Community Energy & Emissions Inventory (CEEI)

Secondary Indicators for Community Inventory Interpretation

Final Project Report

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SUMMARY

Context

The Province has set a target to reduce provincial greenhouse gas (GHG) emissions by 33% by 2020 from 2007 levels. Local governments will play a role in meeting this target as they have some influence over energy consumption and greenhouse gas emissions through their municipal mandates.

Many communities have developed energy and GHG emission reduction plans in B.C. and are moving forward with implementation initiatives. An important component of these plans is measuring the current state of energy consumption and GHG emissions, and tracking the community's progress over time. As well, over 100 communities in B.C. have signed the Climate Action Charter – indicating their commitment to undertake the measurement of GHG emissions.

The Ministry of Environment retained The Sheltair Group on behalf of the Community Energy and Emissions Inventory (CEEI) Working Group to develop a set of secondary (i.e. influence indicators) for the Community Energy and Emissions Inventory.

The CEEI Initiative

The Province is developing a data storage and reporting system (the "Community Energy and Emissions Inventory" - CEEI) to support local governments with their commitments. This will provide data to communities for understanding the magnitude of their consumption and emissions. The initiative is intended to provide all B.C. local and regional governments with inventory baselines, ongoing monitoring and periodic reports to help inform community decision making and support provincial objectives. Reporting will be conducted for each local government in B.C, with data collection and dissemination by the Province.

Along with this inventory data 'clearinghouse', there is a desire for supporting indicators that can help communities to interpret the data, as well as to monitor progress on implementation measures that lead to the longer-term reductions in GHG emissions.

The CEEI Initiative is being led by the Ministry of Environment through a Working Group with representation from several provincial ministries, the Union of B.C. Municipalities, local governments and agencies, and the B.C. Community Energy Association.

Another related provincial initiative is the Green Communities Rating system. This initiative, which is in the early stages of development, aims to provide local governments with the capacity building, performance feedback and incentives needed to advance local sustainability with an early focus on GHG management.

Scope

The scope of the project is focused on the identification of a proposed set of secondary (or influence) indicators at the community level.

- Outcome indicators are defined as indicators that directly measure energy use and greenhouse gas emissions. This is the final outcome that is trying to be addressed.

- Secondary or influence indicators are quantitative characteristics of the community that have an influence on the outcome indicators. Typically they represent the actions that can help lead to the outcomes.

Project Objectives

Specific objectives of the project are to:

- Identify practical secondary indicators to support the CEEI sectors – land use, transportation, buildings, and solid waste - to provide indicators for monitoring the effectiveness of local government policy changes;

- Review currently used community-based indicators focused on energy and GHG emissions including those established for regional growth strategies and community energy plans as well as identify suitable benchmarks appropriate to the local government in B.C. energy and emissions reduction context; and,

- Define those indicators for which targets may be suitable and are also within the control or sphere of influence of local governments.

Indicators

An indicator is a measure that reveals a condition, a trend, from quantifiable data collection. Its purpose is to reveal the direction the community is moving in. As a tool, an indicator provides an opportunity to identify and address areas that may affect energy consumption and GHG reductions. Communication of indicators and trends can help decision makers, including government, business, non profit organizations, and residents, see where changes are needed and desired.

Indicators provide feedback on how the community is doing, although feedback by itself does not facilitate change – it only indicates past performance. However, it does enable the community to learn and "correct its course" by modifying its actions going forward. Indicators are useful for basic information provision but do not explain the workings of a system or the reasons for a particular trend. Indicators should be supplemented by other observations, studies, survey research and more detail assessment and analysis.

Indicator Organizing Framework

A number of system sectors were used as the organizing framework for the indicators, including land use, buildings, transportation, and solid waste. A variety of relevant indicator data sets were reviewed, including indicators used in municipal jurisdictions including regional growth monitoring programs.

The review compiled the researched indicators into a matrix for comparison, including identifying indicator pros and cons which were used to help short-list indicators. The proposed indicators are based on readily available information but may require information beyond the data the CEEI inventory provides, such as density, transit supply, and construction of energy-efficient buildings. An important consideration in indicator selection is the accuracy, stability and comparability of indicators over time and

between communities. The long list of indicators is organized into two categories: recommended and for future consideration.

- Recommended indicators are those that meet the selection criteria and can be calculated with currently collected information.

- Indicators for future considerations are those that may provide a meaningful measure however data are not currently available or accessible. When this data becomes available - potentially requiring new data collection - these indicators would be recommended.

Selection Process

The long list of CEEI indicators consisted of energy and GHG outcome indicators, as well as influence indicators. For the purpose of a CEEI community indicator report, it is proposed that both types of indicators be included.

