Cowichan Region State of the Environment Report

Update 2014

Climate Action

CVRD

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Introduction

Climate change is already affecting the Cowichan Region, and its impacts will increasingly influence the ecosystems, resource base and economy of the area. In its 2014 Summary for Policymakers, the Intergovernmental Panel on Climate Change[1] (IPCC) states that:

> *"Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased. Each of the last three decades has been successively warmer at the Earth's surface than any preceding decade since 1850. In the Northern Hemisphere, 1983–2012 was likely the warmest 30-year period of the last 1400 years."*

Climate action involves measures to mitigate the effects of climate change by significantly reducing the amount of greenhouse gases (such as carbon dioxide and methane) that are released into the atmosphere, as well as protecting and enhancing carbon sinks (such as forested land and wetlands) that absorb carbon dioxide from the atmosphere. These measures are essential to contribute to global efforts to minimize the long-term (potentially catastrophic) impacts of climate change. Unfortunately, climate change impacts are already affecting the region and even with mitigation measures are likely to become more significant for the coming decades. It is thus equally important to take measures to prepare for and adapt to climate change impacts in this region.

How climate change is expected to affect the Cowichan Region

The Pacific Climate Impacts Consortium (University of Victoria) provides information on the physical impacts of climate variability and change in Canada's Pacific and Yukon Region. Their Plan2Adapt website[2] shows the anticipated changes (using a 1961–1990 baseline) for the CVRD.

1 http://www.ipcc.ch/
2 http://www.pacificclimate.org/analysis-tools/plan2adapt

A shown in Table 1, expected changes in the CVRD are as follows.

- An increase in annual temperature of 0.9°C by 2020 (1.6°C by 2050), leading to:
    - o More winter precipitation falling as rain (rather than snow), and thus less snowpack to provide flows to streams and lakes during the summer;
    - o An earlier spring freshet (melting from snow and ice);
    - o A longer growing season for crops (more frost-free days);
    - o Warmer conditions for growing crops (more growing degree days[3]), but also more variable and unpredictable conditions, which may influence the choice of crops grown;
    - o Less need for heating of homes during fall and winter (fewer heating degree days[4]);
    - o The introduction of more invasive species, and pests and diseases that affect native ecosystems.
- More precipitation overall (3% increase by 2020 and 6% increase by 2050). However, winter rainfall is expected to increase slightly (2% by 2020 and 5% by 2050), while summer rainfall will decrease significantly (8% reduction by 2020 and 18% reduction by 2050). Some of the implications of this change are:

3 Growing Degree-Days (GDDs) indicates the amount of heat energy available for plant growth, useful for determining the growth potential of crops in a given area. It is calculated by multiplying the number of days that the mean daily temperature exceeded 5°C by the number of degrees above that threshold. For example, if a given day saw an average temperature of 8°C (3°C above the 5°C threshold), that day contributed 3 GDDs to the total. If a month had 15 such days, and the rest of the days had mean temperatures below the 5°C threshold, that month would result in 45 GDDs.
4 Heating Degree-Days (HDDs) is useful for indicating energy demand (e.g., the need to heat homes). It is calculated by multiplying the number of days that the average (mean) daily temperature is below 18°C by the number of degrees below that threshold. For example, if a given day saw an average (mean) temperature of 14°C (4°C below the 18°C threshold), that day contributed 4 HDDs to the total. If a month had 15 such days, and the rest of the days had average (mean) temperatures above the 18°C threshold, that month would result in 60 HDDs.

Table 1: Climate changes in the CVRD, 2020

Climate Variable	Season	Projected Change from 1961-1990 Baseline	
		Ensemble Median 2020	Ensemble Median 2050
Mean Temperature (°C)	Annual	+0.9 °C	+1.6 °C
Precipitation (%)	Annual	+3%	+6%
	Summer	-8%	-18%
	Winter	+2%	+5%
Snowfall (%)	Winter	-24%	-39%
	Spring	-31%	-53%
Growing Degree Days (degree days)	Annual	+232 degree days	+430 degree days
Heating Degree Days (degree days)	Annual	-316 degree days	-548 degree days
Frost-Free Days (days)	Annual	+10 days	+16 days

Source: Information from Plan2Adapt http://www.plan2adapt.ca/tools/planners?pr=10&ts=7&toy=16 and http://www.plan2adapt.ca/tools/planners?pr=10&ts=8&toy=16, accessed 27 October 2014. This table shows the ensemble median figures, a mid-point value chosen from a PCIC standard set of Global Climate Model (GCM) projections.

o Greater potential for flooding in winter/spring from more (and likely heavier) rainstorms;

o Increased erosion potential in streams (more winter precipitation falling as rain, combined with more precipitation overall, leading to high volume conditions on streams and rivers) and greater potential for mudslides;

o More (and more prolonged) summer droughts, increasing the need for irrigation;

o Warming of water in lakes, with impacts on fish and other aquatic species; and

o More summer/fall low-flow conditions in streams and rivers (less summer precipitation, combined with a loss of flow from melting snowpacks).

Other weather-related anticipated impacts of climate change include more frequent and intense wind- and rainstorms that can topple large trees, as well as warming of the oceans and other water bodies with subsequent impacts on salmon and other aquatic species.

