# Energy & Greenhouse Gas Inventories by Local Governments in BC:

## Implications for the CEEI Initiative

**FINAL REPORT**


Prepared for:
**Ministry of Environment**
**Community Energy and Emissions Inventory (CEEI) Working Group**

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# Summary

Many communities and government agencies in BC have compiled inventories of energy use and GHG emissions. A review was made of energy and greenhouse gas inventory practices as conducted by local governments in BC. As well a review of the methods for evaluating different inventory components was compiled. The objectives of this effort are to define:

- the different **components** that communities choose to include in their inventories - including the core components common to all inventories, as well as the optional components that may be included;
- the different **methodologies** used to compile the inventory components, and the data assumptions and limitations related to each; and
- the **implications** for the Community Energy and Emissions Inventory (CEEI) initiative resulting from these issues.

The Community Energy and Emissions Inventory (CEEI) initiative is focused on **community inventories**. The Partners for Climate Protection (PCP) program, which is promoted by the Federation of Canadian Municipalities (FCM), encourages communities to develop both community and corporate inventories (and subsequent management plans) for their community and corporate inventories.

**Community Inventories**

Community inventories typically include buildings (residential, Commercial, and sometimes industrial), transportation, and waste components. Building energy is compiled for residential, commercial, and (sometimes) industrial facilities. This data is most commonly compiled from utility-provided data, though the residential component is sometimes estimated from the number of dwellings and average energy intensity statistics. Transportation consumption and emissions are included in all inventories and are determined from one of: fuel sales, transportation surveys and modeling, or vehicle count data. Solid waste emissions are usually estimated from generic emission factors and the mass of waste deposited, though some site emissions are defined.

**Corporate Inventories**

Corporate inventories of municipal governments include administrative and utility buildings, recreational and cultural facilities, parks and sports fields, fleet vehicle operations, utility services including street lighting, and solid waste operations. This data is collected from utility data and fleet management systems.

Communities are conducting inventories that follow the PCP program guidance. Variations from this are typically small and mostly relate to the corporate inventories.

The discussion identifies some of the data issues relevant to the CEEI Initiative as it defines its inventory components. Issues include the frequency of desired reporting against the expected changes in the inventory, data and methodological approaches, implications for multi--community reporting, and the potential for using the data for indicators inventory data.

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# 1. Introduction

## 1.1. The Community Energy and Emissions Inventory (CEEI) Initiative

The Community Energy and Emissions Inventory (CEEI) Initiative has been undertaken by a working group led through the Environmental Protection Division of the BC Ministry of Environment. It includes representation from several ministries and agencies. The purpose of the initiative is:

> "To establish a cost-effective, provincially-sponsored, rigorous, yet flexible, data collection, analysis and reporting system (the 'community energy and emissions inventory' system) to provide BC local governments with inventory baselines, ongoing monitoring and periodic reports to help inform community decision making and support provincial objectives." [1]

Specific objectives of the project are:

- To provide all 185 BC local governments with a community-wide inventory on which to consider future energy consumption and greenhouse gas emission reduction targets and related community-wide reduction actions.
- To support many of the present and future BC local government participants in the Federation of Canadian Municipalities' (FCM) Partners for Climate Protection (PCP) Five-Milestone Program. A community energy and emissions inventory will achieve Milestone One of the program.
- To provide the Provincial Government, and other agreed-to users, with information on local government contributions towards reducing energy consumption and greenhouse gas emissions, both as individual jurisdictions and in province-wide summaries.

## 1.2. Background

### 1.2.1 The Partners for Climate Protection (PCP) Program

The Federation of Canadian Municipalities (FCM) has developed the Partners for Climate Protection (PCP) Program in partnership with ICLEI [2] to guide municipal governments towards reducing GHG emissions. The PCP program defines a process for municipal governments to quantify their GHG emissions and then to develop and implement action plans that can achieve emissions reductions.

The PCP program consists of five milestones: [3]

1. Conduct a baseline emission analysis for municipal operations and the community.
2. Establish GHG reduction targets for both municipal operations and the community.
3. Develop a local action plan outlining action items to reduce energy use and greenhouse gas emissions from municipal operations and throughout the community.

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[1] CEEI Project Charter (Project # EQB-08-034) Version 0.8, Last Updated, November 26, 2007

[2] ICLEI was originally an acronym for the "International Council for Local Environmental Initiatives" but since 2003 has been "ICLEI—Local Governments for Sustainability".

[3] http://sustainablecommunities.fcm.ca/Partners-for-Climate-Protection

4. Establish a program to implement action items that will reduce GHG emissions.
5. Continue to monitor, verify, and report GHG reduction achievements and amend the action plan accordingly to reflect new strategies.

The PCP milestone process is used to develop both "**community plans**" - those that address the energy consumption and emissions of the entire community as well as "**corporate plans**" - those that address the energy consumption and emissions of the local government entity through its provisions of services.

More than 150 communities across Canada and 48 within BC have endorsed the PCP program (see Table 1). Of these, 19 have completed at least one milestone for corporate activities (9 have registered inventories) and 25 have completed at least one milestone for community activities (16 have registered inventories).

**Table 1: Current PCP Milestone Status for BC Communities**

| Milestone [4] | Corporate Plan (Number of Local Governments) | Community Plan (Number of Local Governments) |
|---|---|---|
| No Milestone completed | 29 | 23 |
| 1 | 9 | 16 |
| 2 | 5 | 5 |
| 3 | 3 | 2 |
| 4 | 2 | 2 |
| 5 | 0 | 0 |
| **Total** | **48** | **48** |

Note - There are a number of BC communities that have completed either or both a corporate and community-wide emissions inventory that are not members of the FCM PCP program.

### 1.2.2 Provincial Government Climate Change Commitments

The Provincial Government has begun several initiatives to reduce Greenhouse Gas emissions. These include (among other actions):

- The Provinces' membership in the Western Climate Initiative as well as the Climate Registry - both multi-state and province initiatives to coordinate GHG emissions reporting and reduction.
- a provincial target to reduce total GHG emissions by at least 33% from current levels by 2020;
- a requirement that all provincial government entities become carbon neutral by 2010;

[4] From http://sustainablecommunities.fcm.ca/Partners-for-Climate-Protection/Milestone_Status.asp. The milestone progress is updated to Sept 13, 2007 for information received by the FCM. However, many municipalities are in the process of completing milestones that have not been forwarded to the FCM. This list is believed to be missing many activities occurring over the past 12-24 months that have not been registered. In light of the emerging initiatives to reduce GHG emissions within BC, many communities may take action without registering as part of the PCP program.

- establishing a climate charter with local governments in which the local governments commit to become carbon neutral by 2012; and
- defining targets for energy efficient buildings. The **Energy Efficient Buildings Plan** has set voluntary, cost-effective 2010 targets for energy efficiency in new and existing buildings. The BC Energy Plan has also committed to implementing energy efficiency standards for buildings in 2010, and the Province will be actively supporting an increase in local government participation (now at 44 local governments) in the Community Action on Energy and Emissions (CAEE) Program.

### 1.2.3 Protocols for Inventory Development

Most inventories within BC have been compiled as a step in the Partners for Climate Protection program. The PCP program draws upon the "Cities for Climate Protection" (CCP) an ICELI initiative. Protocols for conducting community inventories have been compiled. These include:

- The ICLEI CCP protocol/guidelines for reporting [5]
- A draft FCM inventory guideline document [6].

These protocols define a number of factors for consideration but the primary features are that:

- GHG emissions from the consumption of fossil fuels (direct emissions) are included, but not any upstream emissions associated with production of the fuel;
- GHG emissions from the consumption of electricity include the GHG emissions used to create the electricity (e.g. burning coal or natural gas), but similarly do not include the emissions from production of the fuel.

As well, more general protocols have been defined for organizational reporting including:

- ISO14064 series of standards for GHG reporting.[7]
- "GHG Protocol" - an Initiative of the World Business Council for Sustainable Development (WBCSD) and the World Resource Institute [8].
- The Climate Registry has published draft protocols (dated Oct 29, 2007). These draw heavily from the WBCSD protocols.

The CCP and FCM protocols are generally consistent with the ISO guidance [9]. It is important point to recognize that these CCP and FCM protocols have been developed to help communities

5 Draft 3.0 published April 1999. The ICLEI guidance document is expected to be updated by ICLEI during the coming year and a draft protocol has been published for review (dated Nov 7, 2007).

6 FCM, Developing Inventories for Greenhouse Gas Emissions and Energy Consumption: A guidance Document for Partners for Climate Protection in Canada, Final Draft, March 2006. (NB: This document has not been formally approved or released by the FCM and may undergo or be undergoing further revision).

7 Of specific relevance is ISO 14064-1 (2006, first edition, 2006-03-01) Part 1 Specification with Guidance at the Organization Level for Quantification and Reporting of Greenhouse Gas Emissions and Removals. There is also a document 14064-2 addressing 'project level' guidance, and 12064-3 addressing project validation and verification.

8 www.ghgprotocol.org

understand the components of their inventory and to help guide them though the creation of an inventory. It is accepted within the protocols that each community has its own specific needs. The protocols allow communities to define those activities that are within its "scope of influence". If a community has some variance from the protocols, it should be viewed as the community wishing to define its inventory and plan around those activities they can best address.

## 1.3. Direct and Indirect Emissions

Emissions from both corporate and community activity are either direct emissions or indirect emissions.

- **Direct emissions** occur from the consumption of energy at a site or facility - e.g. tail-pipe emissions of fleet vehicles, stack emissions of buildings.
- **In-direct emissions** are created away from the source of energy consumption through the provision of that energy - e.g. emissions from a distant power plant used to create the electricity that is consumed[10].

Recently, the new ICLEI draft protocol has begun to include a 3rd category of emissions which are those that occur either by contractors (for the corporate inventory) or regional activities that are influenced by the local government (e.g. airports etc.)

