

2007 Community Energy and Emissions Inventory

(CEEI) Reports User Guide

draft March 11th, 2009

Draft CEEI Reports for the inventory year 2007 are being provided for regional districts and municipalities in British Columbia for review and comment. The reports contain four sectors – buildings, on-road transportation, solid waste, and deforestation - each of which capture the type and amount of energy consumed and/or greenhouse gases (CO₂e) released into the atmosphere.

Aggregated, actual energy consumption data and resulting greenhouse gas emissions from electrical utilities, and natural gas and propane distribution companies are included as well as estimates of fuel consumed by vehicles on the road and the resulting estimates of greenhouse gas emissions, the greenhouse gas emissions (methane) from each community's contribution to landfills, and the greenhouse gas emissions released from deforestation (regional district level only).

This User Guide provides an overview of the information included in each sector of the draft 2007 CEEI Reports¹. Each section describes the information included for each sector, the methodology and calculations used, some limitations of the data, and the data sources used. Existing limitations in some of the province-wide data and analysis tools (e.g., Translation Master File) will be the focus of improvement in future CEEI reporting years². A short section on how a community may choose to use 2007 CEEI Reports concludes the document.

The 2007 CEEI Report Format

Each local government's draft 2007 CEEI Report is typically two to three pages in length. The sectors in the Reports and the general information included in each sector are as follows:

- The buildings sector is subcategorized into residential, commercial and industrial buildings. Each subcategory includes the number of connections, the amount of actual (not normalized³) energy consumed (e.g., electricity (kWh) and natural gas (GJ)), and the resulting CO₂e totals for each building subcategory as well as a CO₂e subtotal for the sector;
- The on-road transportation sector is subcategorized into several passenger and commercial vehicle classes. Each subcategory includes an estimate of the amount of fuel used (e.g., gasoline, diesel fuel, and mobile propane), and the resulting CO₂e totals for each vehicle class as well as a CO₂e subtotal for the sector;
- The solid waste sector states the estimated mass of waste disposed by local governments at community and/or regional landfill(s), with the associated CO₂e (methane) net of any known landfill gas flaring, capturing, etc.;
- The land-use change (deforestation) sector includes the estimated amount of CO₂e from the clearing of forests for urban development and agriculture. This data is only provided at the regional district level and as information only (e.g., the data does not form part of the total emissions profile reported); and,
- The total amount of energy and CO₂e for each energy type and direct emission source, and the total combined energy and CO₂e is presented in the Grand Total.

¹ Once completed, refer to the **2007 CEEI Technical Methods and Guidance Document** for more detail.

² The scope and detail of the CEEI sectors, and the quality of the data will continue to improve to meet the increasing information needs of both the provincial and local governments. Refining CEEI mapping to rural community boundaries and improving community-level vehicle kilometres traveled are two such examples.

³ Normalization refers to a process that removes the effect of outside influences (e.g. weather, fuel prices, economic conditions) on the use of energy in buildings year-over-year. For example, energy consumption is normalized for weather by removing the effects of abnormal winters or summers. Actual energy consumption is required under prevailing community inventory protocols, so normalization is not used.

Sector-by-Sector Descriptions

Buildings Sector

What's Included?

The buildings sector includes all electricity and natural gas delivered by the four major utilities in the Province – BC Hydro, Fortis BC, Terasen Gas Inc, and Pacific Northern Gas Ltd. It also includes piped-propane delivered to Whistler and Revelstoke by Terasen Gas Inc. This information is broken down into residential, commercial, and industrial subsectors. The commercial subsector includes traditional business and retail outlets, and institutional buildings such as schools, hospitals and government buildings. For each subsector, the energy consumed and the related greenhouse gases is shown along with the number of physical connections or accounts.

Although the term “buildings” is used to describe this sector, the energy consumption reported in these subsectors includes electricity and natural gas used for other purposes. For example, in the commercial subsector, the energy consumption figure may include streetlights and water pumping stations. For industrial buildings, this could include energy-based industrial processes. However, GHG emissions caused by non-energy consuming processes such as chemical reactions during the production of industrial goods are not presently included.

