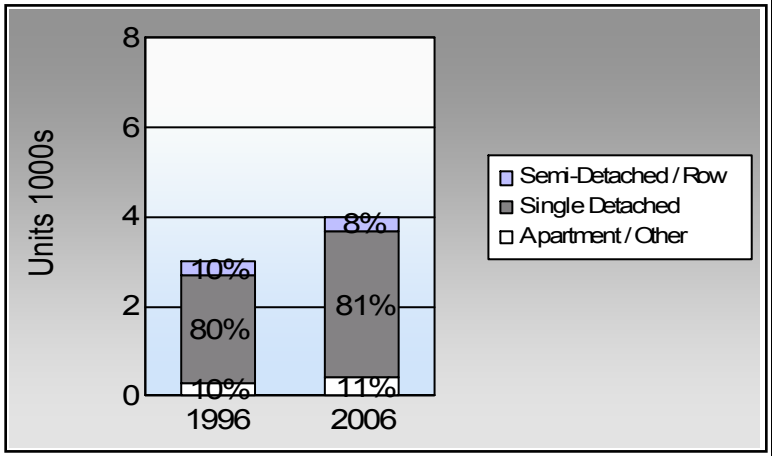


Total for BC Communities



Are we living more compactly?

Housing Type



In BC, single family detached housing made up 49% of housing in 2006.

Are we driving less?

Commute To Work

	1996	2006
	79.5%	76.2%
	8.0%	7.0%
	0.5%	1.8%
	8.0%	9.9%
	0.5%	1.6%

In BC, 10% of people took transit, 7% walked, and 2% cycled to work in 2006.

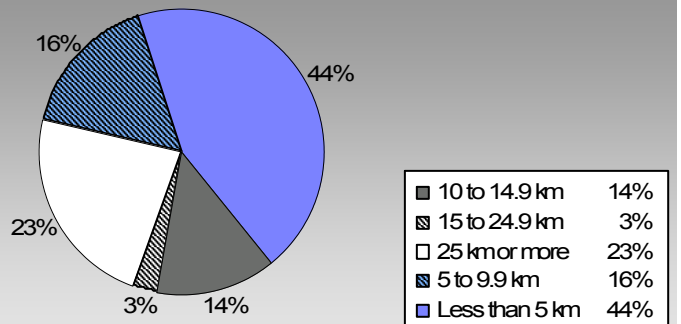
Residential Density

Qualicum Beach Town: 7.8 people per net ha

BC municipal average: 7.4 people per net ha

Are we living closer to where we work?

Commute Distance



In BC, 41% of people lived within 5km of their work in 2006.

For more information and to provide feedback on your Community Energy and Emissions Inventory (CEEI) Report see back page.

Sectors

On Road Transportation		Vehicles	Consumption	Measurement	Average-VKT(km)	Energy (GJ)	CO2e (t)
Small Passenger Cars	Gasoline	1,935	2,501,090	Litres	13,171	87,538	5,954
	Diesel Fuel	82	78,457	Litres	13,561	3,005	214
				Small Passenger Cars		**90,543**	**6,168**
Large Passenger Cars	Gasoline	1,672	3,010,004	Litres	15,333	105,350	7,126
	Diesel Fuel	24	48,701	Litres	15,656	1,865	133
	Other Fuel	< 10	8,912	Litres	11,806	341	14
				Large Passenger Cars		**107,556**	**7,273**
Light Trucks, Vans, SUVs	Gasoline	2,256	6,316,884	Litres	19,384	221,091	15,114
	Diesel Fuel	173	400,653	Litres	18,345	15,345	1,094
	Other Fuel	17	36,833	Litres	13,025	1,411	56
				Light Trucks, Vans, SUVs		**237,847**	**16,264**
Commercial Vehicles	Gasoline	11	44,088	Litres	13,706	1,543	103
	Diesel Fuel	39	182,291	Litres	20,900	6,982	491
	Other Fuel	< 10	12,041	Litres	11,790	461	18
				Commercial Vehicles		**8,986**	**612**
Tractor Trailer Trucks	Diesel Fuel	21	555,899	Litres	71,851	21,291	1,496
				Tractor Trailer Trucks		**21,291**	**1,496**
Motorhomes	Gasoline	84	98,262	Litres	3,385	3,439	230
	Diesel Fuel	11	7,619	Litres	3,257	292	21
	Other Fuel	< 10	2,051	Litres	2,520	79	3
				Motorhomes		**3,810**	**254**
Motorcycles, Mopeds	Gasoline	91	37,652	Litres	5,498	1,318	88
				Motorcycles, Mopeds		**1,318**	**88**
Bus	Gasoline	< 10	5,852	Litres	15,902	205	14
	Diesel Fuel	< 10	115,657	Litres	60,633	4,430	311
	Other Fuel	< 10	4,389	Litres		168	7
				Bus		**4,803**	**332**

