2008

GHG Emissions Gabriola Island

Island Futures

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INTRODUCTION

Gabriola Island lies off the east coast of Vancouver Island about 5 km from the city of Nanaimo. The island has a land area of about 57.6 km^2 and, in 2008, had a population of 4296[1] with an estimated number of 2274 private dwellings.[2] Economic activities include the social services sector (health and education), construction, tourism, retail businesses, arts and crafts, and farming. Gabriola Island is serviced by one ferry operating between Nanaimo and Descanso Bay, and floatplane services operating between Vancouver and the Silva Bay Marina.

This document estimates the greenhouse gas [GHG] emissions on Gabriola Island for 2008 by first getting as much information as possible on energy use and then using emission factors recommended by various sources to estimate the emission quantities.[3] It's important to keep in mind that the estimates depend heavily on choice of emission factor and that different organizations have different ideas of what certain emission factors should be.

Energy use and estimated emissions for the island have been broken into four sectors: buildings (electricity and heating fuels); transportation (vehicles, ferry, boat, float plane, and large trucks); food (transportation); and waste. This audit is confined to those uses that can be readily measured for Gabriola Island. For example, CO2 generated by resident's traveling long distances off island is not considered.

With the information presented, interested members of the community can begin to identify ways of reducing energy use and corresponding GHG emissions, and government bodies can respond with supportive policy and legislative changes.

[1] Extrapolated from Canada Census Statistics 2006 (4050 in 2006 with 2.8% increase per year based on 15% increase over five years).

[2] Waste Management, Regional District of Nanaimo, November, 2009.

[3] See Appendix B for emissions factors and calculations

A. TRANSPORTATION

Energy use in the transportation sector includes that used for cars, trucks, ferry, float plane, boats, and trucks originating off-island. Results show the transportation sector is responsible for 62% of GHG emissions on Gabriola Island.

VEHICLES

As stated in the BC government Greenhouse Gas Emission Assessment Guide for reporting community emissions[4]:

> *"There are several different ways of calculating on-road transportation emissions, including fuel sales, vehicle registrations, traffic counts, and traffic modeling.*

In this report the fuel sale approach is used. This approach is believed to be more accurate for Gabriola for several reasons. One is that Gabriola is an island with one gas station for cars and trucks, so there is a distinctive boundary that separates Gabriola from Vancouver Island. Another is that there are challenges with the other approaches. For example, vehicle registrations are not a useful parameter because many part-time residents register their vehicle on Gabriola Island rather than at their permanent residence in order to get cheaper ICBC rates. In addition, the average number of kilometres travelled by vehicles registered on Gabriola is lower than the average for vehicles registered on Vancouver Island and elsewhere. [5]

The fuel sale approach uses the litres of vehicle fuel sold on Gabriola Island for vehicle use. This approach assumes fuel purchased off island and used on island, and fuel purchased on island and used off island, approximately offset each other. According to the Mid-Island Co-operative (the only gas station on Gabriola) 2,397,451 litres of vehicle fuel were sold on Gabriola in 2008. The proportion of diesel to gasoline is 16% to 84%. Using this approach the energy and GHG emissions[6] from the fuel sold for vehicles on Gabriola Island are:

Table 1: Litres, Gigajoules and GHG emissions Car and Truck fuel 2008

	Litres	Tonnes GHG emissions
Gasoline	2,013,859	4714
Diesel	383,592	1032
Total	2,397,451	5747

Using the Gabriola population over the age of 15, the average amount of fuel used for driving per Gabriola resident is 632 litres per year. If we assume year 2000 mid sized cars driven with no passengers we would each be driving about 18.2 kilometres per day.

[4] Community Energy Association and Ministry of Community Services, "Greenhouse Gas Emission Assessment Guide." 2008. n.p. http://www.townsfortomorrow.gov.bc.ca/docs/ghg_assessment_guidebook_feb_2008.pdf

[5] Public Transportation Committee, "Gabriola Transportation Survey Results", 2008.

[6] Community Energy Association and Ministry of Community Services, Ibid

FERRY

The Gabriola-Nanaimo ferry makes 16 return trips every day except Sunday and Wednesday, when the figure is 15. The route is 3.7 nautical miles (about 7 km) each way. When using the ferry *Quinsam*, the average fuel use per round trip is 190 litres, and when using the *Bowen Queen* (the replacement vehicle when the *Quinsam* is in for repairs) the average is 270 litres[7]. The biggest reason for the difference is that the *Bowen Queen* has to travel faster to keep to the schedule. (Fuel consumption increases with load and speed.)

In 2002, annual fuel use for the Gabriola to Nanaimo ferry was estimated from a statement by a fuel truck operator that every week the ferry used approximately 20,000 litres of diesel fuel[5]. Multiplying this figure by 52 weeks puts the 2002 fuel consumption for the ferry at 1,040,000 litres. A request has been made for fuel consumption in 2008 and the table will be completed when that arrives.