Rising sea level will also be a cause for concern, with conservative estimates of an increase of 0.8–1.0 m (but perhaps higher) by 2100. In addition to placing low-lying areas at risk of flooding, rising sea levels may contaminate nearshore groundwater aquifers with salt water, impacting water supplies for some communities. Residential and industrial areas in and around estuaries—including Mill Bay, Cowichan Bay, Crofton, Chemainus, and Ladysmith—will be most impacted. Sea Level Rise in B.C: mobilizing science into action[5] provides a summary of issues related to sea level rise in B.C.

5 http://www.retooling.ca/_Library/docs/bc_sea_level_rise_en.pdf

All of these changes will impact the natural environment. In addition, there will likely be substantive social and economic change as British Columbians adapt to new realities. Impacts for the Cowichan Region may include increased population pressures as people migrate from other parts of Canada and the world to find more pleasant climates, as well as changes to local agriculture and forestry activity as the climate supports different crops and tree species.

A study of climate impacts in the Georgia Basin includes information from Shawnigan Lake,[6] showing some of the climate impacts that are already apparent in this part of the region (Figure 1).

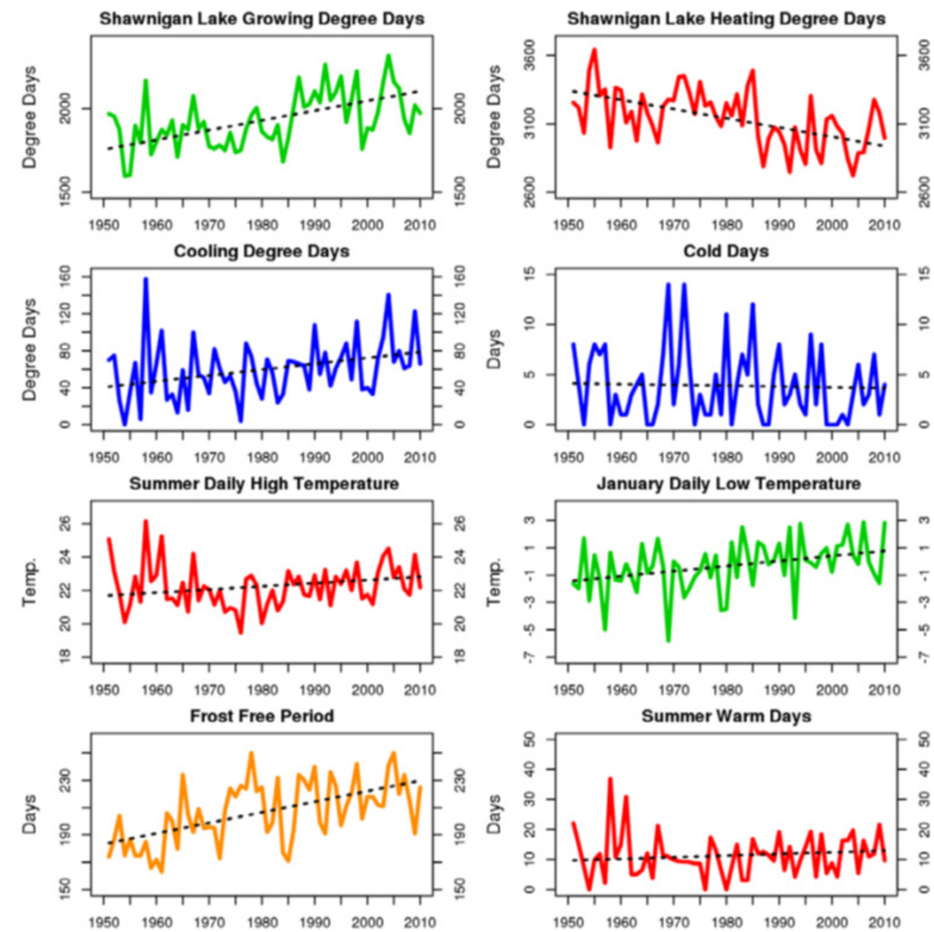
CVRD Strategic Goals

The CVRD Strategic Plan identifies the following strategic actions to address climate change under its goal of Healthy Environment:

- Develop a community focused climate change action plan to meet or beat provincial greenhouse gas emission targets;
- Implement the Strategic Corporate Energy Management Plan; and
- Implement the Corporate Greenhouse Gas Inventory & Emissions Reduction Plan.

Several other strategic actions address climate change, such as supporting green building initiatives and linking the agricultural community with renewable energy supplies. The CVRD is also working on plans to address specific aspects of climate action, including a Regional Energy Strategy, a Climate Change Adaptation Strategy, an Integrated Flood Management Plan for Lower Cowichan/Koksilah River and water security and storage requirements.

Figure 1: Shawnigan Lake temperature parameters 1950–2010



Murdock et al. 2012. Georgia Basin: Projected Climate Change, Extremes, and Historical Analysis. Figure 29.