This sector does not include electricity distributed by systems not owned or operated by BC Hydro or Fortis BC (industrial self-generation, remote community systems, etc.), but does include electricity purchased by local governments to service a segment of their community (e.g., Nelson Hydro). This sector also does not include heating oil, propane, except as noted above, or wood, due to the existing difficulty in obtaining province-wide data for these energy types. The Province is exploring the feasibility of including these estimates in future CEEI Reports.

Methodology and Calculations

Electricity and gas consumption data is obtained directly from the utility companies. GHG emissions from electricity vary from year to year, depending on a number of factors. The 2007 electricity emissions factor used is 0.022 tonnes/kWh (see Data Sources). GHG emissions for natural gas (and piped propane in Whistler and Revelstoke) are calculated using emission factors reported in Table 1 and originate from Intergovernmental Panel on Climate Change (IPCC) guidelines.

Table 1 - 2007 Source Emission Factors – Buildings

Fuel Type	Units	Emission Factor			
		CO ₂	CH ₄	N ₂ O	CO ₂ e
Electricity	tonnes/kWh				0.022
Natural Gas	kg/m ³	1.891	0.000037	0.000035	
Piped Propane	kg/litre	1.51	0.000024	0.000108	

Total energy, reported in GJ, for each of the residential, commercial and industrial subsectors is based on the consumption of electricity (kWh converted to GJ) and natural gas (GJ) for each building 'connection' (i.e., account).

Issues and Accuracy Limitations

Electricity consumption is assigned to each municipality or regional district using the Province's Translation Master File (TMF) for postal codes. In the more rural areas of the Province postal codes can frequently cross municipal boundaries into adjacent electoral areas resulting in all the electricity data for a particular postal code being counted in only one jurisdiction. This is more prevalent in small and/or rural communities and is not generally observed in the higher population centres of the Province. In future years, electrical utilities may use other methods of tracking accounts (e.g., GPS coordinates) to improve the accuracy of account locations. Because of these postal code issues, some CEEI reports have been identified as problematic. Users of these reports should be aware of these concerns and contact Ministry of Environment for further details. Those municipalities determined to have significant boundary-related issues are listed in Table 2.

Table 2 – Communities with CEEI Boundary Issues

100 Mile House	Alert Bay	Anmore	Armstrong
Ashcroft	Burns Lake	Cache Creek	Chase
Chetwynd	Clinton	Enderby	Fort Nelson
Fort St. James	Fraser Lake	Fruitvale	Gibsons
Gold River	Golden	Grand Forks	Granisle
Greenwood	Harrison Hot Springs	Hazelton	Hope
Hudson's Hope	Invermere	Kaslo	Kent
Keremeos	Lake Cowichan	Lantzville	Lillooet
Lytton	Lumby	Masset	McBride
Montrose	New Denver	New Hazelton	North Vancouver, City
North Vancouver, District	Pemberton	Pouce Coupe	Princeton
Radium Hot Springs	Sayward	Sicamous	Slocan
Smithers	Sooke	Spallumcheen	Stewart
Tahsis	Telkwa	Tofino	Tumbler Ridge
Ucluelet	Valemount	Vanderhoof	Wells
Zeballos			

Natural gas data for local governments do not suffer from the same problem as electricity data. Although Terasen Gas Inc. can provide data by municipal boundary, they were not able to separate natural gas data for two pairs of neighbouring local governments. Natural gas data for the City and District of North Vancouver is lumped together within the District of North Vancouver report and natural gas data for the City of White Rock and the City of Surrey is within the City of Surrey report. The Province will work with Terasen Gas Inc. to resolve this issue in the near future.

Each utility uses a different method to describe and assign accounts to the three buildings subsectors. Some buildings cannot be clearly assigned to a specific subsector (e.g. a mixed-use building with ground floor retail is both residential and commercial). Also, some utilities use rate codes to differentiate between accounts, while others use business classifications. This can lead to differences in

the number of accounts and consumption assigned to the subsectors by each provincial utility company. For these reasons, subsector breakdowns should be treated with caution.