Table 2: Litres, GJ and GHG emissions Gabriola-Nanaimo ferry 2002 and 2008

	Litres of diesel	Tonnes C02 equivalent
2002	1,040,000	3120
2008	TO COME	

SEAPLANE AND BOATS

Energy consumed and GHG emissions can be estimated from the fuel purchase figures provided by Columbia Fuels and corresponding conversion factors.[8]

Table 3: Fuel and GHG emissions from seaplane and boats

Fuel type	Litres	Tonnes C02 equivalent
Gasoline (float plane and boats)	200,301	493
Diesel (boats)	76,020	205
Total	276,321	**697**

LARGE TRUCKS

Information still needs to be gathered for large trucks used for delivery, garbage and recycling, construction, maintenance, etc that fuel off island.

[7] Communication with Captain Michael Smit, Nanaimo-Gabriola route, BC Ferries, December 2009
[8] Community Energy Association and Ministry of Community Services, Ibid

B. BUILDINGS

ELECTRICITY[9]

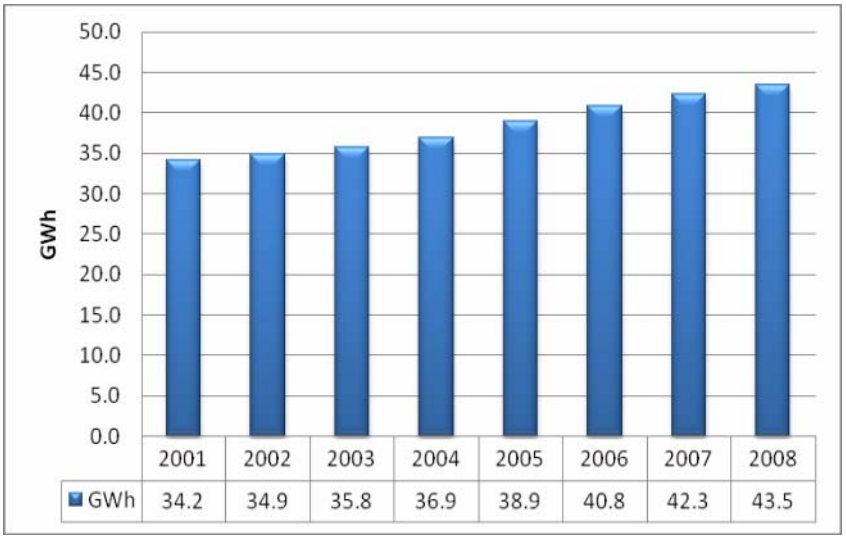
BC Hydro is the sole commercial supplier of electricity on Gabriola. Gabriola's electricity is fed through BC Hydro's HWD 25F38 feeder from Cedar. Gabriola Island had 2828 customers in 2008/09[10].

Table 4 shows Gabriola Island's monthly consumption based on data from BC Hydro, and Fig 1 shows Gabriola's electricity consumption for 2001-2008.

Table 4: Monthly Electricity Consumption 2008

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Total**
GWh	5.6	4.6	4.8	3.3	3.3	2.3	2.3	2.3	2.2	3.7	3.6	5.7	**43.5**

Figure 1: Gabriola's Electricity Consumption 2001 to 2008



For Gabriola, which obviously has no large industry, the proportion of accounts that are residential was 94.6% in 2008.[11] The remaining 5.4% of accounts are classified as "non-residential" meaning commercial, institutional, etc.

[9] See Appendix C and D for Notes related to calculations for electricity consumption
[10] Ted Olynyk, BC Hydro, December 14, 2009
[11] Ted Olynyk, BC Hydro, January, 2010

For BC as a whole, electricity use by residential customers is roughly the same (48.8%) as for non-residential customers (51.2%) excluding large industry. For Gabriola, residential use (87.4%) is much larger than non-residential use (12.6%). This is significant because seasonal use and annual growth differ for the residential and non-residential components.

Table 5: Customer types in BC and on Gabriola

2008	BC		Gabriola	
residential	1,568,508	88.9%	2,664	94.6%
commercial, light industry, instit.	194,861	11.0%	153	5.4%
large industry	160	0.01%	0	0%
TOTAL	1,763,529	100%	2,817	100%

Table 6: Electricity use by different types of customers in BC and on Gabriola. For BC, left column % includes large industry and right column % doesn't.

2008	BC			Gabriola	
residential GWh/yr	17,553	34.2%	48.8%	38.04	87.4%
non-residential GWh/yr	18,406	35.8%	51.2%	5.49	12.6%
large industry GWh/yr	15,380	30.0%	—	0	—
TOTAL	51,339	100%	100%	43.53	100%

Gabriola's annual consumption for all users has grown at 3.5% per year over the past 8 years. The residential and non-residential portions grew at 3.7% and 2.2% per year respectively. Of the 3.7% per year residential component, 0.6% is estimated to be due to an increase in base load (non-heating, non-lighting) and 1.0% is estimated to be due to an increase in heating and lighting requirements. Factoring in a 2.4% increase in the number of residential accounts, the estimated growth works out at 4.0%, which compares favourably with the actual 3.7%. The estimates of the heating portion can be improved by taking into account the extra electricity used during extremely-low-temperature winter days.

All of these usage figures will be explained more fully in Island Future's upcoming Energy Report.

To estimate GHG emissions from electricity, we followed the BC government recommendation of using emission factors provided by BC Hydro in its annual Environmental Report[12]. Table 7 shows the results.