	Gasoline:	420,484	28,629
	Diesel:	53,210	3,760
	Other Fuel:	2,460	98
On Road Transportation Totals	**All Fuels:**	**476,154**	**32,487**

Buildings

	Type	Connections	Consumption	Measurement	Energy (GJ)	CO2e (t)
Residential	Electricity	4,458	65,047,221	Kilowatt Hours	234,170	1,605
	Natural Gas	2,276	137,270	GigaJoules	137,270	7,001
	Heating Oil		24,699	GigaJoules	24,699	1,741
	Propane		4,258	GigaJoules	4,258	260
	Wood		30,127	GigaJoules	30,127	11
			Residential		**430,524**	**10,618**
Commercial/Small-Medium Industrial	Electricity	498	21,977,006	Kilowatt Hours	79,117	542
	Natural Gas	109	53,854	GigaJoules	53,854	2,747
			Commercial/Small-Medium Industrial		**132,971**	**3,289**

	Electricity:	313,287	2,147
	Natural Gas:	191,124	9,748
	Propane:	4,258	260
	Wood:	30,127	11
	Heating Oil:	24,699	1,741
Buildings Totals	**Buildings:**	**563,495**	**13,907**

Solid Waste

		Mass (t)	CO2e (t)
	Community Solid Waste	4,582	940

Grand Total		CONSUMPTION		ENERGY (GJ)	CO2e (t)
	Diesel Fuel	1,389,277	L	53,210	3,760
	Electricity	87,024,227	kWh	313,287	2,147
	Gasoline	12,013,832	L	420,484	28,629
	Heating Oil	24,699	GJ	24,699	1,741
	Natural Gas	191,124	GJ	191,124	9,748
	Other Fuel	64,226	L	2,460	98
	Propane	4,258	GJ	4,258	260
	Solid Waste	4,582	T	0	940
	Wood	30,127	GJ	30,127	11
Total of Transportation / Buildings / Solid Waste:				**1,039,649** GJ	**47,334** tonnes

Memo Items

Buildings	Type	Connections	Consumption	Measurement	Energy (GJ)	CO2e (t)
Large Industrial	Electricity	0	0	Kilowatt Hours	-	-
				Large Industrial	**-**	**-**

Qualicum Beach Town
Updated 2007 Community Energy and Emissions Inventory

Supporting Indicators

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Housing Type - Private dwellings by structural type

Housing type is important for reducing building-related GHG emissions and energy consumption. A trend toward fewer single family dwellings indicates an increase in residential density, which is known to reduce transportation-related GHG emissions.

	1996		2001		2006	
	Units	%	Units	%	Units	%
Single Detached House	2,405	45	2,590	78	3,240	81
Semi-Detached House	100	2	175	5	125	3
Row House	195	4	180	5	215	5
Apartment, Duplex	0	0	10	0	45	1
Apartment, 5 storeys or higher	0	0	0	0	0	0
Apartment, under 5 storeys	270	5	325	10	370	9
Other Single Attached House	15	0	5	0	5	0
Movable Dwelling	10	0	30	1	5	0

Residential Density

* Net of Crown land, parks, Indian Reserves, water features, airports, ALR,waste disposal sites.