Confidentiality is a significant concern in the release of utility data. Some large industrial and commercial customers will dominate energy consumption within a municipality or regional district. For this reason, the utilities generally withhold all data within a subsector when a single customer exceeds 50% of the community's total for that subsector. Therefore, a number of draft 2007 CEEI Reports do not include industrial or commercial data. This is an unfortunate, but unavoidable, deficiency at this time. If energy data in the industrial (or commercial) sector has not been made available, the number of customers will still appear as a line item within the industrial (or commercial) listing, but with an en dash “–” for consumption. If there are no industrial or no commercial customers within the local government boundary, the line item for either industrial or commercial buildings will not appear. In the latter case, the data provider(s) do not recognize any industrial or commercial customers within the local government boundary. In the future, the Province may look to develop release agreements with applicable utility customers that would allow for the release of this information to local governments⁴.

Also, there are many factors that will influence a community's use of electricity and natural gas such as the price of fuel, the state of the economy, and the weather. In terms of weather, GHG emissions from electricity generation and consumption in British Columbia will vary annually based on a combination of total snow pack levels, timing and intensity of rainfall as well as heating and cooling degree days in different areas of the Province⁵.

Data Sources

- Electricity and natural gas consumption data are provided by BC Hydro, Fortis BC, Terasen Gas Inc., and Pacific Northern Gas.
- Emission factors for natural gas and piped propane, and GWPs⁶ are from *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, Volume 2 – Energy, Table 2.2, Intergovernmental Panel on Climate Change.
- 2007 emission factor for electricity from *Global Reporting Initiative report EN8(2)*, BC Hydro http://www.bchydro.com/about/company_information/reports/gri_index/en8_2_greenhouse.html.

⁴ The Province's proposed Mandatory Reporting of Greenhouse Gas Emissions Regulation (GHG Reporting Regulation) will require industrial facilities to submit data on greenhouse gas emissions to the Minister of Environment, providing the foundation for a cap and trade system and other climate policies to reduce greenhouse gases. For 2008 CEEI Reporting, the industry sector will be revisited to ensure it complements industrial reporting requirements under the new regulation.

⁵ See footnote #1 above on 'normalization'.

⁶ Global Warming Potential, or GWP, is a measure of how much a given mass of greenhouse gas is estimated to contribute to global warming. It is a relative scale that compares the gas in question to that of the same mass of carbon dioxide (whose GWP is by definition 1).

On-Road Transportation Sector

What's Included?

For the draft 2007 CEEI Reports, only vehicles on-the-road are reported. This represents all vehicles registered to be driven on public roads, including personal vehicles such as small passenger cars (e.g., Honda Civic, Toyota Prius) and large passenger cars (e.g., Ford Crown Victoria) which are separated by a net vehicle weight of 1400 kg; light trucks and vans (i.e., <3600 kg) such as Ford F150, Dodge Dakota and GMC 1500, passenger vans, and sport utility vehicles; motorhomes; motorcycles and mopeds; commercial vehicles such as cargo vans, panel trucks, heavy trucks, ambulances, and fire trucks; tractor trailer trucks; and buses, representing transit and private buses.

It does not include vehicles not licensed to be driven on public roads such as bulldozers, forklifts, all-terrain vehicles, etc. It also does not include slow moving heavy equipment that is licensed to be operated on public roads such as rollers, pavers, backhoes, graders, etc. Also, the draft 2007 CEEI Reports do not include marine, rail or air transportation. One or more of these sectors may be added in the future.

Methodology and Calculations

There are several different ways of calculating on-road transportation emissions, including fuel sales, vehicle registrations, traffic counts, and traffic modeling. As part of a CEEI background report – “*Assessing Vehicular GHG Emissions: A Comparison of Theoretical Measures and Technical Approaches*” – it was determined that the ‘resident-based’ approach using vehicle registrations at its core was the most practical, accurate and cost effective province-wide approach. The 2007 CEEI on-road transportation emissions are therefore calculated using a vehicle registration method. The formula for calculating fuel consumed and CO₂e emitted for each B.C. community is:

(1) # vehicles X (2) fuel consumption X (3) kilometres driven X (4) GHG emissions factors = GHG Emissions

1. Data of actively insured vehicles was provided by the Insurance Corporation of British Columbia (ICBC). Vehicles are assigned to municipalities and regional districts according to their registered owner's postal code. Vehicles registered to operate in an area of the Province that does not include the registered owner's postal code are not counted in the registered owner's jurisdiction.
2. Fuel consumption, as reported by manufacturers to Natural Resources Canada (NRCAN), are then matched to each vehicle by make, model year, model, body style, engine displacement and transmission. Hyla Environmental Services Ltd.'s (HES) Transportation Energy and Emissions Module™ (TEEM™) matches these vehicles to their NRCAN fuel consumptions, adjusted upwards by 7.5%, a correction factor now used by the US Environmental Protection Agency (USEPA).
3. Kilometres driven, or vehicle kilometres traveled (VKT) are derived from odometer readings from AirCare in the Metro Vancouver area, and odometer readings taken from vehicle transfer forms from around the Province.⁷
4. GHG emissions (CO₂e) are calculated from the above resulting fuel consumption using CO₂ emission factors specific to fuel type, and CH₄ and N₂O emission factors as per Table 1.