## 1.4. Project Objectives

The objectives of this project are to review the energy and GHG inventories compiled by different municipalities within BC to define:

- the different **components** that communities choose to include in their inventories including the core components common to all inventories, and optional components;
- the different **methodologies** used to compile the inventory components, and the data assumptions and limitations related to each; and
- the **implications** for the CEEI initiative resulting from these issues.

## 1.5. Project Methodology

About 20 BC communities were identified that had published energy and GHG inventories. This was based on the communities that signed on to the PCP program, communities identified by MoE staff, discussions with energy related NGOs, and knowledge of the project team and others.

[9] Notably, the ISO guidance allows organizations to expand their scope of influence of 'indirect emissions' (at their discretion) to include the impacts of the organizations activities - e.g. staff transportation and business travel, product transportation, outsourced activities, the production of purchased raw or primary materials.

[10] Other indirect emissions are conceivably those created to extract and deliver energy, goods, produce paper, food, and so forth. In the Climate Registry these are referred to as Scope 3 emissions and are optional for reporting. For example, an organization might wish to report the GHG emissions associated with their paper purchases. These would be considered as scope 3 emissions.

Persons within the municipalities were contacted and available reports were obtained and reviewed. For some municipalities, the reports are currently under development, at a draft stage, or not yet council or management approved. In these situations, the reports were not always available for review. It is acknowledged that not all inventories were obtained, however it is felt that a reasonable sampling of those that have been done has been obtained.

The available reports were reviewed and summary information was extracted to compile the attributes of these inventories including the date of the inventory, the baseline years, the targets years, the energy forms included, the end uses for that energy, etc.

## 1.6. Report Structure

This report is presented in 4 sections:

- Section 1 (this section) presents background information
- Section 2 reviews community inventories
- Section 3 reviews corporate inventories
- Section 4 discusses the implications of the different data and methodological issues for the CEEI initiative.

# 2. Community Inventories

This section presents a review of the components, methods, and uses of community energy inventories.

## 2.1. Inventory Uses

Data and methodologies should be informed by the uses required of the inventory data. The objectives of conducting an inventory have typically been to:

- define the relative magnitude of each of the energy sources used in the community (e.g. how much electricity, how much natural gas, etc.);
- define historic, current, or future patterns of energy consumption;
- define the magnitude of different end uses (e.g. what portion is used by residential buildings, commercial operations, etc.); and
- help scope the quantification of reduction actions (i.e. to inform the creation of an action plan).

Current inventories meet these objectives.

Future applications of inventory data could (or is anticipated to) include:

- tracking performance to measure progress towards the Province's climate change objective of at least a 33% reduction in Province-wide emissions by 2020 (as well as progress towards interim targets for 2012 and 2016).
- developing and calculating province-wide, or municipality-specific, indicators of energy or GHG intensity.
- creating some form of benchmarking / rating system for communities based on their GHG emissions.

To meet these future needs, the inventory data and processes would require review. As presently constructed, there are deficiencies which would limit applicability to these future roles. This will be discussed in subsequent sections.

## 2.2. General Comments

General observations regarding community inventories include:

- Most inventories reviewed through this analysis were conducted with the intent to follow the Partners for Climate Protection milestone sequence [11].

[11] An example noted is the Revelstoke Energy Plan which was developed in the mid-1990s before the PCP program was widely known. In fact, while Revelstoke's community plan was completed in 1997, Revelstoke did not join the PCP program until 2006.

- Many of the communities have proceeded beyond the inventory to define reduction targets and establish action plans.
- For the most part, municipalities have conducted their community inventories with assistance from consultants.

## 2.3. Inventory Components

A summary of the components underlying community inventories is shown in Table 2. Further description of each component is described in the subsequent text. A summary of the reviewed inventories is provided in Table A - 1, Table A - 2, and Table A - 3 of Attachment A.

In Table 2, the components are divided into three categories:

- **Core Components**: These are common to virtually all inventories.
- **Sometimes Included**: These may be present in some inventories. Reasons for the inclusion of this type of component might be that the item is considered a substantial part of the community's energy budget; there is a unique consideration in that community; or it has been defined as important to stakeholders in the community.

  Sometimes, items defined as 'core' within the FCM protocol are excluded because they cannot be reasonably controlled by the municipality. This occurs mostly in corporate inventories. [12]
- **Seldom or Never Included**: Items that are not included within most inventories - though these have been addressed in some plans or have been highlighted as areas of interest to some stakeholders. Their exclusion is not a statement about their importance, but rather that these activities are outside of most significant local government influence.

[12] An example might be a contracted service (water plant, RCMP policing) in which the community does not administer the service.

**Table 2: Components of Community Inventories**

| Item | Core Components | Sometimes Included | Seldom or Never included |
|---|---|---|---|
| **Residential Buildings:** | • Total consumption of electricity and natural gas or fuel oil (where used) for all residential buildings.<br>• Number of connections (accounts) | • Breakdown of consumption by detached, or multi-family dwellings is sometimes possible.<br>• Supplemental fuels such as trucked propane or wood (which is GHG neutral, part still part of the community's energy inventory). | • "Embedded" energy and GHG emissions relating to the provision of material goods and services to the community (e.g. no 'offshore' emissions for manufacture of consumer products etc.). |
| **Commercial Users:** | • Total consumption of electricity and natural gas (or fuel oil).<br>• Number of connections. | • - - - | • Breakdown of commercial users by industry or activity type.<br>• Breakdown of energy end use [13] |
| **Industrial Users:** | • Total consumption of electricity and natural gas (or fuel oil), though not always included in inventories | • Total industrial consumption may be included where it does not infringe on privacy. | • Large Final Emitters [14]<br>• Breakdown of energy end uses. |
| **Transportation:** | • Estimate of total fuel consumption and associated GHG emissions. | • Concurrent evaluation of air contaminants through modeling (SOx, NOx, etc.).<br>• Breakdown by fuel type (e.g. gasoline, diesel).<br>• Propane and natural gas vehicle use (Usually a small contributor).<br>• Small equipment [15]<br>• Off-road travel and equipment may be captured if fuel sales records are used (though this is expected to be small). | • Air travel<br>• Marine operations (NB included in GVRD region-wide inventory but not allocated to any municipality). |
| **Solid Waste:** | • Emissions per tonne of municipal solid waste (MSW) generated. | • -- | • Site specific evaluation of the GHGs generated based on actual landfill gas generation or capture data |

[13] For example, it cannot be determined whether the energy consumed is to heat a building (which could be targeted in a subsequent energy plan) or is used to drive equipment within the building (which can only be peripherally addressed through local government actions).

[14] Large industries (mills, mines, etc.) may choose not to be part of the community plan nor included in the community inventory. As an example, one of the mills in Prince George is classed as a LFE and is not included in the community inventory.

[15] Portable generators, tools, off-road equipment, etc. is captured if the transportation methodology is based on fuel sales. If modeling of license registration data is used this consumption will be missed. Note that this consumption is small compared to registered vehicle consumption.

| Item | Core Components | Sometimes Included | Seldom or Never included |
|---|---|---|---|
| **Agricultural:** | • -- | • -- | • Emissions from agricultural operations within the community (rarely included, one exception is the recent Chilliwack plan).<br>• Food creation and food delivery services (e.g. Salt Spring included local food production as a goal in their subsequent plan). |

NB: See the methodology section below for further elaboration on these components.

## 2.4. Methodologies for Community Inventories

This section describes the methodology used to define the various inventory components - focusing on those in the "core" components of an inventory. Generally, for each component there are a limited number of ways of quantifying the component. These are described and highlighted.

### 2.4.1 Residential Consumption

Residential consumption is determined by one of two methods:

**(i) Real (actual) Consumption Data.**

Utility companies can provide the actual consumption data based on their billing system databases. At the community, level individual account data is protected and cannot be obtained as individual account data. It is usually provided as a roll-up value for a community (or sometimes for a postal code sub-region). This method is quite reliable for electricity data within the BC Hydro service area, as their systems differentiate the types of residential buildings. For natural gas data, there is less precision in the billing codes and so it is not possible to discern the multi-family consumption from other commercial consumption. Thus the utility data is accurate in communities of mostly detached dwellings but less accurate in those with a substantial number of multifamily dwellings.

**(ii) Dwelling counts & Average consumption ('activity-based')**

In this method the number of dwellings of each type is multiplied by the average energy use per unit. The dwelling counts are readily available from municipal planning departments - or from BC stats. Estimated average energy use is available from BC Hydro and/or Terasen resource conservation and consumption studies.

This method can be useful in:

- communities with a mix of detached and multi-family dwellings (see above comments about the challengers of using natural gas data for multi-family dwellings), and
- communities that are transitioning from fuel oil to natural gas - as historical fuel oil sales are rarely available and natural gas data, prior to 2003, is considered unreliable. An example of this is the CRD region.

For fuels not delivered by a regulated utility (e.g. heating oil and propane) there is typically no actual data available. This information is maintained by private companies, who are very competitive, and who currently do not volunteer or release this information.

There is no easy resolution between the two methods. The real data approach is preferred because it can indicate changes that occur on shorter time frames and also changes that reflect consumer changes (e.g. do SF dwellings use less to respond to education and incentive programs). In contract, the activity-based methodology is relatively quick to evaluate the overall community demand from some simple information about the housing stock. Potentially, this activity based data could be cross-checked periodically against the real data.

### 2.4.2 Commercial Consumption

These are extracted directly from utility records. Typically the utility provides a summary consumption total and the number of connections (i.e. accounts)[16]. As discussed above, for natural gas consumption, the commercial accounts will include multi-family dwellings (e.g. condo complex with a single gas meter).

Some utility records indicate the general nature of the activity for an account using either an ICS code or a NAICS code[17]. These are typically very inaccurate for interpreting consumption.