Increasing residential densities is known to reduce vehicle use resulting in fewer transportation-related GHG emissions. There are many additional benefits from more compact development.

	2009
Population	8,766.0
Net Land Area (ha) *	1,130.3
Residential Density (people per net ha)	7.8

Commute to Work - Employed labour force - by mode of commute

An increase in the number of people choosing to walk, cycle and use transit reduces GHG emissions. More compact, complete, connected communities should see an increase in the use of these transportation modes.

	1996		2001		2006	
	People	%	People	%	People	%
Car, Truck, Van as Driver	1,490	79	1,525	83	1,685	76
Car, Truck,Van as Passenge	150	8	85	5	155	7
Public Transit	10	1	20	1	40	2
Walked	150	8	160	9	220	10
Bicycle	10	1	30	2	35	2
Motorcycle	10	1	0	0	10	0
Taxicab	0	0	0	0	0	0
Other Method	55	3	20	1	65	3

Commute Distance

Shorter commute distances generally reduce GHG emissions by increasing the likelihood of people walking, cycling or using transit. Commute distance is also indicative of the 'completeness' of a community from an employment perspective.

	2006	
	People	%
Less than 5 km	770	44
5 to 9.9 km	285	16
10 to 14.9 km	235	14
15 to 24.9 km	50	3
25 km or more	400	23

Parks and Protected Greenspace

* Total is net of Indian Reserves

** The quantity of parkland may be underestimated

Parks and protected greenspaces are important for the protection and enhancement of community carbon sinks.

	2009	
	Area (ha)	%
National Parks	0.0	0.0
Provincial Parks / Protected Areas	0.2	0.0
Local Parks	5.4	0.3
Agricultural Land Reserve	502.8	30.6
Other land use	1,136.5	69.1
Total Land Area	1,645.0	100.0

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Proximity to Transit	Persons, dwelling units (du) and employment within 400m of a quality transit stop/line
Proximity to Services	Persons and dwelling units (du) within 400m of services (e.g. grocery store, school, other retail etc.)
Transit Ridership	Annual per capita transit ridership

Buildings

Residential; Public Building Energy Intensity	Average energy use per person per square metre of floor space
Floor Space	Average residential dwelling unit size

Solid Waste (and Water)

Waste Diversion	Tonnes of waste diverted
Avoided Waste Emissions	Tonnes of CO2e of avoided future emissions due to reduced waste since 2007
Water Use	Per capita residential water use

Land-Use Change

Impervious Surface Cover	% change in impervious surface cover
Tree Canopy Cover	% change in tree canopy cover

Community and Renewable Energy Supply

District Energy	# and energy output (e.g. buildings connected, energy consumed in GJ or kWh) of district energy systems by energy type (e.g. renewable or non-renewable)
On-Site Renewable Energy	# and energy output (in GJ or kWh) from households producing and/or consuming on-site renewable heat (e.g. biomass, solar thermal, geo-exchange) and/or electrical (e.g. solar photovoltaic, small wind, small scale hydro) energy
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APPENDIX 2 / METHODOLOGY

2007 BASELINE INVENTORY

Review of the CEEI Inventory Data

There are a variety of technical challenges associated with developing a credible, accurate emissions inventory. Communities in British Columbia are fortunate to be able to access such inventories from the Province of BC. The Province undertook this work and issued Community Energy and Emission Inventory (CEEI) reports for every regional district and municipality in BC. The initial set of CEEI reports were for the 2007 year, made available in 2009, with updated 2007 reports issued in mid-2010. The 2010 updates provide the baseline emissions inventories for the year 2007 for the Regional District of Nanaimo as a whole, for each of its four member municipalities, and for the RDN's unincorporated electoral areas as an aggregated inventory.