⁷ Based on a recent CEEI Background Report – “*CEEI VKT Study*” – vehicle kilometres traveled (VKT) for cars and for trucks around the Province were estimated from AirCare data. Outside of the Lower Mainland, the *VKT Study* determined AirCare data “adjustment factors” for seven regions of the Province for each of four broad vehicle classes. For example, a regional adjustment factor of 1.13 means that, on average, one of the vehicle classes in the region travels 13% more kilometres in a year than the same type of vehicle in the Lower Mainland. The *CEEI VKT Study* was based on a statistical representation of ICBC vehicle transfer forms around the Province. The consultant (Pacific Analytics Inc.) provided the adjustment factors based on local econometrics for various geographic regions of the Province.

Issues and Accuracy Limitations

As vehicle registrations are assigned to communities by postal code using the Translation Master File (TMF), there are similar problems with overlapping postal codes as are found in the Buildings sector. See Buildings Sector: Issues and Accuracy Limitations above for more details.

As part of the CEEI initiative, significant progress has been made to match the Vehicle Identification Numbers (VINs) database to NRCan's fuel consumption data, greatly improving the accuracy of the estimated fuel efficiency for CEEI reporting purposes. An 'adjustment factor' (7.5%) based on more recent US Environmental Protection Agency research is used to adjust the NRCan data, consistent with the Province's approach to core government and public sector organization estimates of greenhouse gas emissions from vehicle fleets.

The "*CEEI VKT Study*" has taken the first step towards more accurate VKT estimates across the Province, since previous data has used national vehicle class estimates from the National Transportation Study. Even so, for 2007, VKT estimates could only be made for a small grouping of vehicle classes within seven geographical regions. Until more refined VKT estimates, or 'actual VKT data' can be secured, neither differing driving patterns that may exist between communities, nor successful local government efforts to reduce vehicle use in individual communities will be accurately reflected in the annual CEEI reports. The Province is presently exploring ways to improve VKT data for the 2008 CEEI Reports.

Vehicles are assigned to a municipality or Regional District according to their registered owner's policy renewal postal code. Some of these vehicles may operate predominantly in other communities. This can be problematic, since all vehicles in a commercial fleet may be registered at a single location, regardless of where in the Province they operate. Where vehicles are operated outside the ICBC rating territory they are registered in, they have not been included in the CEEI inventory.

Data Sources

- Vehicle registration data provided by ICBC.
- Fuel consumption data from HES' TEEMTM derived from NRCan's fuel consumption tables, US EPA's fuel efficiency tables, and fuel consumption data for vehicles over 6,000 lbs Net Vehicle Weight from HES' research with specific vehicle manufacturers.
- Emission factors for vehicle fuel from *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, Volume 2 – Energy, Tables 3.2.1, 3.2.2, 3.2.3, 3.2.4, Intergovernmental Panel on Climate Change.
- Pacific Analytics' 2008 report entitled: *Assessing Vehicular GHG Emissions: A Comparison of Theoretical Measures and Technical Approaches* provided the rationale for the CEEI's 'resident-based' approach.
- Vehicle kilometres traveled from AirCare database and Pacific Analytics' 2008 report entitled *CEEI VKT Study* provided estimated vehicle kilometres traveled (VKT) for four broad vehicle classes in seven regions around the Province, grounded by AirCare data.

Solid Waste Sector

What's Included?

The draft 2007 CEEI Reports include estimates of the annual mass (tonnes) of municipal solid waste (MSW) disposed⁸ of at all regional district landfills and attributed to contributing municipalities, as well as each community's estimated share of CO₂e (methane) emissions.