Activity-based estimates are not realistically possible for commercial or industrial consumption. There is a wide range of consumption patterns (e.g. an office vs. a restaurant vs. a warehouse will each consume a very different amount of energy). There is very limited or no benchmarking data available and the range of possible uses - and the difficulty in determining the true activities within a building - mean that any such estimates would be only the broadest of guesses.

As with residential consumption, for fuels not delivered by a regulated utility (e.g. heating oil and propane) there is typically no actual data available.

### 2.4.3 Industrial Consumption

The publication of industrial consumption has been cited as not sufficiently protecting the identity of the energy consumer. Typically this occurs when there is a small number of accounts, or a small number of accounts within a certain billing regime. (e.g. a community with only two major industrial facilities). Consequently, industrial consumption is sometimes omitted from inventories to protect the privacy of the customer. When it is included the data are extracted by the utility provider and summed into a total.

For many communities industrial consumption is the result of many consumers and so it could easily be included as a total number. Some factors to consider when including industrial consumption are that:

- The distinction between industrial, commercial, and even institutional is often unclear.
- The industrial consumption is often driven by the processes occurring within the facility and these are generally outside the direct influence of the local government (as opposed to the energy requirements to heat a building which might be within the local governments influence).
- Industrial consumption and reduction measures are currently addressed by the consumers as well as specialized efficiency programs like PowerSmart, etc. which focus on defined industrial sectors.
- Utility records generally indicate the general nature of the activity for an account using either an ICS code or a NAICS code. These are not highly accurate or reliable except for large, obvious, facilities (e.g. a pulp mill). For other facilities (e.g. an industrial park

[16] Some projects have been executed using totals based on postal codes. Then the smaller subsection totals are rolled-up to create the entire community inventory.

17 ICS - Industrial Classification System; NAICS = North American Industrial Classification System.

manufacturing facility) it is difficult to define the activities occurring or assign an accurate classification.

- Some large consumers are classed as Large Final Emitters (LFEs) - which is a Federal classification for facilities emitting more than 100,000 tonnes CO2e per year. These have their own reporting requirements and potentially a future regulatory system. As a result in some communities the LFEs have elected not to participate in the inventories compiled for the PCP initiative.

### 2.4.4 Transportation

Vehicle fuel consumption and emissions are obtained by one of three methods:

**(i) Fuel sales within the community.**

The total amount of vehicle fuels sold is available from the Ministry of Finance. This information is collected because they track provincial taxes on fuel. The level of geographic breakdown is limited to the i) the entire province, ii) the CRD, and the iii) GVRD [18]. The Finance Ministry collects taxes at the point of departure from a distribution centre and not at the point of 'pumping into the tank'. Fuels are often transported substantial distances, so determining these on a geographic basis is not possible.

Private companies collect pump sales data and this information can be very accurate since it is based on census data of all stations and not on a statistical survey (e.g. Kent Marketing). On an individual purchase basis, this information costs several hundred dollars, per community, per year of data. As well, not all communities may be captured by these data collectors.

The fuel sales data from private census firms do not include the commercial fleet consumption and card lock systems.

Fuel sales are a quick method for estimating consumption and can be quite accurate for some communities. Specifically this method may be useful for communities that are separated from their neighbours (i.e. not part of a major metropolitan area). [19] Factors that may make this method less accurate are if the community is:

- part of a larger urban regional district (i.e. the CRD, MetroVancouver)
- a major highway in-transit stop. For example, fuel sales data from Merritt on the Coquihalla, or Squamish on the Sea-to-Sky highway may over estimate the consumption within the community.
- a day-trip destination. For example, a portion of the fuel consumed within Whistler is not purchased there but rather is carried into the community from the Lower Mainland and may not be replaced by sales in the community. The fuel sales could underestimate the actual consumption.

[18] The CRD and GVRD can be extracted only because these areas have special tax levies which identifies this fuel.

[19] This separation may not have to be great - for example, in "grouped town" areas (e.g. the Okanagan valley or the Castlegar/Nelson/Trail area) it may be reasonable to assume that most fuel purchased within the municipality is used by residents, or that transfers from one community to another are about balanced in all directions.

To date, these considerations have not prevented this method from being used in several locations. It may be desired to capture several year's of record as the information may have small year to year variations).

**(ii) Transportation Modeling ("VkmT data")**

The greater Vancouver region, the Capital region, and likely other areas have had transportation studies conducted using computer models. Models such as "EMME2" are used to model transportation flows. These create outputs of the number of kilometers traveled for each vehicle type - referred to as "VkmT data" for "vehicle kilometres travelled".

VkmT data is then used in an emissions model - such as "Mobile6.2c" (from the USEPA, modified to Canada by Environment Canada) to determine consumption, CO2 emissions, and air contaminant emissions. These models use inputs of the types and ages of vehicles on the road and use a library of emission factors for each type and age. The product of the VkmT and the emissions per kilometer provide the total emissions. [20]

**(iii) Vehicle registrations within the municipal boundary ("ICBC data")**

ICBC maintains a record of vehicle registrations and can define the municipality of each vehicle registration. This information has been used to estimate fuel emissions within an area. Either the total vehicle counts, or the individual vehicle data can be multiplied by an average (or specific) fuel economy and by an estimated distance traveled. This method allocates all the emissions from a vehicle, to the community in which it is registered.

The fuel sales method could be used for many areas. For example Kent marketing compiles pump sales information form57 communities in BC, which would represent a vast majority of the population. Some prorating or extrapolation would have to be devised to estimate other community's consumption

The VkmT method would be difficult to use province-wide because there are only a few areas of the province that have had transportation modeling performed. The GVRD and CRD are 2 areas that have been modeled regionally.

The Vehicle registration method could be applied relatively quickly to all communities. Note that the ease of application is not an assurance of better accuracy that the other 2 methods and the values derived should be cross checked against any available data sources.

### 2.4.5 Solid Waste

Solid waste is included in GHG inventories because the decomposition of the organic material in municipal solid waste (MSW) generates methane emissions in the landfill. This methane escapes as landfill gas (LFG) and is a potent greenhouse gas.

[20] These results can be calibrated against gross fuel sales (e.g. the Capital Region inventory scaled-up the Mobile6.2c modeled consumption to match the actual fuel sales data).

**(i) Methane "emissions commitment"**

Most commonly, the GHG emissions are estimated from (A) the number of tonnes of MSW, multiplied by (B) a standard emissions factor per tonne or MSW.

- (A) The waste tonnages can be based on real disposal data. In communities with municipal or private collection there is usually a weighing scale at the landfill and the actual disposal amounts can be determined [21]. In smaller communities, waste may be self-hauled to the dumpsite and amounts are likely not tracked. In these cases a general design calculation of "waste generated per person" can be used.

- (B) At present most inventories use a constant value for the amount of GHGs emitted per tonne of waste [22].

These emissions occur over the course of many years after the waste is deposited, however, they are allocated to the inventory in the year the waste is generated. The intent of the methane commitment method is to allocate the waste component to each community based on the waste it generates regardless of whether the waste leaves the community or not.

**(ii) Actual Emissions**

Site-specific data, where available, defines the actual emissions if there is data on the actual rate of emissions. This method can be administratively complex if the landfill has received waste from numerous communities over its history.

However, there can be areas where these two methods could cause discrepancies. For example a regional district might include the actual emissions from its regional landfill and a municipality within that region may use the methane commitment method. It would be preferable if the municipality accepted its proportionate share of the actual emissions.

### 2.4.6 Data Requirement Summary

A summary of the data requirements for compiling inventories is shown in Table 3.

[21] Often these amounts are readily available through annual solid waste reports generated by the municipality, regional district, or the landfill operator.

[22] In reality, these GHG emissions occur over many years as the waste decomposes, but they are allocated to the waste in the year it is disposed. The value used in most inventories is the same (about 0.485 t CO2e / tonne of MSW). The source of this value is undocumented in the inventories. It is assumed that this value was incorporated with the "Torrie Smith" software originally distributed by the FCM for the PCP program.

**Table 3: Summary of Data Required to Compile Community Inventory**

| Component | Data Required | Source | Comments |
|---|---|---|---|
| Residential Buildings | **1)** Utility data - summarized or by sub-area. Electricity and Natural gas.<br>Non utility energy (oil and propane).<br>Or<br>**2)** Dwelling counts and average energy use intensity. | **1)** BC Hydro / Terasen Fortis and PNG where applicable.<br>Not available<br>Or<br>**2)** BC stats / Regional Districts<br>BC Hydro and Terasen conservation and consumption reviews. | • Most inventories include electricity and natural gas.<br>• Only some include propane.<br>• Most use the real data - okay for smaller communities.<br>• Problems separating multi-family residential consumption from commercial for natural gas.<br>• SF/MF [23] breakdown may be desirable but only available for electricity. |
| Commercial Users | Utility data summary. | BC Hydro and Terasen Fortis and PG&E where applicable. | • Nat Gas data often includes MF residential.<br>• No ability to separate the energy use for heating/lighting/and cooling from the energy use for the activity inside the building (e.g. pumps, machining, processing, etc.) |
| Industrial Users | Utility data summary, IF included in inventory. | BC Hydro and Terasen Fortis and PNG where applicable. | Limited data available to protect privacy |
| Transportation | 1) Fuel Sales Data.<br>Or<br>2) VkmT Data from municipal or regional transportation modeling or vehicle count surveys. Combined with emissions modeling.<br>Or<br>3) Vehicle registration data. | 1) Ministry of Finance or private data source.<br>Or<br>2) Various studies and reports. Data may not be available for all communities.<br>Or<br>3) ICBC. | 1) Ministry data is limited. Private census data does not include card lock fleets.<br>2) Only a few areas have had transportation modeling exercises.<br>Or<br>3) Also requires assumptions (or data) on average fuel economy and average number of kilometres travelled for each vehicle. |

[23] SF = single family dwelling - usually referring to a detached dwelling, duplex or townhouse. MF = multi-family dwellings refer to multi-unit buildings such as apartments or condominiums.

| Component | Data Required | Source | Comments |
|---|---|---|---|
| Solid Waste | 1) Waste disposal amounts.<br>Or<br>2) Actual Landfill Emissions. | 1) -Provincial disposal estimates.<br>-Municipal or regional annual waste reports<br>2) Landfill reporting. | 1) Very approximate does not account for different waste disposal venues. Emissions factor is general and not verified for BC landfills.<br>2) Requires emissions study of each landfill. |

Note: 1) Not all data sources have been verified as being willing to provide data other than on an occasional basis. The CEEI group would have to pursue and confirm that these agencies would provide information and have the resources to do so.