Table 7: Gabriola 2008 GHG emissions for electricity use without domestic imports

	2005	2006	2007	2008
GWh	38.9	40.8	42.3	43.5
Emission factor (tC02e/GWh)	24	27	23	28
tonnes C02 equivalent	934	1,102	973	**1,218**

It should be noted that BC Hydro calculates its emission factors based on the Global Reporting Initiative and therefore "GHG emissions from electricity imports for domestic use are not included"[13], nor are exports. Therefore the mix of fossil based relative to hydro based electricity that flows through the cable to Gabriola Island is not consistent with the emission factor in BC Hydro's report. Rather, it is based on a number of factors including:

- The extent to which there was adequate precipitation to maintain adequate levels in the BC Hydro reservoirs providing hydro based electricity;
- The amount of trading that Powerex engages in with Alberta and USA in order to increase profitability ; and
- The extent to which the peak demand at various times throughout the year can be met by BC Hydro's own resources.

In 2008 there was enough precipitation to ensure adequate levels in the reservoirs, the demand peaks throughout the year could be met by BC Hydro's own resources, and there was extensive trading with Alberta and with the United States as in previous years. The following results from Appendix D reflect one approach to incorporating these various factors.

Table 8: Gabriola 2008 GHG emissions for electricity use with domestic imports

	2001	2002	2003	2004	2005	2006	2007	2008
GWh	34.2	34.9	35.8	36.9	38.9	40.8	42.3	43.5
Emission factor (tC02e/GWh)	58.8	70.6	26.5	45.4	61.1	44.3	58.2	29.4
Tonnes C02e	2,011	2,464	949	1,675	2,377	1,807	2,462	1,279

[12] www.bchydro.com/about/company_information/reports/gri_index/f2009_environmental_EN16_2.html

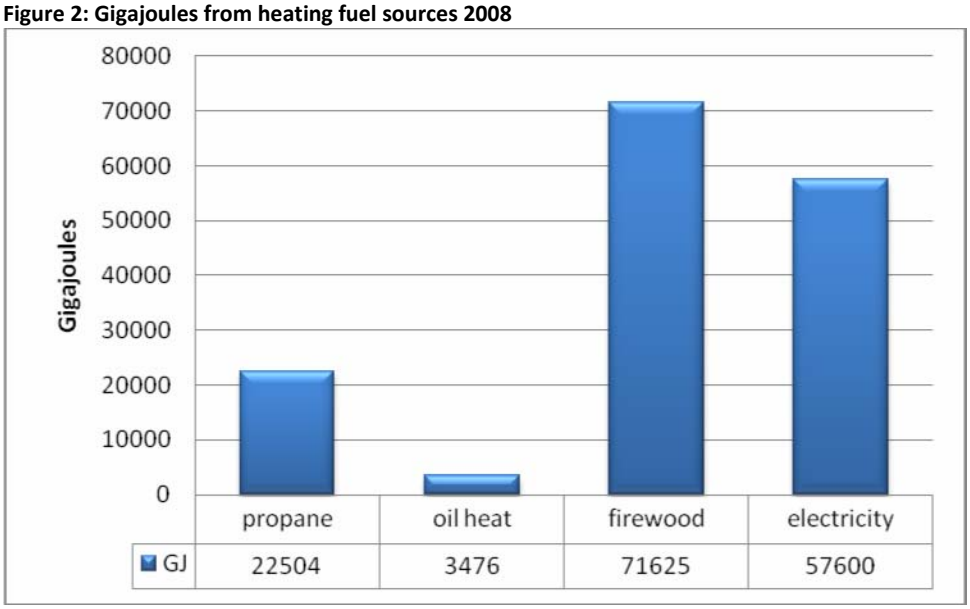
[13] Ibid

HEATING FUEL

Electricity, propane, heating oil, wood pellets, and firewood are all used to heat residential and commercial buildings. An estimate of the number of gigajoules (GJ) from each source is shown in Fig. 2. In deriving this estimate:

- **Propane and heating oil** consumption figures were provided by companies selling these fuels to Gabriola residents in 2008.
- **Firewood** consumption figures are based on the estimate from the Baseline Report done for Salt Spring Island in 2005 that concluded approximately 84% of households use firewood as a source of heat with approximately half using firewood as their primary source of heat[14]. Using the Salt Spring Island figures the amount of wood burned per household is 1.5 long cords. (A long cord is 4'x4'x8', or approximately 3 times the size of a short cord - the usual size used for selling wood.)
- **Electricity** consumption and GHG emissions were calculated in the preceding section.
- The conversion factors for all these fuel sources came from "A Guide to Residential Heating"[15] produced by Canada Mortgage and Housing.

Figure 2: Gigajoules from heating fuel sources 2008



Dividing the total GJ by the number of residences on Gabriola shows the average residence uses 68.5 GJ of energy for heating. This compares to estimates for the Vancouver/Victoria area of 60 GJ for a new home and 85 GJ for an older detached home.[16]

[14] Earth Festival Society. "Salt Spring Island Energy Strategy Baseline Report" 2005 http://www.saltspringenergystrategy.org/docs/ssienergybaseline.pdf

[15] http://www.cmhc-schl.gc.ca/en/co/maho/enefcosa/upload/wood_heating_EN_W.pdf

Table 8 shows the GHG emissions for both residential and commercial use of propane and oil in 2008, using emission factors from the BC Government's GHG Assessment Guidebook[17]. In this report CO2 emissions from wood pellets and firewood aren't considered because CO2 from wood eventually winds up in the atmosphere whether it's burned as a fuel or not.