Waste that is not disposed of at a regionally operated landfill (e.g., a forestry landfill), some industrial waste, compostable material, green waste, and waste originating from federal lands, are not included in the draft 2007 CEEI Reports. There are also no estimates CO₂e provided for closed landfills. Demolition, land clearing and construction (DLC) waste, which is considered relatively inert, has not been included in the tonnage figures where known. The waste shipped to Metro Vancouver's Waste-to-Energy facility and the overall CO₂e contribution has been included in the tonnage figures.

Methodology and Calculations

Waste Composition

To support a common approach, and in the absence of comprehensive province-wide data, it is assumed that the composition of waste (percent organic, paper, plastics, etc.) at all British Columbia landfills is the same.

Waste Disposal Estimates

A variety of data sources were used to compile tonnes of solid waste disposed at MSW landfills across the Province. These included Solid Waste Management Plans or related landfill annual reports, where available to the CEEI Working Group, the Golder Associates recent inventory of major provincial landfills, and the Recycling Council of British Columbia's municipal solid waste tracking reports. The nature of the data available for a particular regional district and its member municipalities guided the methodological approach for calculating tonnes of waste tipped for (deposited by) each municipality. Metro Vancouver and the Capital Regional District maintain accurate records that annually track the amount of waste disposed of by member municipalities. Otherwise, only a small number of landfills owned and operated by other regional districts had such direct attribution data available to the CEEI Working Group. If disposal data was not available, or could not be apportioned by other means, waste disposal estimates for communities were based on regional district totals distributed to each community by their respective population.

Emissions Estimates

There are generally two methods for estimating landfill gas emissions generation: *waste commitment* and *waste-in-place*. The **waste commitment method** calculates each site's total potential future

⁸ Waste 'generated' and waste 'disposed' are different. While waste generated is generally the total amount of waste produced in a community, waste disposed is the net amount of waste going to a landfill after recycling, re-use or other diversion efforts are undertaken. It is waste disposed that is the quantity used for community inventory calculations.

landfill gas production from the waste deposited in one year, regardless of whether or not any landfill gas is generated in the year the waste was disposed. The **waste-in-place methodology** estimates landfill gas production for all the waste tipped at the landfill since the landfill opened. Both of these methods have strengths and weaknesses, however waste-in-place is the most widely used model in North America and is the *de facto* standard in a number of recognized protocols⁹, including adoption by the US Environmental Protection Agency (i.e., LandGEM model). Where practical, the waste-in-place methodology was chosen for the draft 2007 CEEI Reports. In cases where the data was not available to support the waste-in-place methodology, the waste commitment approach was used.

In 2008, Golder Associates provided solid waste tonnages and greenhouse gas emission estimates for the 35 largest landfills of the approximately 92 municipal solid waste landfills currently operating in British Columbia under provincial jurisdiction. They used a first-order kinetic methane generation model, otherwise known as the waste-in-place methodology¹⁰. Landfills that received at least 10,000 tonnes in the 2006 calendar year formed the core part of the study. As a group, these landfills are estimated to account for more than 90% of all MSW disposed of at provincially regulated landfills in British Columbia.

Since Metro Vancouver and Capital Regional District systematically track the amount of annual waste each member municipality contributes to the respective landfill(s), tonnages and methane emissions could be directly attributed to each municipality.

For those Regional Districts with at least one landfill included in the Golder report, a waste-in-place methodology was applied. In most cases, the CO₂e estimate from the Golder report was pro-rated to the other landfills within that RD based on the mass of waste disposed at each landfill. In the majority of cases where the data did not allow the CEEI to attribute mass and/or CO₂e directly from a landfill to a contributing municipality, mass (solid waste tonnage) and CO₂e emissions estimates were assigned on a per capita basis from the total aggregate waste disposed at the Regional District level. In those Regional Districts with no landfills receiving more than 10,000 tonnes of municipal solid waste per year (hence, not treated in the Golder report), a waste commitment method was used for all landfills.

Where available, volumetric data of methane flared or otherwise beneficially used was subtracted from the landfill gas generation totals.