# 3. Local Government Corporate Inventories

This section presents a review of the components, methods, and uses of community energy inventories.

## 3.1. Inventory Uses

### 3.1.1 Applications

The discussion of data and methodological limitations needs to be informed by the uses that are required of the inventory data. The objectives of conducting an inventory have typically been to:

- define the relative magnitude of each of the energy sources used by the government (e.g. how much electricity, how much natural gas, etc.);
- define historic, current, or future patterns of energy consumption;
- define the magnitude of different end uses (e.g. what portion is used by residential buildings, commercial operations, etc.); and
- help scope the quantification of reduction actions (i.e. to inform the creation of an action plan).

### 3.1.2 Reporting and Data Updating

To date most local governments have contracted the development of a corporate inventory to consulting or non-profit agencies (known exceptions being the Township of Langley and the City of Vancouver).

For the most part, most municipalities have not done extensive updating of their inventories. Many municipalities are in the first year or two of implementing their corporate plans. Typically the first inventory compilation is somewhat complex as accounts are sorted, the fleet tracking system reviewed etc.

## 3.2. General Comments

General observations regarding corporate inventories include:

- Most are conducted with the intent to follow the Partners for Climate Protection milestone sequence.
- Most are conducted by consultants, though a few have been conducted by municipal staff.

## 3.3. Inventory Components

A summary of the components underlying corporate inventories are summarized in Table 4. Further description of each component is described in the subsequent text. A summary of the reviewed inventories is provided in Table B- 1, Table B- 2, and Table B- 3 of Attachment B.

In Table 4, the components are divided into three categories:

- **Core Components**: These are common to virtually all inventories.
- **Sometimes Included Components**: These may be present in some inventories. Reasons for inclusion of this type of component might be that the item is considered a substantial part of the corporation's energy budget or there is a unique consideration in that corporation.
- **Rarely or Never Included**: These are items that are not included within most inventories - though these have been addressed in some plans or have been highlighted as areas of interest to some stakeholders.

**Table 4: Typical Components of Corporate Inventories**

| Item | "Core" Components | Sometimes Included | Seldom or never included |
|---|---|---|---|
| **Municipal Buildings:** | • Buildings owned and operated by the municipality (e.g. city hall, works yard, etc.) | • Municipally owned buildings leased to other party who also pays the utilities (e.g. a building leased to RCMP) [24].<br>• Unique facilities (such as local airport terminals, wastewater treatment plants) where applicable. | • Indirect emissions associated with purchasing recycled paper, or low impact products. |
| **Recreation and Cultural:** | • Swimming pools, arenas, museums, community centres.<br>• Sports field lighting (usually included with recreational facilities). | • Municipally owned buildings leased to other party who also pays the utilities (e.g. a building leased to a senior's centre). | • Privately owned and operated buildings that provide municipal type services (e.g. skating rinks, convention centres, etc.). |
| **Vehicle Fleet:** | • On-road and off-road vehicles. | • Fire and Police Services [25]<br>• Personal Vehicle Uses by staff for work purposes.<br>• Small Equipment. | • -- |

[24] Leased buildings are typically defined to be in the corporate inventory as per the FCM guidance document, though some communities have not included these at present.

[25] The protocols define fire and police services within the inventory but sometimes the municipalities do not have control over their purchasing and fueling activities and so these may be left out of a 'first inventory'.

| Item | "Core" Components | Sometimes Included | Seldom or never included |
|---|---|---|---|
| **Lighting:** | • Signal lights.<br>• Street lighting (classed as overhead or ornamental). | • -- | • -- |
| **Utilities: (as applicable)** | • Water pump stations.<br>• Sewage lift stations.<br>• Surface drainage pumps. | • Water treatment if operated by the municipality.<br>• Sewage treatment if operated by the municipality. | • Municipality's share of a regional service. |
| **Transportation Infrastructure:** | • Road crews and maintenance that are captured under vehicle fleet operations. | • Local bus service if provided by the municipality. | • Staff commuting. [26]<br>• Business Travel (Air travel and employee use of personal vehicles for work travel)<br>• Contracted services (e.g. a contractor paves a road for the city, waste haulers and couriers). |
| **Solid Waste:** | • Waste collected at municipal facilities. | • Waste collected from litter barrels (parks and street corners) by municipal or other staff. | • -- |

NB: See the methodology section below for further elaboration on these components.

[26] While staff commuting is generally not part of the corporate inventory, many corporate plans include a staff transportation component to demonstrate leadership in this area - even though these actions do not appear in the corporate inventory.

## 3.4. Methodologies for Corporate Inventories

### 3.4.1 Municipal Buildings

Utility consumption - natural gas and electricity - are typically obtained via the municipality by extracting the data from the utility supplier to obtain the energy consumption. [27] [28]

Some larger municipalities have energy tracking software but they typically only use it to track consumption at large buildings, or major infrastructure facilities which does not capture all the municipal consumption.

### 3.4.2 Vehicle Fuels

For corporate inventories, fuel consumption is estimated by:

- A summation of each vehicle, and its known or assumed annual kilometres driven (or operating hours) multiplied by a fuel economy based on the vehicle. This is used with older inventories or for backcasts to historical years.
- An extract from the fleet management system's data base (Winfuel or Maximo are 2 software systems available).

Additional consumption is sometimes added, such as personal vehicle kilometres traveled for work purposes, or fill-ups at commercial stations charged back as expenses. These items are relatively small but some communities include them. However, this is a cumbersome activity, as it requires a manual review of expense logs.

Larger municipalities have an internal system for recording fuel consumption. Traditionally, this is for budgeting purposes used to track costs and not energy consumption. Depending on the municipality, the fuel tracking system could be an accounts payable system which tracks deliveries to the works yard (e.g. number of tanker delivery to the works yard fuel station); a software system connected to a card lock system which tracks fuel for each vehicle; or a budget system which allows one, or many departments to budget a dollar value for their departmental fuel consumption.

Historical data is often difficult to obtain, as internal systems are changed and the data can be erred. As well, some fuel purchases are made at commercial outlets and charged back through project accounts (virtually making it impossible to recapture the consumption) or in personal vehicles and charged back on a kilometer basis.

[27] A municipality of 50,000 to 100,000 people might have a corporate inventory of 25-50 natural gas accounts and 200-400 electricity accounts.

[28] This data also resides within the municipality, though it is in the form of utility bills to specific departments, which are paid and then filed within an accounts payable system. The energy consumption are not available in an electronic form within the municipality. Extraction of the accounts payable information within the municipality is time consuming, and can be erred, as it does not ensure that all accounts are captured.

In recent years, there is a growing interest in these systems and the newly launched E3 fleet management system has increased the awareness of tracking systems. Recent (and likely future) increases in fuel costs mean that more attention will be paid to managing fuel systems.

### 3.4.3 Solid Waste

Solid waste is included in GHG inventories because the decomposition of the organic material in municipal solid waste (MSW) generates methane emissions in the landfill. For corporate inventories this is tracked the same way as for community inventories. That is, the waste generated at municipal facilities (estimated from dumpster counts etc.) is multiplied by an emission factor to determine the total lifetime GHG emissions.

### 3.4.4 Items outside Current Corporate Inventories

#### (i) Contracted Services

For many municipal services (e.g. water and sewer construction, streets and sidewalks, road paving), municipalities employ a combination of in-house staff and equipment, and contracted services. As well, developers may construct a portion of the infrastructure themselves as part of their development activities.

Only the activities performed by the municipality will be recorded on the inventory through the fuel consumption of municipally owned vehicles.

The recently released draft of the new ICLEI international emissions inventory protocol, includes this type of activity as an optional "Scope 3" category of emission.

#### (ii) Construction of Infrastructure and Facilities

Corporate inventories focus on the **operational** energy of facilities and other operations. Corporate inventories do not include the energy inputs (and resulting emissions) to construct infrastructure or facilities. There is a body of research in the area of Life Cycle Assessment (LCA) which examines these inputs and outputs, however, it is an extremely complex analysis and includes some approximations.

The impact of this is that municipalities that embrace low impact construction activities (e.g. re-used materials) will not see a numerical change on their inventory. However, while these emissions may be large in the year of construction (imagine the machinery required to construct a swimming pool), they are typically not large in the long-term compared to the operation of the building (e.g. the construction energy used to build a swimming pool will be dwarfed by the long-term operating energy over the 25 or 40 years of operations).

# 4. Discussion

This section includes a discussion of some of the data and methodology challenges of compiling inventories, and a discussion of the implications of these factors for the activities of tracking progress and developing indicators and metrics.

## 4.1. Data and Methodology Implications

### 4.1.1 Residential Consumption

- **Detached dwelling Residential Consumption**

Natural gas and electricity data can be compiled from the utility suppliers. It can be obtained as a roll-up value for the municipality or for smaller subsections of the community.

- **Multi-unit Residential Consumption**

Natural gas account data typically codes all multi-family residential buildings (e.g. condos and apartments) that have a single meter as a commercial building. The data cannot be easily differentiated from other commercial uses.