6 Murdock, T.Q., S.R. Sobie, H.D. Eckstrand, and E. Jackson, 2012: Georgia Basin: Projected Climate Change, Extremes, and Historical Analysis, Pacific Climate Impacts Consortium, University of Victoria, Victoria, BC, 63 pp. http://www.pacificclimate.org/~tmurdock/GeorgiaBasin/GeorgiaBasinImpacts_Draft_v6.2.pdf

Measuring Climate Action

"Climate action" includes measures taken to address climate change mitigation and adaptation.

Indicators included in this report are:

- Climate mitigation:
  - o Community-wide energy and greenhouse gas emissions from buildings, transportation and waste management;
  - o Corporate emissions from the Regional District and municipalities' operations;
  - o The availability of carbon sinks (that absorb carbon dioxide from the atmosphere).
- Climate adaptation:
  - o Summary of programs underway to prepare for the current and anticipated impacts of climate change.

Community Energy and Emissions

Data Sources and Reliability

Energy use and greenhouse gas emissions data are available through the provincial Community Energy and Emissions Inventory[7] (CEEI) that tracks energy use from buildings, transportation and waste in all B.C. communities. The CEEI Reports present high-level estimated community energy consumption and greenhouse gas emissions from various sectors. Data are available for the region as a whole, and for individual municipalities.

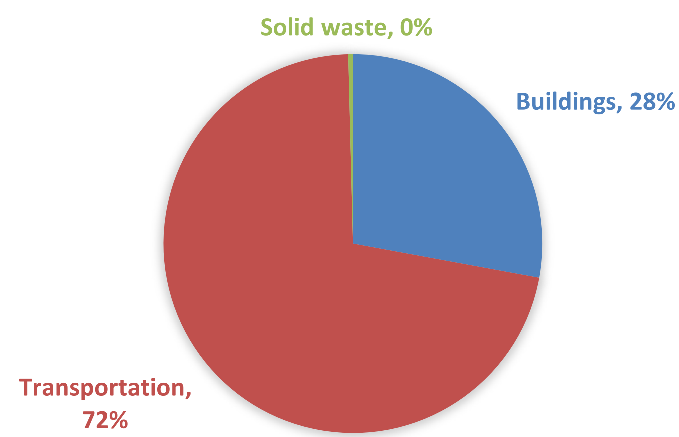
The baseline survey was collected in 2007, with an update and more detailed analysis in 2010. The Province is working to improve the data quality of the CEEI reports, for example data from ICBC has been more accurately aligned with municipal boundaries. The 2007 data have been updated to reflect improved information, hence there may be some differences in the 2007 data reported here versus the 2010 State of Environment Report. The Province is preparing updated community energy and emissions information from 2012, but these data were not available at the time of writing.

Findings

Transportation and buildings are the source of most greenhouse gas emissions in the CVRD (Figure 2), with on-road transportation accounting for almost three-quarters of the emissions. As shown in Figure 3, gasoline and diesel account for a large share of the emissions. Although electricity is widely used, in British Columbia it is a 'clean' fuel option with very low carbon footprint.

Overall, total energy use and emissions from buildings and transportation have risen 3–4% between 2007 and 2010 (Table 2, Table 3 and Table 4).

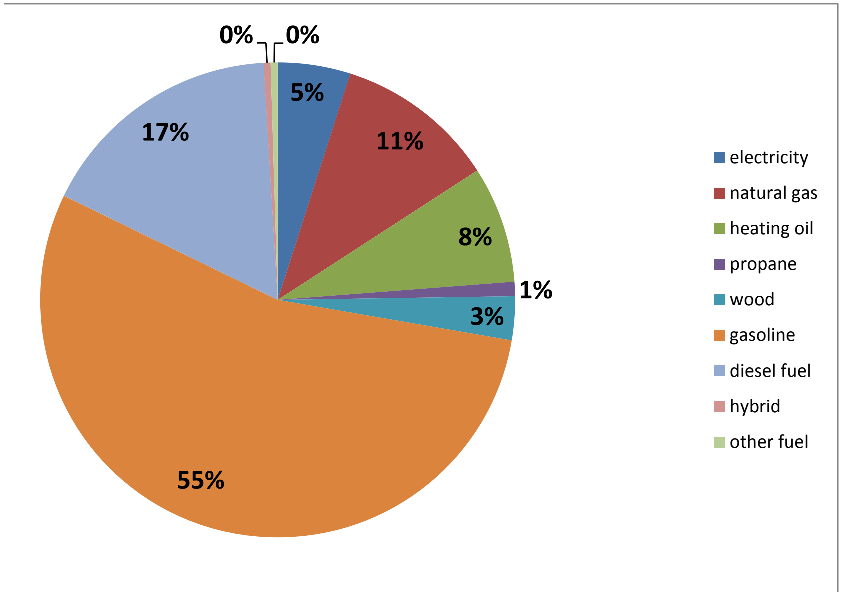
Figure 2: Greenhouse gas emissions sources, CVRD 2010



Source: Community Energy and Emissions Inventory 2010

7 toolkit.bc.ca/ceei

Figure 3: Total emissions by fuel type, CVRD 2010



Source: Community Energy and Emissions Inventory 2010

Energy use and emissions from buildings

Energy use from residential buildings has remained level, despite a 6% growth in the number of buildings, while emissions have actually declined slightly (3%) (Table 3 and Figures 4 and 5). This has been achieved because use of heating oil and propane has declined, while use of electricity (which has a low carbon footprint) for home heating has increased.