Table 9: Gabriola 2008 GHG emissions from Heating Fuels

Fuel	Litres	Tonnes CO2-equivalent
Propane	889,498	1370
Heating and furnace oil	91,003	258
Total		1628

C. EMISSIONS FROM OTHER SOURCES

FOOD TRANSPORTATION

"Our food purchases have a large impact on the amount of fossil fuel energy we consume and the GHGs we produce. Energy is used at every step of food production: to manufacture fertilizers, pesticides and herbicides, for tillage and harvesting, for processing and packaging, and last but not least for transportation." Salt Spring Island Community Energy Strategy Baseline Report

To estimate the GHG emissions produced as a result of transporting food to where it's sold we used a 2005 Canadian study[18] that calculated the CO2 emissions for locally produced food at 0.006316 tonnes CO2 per year per person and imported food at 0.573 tonnes C02 per year per person. These calculations were based on the GHG emissions from transportation for the food in a grocery store (comparable to the grocery stores used by Gabriola Island residents) compared to those being sold at a local farmer's market. As well, the percentage of local food produced on Gabriola is estimated as 5%.[19]

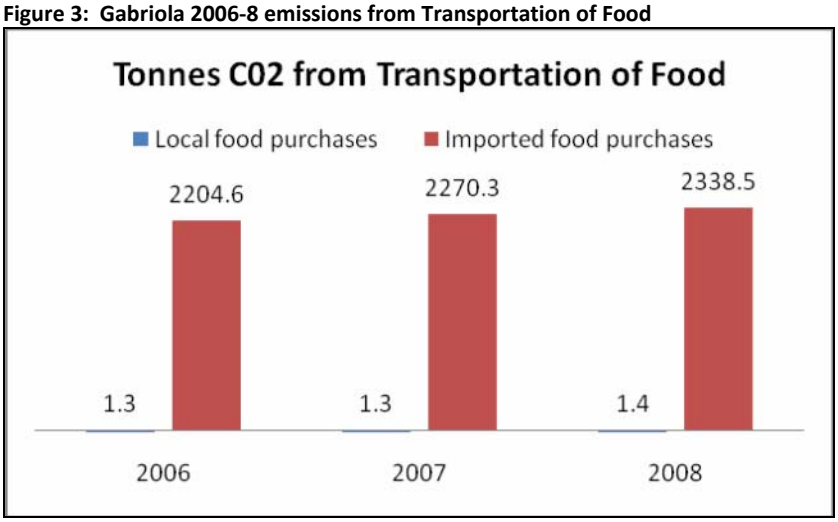
Table 9 and Fig. 3 show the emissions for the transportation component of food purchased for 2006 to 2008 based on the preceding assumptions. Given the high proportion of imported food, the bar for local food purchases is barely visible; however the actual tonnes of C02 from local food is printed to the left of each of the red bars.

[16] http://www.cmhc-schl.gc.ca/en/co/maho/enefcosa/upload/wood_heating_EN_W.pdf
[17] http://www.townsfortomorrow.gov.bc.ca/docs/ghg_assessment_guidebook_feb_2008.pdf
[18] Bentley, S., Barker, R. "The Role of Local Food Systems in Reducing Greenhouse Gas Emissions." FoodShare Toronto, 2005. http://www.foodshare.net/resource/files/ACF230.pdf
[19] Gabriolans for Local Food Choices and Island Good Food Initiative

Table 10: Tonnes of C02 equivalent from Transportation of Food

	C02e local food purchases	C02e imported food purchases	Tonnes C02 equivalent
2006	1.3	2204.6	2206
2007	1.3	2270.3	2272
2008	1.4	2338.5	2340

Figure 3: Gabriola 2006-8 emissions from Transportation of Food



WASTE

The Regional District of Nanaimo (RDN) is responsible for picking up garbage as well as certain recyclable items on Gabriola. They have provided the following statistics for 2007, 2008 and 2009 (up to November 3):

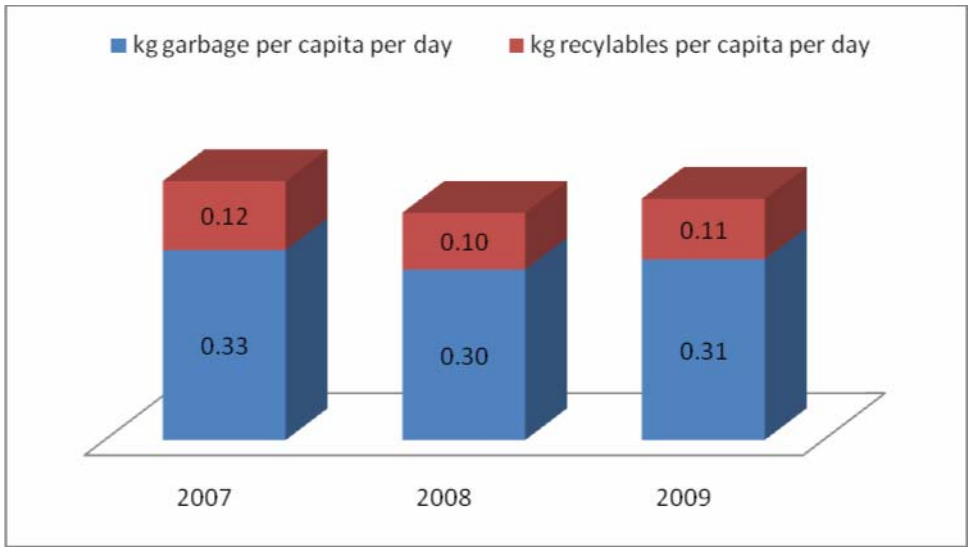
Table 11: Garbage and Recycling for Gabriola 2007-9