In a community of mostly detached dwellings, this creates small errors as the few multi-family buildings are reported as commercial consumption. In more urban areas, this can result in a substantial amount of consumption being incorrectly classified.

One resolution would be for Terasen to implement a new rate code defined as multi-family residential[29]. This would ensure that this consumption would be recorded properly as residential consumption. It does still leave some gaps as the account data would not likely indicate how many units were in the residence, or how much common space was also included, etc. However, BC Stats data and municipal planning data would provide reasonable measures of the number of units. [30]

- **Residential Consumption by Activity-Based Estimates**

Activity-based estimates are used to define the community consumption (see Section 2.4.1) by multiplying the number of dwellings by a derived average energy use. Over time, the number of dwellings will typically increase and periodically, the utilities (or Natural Resources Canada) will publish information regarding the typical and average energy use intensity.

### 4.1.2 Commercial and Industrial Consumption

There are a variety of sectors in the commercial and industrial groups and their energy use will vary widely. Commercial and industrial consumption cannot be sub-divided accurately. While

[29] This statement might also apply to Pacific Northern Gas, though their service area (northern BC) is likely to have fewer multi-family dwellings.

[30] One consultant has developed a methodology to correct this multi-family natural gas data by cross checking postal code summary data with electricity data. It can identify some of the commercial consumption which is actually residential.

this does not prevent accurate totals, it does prevent the evaluation of data by industry and sectors types.

This is primarily due to the industry codes applied to the account information. These are not consistent between utilities, and the level of accuracy of the codes within a utility is sometimes unreliable. [31]

### 4.1.3 Solid Waste

Using the commitment method for estimating methane emissions provides an incentive for communities to reduce their waste disposal and achieve a corresponding reduction in emissions. While this method is not site specific it does provide a reasonable estimate of the landfill gas generated in a wet climate - though is perhaps a high estimate for a dry region landfill. As well, it does not reflect other forms of disposal such as waste to energy.

## 4.2. Reporting and Updating

Most municipalities only commenced their energy and GHG plans in the past few years. Some municipalities have undertaken updates to their inventory. The Resort Municipality of Whistler [32] is one example of this, and they report annually on their emissions.

## 4.3. Other Issues

### 4.3.1 GHG Intensity of Electricity

GHG inventories include the indirect emissions associated with the production of electricity. Most inventories use the BC production average intensity for electricity - which does not include an accounting for the complex imports and exports of electricity. The value ranges from 20 to 60 tonnes of $CO_2$ per GWh consumed. Most inventories use a number in the range of 25 - 35 tonnes of $CO_2e$ per GWh. A few inventory and reporting systems use the specific year values of their inventory.

The GHG intensity of electricity causes the most confusion in the realm of GHG offsets. The production of power from a green energy source, has many times been stated, can displace the production coal-fired power plants - which have GHG intensities of 900-1100 tonnes $CO_2e$ per GWh. While some of the power displaced may be coal-sourced much of it would come from a variety of sources so this assertion is potentially misleading. This issue may become more important as many GHG reduction activities will include both conservation as well as energy generation.

[31] BC Hydro and Terasen have transitioned to using NAICS (North American Industrial Classification System) codes but these may not accurately reflect the activity within the premises. PG&E uses the former SIC codes (Standard Industrial Classification).

[32] www.whistler2020.ca/whistler/site/explorer.acds

It is expected that the Province's Climate Action Secretariat (CAS), through its work on the Western Climate Initiative and through the Climate Registry's evolution will provide communities with values to use for GHG intensity, and appropriate offset values for the generation of electricity.

### 4.3.2 Renewable Energy

**Renewable energy** only appears in an inventory through the GHG intensity of the electricity or through a reduced GHG emissions for biofuel combustion. However, in subsequent energy plans, communities have made commitments to achieving a certain part of their energy from clean or renewable sources. These are not currently tracked in an inventory but may require some tracking in the future. For example, a community that sought out to supply itself with green electricity, might have a GHG intensity of 0 tonnes/GWh while the reminder of the province would have a different value.

### 4.3.3 Data Privacy

Utility companies have an obligation (or a policy) to protect certain confidential information of their clients. As such they will not release this information without the consumers' permission. For a corporate inventory this can be achieved through the local government granting permission. For a community the utility provides some form of rolled up summary - such as all accounts in a single rate code.

Data privacy issues do not prevent inventories being created but it does prevent the distribution of raw data to municipalities or consultants.

## 4.4. Desired Accuracy and Frequency of Community Inventories

Data accuracy requirements are driven by a range of factors including the amount of change that is to be detected, and the year-to-year variability based on a number of factors such as weather that can affect space-heating consumption. Data reporting should be informed by an understanding of:

- **the desired changes or trends to be observed in the inventory.** For example, achieving a 33% reduction in community emissions between 2008 and 2020 - if achieved in a straight-line fashion - is about a 3% annual reduction.
- **the year-to-year variability** of the documented (i.e. consumption) data. Substantial variation may occur due to seasonal effects etc.
- **the frequency of updating activity-based factors**. For example, transportation modeling might be done every few years, while ICBC data is maintained current and could be obtained regularly. Energy intensity reviews for residential or commercial buildings for the BC area may only be published every 5 or 10 years.

What should always be borne in mind is that regardless of the methodologies used, the community inventories will always include a mixture of documented data (from consumption records) and estimated data.

## 4.5. Regular Inventory Generation

Up until now, community inventories have been compiled one at a time for individual communities[33]. These have been done with the objective to use the methods most suitable for the community.

In contrast, the CEEI initiative has an objective to provide 185 local governments in BC with a community inventory, and presumably, periodic updates. Features that would make this process efficient include:

- For each community the estimation method used should be consistent over time - i.e. no change in methods between updates.
- There would be efficiencies in producing the reports from selecting the same methodology for all communities if possible.[34]
- The process would require automation and needs to be relatively stable without extensive oversight. Obviously, generating this many inventories would illuminate many data glitches and anomalies. While some manual review is required, it is desired that the system produce reliable results with a minimum of intervention and that this include data flagging for anomalous values.

## 4.6. Implications for Development of Indicators

An **indicator** is a compilation of the data - converted to a form comparable to other communities. So while the "total tonnes of GHG emission for a community" is the output of the inventory, it is difficult to compare on its own to other communities without normalizing to some factor like population.

Indicators for comparison would be values like emissions per person, emissions per dwelling, or per square foot of commercial floor space, etc. While many indicators can be defined conceptually, not all can actually be calculated. The characteristics of an ideal indicator for local action of climate change would be one that:

- Describes a condition or state of the urban or built environment representing the **magnitude** of emissions;
- Is within the **influence** of local governments to affect;
- Is **responsive** to changes in policies and actions;

[33] There was an effort within the GVRD around 2000 or 2001 which started to assemble inventories on behalf of the member municipalities, and the recent Capital Region Inventory (2005) include a breakdown of the regional total by community.

[34] For example solid waste emissions would be most easily determined by the methane commitment method. Yet the inventory ought to be flexible enough to include a municipality that uses actual emissions, so that there is a reported reduction incentive to reduce methane emissions.

- Is **measurable** and 'stable' from year to year
- Is **affordably** measured and easily calculated;
- Is **understood** by a broad range of readers and audiences; and,
- Is **comparable** to indicators used by other municipalities and agencies.

A sampling of possible indicators, and the factors that affect their use, is shown in Table 5.

**Table 5: Selected Indicators that could be derived from Energy & GHG Inventory Data**

| Indicator | Measures | Comments |
|---|---|---|
| Total GHG emissions per person (t $CO_2e$ / person) | Most of the total energy budget of a citizen (no industrial). | Should not include industrial consumption as a single large emitter will skew the results |
| Residential GHG emissions (t $CO_2e$ / person) | Only the consumption from residential buildings - the component that residents can most directly control. | If using activity-based estimates this will not change until the average energy uses changes.<br>New developments occur at the margins (new buildings) while the bulk of emissions occur from existing building stock. Virtually impossible to see the impact of a new building or a new development. |
| Residential GHG emissions by dwelling type - e.g. SF, MF, etc (t $CO_2e$ / person) | Shows the efficiencies of multi-family dwellings compared to detached dwellings. | Can't be reliably estimated without either a recoding or verification of the natural gas data and some information on fuel oil consumption.<br>Not suitable if using activity-based estimates. |
| Commercial Emissions (t $CO_2$ / sq meter) | Measures emissions per the amount of commercial floor space. | Provides a total only.<br>Can't be used to benchmark against other communities since the commercial sectors are so diverse. |
| Industrial | Difficult to normalize. No indicator proposed. | Sector is diverse - not easily benchmarked except against similar industries.<br>A small number of large emitting facilities can skew the data. |
| Transportation emissions per person (t $CO_2e$ / person)<br>per vehicle (t $CO_2e$ / vehicle) | GHG impact of mobility | Indicator monitor progress in areas of resident control - driving vs. transit, reduced driving, smaller car purchases etc. |
| Solid Waste GHG emissions per person. (t $CO_2e$ / person) | GHGs of waste generated. | Methane commitment method is an ineffective metric if communities implement organic diversion programs.<br>Could also subdivide into emissions due to residential waste generation though this data is not possible to obtain except for single-family homes in some communities. |

Notes:

1) For each of these GHG emission indicators (except solid waste), a parallel indicator of energy could be could be developed.

2) These are indicators and not used for setting targets. GHG targets are always expressed as absolute amounts of emissions.