Energy and emissions from commercial and small industrial operations has increased significantly over this period. Energy use has grown 13%, while emissions have increased by 26%. Some of this increase comes from growth in industry; but much of the increased energy is due to the use of natural gas, which has a higher carbon footprint than electricity. The CEEI notes that there are seven connections that would qualify as "large industrial"; however data for these large industrial operations are not available.

Table 2: Increase in CVRD energy and emissions 2007–2010

	Increase (decrease) in energy use (%)	Increase (decrease) in emissions (%)
Buildings		
Residential	0%	-3%
Commercial/ small-medium industrial	13%	26%
Large industrial	Data not available	Data not available
Total	3%	4%
Transportation		
Small passenger cars	6%	0%
Large passenger cars	-2%	-8%
Light trucks, vans, SUVs	15%	9%
Commercial vehicles	27%	23%
Tractor trailer trucks	-15%	-18%
Motorhomes	-3%	-7%
Motorcycles/ mopeds	41%	34%
Buses	-3%	-6%
Total	**3%**	**4%**

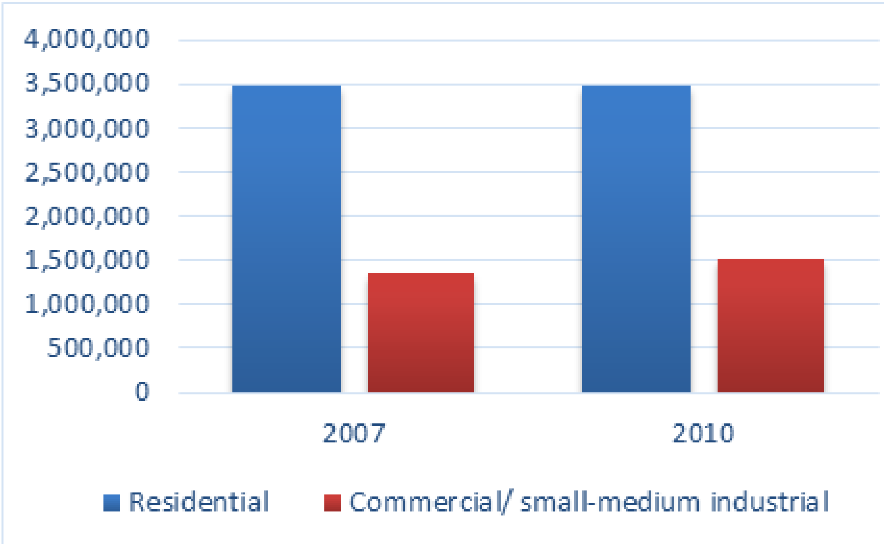
Source: Community Energy and Emissions Inventory 2007, 2010.

Table 3: Energy and emissions from buildings, CVRD 2007 - 2010

Buildings	2007		2010	
	Energy (GJ)	CO2e (t)	Energy (GJ)	CO2e (t)
Residential	3,492,044	85,616	3,476,455	82,994
Commercial/ small-medium industrial	1,355,382	29,282	1,525,269	36,775
Large industrial	No data	No data	No data	No data
Total	**4,847,426**	**114,898**	**5,001,724**	**119,769**

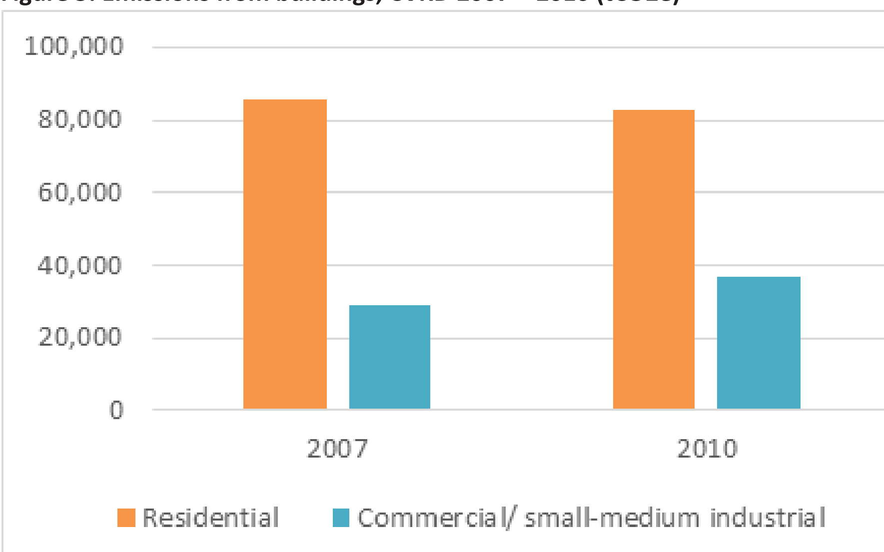
Source: Community Energy and Emissions Inventory 2007, 2010. Data from large industrial operations is not available.

Figure 4: Energy use by buildings, CVRD 2007 – 2010 (GJ)



Source: Community Energy and Emissions Inventory 2007, 2010. Data from large industrial operations is not available.