To refine the aggregated 2007 inventory for the electoral areas, the RDN hired technical experts to portion the total into inventories for each of these rural areas. Community energy and emissions for the electoral areas were estimated by subtracting the municipal inventories of Nanaimo (City), Lantzville, Parksville, and Qualicum Beach from the total RDN inventory. The resulting values were then reviewed and compared to the CEEI reports for Unincorporated Areas and other data sources for the purpose of cross checking the accuracy of the data. This review helped to validate the CEEI information, which is warranted because the CEEI is still a relatively new reporting feature in BC. The overall findings, based on the data available for comparison, are that the CEEI reports provide a reasonable estimate of the energy use and GHG emissions from residential buildings and vehicles in the RDN's electoral areas.

The Community Energy and Emissions Inventory reports provide the total energy consumed through electricity and natural gas, and an estimate of propane, heating oil, wood, and vehicle fuel consumed for the baseline year of 2007. The associated emissions are calculated for each energy source, and for estimated waste tonnages disposed at regional district landfills.

2036 BUSINESS-AS-USUAL FORECAST

GHG Emissions

A business-as-usual (BAU) forecast was developed for each electoral area to 2050. For the 2007–2036 period, the forecast is driven by population growth but also considers efficiency improvements expected as a result of senior government policy and commitments, which will occur regardless of action taken by the RDN. Assumed efficiency improvements are outlined in Table 8.

For the 2036–2050 period, the business-as-usual forecast for emissions is an exact reflection of population increase. This is due to the lack of adequate data available to develop defensible assumptions for emissions into the more distant future.

TABLE 8: BUSINESS-AS-USUAL FORECAST ASSUMPTIONS

Sector	Assumptions	Reference
New residential buildings	Reduce average energy demand per home by 20% by 2020 (through building code improvements, appliance/equipment standards).	BC Energy Efficient Buildings Strategy (www.energyplan.gov.bc.ca/efficiency)
New commercial buildings	Reduce average energy demand of commercial buildings by 9% per square metre by 2020 (through building code improvements, appliance/equipment standards).	BC Energy Efficient Buildings Strategy (www.energyplan.gov.bc.ca/efficiency)
Passenger vehicles	Achieve a 20% reduction in greenhouse gas emissions from new passenger vehicles beginning in 2012 (assuming a fleet turnover rate of 5.6% annually).	The Pembina Institute's "Comments on Canada's Proposed Passenger Automobile and Light Truck GHG Emissions Regulations" (www.pembina.org/pub/2055) Fleet turnover rate taken from Metro Vancouver statistics on vehicle age distribution.
Electricity generation	GHG emissions intensity reduced from 22 tonnes per GWh to zero by 2016; BC to become energy self-sufficient by 2016.	The BC Energy Plan commits to net zero GHG emissions from electricity and to electricity self-sufficiency by 2016. (www.energyplan.gov.bc.ca)

APPENDIX 3 / ENERGY USE AND EMISSIONS

ENERGY USE

Energy use focuses on the total amount of energy consumed by buildings and vehicles in the Regional District of Nanaimo. For buildings, this includes the total amount of electricity, natural gas, and heating oil used. For vehicles, energy use refers to consumption of gasoline, diesel fuel, and other fuels (mostly propane and natural gas).

These various energy sources are commonly measured in different units. For example, electricity consumption is measured in kilowatt hours (kWh), while gasoline is measured in litres. In order to compare energy use across different energy sources, a single unit of measurement is needed. In this plan, that unit is the gigajoule (GJ). Table 9 shows the conversions between commonly used units and gigajoules for energy sources found in this plan.

Showing a common unit for the consumption of different sources of energy reveals energy demand in our society—what we get for the energy we consume. This is particularly informative at the household scale. For example, a standard 26.6-cubic-foot EnergyStar-rated refrigerator consumes about 2 GJ of electricity over the course of a year[12] while the same 2 GJ is present in a tank of gasoline (58 litres). Extending that comparison, we tend to use about the same amount of energy in our homes in a year as we do driving. In homes that do not have electric baseboards, about 10,000 kWh (36 GJ) of electricity is consumed each year. This 36 GJ is roughly equivalent to the energy used in driving an average vehicle 10,000 km.[13]

[12] From Natural Resources Canada Energy Efficiency Ratings website for refrigerators and wine chillers: http://oee.nrcan.gc.ca/residential/business/manufacturers/search/refrigerator-results.cfm?sc_1=energy_consumpt&sc_2=search_energy_star&sq_1=desc (accessed October 25, 2011).