Routes 50&51	# Houses	Garbage (tonnes)	Recycling (tonnes)
2007	-	503.7	182.6
2008	2,276	465.2	155.1
2009 (to Nov 3)	2,297	427.0	143.6

Source: Regional District of Nanaimo 2009

Figure 4 shows the amounts in the preceding tables on a per capita per day basis for both recyclables and garbage:

Figure 4: Per capita per day kg garbage and recyclables trucked off island



The RDN representative indicated that the upward trend in 2009 could be the result of not being able to pick up Christmas garbage in 2008 due to weather and then picking it up in early 2009. The average amount of garbage produced per capita per day by Gabriolans in 2008 is 0.3 kg with 0.1 kg of recyclables for a total of .4 kg.

Each kg of trash thrown away will emit approximately 1.25 kg of carbon dioxide equivalent in the form of methane[20]. Based on this factor and considering only the garbage, not the recyclables, Gabriola produces the following greenhouse gas emissions from waste:

Table 12: Gabriola 2008 GHG emissions from Garbage

Gabriola Island	2007	2008
Tonnes Garbage	504	465
C02 from Garbage	630	581

[20] Methane emission factor

D. TOTAL GHG EMISSIONS

Figure 5 depicts percentage of sources for GHG emissions on Gabriola Island in 2008 per the figures shown in Table 12, with the assumptions, conversions, and emission factors described throughout summarized in Appendixes B and C.

Figure 5: Gabriola 2008 Percentage of Sources for GHG emissions

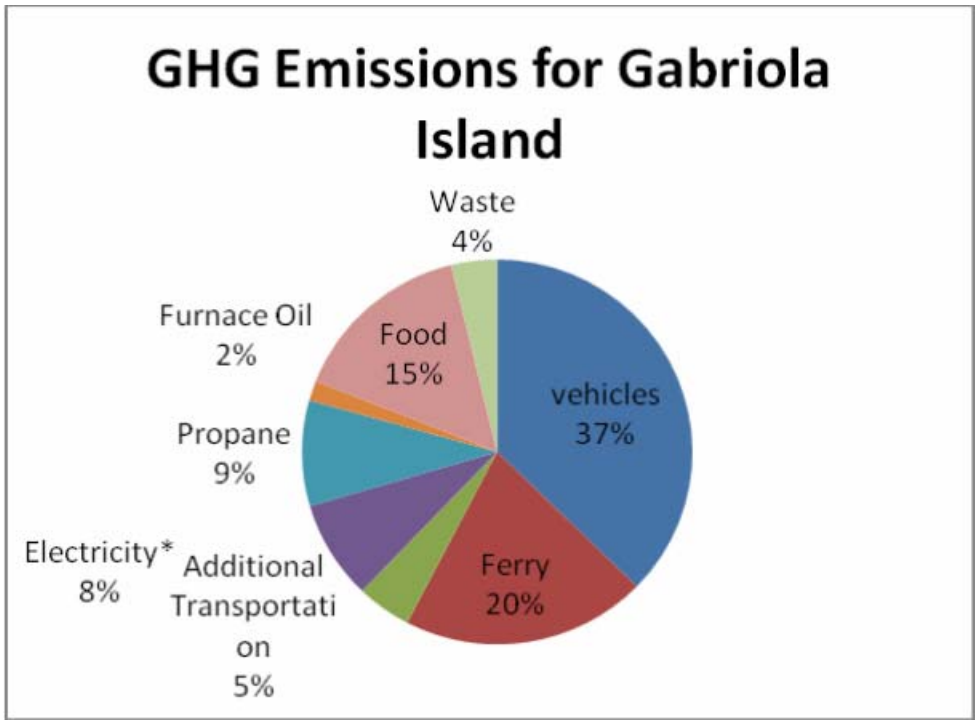


Table 13: Gabriola 2008 GHG emissions by source

Source of emissions	Tonnes of C02 equivalent
Vehicles	5747
Ferry	3120
Seaplane and boats	697
Electricity	1279
Propane	1370
Furnace Oil	258
Food	2340
Waste	581
Total	**15,392**

*Emission factor includes estimate of domestic imports

In 2008 it is estimated that Gabriola Island's population was 4296 people. The GHG emissions per person based on the preceding then is 3.57 tonnes CO2 equivalent.