Using the sectors as an organizing framework, a long list of indicators was developed. The list was refined, initially by the consultant team, using the criteria that an ideal indicator would be:

- Within the influence of local government

- Meaningful

- Measurable and data are available (or could be developed if the indicator is very important)

- Easily and affordably measured

- Easily understood by a broad range of readers and audiences

- Comparable to indicators used by other municipalities or by regional districts and other agencies

The list was reviewed at two workshops held in March 2008 – one in Vancouver and the other in Victoria attended by CEEI Working Group members, and representatives of local government and several non-governmental organizations. Based on the feedback received, the list was further refined.

Proposed CEEI Monitoring Indicators

The proposed indicator set consists of 19 true secondary indicators and 4 "interpretive" indicators - typically per capita values based on the outcome indicators. Several other indicators and categories were listed for "future consideration." Through the workshops, the desire for additional indicators was expressed. These are documented in the report for possible development in the future but not for the basic CEEI reporting as many of these are currently incalculable except perhaps on a special study basis.

In addition to the key indicator sectors, there are a number of additional categories that are proposed. It is recommended that context indicators be included to track factors that may have an impact on energy consumption and GHG emission (e.g. energy prices) but are entirely outside the sphere of influence of local government, or are simply descriptive of the community(e.g. population). For the purpose of the CEEI reporting, it is proposed that agricultural indicators not be included as this is more appropriate to report at the provincial or regional level.

An important consideration in using GHG emissions indicators to track progress is the level of control that local governments have over the factors influencing the indicator. This can be envisioned as "spheres of influence". The municipal government has a limited influence on energy use and many factors may affect consumption.

Monitoring Performance

Setting targets for indicators provides a way of determining progress from a baseline year. Local governments will soon be required to set GHG emissions targets in their OCP documents. Monitoring progress through the annual CEEI indicator reports can help local governments set their own targets and determine if they are on track to meeting them. To ensure consistency in the development of targets, it is useful to define a set of criteria to select and set targets. In this case, the SMART approach is suggested. A "SMART" target is Specific, Measurable, Achievable, Realistic, and Time-bound.

Given that most local governments will be fixed on defining GHG reduction targets for their OCPS, as per the recently enacted Bill 27, no requirements for target setting with CEEI indicators is recommended. However, if a local government wished to, they could set their own targets, and certainly target setting should be done by individual local governments based on the indicators that best describe their community.

Implementation and Reporting

Establishing data standards, specifications and protocols is critical to ensure that the data is of the highest quality and calculated and portrayed in an accurate manner. For the energy and GHG emission indicators, the Province is working with several consultants in developing standards and protocols that are consistent with national protocols.

An important first step in establishing a monitoring and reporting program is the collection, tabulation and archiving of baseline data for each indicator. The baseline year for the Community Energy and Emissions Inventory is 2007. For some of the indicators that are based on Statistics Canada Census data, 2006 is used as the baseline year.

Benchmarking is another tool for measuring progress or comparing against another similar jurisdiction. It can be used to provide feedback about what is achievable and to highlight the 'realm of possibilities'. Individual communities should each determine for themselves which jurisdictions are most similar and therefore comparable, based on the criteria below.

Some of the criteria for selecting benchmarks include:

- Comparable data is available for the benchmark jurisdiction.
- The community or region is of a similar population size.
- The community or region is of a similar climate.
- The community is of a similar type (e.g. urban, suburban, rural, resource, resort, etc.)
- The benchmark is an area with a similar settlement pattern with a similar economic structure.

One of the key aspects of the CEEI is to provide B.C. local governments with inventory baselines, ongoing monitoring and periodic reports to help inform community decision making and support provincial objectives. It is anticipated that the Province will produce a CEEI report for each municipality and regional district in B.C. The reports would be based on a standard template, approximately four to six pages in length. A mock up of a sample report is included in this report.

Recommendations

The following are recommendations for refining and finalizing the set of indicators and moving towards developing a first set of CEEI reports for each community in B.C.

1. Review the energy and GHG emission data that will be included in the CEEI reports and refine the energy and GHG emission outcome indicators so that they are consistent.

2. Develop a template for the four to six page CEEI indicator reports. A mock-up has been included in this report that can be used to provide ideas regarding layout of data and content.

3. Using the template, prepare indicator reports for between three to six communities that represent different community types (e.g. urban, suburban, rural, resource, resort municipality, small vs. Large population)

4. Customize the templates for each community typology (e.g. different limitations, data caveats, eliminate transit indicators for communities without public transit, etc.)

5. Develop the metadata (i.e. descriptive information about the data) for each indicator and prepare a technical report to document data quality and consistency.