EMISSIONS AND CARBON DIOXIDE EQUIVALENT

Emissions describe the production of six criteria greenhouse gases that result primarily from energy use, and specifically from the combustion of fuels. The six criteria greenhouse gases are:

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous Oxide (N_2O)
- Hydrofluorocarbons (HFCs)
- Perfluorocarbons (PFCs)
- Sulfur Hexafluoride (SF_6)

Each of these gases has unique characteristics[14] that influence how effectively it traps heat in the atmosphere. Due to these characteristics, some greenhouse gases are more potent than others. This is known as global warming potential. The concept of global warming potential is described in the *Methodology for Reporting BC Local Government GHG Emissions*. The excerpt below is adapted from that document:

> *The concept of global warming potential…has been developed to enable a comparison of the ability of different GHGs to trap heat in the atmosphere. By definition, the global warming potential from the release of 1 kg of CO_2 equals 1, with the global warming potential of other GHGs stated relative to CO_2. The global warming potential of a greenhouse gas*

[13] 36 GJ equals 1028 litres of gasoline. This is enough gasoline to fuel a vehicle that achieves 9.7 litres per 100 km for 10,000 km.

[14] Mainly its ability to absorb infrared radiation (radiative efficiency), and the length of time each gas persists in the atmosphere (decay rate).

TABLE 9: CONVERSION OF COMMON UNITS TO GIGAJOULES

Energy Source		Common Units to GJs		1 GJ to Common Units
Buildings	Electricity	kWh	1 kWh=0.0036 GJ	1 GJ=277.78 kWh
	Natural Gas *	GJ	1 GJ=1 GJ	1 GJ=1 GJ
	Heating Oil	litre	1 litre=0.0388 GJ	1 GJ=25.77 litres
	Wood **	kg	1 kg=0.018 GJ	1 GJ=55.56 kg
Vehicles	Gasoline	litre	1 litre=0.0350 GJ	1 GJ=28.57 litres
	Diesel	litre	1 litre=0.0383	1 GJ=26.09 litres
	Other Fuels	litres	1 litre=0.0383 GJ	1 GJ=39.2 litres

* In this plan, GJs are the common units used to describe natural gas consumption. However, natural gas is also often described in cubic metres (m^3). There are 0.03832 GJ/m^3 of natural gas, and 1 GJ = 26.09 m^3 of natural gas.

** In this plan, residential wood use for energy is estimated in GJs. However, wood is most commonly purchased in cords. A cord of wood is 4' X 4' X 8', which equals 128 cubic feet or 3.625m^3. The mass of wood in a cord can vary considerably by species and moisture content. Only dry, well-seasoned wood should be used for heating. A dry cord of western red cedar weighs approximately 1,335 kg (24 GJ), balsam fir approximately 1,450 kg (26.1 GJ), and douglas fir approximately 1,900 kg (34.2 GJ).

accounts for both the immediate radiative forcing due to an increase in the concentration of the gas in the atmosphere, and the lifetime of the gas. For example, 1 tonne of methane has a global warming potential of 21, indicating that its radiative forcing is 21 times that of CO_2 over a 100-year period.

Table 10 highlights the global warming potential for the six criteria greenhouse gases.

There are many potential sources for these greenhouse gases. Since the focus of this plan is on energy use, it is the emissions that arise out of our energy use—primarily from the combustion of fossil fuels—that are considered here.

Whenever a fossil fuel is combusted, a mixture consisting mainly of CO_2, CH_4 and N_2O is produced. Just as a common unit of energy consumption is useful to compare energy demand, a common unit is also necessary to understand the emissions associated with the use of different energy sources. The universal unit of measure for greenhouse gases is carbon dioxide equivalent, or CO_2e (usually presented in kilograms or tonnes).