OTHER SOURCES OF CO2 NOT INCLUDED IN REPORT

Synthetic Fertilizers: GHG's come from the fossil fuel used to make them. Synthetic fertilizers also produce 1 kg/ha/year of NO2.[21]

Peat: Peat used in garden soil decays far more rapidly to CO2 than it would if left alone in its original bog. All peat is imported into BC from other provinces with resultant GHG emissions from transportation.

Animals: In 2003 New Zealand proposed a "flatulence tax" to address over 50% of their GHG emissions - all coming from livestock. Gabriola Island has animals that contribute to GHG emissions, but quantitative figures are not available.

Forests and Decaying wood: Forests are carbon stores, and they are carbon dioxide sinks when they are increasing in density or area. The average tree removes 907 kilograms of carbon from the atmosphere during its lifetime. Carbon is emitted slowly back into the air as trees decay. In addition, forest fires cause rapid release of GHG emissions. Removing trees from the natural cycle contributes to GHG emissions.

Airplane travel by residents: Compared to other modes of transport, such as driving or taking the train, travelling by air has a greater GHG impact per passenger kilometre, even over longer distances.

[21] Nick Doe, December 2009

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APPENDIX B: CALCULATIONS AND ASSUMPTIONS

Table 13: Assumptions and Calculations for each Source of GHG Emissions

Vehicles	litres	emission factor	conversion factor	CO2e
Diesel	383,592	3	0	1,032
Gasoline	2,013,859	2	0	4,714
Total				5747

Ferry	litres	emission factor	conversion	C02e
Diesel 2002	1,040,000	3	0.001	3120
Diesel 2008				

Seaplane and boats	litres	Emission factor	conversion	C02e
Gasoline	200301	2.46	0.001	492.74
Diesel	76020	2.691	0.001	204.57
Total				697

Electricity	GWh	emission factor		C02e
2008	43.5	29.4		1279

Heating Fuels	amount	emission factor		C02e
Propane (litres)	889498	1.54	0.001	1370
Furnace Oil (litres)	91003	2.84	0.001	258
Firewood (cords)	2865240	0		0

Food	People	emission factor		CO2e
Local food	214	0.006316		1.3
Imported food	4080	0.573		2338.4
Total				2339.7

Waste	kg	emission factor		
Garbage	465	1.25		581

Population	2006	2007	2008	2009
	4050	4170	4295	4424

APPENDIX C: NOTES RELATED TO ELECTRICITY

NOTES

1. In this report, "2008" means calendar year 2008 (Jan.08–Dec.08, or C2008). Sometimes data is only available for financial year 2008 (Apr.08–Mar.09, or F2008). In these cases, the conversion used is C2008 = 0.25F2007 + 0.75F2008. This may mean that numbers used here differ slightly from numbers quoted elsewhere. Statistically, "2008" means 2008.5, that is the mid-point of the year.

2. All "growth" figures are compounded growths calculated using annual data for the years 2001–8, with 2001 as the base year. The only exception is population where annual counts are not available. Growths have been estimated using a least squared error match with the raw data.

3. The term "non-residential" when applied to Gabriola includes both institutional accounts (school, churches, public spaces, etc.) and commercial accounts (stores, restaurants, small businesses, etc.). Use by some small home-based businesses on Gabriola is not distinguishable from residential use, but it is doubtful that this is statistically significant and in any case is an unknown quantity.

4. In analyses like this, it is easier to consider numbers of BC Hydro (BCH) "service locations" than it is population because annual population figures are only available by extrapolation from census figures taken very five years whereas BCH service-location counts are readily available annually. For residential customers on Gabriola, a service location is taken to mean a residence, most often a single house. A second advantage of using service-location numbers is that the number of residences is not seasonal, whereas population is. There were 1.58 residents per residential BCH account on Gabriola in census year 2006, which is not significantly different from census year 2001 when it was 1.55.

5. The formal unit of energy is the joule (J), and the formal unit of power is the watt (W). By definition, a watt is the supply of 1 joule of energy per second. The standard SI prefixes are kilo- (k) = 10^3, mega- (M) = 10^6, giga- (G) = 10^9,and tera- (T) = 10^{12}. It is common practice in reports of electrical energy to use time units other than one second such as hour (h), day (d), month (mth, informal), and year (yr, formal "a"). In calculations, every "month" is taken to be a twelfth of a year, and every year is taken to be 365.25 days. Thus:
1 gigawatt hour per year (GWh/yr) = 114 kilowatts (kW)
1 megawatt hour per month (MWh/mth) = 1.37 kilowatts (kW)
1 gigajoule (GJ) = 278 kilowatt hours (kWh)
1 kilowatt hour per day (kWh/d) = 41.7 watts (W)
1 kilowatt (kW) used continuously = 24.0 kilowatt hours per day (kWh/d)
1 kilowatt (kW) used continuously = 731 kilowatt hours per month (kWh/mth)
1 kilowatt (kW) used continuously = 8.77 megawatt hours per year (MWh/yr).

APPENDIX D: ELECTRICITY EMISSION FACTOR CALCULATIONS

Electrical energy GHG emission factors

Calculating greenhouse gas (GHG) emissions resulting from electrical energy generation and consumption is problematic. The energy comes from many different sources, each with its own emission factor (EF), but because power supply systems are integrated across North America, it is not possible to identify which particular source is supplying which particular customer. Any solution to this accounting problem has to provide useful information, yet be simple enough that the calculation can easily be repeated by others.