Issues and Accuracy Limitations

In addition to any inaccuracies in the assumptions applied to calculate methane using the waste-in-place methodology in the Golder report (for those landfills receiving more than 10,000 tonnes of solid waste per year), the quality of the data available for a number of the other landfills in the Province limited the overall accuracy of greenhouse gas emissions estimates within the draft 2007 CEEI reports. To address some of these deficiencies in the future, the Province will draw upon the experiences of regional landfill managers in pursuit of a common (i.e., waste-in-place) approach for monitoring and reporting tonnes of

⁹ A number of organizations with recognized inventory protocols support a Waste-In-Place approach, including *IPCC*, *ICLEI*, *Environment Canada* (National Inventory Reporting), and the *Federation of Canadian Municipalities Partners in Climate Protection* (Developing Inventories for Greenhouse Gas Emissions and Energy Consumption).

¹⁰ *Inventory of Greenhouse Gas Generation from Landfills in British Columbia*
(http://www.env.gov.bc.ca/epd/codes/landfill_gas/pdf/inventory_ggg_landfills.pdf).

municipal solid waste disposed in all significant landfills across the Province (note, many very small landfills in the Province receive less than 1,000 tonnes of municipal solid waste per year, and do not have weigh scales) as well as work to refine the waste-in-place methodology to reflect local conditions.

Since the waste-in-place methodology estimates greenhouse gas emissions (CO₂e) from all the solid waste that has been tipped since the landfill opened, reducing waste streams in an inventory year will not necessarily result in an equivalent reduction in GHG emissions. Regardless, CEEI Reports will still capture direct reductions in the mass of solid waste disposed in any given year.

Local governments are encouraged to inquire in the short term whether or not more accurate 2007 data is available locally and, if so, provide this information so that the draft 2007 CEEI Reports can be improved accordingly. This is the first leg of a journey to continuously improve the accuracy of solid waste disposal and CO₂e estimates at the local government level, providing an ever-improving province-wide understanding of the role solid waste plays in contributing to community-based greenhouse gas emissions, and the steps necessary to reduce these important sources of methane.

Data Sources

- Recent Solid Waste Management Plans (SWMPs) or annual reports (i.e., Annual Operations and Monitoring Reports) for each landfill where they could be identified.
- Golder Associates' *Inventory of Greenhouse Gas Generation from Landfills in British Columbia* (2008).
- Recycling Council of British Columbia's *BC Municipal Solid Waste Tracking Report* (2006 or 2003-2005).
- BC Stats' *British Columbia Municipal & Regional District Population Estimates 1996-2007*.
- Municipal waste disposal rates and estimated methane emissions from the Metro Vancouver landfills and waste-to-energy facility and City of Vancouver landfill provided by Metro Vancouver and City of Vancouver staff.
- Methane emissions factor for landfills was based on a methane factor of 0.53 tonnes CO₂e per tonne waste from the IPCC Second Assessment Report (SAR).

Land-Use Change (Deforestation) Sector

What's included?

The draft 2007 CEEI Reports include estimates of hectares of deforestation for each Regional District, broken down into agriculture and urban development, and the resulting CO₂e emissions. For the purposes of greenhouse gas accounting, deforestation is defined as "the direct human-induced conversion of forested land to non-forested land". Deforestation includes activities such as clearing of forest for urban development or agriculture. Human activities that do not cause a land-use change, such as forest harvesting followed by regeneration of a new forest and natural events such as beetle-killed forests or forest fires, are excluded.

British Columbia is using the same criteria for a deforestation 'event' that Canada is using internationally: 1 ha (hectare) minimum area, 20m (metres) minimum width, 5 m minimum tree height at maturity, and 25% minimum crown closure¹¹.

The CEEI reports only consider deforestation. Afforestation (the conversion of non-forested land to forest) is not included.

Methodology and calculations

CEEI uses deforestation emissions estimated by the Canadian Forest Service (CFS) and Environment Canada for reporting of Canada's emissions. Satellite images from different years were compared and interpreted to determine whether deforestation had occurred.

The CFS chose areas (sample plots) to provide reasonable estimates within each terrestrial ecozone¹² across Canada. Deforestation rates from these sample plots have been extrapolated to other areas with similar characteristics to be able to estimate deforestation in each regional district.

The amount of greenhouse gas emissions from each hectare deforested was determined based on the general age, type and density of forest prior to deforestation (as mapped from the satellite imagery and aerial photographs) within each terrestrial ecozone. These calculations assume that all carbon contained in the forest above ground is released to the atmosphere either during or in the years following a deforestation 'event'.