Figure 5: Emissions from buildings, CVRD 2007 – 2010 (tCO2e)



Source: Community Energy and Emissions Inventory 2007, 2010. Data from large industrial operations is not available.

Energy use and emissions from transportation

Energy and emissions from transportation have also increased between 2007 and 2010 (Table 4, Figures 6 and 7). This varies by vehicle type as follows.

- Energy use from small cars has increased by about 6%, but the emissions level has remained the same. This is likely due the growth in use of hybrid vehicles and higher emissions standards in fuels.
- Both energy use and emissions from large passenger cars has declined (2% and 8% respectively). This represents a small decline in the total number of large passenger cars and an increase in the use of hybrid models.
- Energy use from light trucks, vans and SUVs increased 15% and emissions increased by 9%. The number of hybrid and gasoline vehicles increased, while vehicles powered by diesel and other fuels declined. Emissions by light trucks, vans and SUVs account for almost half (47%) of the transportation emissions.

Table 4: Energy and emissions from transportation, CVRD 2007 – 2010

Transportation	2007		2010	
	Energy (GJ)	CO2e (t)	Energy (GJ)	CO2e (t)
Small passenger cars	844,693	57,626	897,485	57,891
Large passenger cars	466,303	31,735	455,884	29,324
Light trucks, vans, SUVs	1,947,893	133,607	2,242,428	145,819
Commercial vehicles	495,518	34,217	628,191	41,982
Tractor trailer trucks	499,897	35,115	423,588	28,865
Motorhomes	78,992	5,400	76,861	5,041
Motorcycles/ mopeds	8,653	576	12,203	774
Buses	25,986	1,803	25,233	1,698
Total	**4,637,935**	**300,079**	**4,761,873**	**311,394**

Source: Community Energy and Emissions Inventory 2007, 2010.

Figure 6: Energy use from transportation, CVRD 2007–2010 (GJ)

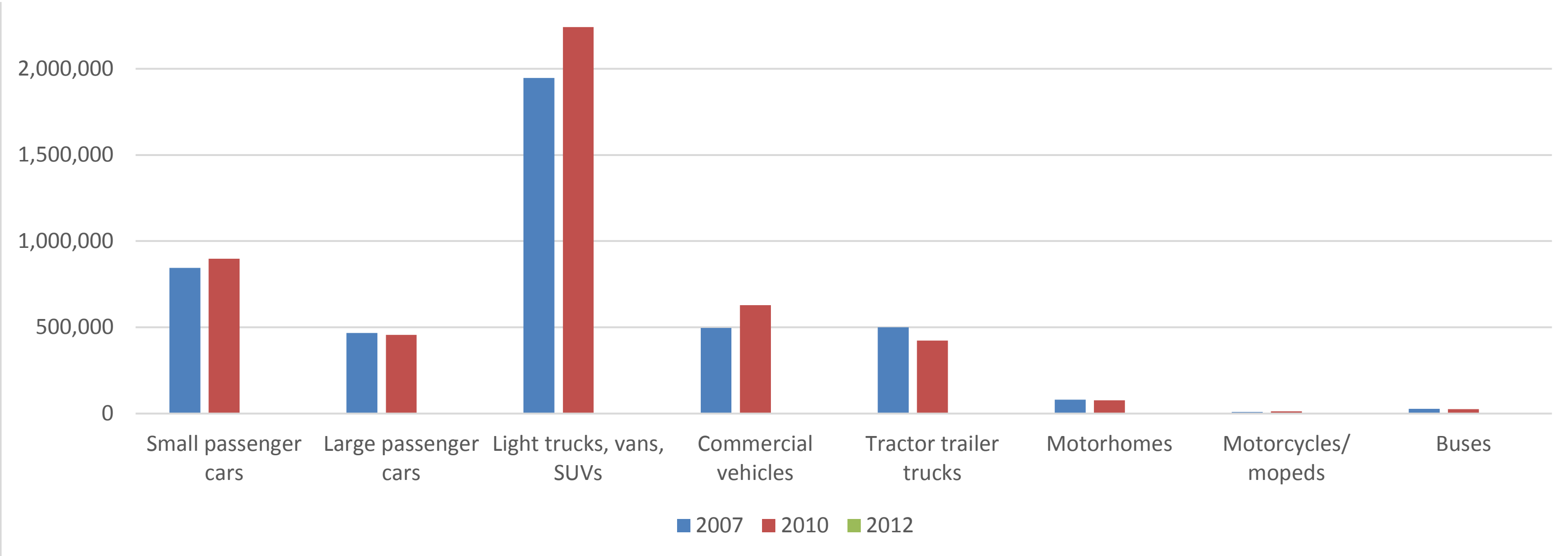
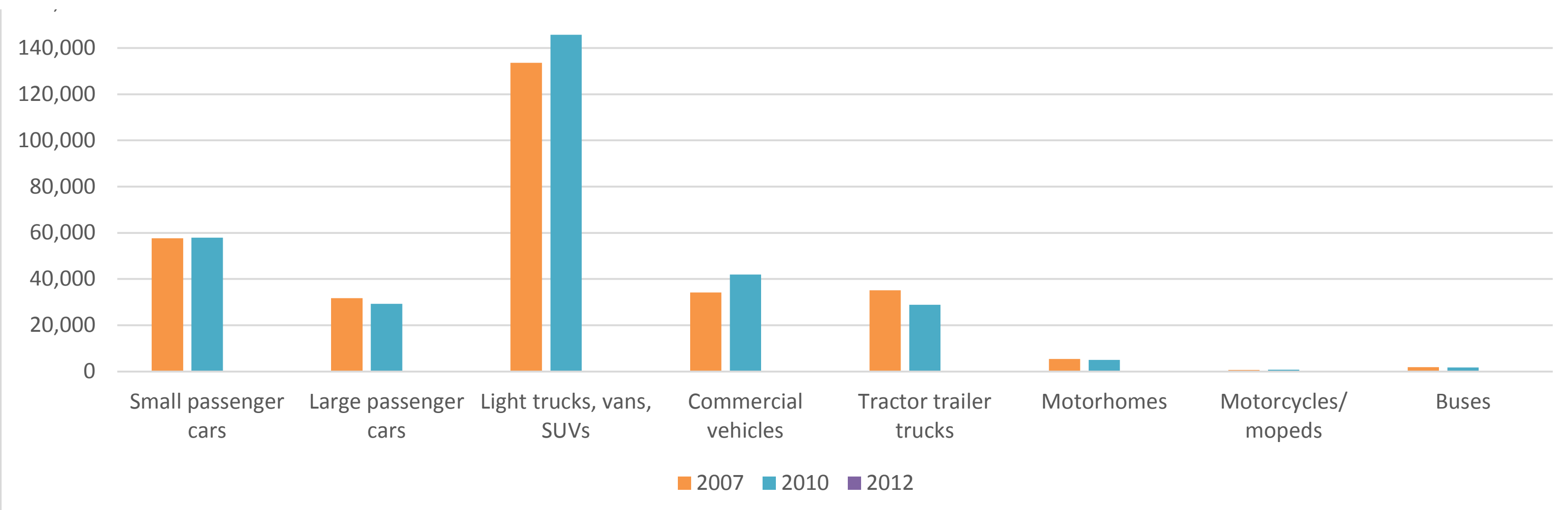


