3.4 Climate Change Mitigation and Adaptation

Introduction

Climate change is upon us. The 2009 Copenhagen climate conference update[164] states that "rapid, sustained, and effective mitigation is required to avoid dangerous climate change" and that "inaction is inexcusable."

In order to mitigate the effects of additional climate change, the amount greenhouse gases released into the atmosphere must be reduced. At the same time, steps need to be taken to adapt to the climate change that is already happening and is expected to become more pronounced in the coming years. Together, steps to mitigate and adapt to climate change are referred to as climate action.

Section 1 provides a description of the climate change impacts expected in the Cowichan Region.

Measuring Climate Action

Measuring Climate Mitigation Efforts

Efforts to mitigate climate change can be measured by tracking:

> Energy and emissions

- The use of fossil fuels as an energy source
- The use of "clean"[165] (low-carbon) energy sources
- Greenhouse gas emissions from buildings, transportation and waste management activities; and

> The availability of carbon sinks (that absorb carbon dioxide from the atmosphere).

Energy use and greenhouse gas emissions data are available through the provincial Community Energy and Emissions Inventory[166] (CEEI) which tracks energy use from buildings, transportation and waste in all BC communities. The 2007 CEEI Reports presents high-level estimated community energy consumption and greenhouse gas emissions from various sectors.

164 Climate Change Synthesis Report, Copenhagen, 2009. www.climatecongress.ku.dk/pdf/synthesisreport

165 Low carbon or carbon neutral sources of energy, such as solar or wind power.

166 toolkit.bc.ca/ceei

The province is currently working on updating and improving the data quality of the CEEI reports; however, revised data were not available at the time of writing. CEEI background material notes that

> *"As with most inventories, the level of accuracy depends highly on the completeness of the data sources and consistency in the methodologies applied... The CEEI Working Group will continue to work to improve data accuracy. As data improves, past reports will be updated and re-posted in order to provide a consistent method of comparison over time."*[167]

The 2007 CEEI Report User Guide provides additional information on accuracy and technical issues.

The 2007 CEEI data are limited, in that reporting was restricted to information that was available province-wide, and does not include, for example, energy and emissions related to oil-based home heating or wood stoves. However, the provincial nature of the data makes it easy to compare the results for the Cowichan Valley Regional District (CVRD) to other regional districts.

Measuring Climate Adaptation Strategies

Climate adaptation measures include actions taken to prepare communities for the expected impacts of flooding, drought, sea-level rise, and more intense wind- and rain-storms. These changes will create impacts throughout the region, including to industries such as agriculture, forestry, tourism, and fishing, and to infrastructure requirements. At this time there are no statistical measures of climate adaptation strategies, but this report lists some of the actions taking place with climate change needs in mind.

Adaptation measures will also require taking action to address expected population and social changes brought by global climate change, such as climate refugees from other countries. However, these matters are beyond the scope of this State of the Environment report.

167 www.env.gov.bc.ca/epd/climate/ceei/faq.htm

Energy and Emissions

Indicator and Measure

The Community Energy and Emissions Inventory (CEEI) tracks energy use from buildings and transportation, and estimates emissions from these sources as well as from solid waste and deforestation. Emissions are measured as "carbon dioxide equivalent" (CO_2e), as some sources such as methane have a far greater greenhouse gas impact than carbon dioxide.

> The buildings sector is subcategorized into residential, commercial and industrial buildings. Each subcategory includes the number of connections, the amount of actual energy consumed (e.g., electricity in kWh and natural gas in GJ), and the resulting carbon dioxide equivalent (CO_2e) totals for each building subcategory, as well as a CO_2e subtotal for the sector.

> The on-road transportation sector is subcategorized into several passenger and commercial vehicle classes. Each subcategory includes an estimate of the amount of fuel used (e.g., gasoline, diesel fuel, and mobile propane), and the resulting CO_2e totals for each vehicle class, as well as a CO_2e subtotal for the sector. Emissions from rail, marine and air travel are not included in the 2007 data.