# Attachment A: Community Inventory Summary

### Table A - 1: Community Inventories: Part 1 Administrative

| Community | Administrative | | | PCP Milestones | | | | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pop. (year) | Date | Author | 1a | 1b | 1c | 2 | 3 | 4 | 5 | |
| Notes: -> | [A] | [B] | [C] | [D] | [E ] | [F] | [G] | [H] | [I] | [J] | |
| **Bowen Island** | ~3,000 (2002) | Inv: 2002<br>Plan: 2003 | C | 1996 | 2000 | 2010 | 3 Scenarios of reduction from projected 2010 emissions:<br>12%, 15%, & 46% | Y | | | Includes Municipal |
| **Chilliwack** | 76,000 (2001) | 2007 | C | 2005 | | From 2005 to 2025 | 6% below 2005 levels by 2015 | Y | | | Includes agriculture<br>Residential inventory: Based on dwelling counts and total energy use |
| **Dawson Creek** | 11,615 (2006) | Inv: 2005<br>Plan:in progress | C | 2004 | - | - | - | N | | | CEP in development |
| **Kamloops** | 84,064 (2006) | 1997 | C | 1996 | - | N | N | Y | | | |
| **Kelowna** | 102,299 (2002) | Not provided | C | 2002 | - | 2012 | - | | | | Report in progress, inventory from a PCP Emissions Summary SHeet |
| **North Vancouver** | 48,136 (2001) | 2005 | C | 1995 | - | 2010 | 6% reduction from 1995 by 2010 | Y | Y | | CEP update in progress<br><br>Residential account: Based on dwelling counts and average energy use |
| **Prince George** | 75,568 (2001) | Inv 2005<br>Plan 2007 | C | 2002 | - | 2012 | 2% reduction from 2002 by 2012 | Y | | | |
| **Quesnel** | 10,044 (2001) | Inv: 2002<br>Target & Plan: 2003 | C | 1996 | 2001 | 2010 | Proposed 6% from 1996 by 2010 | Y | | | |
| **Revelstoke** | 8,507 (1996) | 1997 | C | 1996 | | 2016 | 6% below 1996 by 2016 | Y | | | |
| **Salt Spring Island** | 9,279 (2001) | Inv: 2004<br>Plan: 2005 | C | 1996 | 2000 - 2003 | 2012 | Stabilize emissions at 2002, by 2012 (23% below BAU projection) | Y | | | |
| **Smithers** | 5,414 (2001) | 2007 | C | 2005 | | N | Recommendations:<br>6% below 2005 by 2015;<br>33% below 2006 by 2025 | Y | | | |
| **Squamish** | 14,247 (2001) | 2007 | C | 2005 | | 2025 | 70% from 2005, by 2030 (1 tonne per capita) | N | | | |
| **Surrey City Centre** | ~16,000 (2006) | 2007 | C | 2006 | - | 2031 | 33% from BAU in 2031 | Y | | | Residential account: Based on dwelling counts and average energy use.<br><br>Commercial forecast based |

| Community | Administrative | | | PCP Milestones | | | | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pop. (year) | Date | Author | 1a | 1b | 1c | 2 | 3 | 4 | 5 | |
| | | | | | | | | | | | on the proportional relationship of population growth and commercial floor space |
| **Vanderhoof** | ~4,500 (2007) | 2007 | C | 2005 | | N | N | Y | | | |
| **Vancouver** | ~ 600,000 (2005) | 2005 | I (& C) | 2000 | | 2012 | 6% below 1990 levels by 2012 | Y | | | |
| **Whistler** | ~24,400 (2000) | 2004 | C | 2000 | | 2020 | 9% below 1990 levels by 20xx ? | Y | | | Milestone 4 and 5 in progress<br><br>Residential account: Based on dwelling counts and average energy use |
| **Regional Districts** | | | | | | | | | | | |
| **Capital Region District.** | 359,439 (2006) | 2006 | C | 1995 (back-cast) | 2004 | 2012 | 3 scenarios defined. Not yet adopted by Board. | Y | | | |
| **Metro Vancouver (formerly GVRD)** | various municipalities | 2003 | I | 1990 | 2000 | 1985, 2025 | N | | | | This Inventory does not follow the categories used in other inventories. Rather it uses point sources, area sources, mobile sources |
| **CEEI "Pilot" Inventories** | | | | | | | | | | | |
| Chilliwack<br>Port Moody<br>Vanderhoof<br>Smithers<br>Squamish<br>Kamloops | | 2007 | C | | | | | | | | |

Notes, by column heading:

**[A] Population** (abbreviated to pop): The symbol '~' is used to refer to reported population estimates.

**[B] Date**: Dates are provide for the year the inventory was released – listed as Inv, as well as the year the energy plan was released, listed as Plan.

**[C] Author**: C is used for consultant, and I is used for in-house.

**[D] 1a**: Refers to the completion of Milestone 1(Creating an inventory and forecasts) – the Baseline Year for the inventory is referenced

**[E] 1b**: Refers to the completion of Milestone 1(Creating an inventory and forecasts) – Additional Year(s) for the inventory are referenced

**[F] 1c**: Refers to the completion of Milestone 1 (Creating an inventory and forecasts) – Forecasted Year(s) for the inventory are referenced

**[G] 2**: Refers to the completion of Milestone 2 (Setting a GHG emissions target) - % , from what year, by what year is referenced

**[H] 3**: Refers to the completion of Milestone 3 (Develop a local action plan) – Yes or No

**[I] 4**: Refers to the completion of Milestone 4 (Implement the action plan) – left blank for future completion

**[J] 5**: Refers to the completion of Milestone 5 (Measure progress - monitoring and reporting of the action plan) – left blank for future completion

## Table A - 2: Community Inventories: Part 2 Energy Data Sources

| Community | Energy Sources | | | | | | |
|---|---|---|---|---|---|---|---|
| | Natural Gas | Electricity | Propane | Fuel Oil | Diesel | Gasoline | Wood / Biomass |
| **Bowen Island** | n/a | BC Hydro | n/a | State of Bowen Island (2001) | BC Ferries | vehicles per resident (ICBC). | GVRD |
| **Chilliwack** | Terasen | BC Hydro | n/a | n/a | Fuel stations | Fuel stations | n/a |
| **Dawson Creek** | PNG | BC Hydro | n/a | n/a | Dawson Co-operative Union (combined with gasoline) | Dawson Co-operative Union (combined with diesel) | n/a |
| **Kamloops** | No details provided | No details provided | No details provided | No details provided | No details provided | No details provided | No details provided |
| **Kelowna** | Consumption from utilities | Consumption from utilities | n/a | n/a | Gross fuel sales by fuel type in community | Gross fuel sales by fuel type in community | n/a |
| **North Vancouver** | Data source not provided | Data source not provided | n/a | Data source not provided | Data source not provided | Data source not provided | n/a |
| **Prince George** | Terasen | BC Hydro | n/a | n/a | Gross fuel sales within municipality. | Gross fuel sales within municipality. | n/a |
| **Quesnel** | BC Gas | BC Hydro | n/a | n/a | ICBC, vehicles per resident | ICBC, vehicles per resident | City of Kelowna and Regional District of the Central Okanagan |
| **Revelstoke** | n/a | BC Hydro | BC gas | 2 local distributors | No details provided | No details provided | No details provided |
| **Salt Spring Island** | n/a | BC Hydro | Fuel Providers | Estimates based on 1986 Stats Can data for the whole Southern Gulf Islands | ICBC data, BC Ferry, traffic | ICBC, BC Ferry, traffic | Est of average residential consumption rate – 1.5 cords |
| **Smithers** | PNG | BC Hydro | n/a | n/a | Based on # of registered vehicles. | Based on # of registered vehicles. | Not available but Potentially a substantial % of residential heat |
| **Squamish** | Terasen | BC Hydro | n/a | n/a | ICBC | ICBC | n/a |
| **Surrey City Centre** | Terasen | BC Hydro | n/a | n/a | Transportation emissions not disaggregated by fuel type | Transportation emissions not disaggregated by fuel type | n/a |

| Community | Energy Sources | | | | | | |
|---|---|---|---|---|---|---|---|
| | Natural Gas | Electricity | Propane | Fuel Oil | Diesel | Gasoline | Wood / Biomass |
| **Vanderhoof** | PNG | BC Hydro | n/a | n/a | ICBC and MoT | ICBC and MoT | n/a |
| **Vancouver** | Terasen | BC Hydro | n/a | GVRD total consumption prorated (by population?) to Vancouver | Regional Fuel sales - prorated by numbers of registered vehicles. (from GVRD 2002 emissions inventory). | Regional Fuel sales - prorated by numbers of registered vehicles. (from GVRD 2002 emissions inventory). | n/a |
| **Whistler** | n/a | BC Hydro | Terasen/ Centra Gas | n/a | Whistler Fuel sales | Whistler Fuel sales | Whistler housing authority estimates |
| **Regional Districts** | | | | | | | |
| **Capital Region District.** | Terasen | BC Hydro | Data source not provided | Housing count, with per house consumption estimates. | Region wide fuel sales (from Finance Ministry) | Region wide fuel sales (from Finance Ministry) | Study by BC Environment (2005) |
| **Metro Vancouver** | Terasen and industrial permit data | Did not include. | Data source not provided | Industrial permit data and Statistics Canada | Region wide fuel sales (onroad fuel volumes from TransLink; offroad fuel volumes from Ministry of Small Business and Revenue, Consumer Taxation Programs Branch) | Region wide fuel sales (onroad fuel volumes from TransLink; offroad fuel volumes from Ministry of Small Business and Revenue, Consumer Taxation Programs Branch) | Industrial permit data and residential wood burning survey |
| **CEEI "Pilot" Inventories** | | | | | | | |
| Chilliwack<br>Port Moody<br>Vanderhoof<br>Smithers<br>Squamish<br>Kamloops | Terasen | BC Hydro | Data source not provided | Data source not provided | ICBC vehicle registrations | ICBC vehicle registrations | Data source not provided |

Notes:

**n/a**: Indicates that this information was not reported, which either means that the energy source is not used in the municipality or it is expected to be minimal in comparison to other sources.