Figure 7: Emissions from transportation, CVRD 2007–2010 (tCO2e)



Source: Community Energy and Emissions Inventory 2007, 2010.

- Energy and emissions from commercial vehicles increased significantly (27% and 23% respectively). In part this is due to an increasing number of these vehicles, with many of them diesel powered.
- Energy and emissions from tractor trailers declined (15% and 18%), primarily because fewer vehicles were in operation.
- Fuel consumption from motorhomes declined slightly, especially those using diesel. As a result, energy use declined 3% while emissions declined 7%.
- Use of motorcycles and mopeds increased significantly, with a 41% increase in energy use (and 34% emissions increase). This is likely a good news story, however, as these modes of transport are more fuel efficient that cars and SUVs.
- Energy and emissions from buses declined slightly (3% and 6%), again likely a result of greater fuel efficiency.

While some gains have been made in terms of moving towards more fuel-efficient vehicles, it is clear that energy and emissions from transportation continues to rise, a trend that does not support climate action goals.

Emissions from waste

Decomposing garbage in the landfill produces methane, a gas that is much more potent than carbon dioxide as a greenhouse gas.[8] Reducing emissions from landfills by diverting organics and preventing methane emissions (e.g., by capturing and reusing the gas or by flaring off) is an important contribution to climate action. More information on methane capture from landfills is provided in the next section (Corporate Energy and Emissions).

The CEEI calculates that in 2007, community solid waste was responsible for 5,923 tCO2e of greenhouse gas emissions (data are not available for 2010). As shown in Table 5, solid waste production has declined slightly between 2007 and 2010. It is hoped that 2012 data show a further reduction, reflecting a continued diversion of waste from the landfill to compost and recycling. In 2013, composting of household organic waste resulted in a reduction of 1,645.2 tCO2e from the waste emissions.

Table 5: Community solid waste, CVRD 2007 – 2012 (tonnes produced)

	2007	2010
Community solid waste	27,948	27,139

Source: Community Energy and Emissions Inventory 2007, 2010.

Corporate Emissions

As signatories to the B.C Climate Action Charter, the CVRD and member municipalities report annually on the emissions from their corporate operations, and the steps they have taken to reduce greenhouse gas emissions from these activities. This includes energy used for buildings (e.g., municipal offices, swimming pools and ice rinks, and fire halls) and transportation. Functions performed by contractors—such as road repairs—are also reported.

Local governments are able to use “Option 1 projects” to offset (“balance”) the corporate emissions. These are community emissions reductions projects that are pre-approved by the Province (such as composting household organics and helping community members to switch to more energy efficient buildings). The value of emissions saved through these projects can be applied against the local government’s total emissions to reduce that total. For any remaining emissions quantity, the local government can purchase offsets to achieve carbon neutrality, or choose not to do so (they are then rated as “making progress towards” carbon neutrality).