> The solid waste sector includes the estimated mass of waste disposed of by local governments at community and/or regional landfill(s), with the associated CO_2e (methane) net of any known landfill gas flaring, methane capture, etc.

> The land-use change (deforestation) sector includes the estimated amount of CO_2e from the clearing of forests for urban development and agriculture. For the purposes of greenhouse gas accounting, deforestation is defined as "the direct human-induced conversion of forested land to non-forested land." This measure looks only at deforestation, and does not consider afforestation activities. This data is provided only at the regional district level.

The Cowichan Valley Regional District and some of its member municipalities have also undertaken inventories of their own (corporate) energy and emissions.

Findings

Community Energy and Emissions Inventory (CEEI) Results

Table 3.3 and Figure 3.25 show that in the Cowichan Region, on-road transportation consumes more energy than buildings (55% compared to 45%). However, when comparing the greenhouse gas emissions from these sources, the contribution of transportation is more than six times that from buildings (Figure 3.26). This is because electricity is a major source of energy for buildings, and in British Columbia most electricity comes from "clean"[168] (hydro) sources (the 2007 electricity emissions factor used is 0.022 tonnes/kWh.[169]).

In the Cowichan Valley, deforestation is also identified as a significant source of greenhouse gas emissions (9%). Deforestation has been identified globally as one of the largest contributors to overall greenhouse gas emissions, and as a primary area for action to mitigate climate change.[170]

Total emissions from all sectors are 427,398 tCO_2e.

TABLE 3.3: Energy use – buildings and on-road transportation

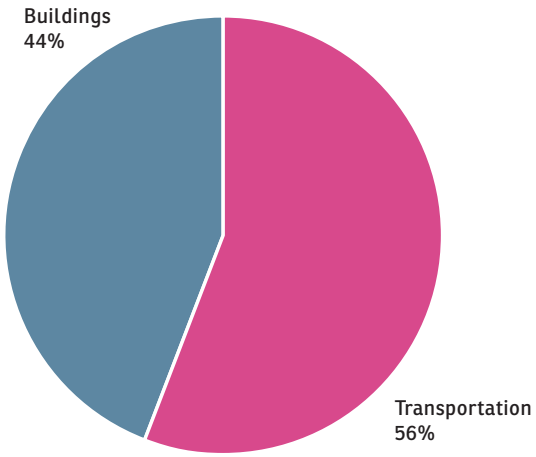
Buildings	(Energy GJ)
Residential	2,291,368
Commercial	1,110,984
Industrial	104,292
Total	3,506,644
On-road transportation	Energy (GJ)
Small cars	754,182
Large cars	367,023
Light trucks, vans, SUVS	2,154,185
Commercial vehicles	897,786
Tractor trailer trucks	123,607
Motor homes	86,746
Motorcycles/mopeds	28,688
Bus	90,314
Total	4,502,531

168 Hydro-electric power is considered a "clean" source of energy as it is a low-carbon form of energy, unlike, for example, electric power from a coal-fired power station. However, it should be noted that British Columbia imports power from Alberta and the United States during peak periods, and so not all electricity comes from "clean" sources.

169 CEEI Reports User Guide, March 2009.

170 International Panel on Climate Change, Contribution to Group III: Summary for Policymakers, 2007. www.ipcc.ch/pdf/assessment-report/ar4/wg3/ar4-wg3-spm.pdf