6. Work with those selected communities for piloting the template and CEEI report, as well various committees to review the sample report and refine it based on their feedback (the CEEI Working Group, local government technical committees and representatives, UBCM, Fraser Basin Council, and non-governmental organizations)

7. Evaluate timelines and activities required to collect baseline and historical data and provide estimates for time to track this data in the future, including resource requirements.

8. For those transportation and land use indicators requiring long lead times (e.g. requiring a custom census data order from Statistics Canada), work with local government representatives, BC Transit, TransLink, and the CEEI Working Group to review technical issues and specifications (e.g. buffer width around bus stop or transit corridors and determine the transit frequencies to use). Obtain cost estimates from Statistics Canada and determine budget and timing to order data and coordinate GIS work.

9. Develop an automated system for generating the CEEI reports for the communities (as a spreadsheet and/or GIS)

10. Prepare the first set of CEEI reports using 2007 energy and GHG data, 2006 Census data and data of the most recent year for all other indicators.

11. Review the indicators for future consideration with relevant organizations (e.g. ICBC) and identify how the Province could support this and have systems put in place for future tracking.

By regularly reporting on the CEEI indicators, local governments and their partner agencies will be able to determine their effectiveness in taking action to meet their identified energy and GHG targets and to identify steps to refine and implement their action plans based on this feedback.

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1 INTRODUCTION

1.1 Background

The Province has set a target to reduce greenhouse gas (GHG) emissions by 33% by 2020 from 2007 levels. Local governments will need to play a significant role in meeting this target as they exert considerable influence over energy consumption and generation of greenhouse gas (GHG) emissions through exercising their mandates. An initial calculation conducted by the Province estimates that in 2005 approximately 43% of total provincial GHG emissions are subject to some form of control or influence by local governments[1].

Many local governments in B.C. have already developed Local Action Plans or Community Energy Plans and are moving forward with reducing energy consumption and reducing GHG emissions in their communities. With recent legislation passed by the Province, communities will be required to incorporate energy and greenhouse gas emissions targets and policies into their official community plans and regional growth strategies.

An important component of any Community Energy Plan or greenhouse gas Local Action Plan will be the measurement and monitoring of the current state of each community and the progress over time relative to a baseline. In fact, over 100 communities in B.C. have signed on to the Climate Action Charter, which includes a commitment to undertake measurement of GHG emissions.

The Province is supporting local governments through providing key services such as monitoring energy and GHG emissions for each community. Through the Community Energy and Emissions Inventory (CEEI) Initiative, the Province is providing B.C.'s local governments with energy and GHG emission inventory baselines, ongoing monitoring and periodic reports to help inform community decision making and support provincial objectives.

The Province is developing a set of common indicators that are calculated for each community focused on energy and GHG emissions, or has a significant influence over energy and GHG emissions. The advantage of the Province coordinating the development of a set of indicators and reporting regular for each community includes:

- A common set of indicators are calculated and reported for each community
- A common set of methods, standards and protocols are used to ensure consistency and comparability of data;
- Conducting monitoring and reporting of indicators through a centralized agency is more efficient, reliable, and cost-effective than if conducted through individual communities; and,

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[1] Source: Ministry of Environment, unpublished data. Based on data from Environment Canada's 2005 National Inventory Report.

- There is no or minimal cost to local government for monitoring and reporting on energy and GHG emissions.

In December 2007, the Ministry of Environment retained The Sheltair Group on behalf of the CEEI Working Group to develop a set of indicators for the Community Energy and Emissions Inventory.

1.2   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 Ministry of Environment. The Working Group includes representation from several ministries, local governments and agencies (including regional district and transit agencies), and the BC Community Energy Association. 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 B.C. local governments with inventory baselines, ongoing monitoring and periodic reports to help inform community decision making and support provincial objectives."[2]

Specific objectives of the CEEI project are to:

- Provide all B.C. local governments with a community-wide inventory with which to consider future energy consumption and greenhouse gas emission reduction targets and related community-wide reduction actions;

- Support many of the present and future B.C. 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; and,

- Provide the Provincial Government, and other agreed-to users, with information on local government contributions towards reducing energy consumption and GHG emissions, both as individual jurisdictions and in province-wide summaries.

Reporting of energy and GHG emissions will be conducted for each community. The reports must meet agreed-to standards, be reproducible across communities and time, and be available to B.C. local and provincial governments and other agencies in a user-friendly and transparent format.

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

1.3   Green Communities Rating System

A related provincial initiative is the Green Communities Rating System. The Green Communities Rating System aims to provide local governments with some of the capacity building, performance feedback and incentives needed to advance local sustainability. While initially the intent of the Green Communities Rating System is to reward local government corporate and community GHG emission and energy reduction activities and performance, the system will have the flexibility to extend to other community sectors. It is anticipated that the GHG emissions and energy data provided by the CEEI will be used in the Green Communities Rating System. In addition to its utility for the CEEI initiative, this CEEI Indicators report is intended to provide information that will be useful for the future development of the Green Communities Rating System. The Green Communities Rating System includes corporate emissions and has policy and funding implications, all of which are outside the scope of this project and report.