## Table A - 3: Community Inventories: Part 3 End Uses

| Community | End Uses | | | | |
|---|---|---|---|---|---|
| | Residential | Commercial | Industrial | Transportation | Solid Waste |
| Notes - > | [A] | [B] | [C] | | |
| **Bowen Island** | Total: E, O, W | C/M/I: - E, O | Only includes construction activities | Number of private vehicles, BC Ferries (L), Bowen Bus (L) | Port Mann, Cache Creek (GVRD) |
| **Chilliwack** | SF: E, NG<br>MF - E, NG<br>(not sure if O, W included) | C: E, NG | Details not provided | ICBC inventory of LD cars and trucks, MD trucks, motorcycles - gas and diesel | Mass of waste & fixed emissions value per tonne of MSW. |
| **Kamloops** | Total: E, NG<br>(W assumed to serve 10% of total) | Non residential buildings | n/a | Source unknown: G, D | n/a |
| **Kelowna** | Total: E, NG | Total: E, NG | Total: E, NG | Modeled based on vehicle registrations, vkt, and national avg fuel efficiency. | Actual volume/mass |
| **North Vancouver** | Total: E, NG | Total: E, NG | Total: E, NG (limited activity) | Light duty, Heavy duty vehicles: G, D | Total<br>(no detail) |
| **Prince George** | Total: E, NG | Total: E, NG | Total: E, NG<br>(LFE not included) | Fuel sales by fuel type: G, D | Mass of waste & fixed emissions value per tonne of MSW. |
| **Quesnel** | Total: E, NG, Wood<br><br>(O, P not included considered minor) | C/M/I: E, NG | Total: E, NG, W, P, D | private vehicles: vehicles registered and the avg distance traveled (using national avg).<br>Public transit: actual consumption | Mass of waste & fixed emissions value per tonne of MSW. |
| **Revelstoke** | Total: E, P, O, W | C/I: E, P, O | Total: E, P, O | Personal, commercial and institutional (not disaggregated by fuel type) | n/a |
| **Salt Spring Island** | Total: E, O, P, W | n/a | n/a | ICBC data of automobiles, light trucks, motorcycles and heavy trucks, ferry fuel | n/a |
| **Smithers** | Total: E, NG | Total: E, NG | Total: E, NG | ICBC registered vehicles - passenger/commercial | MoE and RCBC - landfill gas |
| **Squamish** | Total: E, NG | Total: E, NG | Total: E | fuel sales (gas and diesel) | Mass of waste & fixed emissions value per tonne of MSW. |
| **Surrey City Centre** | SF: E, NG<br>MF: E, NG | Total: E, NG | n/a | GVRD Air Quality Emissions Forecast and Backcast (2003) | n/a |
| **Vanderhoof** | Total: E, NG | Total: E, NG | Total: E, NG | passenger, trucks: vehicles registered, national averages of fuel consumption, by vehicle type (heavy duty trucks not included) | n/a |

| Community | End Uses | | | | |
|---|---|---|---|---|---|
| | **Residential** | **Commercial** | **Industrial** | **Transportation** | **Solid Waste** |
| **Vancouver** | Total: E, NG, O | Total: E, NG, O, (includes transit and related facilities) | Total: E, NG, O (electricity approximated from commercial numbers; natural gas and fuel oil derived from GVRD's permitted point sources) | Divided into LD and HD - LD used aircare data (along with ICBC and regional fuel sales data), but only gasoline, HD was diesel only | Methane produced at landfills, emissions from the incinerator |
| **Whistler** | Total: E, P, W | C/I: E, P,D, G | Total: E | Vehicle stock - ICBC<br>Peak Travel Demand: use of EMME/2 travel demand forecasting model<br>Fuel sales from Whistler service stations, Whistler Blackcomb fleet, and WAVE vehicles | Methane produced at landfills converted to weight equivalents using density conversion factors |
| **Regional Districts** | | | | | |
| **Capital Region District.** | Total: E, NG, O, P, W | Total: E, NG, P | Total: E, NG | MOBILE 6.2c emissions model was used with estimates of vehicle kilometres traveled provided by CRD Regional Planning Services. These fuel consumption amounts were then compared to fuel purchase receipts (Ministry of Finance) to verify accuracy. | Landfill model estimates LFG gas released. |
| **Metro Vancouver** | Not defined | Not defined | Not defined | Not defined | Not defined |
| **CEEI "Pilot" Inventories** | | | | | |
| Chilliwack<br>Port Moody<br>Vanderhoof<br>Smithers<br>Squamish<br>Kamloops | All residential Natural Gas & Electricity Community Total + # of accts | Natural Gas & Electricity Community Total + # of accts | Natural Gas & Electricity Community Total + # of accts | From ICBC registration data. Sub divided into 78 vehicle classes. | Per capita disposal estimate and fixed GHG emissions per tonne disposed. |

Notes:
[A] Residential: **SF**=single family; **MF**=multi-family; **Total=**all residential included; **E**=electricity; **NG**=natural gas; **P**=propane; O=fuel oil; **W**=wood
[B] Commercial: **C**=commercial; **I**=institutional; **M**=municipal; **D**=diesel; **P**=propane; **Total**=all commercial included
[C] Industrial: **Total**=all industrial included
**n/a**: Indicates that this information was not reported, which either means that the energy source is not used in the municipality or it is expected to be minimal in comparison to other sources.

# Attachment B: Corporate Inventory Summary

**Table B- 1: Corporate Inventories: Part 1 Administrative**

| Community | Administrative | | | PCP Milestones | | | | | | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pop. (year) | Date | Author | 1a | 1b | 1c | 2 | 3 | 4 | 5 | |
| Abbotsford | 128,940 (2006) | in progress | C | 2006 | ? | ? | ? | In progress | | | |
| Chilliwack | 73,000 (2006) | 2007 | C | 2005 | | 2025 | | | | | |
| Coquitlam | 122,000 (2005) | 2007 | C | 2005 | | 2015 | 30% below 2005 by 2015 | | | | |
| Dawson Creek | 11,615 (2006) | 2005 | C | 2004 | N | N | next steps | | | | |
| Delta | 96,723 (2006) | 2007 | C | 1995 | 2003-2006 | N | N | | | | |
| Kelowna | 112,775 (2006) | ? | C | 2002 (may be incomplete) | 2012 | | | | | | Full inventory not available, summary sheet only. |
| Langley (Township) | 94,775 (2004) | Inv:2004 Plan 2006 | I (C updated). | 1995, | 1999, & 2003. Updated to include 2000 & 2004 for Plan | 2010 | 12% below 2000 levels by 2010 | GHG reduction plan | | | |
| Hudson's Hope | 1,159 (2006) | starting fall 2007 | C | ? | ? | ? | ? | | | ? | |
| Nanaimo (City) | 80,949 (2006) | Fall 2007 | C | 2001 | | 2012 | 13% below 2001 by 2012 | Y | | | Approved by council in Sept 2007 |
| North Vancouver (city) | 48,136 (2001) | 2005 | C | 1995 | | 2010 | 20% from 1995 by 2010 | Y | Y | | Inventory currently being updated |
| Prince George | 75,568 (2001) | Inv:2005 Plan: 2007 | C | 2002 | | 2012 | 10% from 2002 by 2012 | 2006; (Council approved 2007) | | | |
| Squamish | 14,247 (2001) | 2007 | C | 2005 | | 2025 | 20% below BAU in 2015 | Begins Fall 2007 | | | |
| Vancouver | ~600,000 (2005) | 2004 | I (Cool Vancouver Task Force) | 1990 | 1999 | 2010 | 20% from 1990 by 2010 | Y | | | |
| Victoria | 78,659 (2006) | 2002 | C | 2001 | | N | 20% from 2001 (recommendation, no date) | N | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Whistler | ~24,400 (2004) | 2004 | C | 2000 | | 2020 | 10% from 2000 by 2010; 33% from 2000 by 2020 | Y | Y | Currently working on Milestone 5<br><br>Municipal Inventory is a sector of the community inventory –there is therefore less detail in the reporting |
| Capital Region District: | 359,439 (2006) | 2006 | C | backcast to 1995 | 2004 | 2012 | N | Y | | Inventory is incomplete.<br><br>Plan not approved by CRD or member governments |
| Nanaimo (Regional District) | 143,791 (2006) | 2007 | C | 2004 | | 2012 | 4% below 2004 by 2012 | Y | | |

Notes:

**Population** (abbreviated to pop): The symbol '~' is used to refer to reported population estimates; reported year in brackets