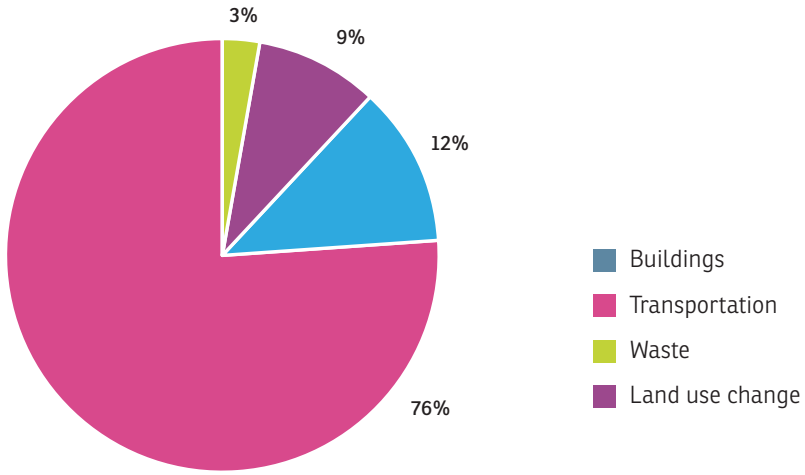
FIGURE 3.25: Energy use by sector, 2007



Source: Community Energy and Emissions Inventory, 2007

www.env.gov.bc.ca/epd/climate/ceei/pdf/2007Cowichan-Valley-rd.pdf

FIGURE 3.26: Emissions by sector, 2007



Source: Community Energy and Emissions Inventory, 2007

www.env.gov.bc.ca/epd/climate/ceei/pdf/2007Cowichan-Valley-rd.pdf

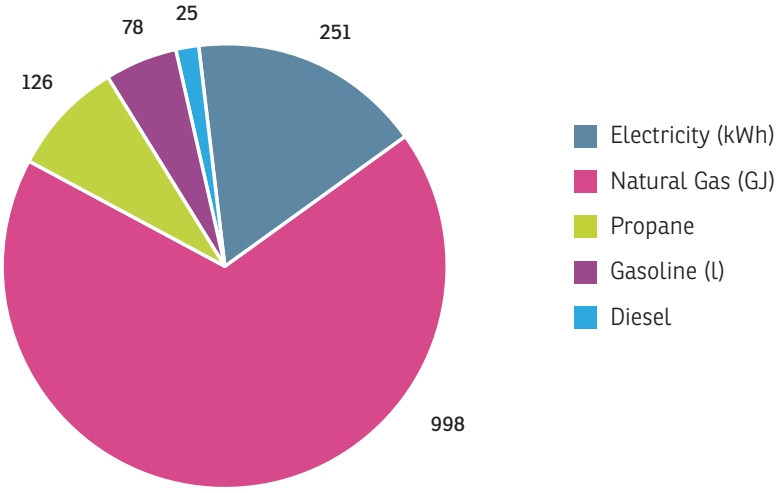
Cowichan Valley Regional District Emissions

The Cowichan Valley Regional District and its member municipalities have signed the Climate Action Charter[171], pledging to reducing both corporate greenhouse gas emissions (resulting from local government operations) and community emissions (from the community as a whole), and becoming carbon neutral in respect to their operations by 2012. Figure 3.27 shows the CVRD's corporate emissions from a variety of fuel sources. Natural gas is by far the largest source of corporate emissions from these sources. The total emissions from the CVRD corporate activities are 1,478 tCO_2e. This is less than 0.4% of the total (community) emissions for the region, meaning that, while the CVRD must lead the way in reducing emissions, community emissions remain by far the largest contributor to climate change.

If the CVRD were to buy offsets for its corporate emissions at $25 per tonne (to become "carbon neutral),[172] this would cost almost $37,000 per year, based on 2007 activities.

Under the 2008 Local Government (Green Communities) Statutes Amendment Act, municipalities are required to have specific and quantifiable emission targets in their Official Community Plans by May 2010 (the Regional District has until May 2011 to prepare emissions targets for the region).

FIGURE 3.27: Emissions, CVRD 2009



Note: Units are tCO2e.

Source: CVRD, 2009.

171 www.cd.gov.bc.ca/ministry/docs/climate_action_charter.pdf

172 $25 per tonne is the amount that provincial facilities will pay to offset carbon emissions in 2010. Local governments are not currently legally required to pay carbon offsets.