Issues and accuracy limitations

As the mapping was completed to provide estimates at the provincial and national level, the very low sampling rate for most regional districts will mean that the estimates reported here are very uncertain. In the few cases where the sample plot network is poor for a regional district (e.g., due to budget and

¹¹ Crown closure is the proportion of tree canopy overlying the forest floor. '25% crown closure' implies that 1/4 of the ground surface area has tree growth above it.

¹² Terrestrial Ecozones are a Canada-wide ecosystem classification. B.C. contains three zones (see <http://www.ec.gc.ca/soer-ree/English/vignettes/Terrestrial/terr.cfm>). Terrestrial ecozones are on a similar scale to B.C. Ecodomains in the 'Ecoregions of British Columbia' series.

time constraints), relevant deforestation rates from other regional districts were extrapolated to those with similar characteristics.

In addition, as the estimates are extrapolated to 2006 from interpretations of 1990 and 2000 satellite imagery and aerial photographs, deforestation rates may have decreased or increased since that time (e.g., preliminary analysis of new data indicates the 2000-2006 agricultural deforestation rate may be lower than the 1990-2000 deforestation rates).

For these reasons, the reported deforestation areas should be viewed as preliminary data provided for information rather than decision-making or comparison purposes. To reduce temporal uncertainty the Canadian Forest Service and British Columbia are currently updating the sample plot mapping to add deforestation events for the 2000-2006 time period. Options to reduce uncertainty at the scale of a municipality are also currently being explored.

Data sources

- Canadian Forest Service (http://carbon.cfs.nrcan.gc.ca/TrackingLandUse_e.html; and http://carbon.cfs.nrcan.gc.ca/deforestation_e.html) and Environment Canada.

Suggestions for Using the 2007 CEEI Reports

A Recognized Inventory

The draft 2007 CEEI Reports fulfill one of three voluntary commitments most B.C. local governments have made under the *Climate Action Charter*¹³: “measuring and reporting on their community’s GHG emissions profile”. In and of themselves, CEEI Reports will become an important monitoring tool, informing communities of their level of success in implementing energy conservation and greenhouse gas reduction actions. As an additional benefit, B.C. local governments can use their draft 2007 CEEI Report and an accompanying ‘forecast’ as recognition for Milestone One of the community stream of the Federation of Canadian Municipalities’ (FCM) Partners for Climate Protection (PCP) program.

Forecasting

The PCP program requires a “Business As Usual” (BAU) forecast of future energy consumption and emissions. Future forecasts are notoriously unreliable and typically do not take into account changes in technology or land-use. Whereas this level of forecasting is generally not considered accurate, a forecast can otherwise provide an informative picture of the future based on the observed trends and should energy consumption and waste generation continue unabated. Although simplistic, forecasts are often extrapolated at the rate of projected population growth. Other extrapolations are possible depending upon the type and quality of trend data local governments have available to them (e.g., commercial buildings can be extrapolated at the rate of anticipated economic growth).

Target-setting

Local governments are encouraged by the Province to approach target setting on a number of levels. First, it is important to set an overall “visionary target” or community goal. It is then useful to think about setting targets related to actions in different sectors of the community. The development of action-oriented targets related to secondary indicators (see below) will be critical to effectively measuring progress in each sector.

A target sets a goal for the community and encourages the development and alignment of a set of progressive policies and initiatives aimed at achieving the target. A target makes a statement about a community’s commitment to addressing climate change and other community objectives. Provincial legislation now requires all local governments to include GHG reduction targets, policies and actions in OCP’s and RGS’s by 2010 and 2011, respectively.

The Province recommends local governments set bold and aggressive targets consistent with the provincial targets of 33% reduction in province-wide GHG emissions by 2020 and 80% by 2050 (2007 baseline). Whether a community chooses to mirror the provincial targets or identify other targets, the broad community targets should inspire strong action particularly in areas that are within local government jurisdiction.

¹³ The *Climate Action Charter* can be found at http://www.cd.gov.bc.ca/ministry/docs/climate_action_charter.pdf. The *Charter* acknowledges the shared goals of the Province of British Columbia, the Union of BC Municipalities and signatory Local Governments, and the collaborative effort required between all parties to reduce greenhouse gas emissions.