To calculate CO_2e, the mass of each greenhouse gas emitted is measured and then multiplied by its global warming potential. These values are then added together. When this sum is calculated for a common unit of consumption, the result is referred to as an emission factor.

TABLE 10: GLOBAL WARMING POTENTIAL FOR SIX CRITERIA GREENHOUSE GASES

Criteria Greenhouse Gas	Global Warming Potential
Carbon dioxide (CO_2)	1
Methane (CH_4)	21
Nitrous Oxide (N_2O)	310
Hydrofluorocarbons (HFCs)	140–11,700
Perfluorocarbons (PFCs)	6,500–9,200
Sulphur hexafluoride (SF_6)	23,900

Source: Intergovernmental Panel on Climate Change – Second Assessment Report. Accessed via the Environment Canada Website: http://www.ec.gc.ca/ges-ghg/default.asp?lang=En&n=CAD07259-1. Different global warming potential values are shown for the IPCC Fourth Assessment Report, though the values shown here are those most commonly seen in current literature, including the Methodology for Reporting BC Local Government GHG Emissions.

As an example, when one litre of gasoline is burned in a light-duty vehicle, the following emissions are produced:

- 2.250 kg of CO_2
- 0.0023 kg of CH_4
- 0.00047 kg of N_2O

Applying the values for global warming potential to these emissions, calculating the CO_2e of combusting one litre of gasoline is done as follows:

(2.250 kg X 1) + (0.0023 kg X 21) + (0.00047 kg X 310)
= 2.250 kg + 0.0483 kg + 0.1457 kg
= 2.444 kg

By this calculation, burning one litre of gasoline produces 2.44 kg of CO_2e. Considering that gasoline is typically measured in litres, 2.44 kg CO_2e per litre is a useful emission factor for determining the amount of greenhouse gases attributable to our driving habits.

Table 11 shows emission factors for the energy sources referenced in this plan. Emissions for common units as well as gigajoules are shown.

TABLE 11: COMPARISON OF CO_2E PER COMMON UNIT OF MEASURE AND PER GIGAJOULE

Energy Source		CO_2e / Common Unit of Measure (emission factor)	CO_2e / GJ
Buildings	Electricity	22–26 grams CO_2e / kWh	6.11–7.22 kg CO_2e / GJ
	Natural Gas	51.16 kg CO_2e / GJ	51.16 kg CO_2e / GJ
	Heating Oil	2.73 kg CO_2e / litre	70.43 kg CO_2e / GJ
	Wood	2.5 tonnes CO_2e per cord (cedar) (486 kg CO_2e excluding biogenic CO_2)	103.59 kg CO_2e / GJ (20.26 kg CO_2e excluding biogenic CO_2)
Vehicles	Gasoline	2.44 kg CO_2e / litre (2.37 kg excluding biogenic CO_2)	69.71 kg CO_2e / GJ (67.71 excluding biogenic CO_2)
	Diesel	2.72 kg CO_2e / litre (2.62 excluding biogenic CO_2)	70.97 kg CO_2e / GJ (68.41 kg CO_2e / GJ excluding biogenic)
	Other Fuels	1.53 kg CO_2e per litre	59.99 kg CO_2e / GJ

Other sources of community-wide emissions include the agriculture sector and the decomposition of solid waste. In the agriculture sector, the main source of emissions is enteric fermentation, a technical way of describing methane gas passed by livestock. As livestock populations increase, so does their contribution of greenhouse gases. The decomposition of solid waste also generates methane as organic material breaks down in a landfill. Diverting organic material from a landfill will have an immediate impact on reducing the methane released from a landfill, though the organic material already in place will continue to decompose and produce methane for many years.

Land use change that results in deforestation also contributes greenhouse gas emissions. Deforestation reduces nature's ability to draw carbon dioxide out of the atmosphere. While this is not an emission source, the end result is an increase in concentrations of carbon dioxide in the atmosphere. Protecting intact forest land from conversion to a non-forest use (i.e., development) is an essential way to ensure that carbon dioxide continues to be removed from the atmosphere.


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