Emissions by Municipality

The City of Duncan has prepared a 2008 Report on Energy and Emissions.[173] This report found that overall corporate (municipal operations) energy consumption in 2007 was 14,946.6 GJ, and emissions were 332.4 tCO_2e. Categories include city-owned facilities, Public Works and Fire Department vehicles, water and wastewater systems, street and signal lighting, and solid waste generated at city-owned facilities. Corporate emissions increased by 3.8%, or 12.6 tCO_2e, from 2007 to 2008. The report identified targets for inclusion in the Official Community Plan (suggesting a 33% reduction by 2020 and 80% by 2050, relative to 2007 levels), and a series of strategies to reduce energy use and emissions.

The Town of Lake Cowichan has also produced a detailed Report on Energy and Emissions[174] (2009). This report found that total emissions for corporate operations in 2007 were 205.2 tCO_2e. The top greenhouse gas emitters for the Town of Lake Cowichan operations are the vehicle fleet (49%) and facilities (45%).

Carbon Sinks

Natural ecosystems – such as oceans, forests, wetlands and grasslands – absorb carbon dioxide from the atmosphere and so can act as "carbon sinks", making carbon dioxide at least temporarily unavailable to contribute to atmospheric warming. Management strategies and natural processes within ecosystems can either result in additional storage or in release of carbon dioxide over time. For example, forest fires can result in significant amounts of carbon dioxide being released back into the atmosphere. Similarly, harvesting high biomass (i.e., large structured) forests, especially those that have been undisturbed for many hundreds of years and have large amounts of carbon tied up in their soils, can result in a significant release of carbon back into the atmosphere.[175]

The science behind how much carbon ecosystems can absorb and store is imperfect and complex, and depends on issues such as age, productivity, tree species and wetland type, as well as their natural pathways, and the impacts of management systems. There are few simple measures of this process available currently, but undisturbed forested ecosystems such as those present on the west coast of the CVRD can store significant amounts of carbon for very long periods. Ecosystems with higher natural disturbance rates (e.g., fires), especially in productive sites such as those on the east side of the CVRD, can also be managed to sequester a maximum potential amount of carbon. Strategies for taking account of carbon in management decisions for any ecosystem are in their formative stages. However, this measure has been included in this report, as it is

173 City of Duncan, 2008.

174 Town of Lake Cowichan, 2009.

175 Holt, 2009.

an item of increasing interest to communities, particularly given the potential to use ecosystems to reduce the currently dangerous build-up of carbon dioxide into the atmosphere. There are also potential synergies to be gained in future, with the possibility of using "carbon offsets" from ecological assets to contribute to both the broader mitigation of climate change and ecological adaptation to the changes that are already destined to occur.[176]

Indicator and Measure

This report provides a baseline of information on the amount of forest and wetland cover in the region (as discussed in Section 2.1). Recently logged forest land has not been included in this table on the assumption that any remaining trees do not contribute significantly to carbon absorption.

Findings

Table 3.4 indicates that there are 222,491 ha of forest/wetland in the Cowichan Region, or about 62.6% of the landbase.

TABLE 3.4: Carbon sinksG

Land Use Type	Area(ha)	Percent
Young Forest	156,234	43.9
Old Forest	65,302	18.4
Wetlands	955	0.3
Total	222,491	62.6

176 The 2010 Provincial Budget promised to introduce a Carbon Offset Credit program for reforestation. www.bcbudget.gov.bc.ca/2010/speech/2010_Budget_Speech.pdf

Climate Adaptation Strategies

As noted in Section 1, predicted major impacts to communities in coastal BC resulting from climate change include:

> Increased winter flooding in low-lying areas

> Summer water shortages resulting from drought and reduced snow-packs

> Increased damage from wind- and rain-storms

> Sea level rise and higher storm surges.

Indicator and Measure

Ideally, all parts of the region would have climate adaptation strategies to deal with the impacts most likely to be faced in that part of the region. In addition, land use zoning would identify (and prohibit construction within) areas subject to flooding or other hazards, and all infrastructure (e.g., stormwater pipes) would be designed to cope with expected increased levels of storm water flow and a rise in sea level.