Approximately 88% of BCH's installed generating capacity is hydroelectric and emits no GHG. The remaining 12% is fossil fuelled and is used for meeting peak demand in winter and supplying remote off-grid locations. Installed generating capacity however does not accurately reflect usage. Burrard thermal generating plant is a typical example. It only produces expensive and "dirty" power and so is used as seldom as possible even though it remains on BCH's books as an available generator. Installed capacity is thus a poor indicator of GHG emissions.

A better way is to look at energy statistics. There are two sources of data on energy usage, namely *energy production* and *energy consumption*. These two are exactly equal when all sources of production and all sources of consumption are considered in a self-contained system. However, for a selected area within the system, the two numbers will only rarely balance, the difference being made up of the selected area's imports and exports.

Imports are hugely beneficial because imports allow a geographical area to handle its peak demand without having to build generating capacity that would, at other than peak times, not be required. Equally, exports make good use of any available spare generating capacity that would otherwise be idle. Unfortunately for the environment however, once the infrastructure for transmitting energy back and forth exists, decisions as to whether to import or export are made with an eye to making money on the trade, not minimizing GHG emissions.

From a GHG accounting perspective, the difficulty is that the emission factors (EF in kilotonnes of CO_2 equivalent per GWh) of imports and exports are not the same. In BC, we like to use an accounting system that uses only the EF of energy produced in BC because at 17 kt/GWh it is low. Albertans on the other hand object, with reason, to being held responsible for emissions resulting from the generation of electrical power for out-of-province users because at 882 kt/GWh, their EF is high. They would prefer a system where only the EF of energy consumed is considered. With an accounting system that counts GHG only where it is emitted, it would be better for Alberta to ship fossil fuel and let their customers use it to generate energy, because that way they avoid having the GHG on their account. BC does exactly this when it exports coal.

My suggested solution to this problem is as follows. It counts all the energy produced in BC by BCH and Independent Power Producers (IPPs) for the benefit of consumers in BC

as having the average EF of BCH using its own facilities. It counts the *net* energy imported into BC for the benefit of consumers in BC as having the weighted average Canadian EF. Here's the calculations for 2001–8 using re-interpreted data from BCH Annual Reports.

This indicator has all the following advantages: reducing imports makes the EF closer to BCH's EF, increasing imports makes the EF closer to the Canadian EF, improving BCH's EF improves the EF, improving the Canadian average improves the EF, it is not assumed that all imported energy has a high EF.

BCH BALANCE SHEET 2008

USED IN BC(GWh)			
Electricity sold, domestic total		53300	
Line loss and system use		5676	
TOTAL		58976	58976
ACQUIRED (GWh)			
Electricity purchased, long-term contracts		11878	
Electricity purchased, short-term contracts		32281	
Less electricity sold, trade		–37450	
Energy exchange net		–486	
TOTAL		6223	6223
GENERATED IN BC			
Burrard thermal generation	260		
Other thermal	353		
Total thermal	613	613	
Hydro generation		52140	
TOTAL		52753	52753
ACQUIRED AND GENERATED			58976

BCH emission factor 2008

GWh		kt/GWh	Mt
260	@ BCH thermal generation rate	523	136.0
353	@ BCH thermal generation rate	640	225.9
52140	@ BCH hydroelectric generation rate	0	0
6223	@ Canadian average rate	220	1369.3
58976			1731.2

BCH average for BC 2008 29.4 kt/GWh

BCH BALANCE SHEET 2007

USED IN BC(GWh)			
Electricity sold, domestic total		52911	
Line loss and system use		5329	
TOTAL		58240	58240
ACQUIRED (GWh)			
Electricity purchased, long-term contracts		10306	
Electricity purchased, short-term contracts		35360	
Less electricity sold, trade		–33372	
Energy exchange net		410	
TOTAL		12704	12704
GENERATED IN BC			
Burrard thermal generation	727		
Other thermal	333		
Total thermal	1060	1060	
Hydro generation		44476	
TOTAL		45536	45536
ACQUIRED AND GENERATED			58240

BCH emission factor 2007

GWh		kt/GWh	Mt
727	@ BCH thermal generation rate	523	380.2
333	@ BCH thermal generation rate	640	213.1
44476	@ BCH hydroelectric generation rate	0	0
12704	@ Canadian average rate	220	2794.9
58240			3388.2

BCH average for BC 2007 58.2 kt/GWh

BCH BALANCE SHEET 2006

USED IN BC(GWh)			
Electricity sold, domestic total		52440	
Line loss and system use		5356	
TOTAL		57796	57796
ACQUIRED (GWh)			
Electricity purchased, long-term contracts		11275	
Electricity purchased, short-term contracts		29831	
Less electricity sold, trade		–29906	
Energy exchange net		–629	
TOTAL		10571	10571
GENERATED IN BC			
Burrard thermal generation	39		
Other thermal	336		
Total thermal	375	375	
Hydro generation		46580	
TOTAL		47225	47225
ACQUIRED AND GENERATED			57796