Local governments who provide an annual CARIP[9] (Climate Action Revenue Incentive Program) Report receive a grant equal to the amount of carbon taxes they have paid.

8 *“While methane doesn’t linger as long in the atmosphere as carbon dioxide, it is initially far more devastating to the climate because of how effectively it absorbs heat. In the first two decades after its release, methane is 84 times more potent than carbon dioxide.”* Environmental Defense Fund http://www.edf.org/climate/methane.

9 For more information on carbon neutral local government and CARIP see http://www.toolkit.bc.ca/carbon-neutral-government and http://www.cscd.gov.bc.ca/lgd/greencommunities/carip.htm

Data Sources and Reliability

Local governments use an analytical tool called SMARTTool to gather information on their corporate emissions, so that each local government is collecting and reporting on the same types of data. 2012 was the first year for reporting on carbon neutrality, and many local governments were not including contractor information at this stage. The 2013 reports generally contain more complete data. Reports are completed every year (2014 reports will be completed by March 2015).

These data are reliable and repeated annually.

Findings

The CVRD and member municipalities all reduced emissions from their corporate operations between 2012 and 2013, and all used Option 1 projects (primarily composting of household waste) to further reduce their total emissions (Table 6 and Table 7). The CVRD was able to achieve carbon neutrality entirely through Option 1 projects, and the municipalities of Duncan and Ladysmith purchased the required amount of offsets to become carbon neutral for the 2012 and 2013 reporting years. All of the local governments reduced their emissions between 2012 and 2013.

Emissions from contracted services tend to vary year by year, depending on the nature of the contracts. For example, contracts for snow clearing will depend on the amount of snowfall in a given year.

Table 6: Corporate emissions, CVRD 2012 - 2013

CVRD	2012 (tCO2e)	2013 (tCO2e)
Emissions from services delivered directly by the local government	1,450	1,428
Emissions from contracted services	Not recorded	246
Annual corporate emissions	1,450	1,674
Less Option 1 GHG reductions	0	1,674
Less purchased offsets	0	0
Balance of corporate emissions for reporting year	1,450	0

Source: CVRD Climate Action Revenue Incentive Program 2012, 2013

Table 7: Corporate emissions, CVRD municipalities 2012 - 2013

Duncan	2012 (tCO2e)	2013 (tCO2e)
Emissions from services delivered directly	294	242.78
Emissions from contracted services	0	100.25
Annual corporate emissions	294	343.03
Less Option 1 GHG reductions	156.3	145
Less purchased offsets	137.7	198
Balance of corporate emissions for reporting year	0	0
Ladysmith	**2012 (tCO2e)**	**2013 (tCO2e)**
Emissions from services delivered directly	443.91	386.66
Emissions from contracted services	3.48	3.48
Annual corporate emissions	447.39	390.14
Less Option 1 GHG reductions	82.88	99.48
Less purchased offsets	364.51	291
Balance of corporate emissions for reporting year	0	0
Lake Cowichan (data missing)	**2012 (tCO2e)**	**2013 (tCO2e)**
Emissions from services delivered directly	217	203
Emissions from contracted services	-	-
Annual corporate emissions	217	203
Less Option 1 GHG reductions	0	0
Less purchased offsets	0	0
Balance of corporate emissions for reporting year	217	203
North Cowichan	**2012 (tCO2e)**	**2013 (tCO2e)**
Emissions from services delivered directly	1358	1274
Emissions from contracted services	74	195
Annual corporate emissions	1432	1469
Less Option 1 GHG reductions	684	483
Less purchased offsets	0	0
Balance of corporate emissions for reporting year	748	986

Source: Climate Action Revenue Incentive Program Reports for Duncan, Ladysmith, Lake Cowichan and North Cowichan 2012, 2013. GHG reductions are from organic waste composting.

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 the 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 forests (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.[10]

The science behind how much carbon can be absorbed and stored by ecosystems is imperfect and complex, and depends on parameters of the ecosystem and the organisms within it including growth rates, ages, species composition, topography, wetland type and size, and the impacts of management processes. 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., due to fires), especially in productive sites such as those on the east side of the CVRD, can also be managed to store 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 an item of increasing interest to communities, particularly given the potential to use ecosystems to reduce the currently dangerous build-up of carbon dioxide in 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.[11] However, warming temperatures may ultimately tip carbon sinks such as the ocean and forests into becoming emitters, exacerbating climate instability.

Data Sources and Reliability

The Community Energy and Emissions Inventory includes information on deforestation. Data are currently only available for 2007 (this was not included in the 2010 CEEI).

Overall, data for loss of carbon sinks is scarce and of a generic nature.

Findings

As reported in the 2010 State of Environment Report, there are 222,491 ha of forest and wetland in the Cowichan Region, or about 23.6% of the landbase (Table 8).

Table 8: Carbon sinks, CVRD

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**	**23.6**

Source: CVRD 2010 State of Environment Report

The 2007 CEEI reports that the loss of forest land to agriculture and settlement has contributed 35,465 tCO_2e to the CVRD’s community emissions.[12]

10 Holt, 2009.

11 The Province has developed a Forest Carbon Offset Protocol (FCOP) to guide the design, development, quantification and verification of B.C forest carbon offsets. http://www.env.gov.bc.ca/cas/mitigation/fcop.html

12 CEEI 2010.

Climate Adaptation

The CVRD and partners have been undertaking several projects to support different aspects of climate adaptation. There is no way to directly measure progress on climate adaptation; hence this section provides a summary of key initiatives to address some of the challenges.