As noted above, there are no statistical measures of adaptation at this time. However several plans and activities indicate that the Cowichan Valley Regional District is beginning to consider adaptation approaches.

Findings

Examples of strategies that address climate adaptation include the following:

> Flood Management: The winter of 2009-2010 saw considerable impact from flooding, especially in the lower Cowichan/Koksilah river flood plain. The City of Duncan, with a population of approximately 5,000, lies at the centre of the floodplain. The Cowichan Tribes has about 3,800 members, many of whom live on the floodplain. In addition to residential areas, there is urban and agricultural development in the floodplain, as well as significant and critical infrastructure. To date, land use planning has not controlled the development of houses and other critical infrastructure on the floodplain.

  The 2009 Lower Cowichan/Koksilah River Integrated Flood Management Plan[177] reviewed flood hazards on the lower floodplain, and prepared maps showing the degree of flood hazard. These were based on an increase of 1 m in the 200-year ocean level, with or without a change in the 200-year peak river discharges (at the time of writing, the flood management report has yet to be released, so maps are not included in this State of the Environment report). The flood management report suggests several strategies and actions to address flood issues.

177 Northwest Hydraulic Consultants, 2009.

- Drought management: The Cowichan Basin Water Management Plan considered the combined impacts of population growth and climate change, making several recommendations on ways to ensure an adequate drinking water supply for the future. A Water Management Plan for the South Cowichan (Mill Bay/Malahat, Shawnigan Lake, Cobble Hill, and Cowichan Bay) is also under development.
- Agriculture: A changing climate means more extreme weather events (droughts, heat waves, floods) that can alter how and what kinds of food can be grown, the kinds of pests and diseases that growers will have to contend with, and the availability of freshwater.
- Fisheries: The Pacific Fisheries Resource Council has prepared a backgrounder on climate change impacts[178] in the Cowichan River system, based on the work from the Cowichan Basin Water Management Plan.
- Energy resiliency: The Regional District is currently in the process of developing a Regional Energy Plan that will identify a range of energy-related policies and initiatives aimed at developing more energy resilient communities and providing a range of adaptation strategies.

Summary

The Regional District and its member municipalities, together with many groups and individual citizens, have recognized climate change as an issue that needs to be addressed. Some early steps have been taken to mitigate and adapt to climate change, but major region-wide strategic and sectoral approaches have yet to occur. This report provides a baseline for future climate action reporting.

Missing Information

There are many gaps in the data on climate action. For example, while data are available on fossil fuel use, there are no data sources on how much energy is being generated from "clean" energy sources such as solar or wind power. In addition, the Community Energy and Emissions Inventory (CEEI) does not provide trend data that show whether energy consumption (overall and per capita) is increasing or decreasing, and did not include some fuel sources such as heating oil and the use of wood stoves.

As noted above, the 2007 CEEI data are incomplete. The provincial government is working on updated inventories that will contain additional data. One data gap of concern for the Cowichan Region is marine transportation emissions, which contain many substances of air quality concern as well as greenhouse gases. The CVRD hopes to develop a more detailed emissions inventory in the near future.

178 www.fish.bc.ca/backgrounder-climate-change-adaptation-strategies-cowichan-river-basin

Data on carbon sinks in the region are incomplete, and do not provide a clear picture of the value of these sinks. For example, while the amount of data on forests and wetlands can be derived from available information, there is no conclusive information to date as to the relative value of older forests, younger forests, and wetlands as carbon sinks.[179]

Gaps in adaptation data are even more significant. The region and its member municipalities do not have comprehensive adaptation strategies, so it is not yet clear what activities should be taking place. However, some parts of the region have begun to address issues that are current and likely to worsen with climate change, such as winter flooding and water-supply shortages because of summer drought. Some research work is now underway to look at the sensitivity of the shoreline zone to sea level rise, also currently a data gap.

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Town of Lake Cowichan. 2009. Report on Energy and Emissions.

179 Several studies are underway.