Though most communities may set a single target, usually an overall GHG reduction target, it is helpful to include an overall energy reduction target as well. Though electricity in B.C. is mostly generated from hydroelectricity, which has minimal GHG emissions, such an energy target would ensure that the community is working assertively towards energy efficiency, energy security and reduced energy costs, while also mitigating greenhouse gas emissions.

Secondary or ‘Influence’ Indicators

Secondary indicators represent actions that directly influence energy consumption or GHG emissions, and can be useful in assessing progress in those areas. Secondary or ‘influence’ indicators represent actions that local governments have under their control, or in partnership with others, and help to inform community decision makers by providing a more complete, detailed picture, in tandem with the higher level CEEI Reports, of energy consumption and greenhouse gas emissions in each of the major sectors. Examples include kilometres of bike lanes or trails, transit ridership, residential building density, renewable energy generation, solid waste recycling, etc.

Target Periods

It is important for a plan to include both long-term and short-term targets. Longer-term targets (e.g., to 2020 or 2050) reflect the overall vision, while short-term target(s) (e.g., to 2012 or 2016) can build momentum and more definitive steps toward the longer term vision. If aligning with recognized standards, the date for achieving the target is usually set (e.g., 2020 for B.C. Government targets). Alternatively, a community may choose to meet an established target, but by a different date, or to set a variety of unique targets and dates. Interim targets can be important in assessing progress, particularly if they align with recognized standards (e.g., 2012 and 2016 for B.C. Government interim targets).

Developing Action Plans

The CEEI Reports can broadly guide communities in determining which actions to pursue in reducing energy and GHG emissions. Target-setting can be a very informative exercise for any community. A prioritized listing of energy conserving, greenhouse gas reducing actions that identifies which actions will be undertaken when can comprise the core of any community action plan. See the CEEP guide for more information <http://www.toolkit.bc.ca/ceei>).

The *Climate Action Toolkit* is a web-based tool – <http://www.toolkit.bc.ca> – designed to assist BC local governments to take actions on conserving energy, developing renewable energy options, and reducing GHG emissions. The growing list of community-wide actions can be found at <http://www.toolkit.bc.ca/taking-action/community-wide>. In determining community priorities for action, an essential part of a good action planning framework is a situational analysis - <http://www.toolkit.bc.ca/community-wide-situational-analysis>.

Monitoring

In subsequent years, annual CEEI reports will allow communities to monitor the progress they are making in reducing energy consumption and GHG emissions. Comparisons will also be able to be made with other jurisdictions, but should always be undertaken with caution, and with comparative benchmark indicators that enable more rational alignments (e.g., accounting for variables such as population size, geographical conditions and municipal area). However, it should be recognized that community emissions will fluctuate from year to year due to factors such as weather and the economy.

It may take several years before action on climate change will result in sufficient reductions to be noticeable for some communities. In addition, some sector data is not yet sufficiently accurate to capture reductions occurring within a given community. In future, as the pace of reductions grows and accuracy increases, CEEI will become an invaluable monitoring tool for local governments.

Conclusion

In addition to this draft 2007 CEEI Reports *User Guide*, a *2007 CEEI Technical Methods & Guidance* document is being produced, providing greater technical detail on the data sources and methodologies used in developing the draft 2007 CEEI Reports. Emerging protocols for voluntary reporting requirements for local government energy and greenhouse gas emissions inventories are anticipated to become more rigorous and, therefore, the information provided through future CEEI reports may include sectors not customarily reported on by local government. For 2008 Reports, the CEEI Working Group will be exploring what other sectors should be included, and to what extent additional detail (e.g., breaking out the types of residential buildings, or finer detail of vehicle classes) can be provided. Input from Regional Districts and member municipalities province-wide will be an invaluable component of determining the 2008 CEEI Reports over the first six months of 2009.

The document *Community Energy and Emissions Planning: A guide for local governments* (www.toolkit.bc.ca/ceei) provides present context for local government community inventories (CEEIs), to develop emission targets and action plans, to implement relevant policies and actions, and to monitor success. The Province, in partnership with BC Hydro, are developing a series of workshops from May through September 2009 to engage with local governments on how to most effectively develop and implement GHG and energy reduction targets, policies and actions in their OCPs and RGSs. New tools for local governments to consider in developing community energy and emissions targets and action plans are also forthcoming.