**C**=consultant; **I**=In-house

**?**=information either not available or not provided

**Inv**=Year inventory was released

**Plan**=Year plan was released

## Table B- 2: Corporate Inventories: Part 2: Data

| Community | Data for Energy Sources and Consumption | | | | | |
|---|---|---|---|---|---|---|
| | Natural Gas | Electricity | Propane | Fuel Oil | Diesel | Gasoline |
| Abbotsford | Terasen (consumption and cost) | BC Hydro (Consumption and cost). | Superior Propane | TBD | TBD | TBD |
| Chilliwack | City | City | n/a | n/a | City | City |
| Coquitlam | Terasen | BC Hydro | mobile propane only | n/a | Internal records (to check purchasing or cardlock system) | Internal records (to check purchasing or cardlock system) |
| Dawson Creek | PNG | BC Hydro | n/a | n/a | Dawson Co-operative Union (combined with gas) | Dawson Co-operative Union (combined with diesel) |
| Delta | Terasen and Direct Energy | BC Hydro | n/a | n/a | E3 Fleet data.<br>Km charges and ave economy for personal vehicle km. | E3 Fleet data.<br>Km charges and ave economy for personal vehicle km. |
| Kelowna, City of | " Municipal Accounts" (no detail provided in PCP summary sheet) – likely Terasen. | " Municipal Accounts" (no detail provided in summary sheet) - likely BC Hydro | n/a | n/a | Gross fuel sales by fuel type | Gross fuel sales by fuel type |
| Langley (Township) | Terasen | BC Hydro | Fuel purchase records: Mobile propane | n/a | Fuel purchase records | Fuelling system records |
| Hudson's Hope | TBD | TBD | TBD | TBD | TBD | TBD |
| Nanaimo (City) | Terasen | BC Hydro | n/a | n/a | Internal city records | Internal city records |
| North Vancouver (city) | Data Source not defined | Data Source not defined | n/a | n/a | Data Source not defined | Data Source not defined |
| Prince George | Terasen | BC Hydro | n/a | n/a | Reported vehicle kilometer traveled is converted to fuel volumes using average fuel efficiency factors for similar fleet vehicles owned by the City. | Reported vehicle kilometer traveled is converted to fuel volumes using average fuel efficiency factors for similar fleet vehicles owned by the City |
| Squamish | Terasen | BC Hydro | n/a | n/a | ICBC | ICBC |
| Vancouver | Terasen | BC Hydro | n/a | n/a | Fuel sales | Fuel sales |
| Victoria | Centra Gas | BC Hydro for each metered account charged to the city | n/a | n/a | Internal, fuel consumption, by vehicle, including km logged for each vehicle | Internal, fuel consumption, by vehicle, including km logged for each vehicle |
| Whistler | No service | BC Hydro | Terasen/Centra Gas | n/a | RMOW fleet's fuel consumption | RMOW fleet's fuel consumption |
| Capital Region District: | Terasen | BC Hydro | n/a | n/a | Incomplete corporate inventories | Incomplete corporate inventories |
| Nanaimo (Regional District) | Terasen | BC Hydro | n/a | n/a | Internal RDN records | Internal RDN records |

Notes:

**n/a**: Indicates that this information was not reported, which either means that the energy source is not used in the municipality or it is expected to be minimal in comparison to other sources.
**TBD**: To be determined (this report is not yet published)

## Table B- 3: Corporate Inventories: Part 3: End Uses

| Community | Enduse Methodology - Corporate | | | | | |
|---|---|---|---|---|---|---|
| | **Buildings (Note: unique features)** | **Lighting (see note C)** | **Water and Waste Water (see note B)** | **Vehicle Fleet (see note D)** | **Solid Waste (see note A)** | **Data Archive / Software** |
| Abbotsford | City Hall<br>Emergency Services (police hall, fire halls)<br>Parks and Rec (fields and arenas)<br>Community and cultural<br>Note: Includes Airport | Signal<br>Overhead<br>Ornamental | PS<br>LS<br>DPS<br>buildings and works | Included (no details) | Not included | Unknown (report not released) |
| Chilliwack | Rec centres,<br>city hall,<br>civic services and parks operations,<br>library and community centre | Not included | Not included | Included (no details) | Included (no details) | none |
| Coquitlam | Administration,<br>Rec/sport centres,<br>fire services,<br>police services<br>leased buildings;<br>diesel fuel equipement<br>methane recovery system | Signal<br>Overhead<br>Ornamental | well,<br>PS,<br>LS,<br>Drainage PS,<br>other systems. | All vehicles operated by the city:<br>Passenger vehicles<br>Truck<br>Tractors, graders, backhoes, dump trucks<br>Fire trucks<br>Off-road vehicles<br>Sweepers & packers<br>Propane vehicles<br>Unidentified gas accounts<br>Misc. gas powered equipment<br>Hybrid vehicles<br>Misc. gas powered equipment | Estimated from pickup records. | Spreadsheets |
| Dawson Creek | recreation facilities,<br>cultural centres,<br>emergency services,<br>engineering and public works,<br>airport<br>other buildings | Overhead<br>Ornamental | PS,<br>water boosters,<br>sewage pond and stations | Total fuel consumption available. Mileage records and the breakdown of vehicles by fuel type were used to estimate the fuel split. | Not included | none |
| Delta | Rec centers,<br>Cultural Facilities,<br>Municipal Administration,<br>Fire and police,<br>Parks<br>municipally supported community services (services in municipally-owned buildings eg. Delta Health Centre). | Signal<br>Overhead<br>Ornamental | PS,<br>LS,<br>DPS,<br>Works yard | PkT (personal vehicle kilometers) included.<br>Police vehicles excluded.<br>Includes biodiesel. | Estimated from pickup records | Constructed Excel spreadsheets |
| Kelowna | Included (no details) | Included (no details) | Included (no details) | Included (no details) | Estimated from pickup records | Unknown |
| Langley (Township) | Municipal hall,<br>operations centre,<br>community and rec centres,<br>RCMP detachment, | Signal<br>Overhead<br>Ornamental<br>Parks | Wells,<br>PS,<br>LS,<br>storage reservoirs | PkT (personal vehicle kilometers) included.<br>Police vehicles excluded.<br>Includes biodiesel. | Estimated from pickup records. | Constructed Excel spreadsheets |

| Community | Enduse Methodology - Corporate | | | | | |
|---|---|---|---|---|---|---|
| | **Buildings (Note: unique features)** | **Lighting (see note C)** | **Water and Waste Water (see note B)** | **Vehicle Fleet (see note D)** | **Solid Waste (see note A)** | **Data Archive / Software** |
| | community policing offices | | (water) | Included Fire Department<br>Parks and Recreation<br>Municipal operations. | | |
| Hudson's Hope | TBD | TBD | TBD | TBD | TBD | TBD |
| Nanaimo (City) | Community and Rec Centres<br>Public Works Yard<br>RCMP building<br>City Hall<br>Police Stations | Signal<br>Overhead<br>Ornamental | PS<br>Reservoirs<br>Pump<br>Water process centre<br><br>(no sewage treatment or potable water treatment plants) | All motorized vehicles operated by the city, backup generators, and miscellaneous equipment for roads and parks maintenance, lawns etc. | Estimated from pickup records.<br>(Note A) | Spreadsheet based system |
| North Vancouver (city) | Rec centres,<br>City Hall<br>Parks,<br>RCMP building,<br>Policing station,<br>Community and cultural centres,<br>Fire hall.<br>Lonsdale Quay | Included (no details) | Included (no details) | Included (no details) | Included (no details) | Unknown |
| Prince George | Included (no details) | Signal<br>Overhead<br>Ornamental<br>Parks | Included (no details) | Car<br>Pkt (personal vehicle kilometers)<br>Van and jeep<br>Pick up truck<br>Dump truck<br>Fire department pumper<br>Packer<br>Flusher and sweeper<br><br>(not included: off-road backhoe, grader, loader, excavator, misc. equipment – as per PCP protocol) | Estimated from pickup records.<br>(Note A) | ICLEI protocol document |
| Squamish | Included (no details) | Streetlighting<br>Parks (unspecified) | Water/wastewater treatment<br>Dyke pumping and unknown | Included (no details) | Included (no details) | none |
| Vancouver | Included (no details) | Included (no details) | Not included | Included (no details) | Included (no details) | unknown |
| Victoria | Admin,<br>City hall,<br>Cultural centre/library,<br>Maintenance yard/garbage,<br>Other,<br>Parking garage,<br>Recreation | Signal<br>Overhead<br>Ornamental<br>Parks | PS,<br>LS,<br>(26 water/sewer facilities) | Cars<br>Heavy trucks<br>Light van or truck<br>Motorcycle<br>Other<br>Specialized heavy equipment | Not included | Torrie Smith Associates (ICLEI) |

| Community | Enduse Methodology - Corporate | | | | | |
|---|---|---|---|---|---|---|
| | **Buildings (Note: unique features)** | **Lighting (see note C)** | **Water and Waste Water (see note B)** | **Vehicle Fleet (see note D)** | **Solid Waste (see note A)** | **Data Archive / Software** |
| Whistler | Municipal hall<br>Community centre facilities<br>Library<br>Rec centre and park facilities<br>Housing and works building<br>Fire protection services<br>Permitting and licensing services<br>Property taxation services | Signal<br>Overhead | Included (no details) | Cars,<br>Light trucks<br>Heavy trucks<br>Tractors<br>Trailers<br>Other<br><br>Included: Public Transit | Included (no details) | none |
| Capital Region District: | Incomplete inventory - CRD conducted an inventory of 45 buildings in the CRD | Not included | Not included | Cars<br>Light trucks<br>Heavy trucks<br>Off-road vehicles | Not included | Senes Accounting software |
| Nanaimo (Regional District) | Admin offices,<br>Fire services,<br>Rec centres (ice and pool),<br>Other bldgs,<br>Parks and sportsfields | Overhead<br>Ornamental | Wells,<br>LS | Data broken out by department, including:<br>Transit buses and support vehicles<br>Solid waste vehicles<br>Other municipal vehicles | Estimated from pickup records from:<br>Admin offices<br>Ice Arenas<br>Indoor Pools | Spreadsheet based system |

Notes.

[A] Estimated GHGs from i)number of bins, ii) frequency of pick-up, iii) estimated capacity, & iv) fixed GHG conversion. (I.e. not site specific to disposal option).

[B] DWTP = drinking water treatment plant/station, WWTP = wastewater treatment plant.
Well = water well, PS = pump station (water), LS = lift station (sanitary sewer), DPS =drainage pump station

[C] Overhead lighting = street lighting owned and maintained by BC Hydro, Ornamental = street lighting owned and maintained by the municipality or other customer; Signal lighting are traffic signals.

[D] Vehicle fleet typically includes street vehicles and well as heavy vehicles and equipment. May or may not include small equipment consumption. Variability may exist whether fire and police services are included within the inventory. "Vehicle Count" = estimated from number of vehicles and estimated annual kms (or hours) of operation. PVkmT = includes estimate of Personal Vehicle kms Traveled for work purposes (not commuting)