BCH emission factor 2006

GWh		kt/GWh	Mt
39	@ BCH thermal generation rate	523	20.4
336	@ BCH thermal generation rate	640	215.0
46580	@ BCH hydroelectric generation rate	0	0
10571	@ Canadian average rate	220	2325.6
58976			2561.0

BCH average for BC 2006 44.3 kt/GWh

BCH BALANCE SHEET 2005

USED IN BC(GWh)			
Electricity sold, domestic total		51205	
Line loss and system use		4660	
TOTAL		55865	55865
ACQUIRED (GWh)			
Electricity purchased, long-term contracts		10992	
Electricity purchased, short-term contracts		32637	
Less electricity sold, trade		–29706	
Energy exchange net		–440	
TOTAL		13483	13483
GENERATED IN BC			
Burrard thermal generation	456		
Other thermal	325		
Total thermal	781	781	
Hydro generation		41601	
TOTAL		42382	42382
ACQUIRED AND GENERATED			55865

BCH emission factor 2005

GWh		kt/GWh	Mt
456	@ BCH thermal generation rate	523	238.5
325	@ BCH thermal generation rate	640	208.0
41601	@ BCH hydroelectric generation rate	0	0
13483	@ Canadian average rate	220	2966.3
58976			3412.8

BCH average for BC 2005 61.1 kt/GWh

BCH BALANCE SHEET 2004

USED IN BC(GWh)			
Electricity sold, domestic total		50151	
Line loss and system use		4969	
TOTAL		55120	55120
ACQUIRED (GWh)			
Electricity purchased, long-term contracts		10681	
Electricity purchased, short-term contracts		29402	
Less electricity sold, trade		–28373	
Energy exchange net		–1218	
TOTAL		10132	10132
GENERATED IN BC			
Burrard thermal generation	136		
Other thermal	312		
Total thermal	448	448	
Hydro generation		44540	
TOTAL		44988	44988
ACQUIRED AND GENERATED			55120

BCH emission factor 2004

GWh		kt/GWh	Mt
136	@ BCH thermal generation rate	523	71.1
312	@ BCH thermal generation rate	640	199.7
44540	@ BCH hydroelectric generation rate	0	0
10132	@ Canadian average rate	220	2229.0
58976			2499.8

BCH average for BC 2004 45.4 kt/GWh

BCH BALANCE SHEET 2003

USED IN BC(GWh)			
Electricity sold, domestic total		48677	
Line loss and system use		4689	
TOTAL		53366	53366
ACQUIRED (GWh)			
Electricity purchased, long-term contracts		7518	
Electricity purchased, short-term contracts		30560	
Less electricity sold, trade		–31182	
Energy exchange net		–1605	
TOTAL		5291	5291
GENERATED IN BC			
Burrard thermal generation	110		
Other thermal	300		
Total thermal	410	410	
Hydro generation		47665	
TOTAL		48075	48075
ACQUIRED AND GENERATED			53366

BCH emission factor 2003

GWh		kt/GWh	Mt
110	@ BCH thermal generation rate	523	57.5
300	@ BCH thermal generation rate	640	190.0
47665	@ BCH hydroelectric generation rate	0	0
5291	@ Canadian average rate	220	1164.0
58976			1413.5

BCH average for BC 2003 26.5 kt/GWh

BCH BALANCE SHEET 2002

USED IN BC(GWh)

Electricity sold, domestic total	47801	
Line loss and system use	5033	
TOTAL	52834	52834

ACQUIRED (GWh)

Electricity purchased, long-term contracts	7512	
Electricity purchased, short-term contracts	22608	
Less electricity sold, trade	–20666	
Energy exchange net	–283	
TOTAL	9171	9171

GENERATED IN BC

Burrard thermal generation	2731		
Other thermal	447		
Total thermal	3178	3178	
Hydro generation		40485	
TOTAL		43663	43663

ACQUIRED AND GENERATED 52834

BCH emission factor 2002

GWh		kt/GWh	Mt
2731	@ BCH thermal generation rate	523	1428.3
447	@ BCH thermal generation rate	640	286.1
40485	@ BCH hydroelectric generation rate	0	0
9171	@ Canadian average rate	220	2017.6
58976			3732.0

BCH average for BC 2002 70.6 kt/GWh

BCH BALANCE SHEET 2001

USED IN BC(GWh)			
Electricity sold, domestic total		48131	
Line loss and system use		5200	
TOTAL		53331	53331
ACQUIRED (GWh)			
Electricity purchased, long-term contracts		6304	
Electricity purchased, short-term contracts		21655	
Less electricity sold, trade		–23900	
Energy exchange net		–613	
TOTAL		3446	3446
GENERATED IN BC			
Burrard thermal generation	3974		
Other thermal	464		
Total thermal	4438	4438	
Hydro generation		45447	
TOTAL		49885	49885
ACQUIRED AND GENERATED			53331

BCH emission factor 2001

GWh		kt/GWh	Mt
3974	@ BCH thermal generation rate	523	2078.4
464	@ BCH thermal generation rate	640	297.0
45447	@ BCH hydroelectric generation rate	0	0
3446	@ Canadian average rate	220	758.1
58976			3133.5

BCH average for BC 2001 58.8 kt/GWh