Flooding

The Lower Cowichan-Koksilah River floodplain has experienced many flood events resulting from high flows in the Cowichan and Koksilah rivers and their tributaries, and from ponding in low-lying areas during heavy rain events. The flood events of 2008–2010 resulted in the closure of the Island Highway as well as the evacuation of communities living on the floodplain. Climate change is expected to increase flooding frequency. In response, the CVRD has prepared an Integrated Flood Management Plan for Lower Cowichan/Koksilah River[13] that identifies actions to minimize flood risk.

Drought

Low summer and early fall water levels on the Cowichan River are already a concern for fish returns, industry (notably Catalyst Paper) and tourism. Increasingly dryer summers will exacerbate these low flows and impact groundwater supplies in some locations. In response, the CVRD and other key partners are exploring options to improve water storage in Cowichan Lake in order to be able to supply more water during dry periods. Public education about appropriate water use is also essential, so the "flowdown" website[14] provides up-to-date information on lake storage, water quality, water temperatures, and impacts for fish.

The CVRD and Ministry of Agriculture undertook an analysis of farm-based water use across the region in order to develop a better understanding of crops likely impacted by limited water resources.

13 http://www.cvrd.bc.ca/DocumentView.aspx?DID=7999
14 http://www.flowdown.ca/

Sea level rise

Sea level is expected to rise by at least 0.8 m by 2100. Sea level rise will create numerous concerns for the Cowichan region, including:

- More frequent and extreme high water levels in coastal areas;
- Increased erosion and flooding;
- Increased risk to coastal infrastructure and marinas, as well as increased maintenance and repair costs;
- Loss of property due to erosion;
- Loss of habitat and reduced biodiversity;
- Saltwater intrusion into coastal aquifers;
- Impacts on industrial areas; and
- Loss of cultural and historical sites.

Impacts of sea level rise will be compounded by increased winter storms that can push sea water further inland.[15] The CVRD has undertaken an impact analysis and preliminary mapping of the eastern shoreline areas to determine the potential impacts of sea level rise and increased storm events in these areas. This work will lay the foundation for future infrastructure analysis as well as land use planning in the impact zone.

Impacts to agriculture and growing seasons

Changing weather patterns will affect growing seasons and the types of crops that will thrive (see SOE Report on Farmland and Food Security for more detail). The CVRD is developing Regional Adaptation Strategies[16] that focus on climate change adaption for agriculture. Four projects have been completed or are underway:

15 For more information see the B.C. Government website Sea Level Rise and Storm Surges on the B.C. Coast http://www2.gov.bc.ca/gov/topic.page?id=F09F1EC7576643CEB5FB1536913730BA
16 http://www.cvrd.bc.ca/index.aspx?nid=1792

- An integrated and comprehensive approach to water management (from supply and storage, to irrigation, to drainage) at the farm level, assisting farmers to better manage the water they have. This approach is being tested at several local farms;
- A study of best practices for regional agriculture extension services to assist producers with strengthening their adaptive capacity;
- Development of information on extreme weather events preparedness and mitigation; and
- A study of options to enhance local agricultural processing and storage. Storage provides flexibility for farmers; important in a changing climate because the timing of production and the quality of products will become more unpredictable and variable.

Impacts to native ecosystems

Changing climate creates conditions that stress native ecosystems that will be pushed beyond their natural range of variability; facilitating the introduction and spread of invasive species. The CVRD has developed an invasive species strategy[17] that will target invasive plants of particular concern in this region. Proposed actions include new bylaws to control and manage species of concern, as well as providing public education on ways to eradicate invasive plants and prevent infestations.

Wildfire

Increasing summer and fall drought will lead to loss of soil moisture. Coupled with higher temperatures, this will lead to more wildfires. In turn, these fires will negatively impact air quality, require increased water storage for fighting fires and require increased resources to fight fires and ensure public safety. A possible benefit is that the return to a more fire prone landscape could mimic historic conditions and may assist Coastal Douglas-fir ecosystems and the species they support.

17 http://www.cvrd.bc.ca/DocumentCenter/View/64724

Community energy resilience

Moving to clean, renewable and local energy sources is an important step in climate mitigation. It is also an important adaptation mechanism, as it increases energy self-sufficiency in the face of global and regional uncertainty related to energy opportunities. The CVRD has completed Cowichan Valley Energy Mapping and Modelling studies[18] that identify ways to increase its energy resilience, as well as reduce energy consumption and GHG emissions, with a primary focus on the residential sector. The aim is to have 75% of the region's residential energy needs met from locally sourced renewables by 2050.

Data Gaps

Local government information on carbon emissions is now tracked and easy to obtain. Data on community emissions is more complex to gather and results in a greater time delay in preparing data sets. It would be helpful to have data on amounts of 'clean' energy produced, for example from wind, solar or tidal generation.

18 http://www.cvrd.bc.ca/index.aspx?NID=1693