1.4   Project Objectives

This project was initiated to review and propose 'secondary' or influence indicators of progress related to energy and GHG emissions at the community level.

Specific objectives of the project are to:

- Identify practical indicators to support the CEEI sectors – land use, transportation, buildings, solid waste, and agriculture – to provide local and provincial government representatives with enhanced indicators for monitoring the effectiveness of local government policy changes;

- Review currently used community-based indicators focused on energy and GHG emissions including those established for regional growth strategies and community energy plans, as well as identify suitable benchmarks appropriate to the local government in BC energy and GHG emissions reduction context; and

- Define those indicators for which targets may be suitable and are also within the control or sphere of influence of local governments.

1.5   Scope

The scope of the project is focused on the identification of a set of secondary indicators that can be compiled along with the CEEI energy and GHG inventories. Secondary indicators might also be called influence or driver indicators (see Figure 1).

As shown schematically in Figure 1, the types of indicators are:

- Outcome indicators: For the purpose of this report, outcome indicators are indicators that directly measure energy use or greenhouse gas emissions.

- Influence indicators (or secondary indicators), or intermediate indicators, are quantitative characteristics of the community that have an influence on the outcome indicators. These community characteristics are a result of community actions that have been completed, in the past or currently, that are expected to have an effect on that community's energy and GHG emissions.

The CEEI initiative is already working to define the Primary outcome indicators and has developed a number of pilot test and prototype reports.

The intent of the influence indicators is to help communities interpret the energy and GHG outcome indicators, including opportunities to influence the trends for the outcome indicators. This project is to create a starting point for discussion, consultation, prototyping, and pilot testing.

This project is focused on community-wide indicators, at the municipal and regional district level. Activities that are not included in this work are:

- First Nation communities located on Indian Reserves - though there may be situations where their utility data are captured within a data extract.

- Corporate indicators of municipal or regional district operations. The energy consumption of these operations is not broken out from the community total. Note that corporate operations energy use and GHG emissions is typically a fraction of the community total (from 0.1% to 0.5%). No specific secondary indicators related to corporate operations are included.

- Air, rail, and marine transportation (either passenger travel or for goods transportation).
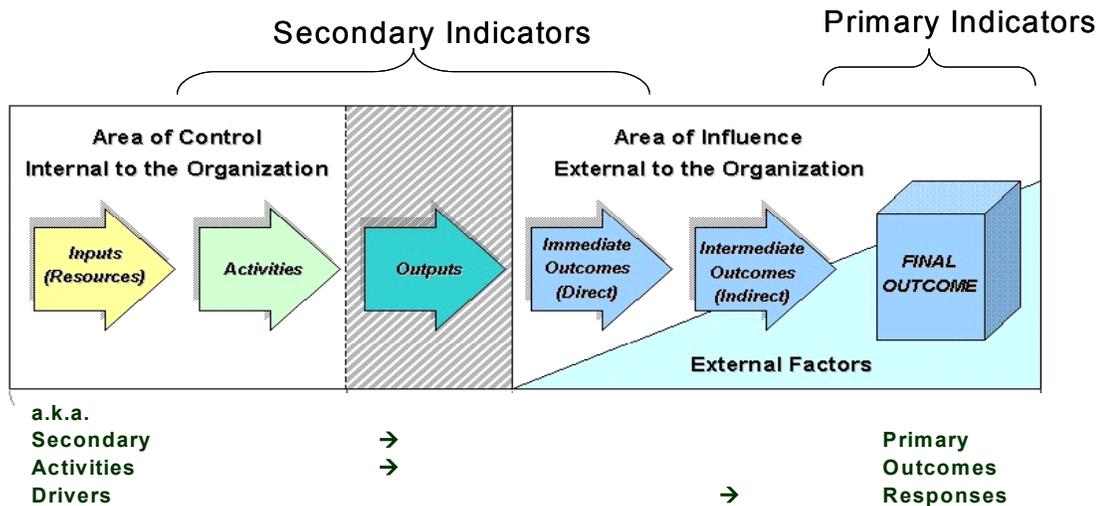
Figure 1: Relationship between Inputs, Outputs, and Outcomes

The activities of the local government are the inputs (e.g. planning, program development) and these have certain outputs (e.g. green buildings, community participation). These

outputs, combined with the impact of a range of external factors determine the final outcome (e.g. energy consumption, GHG emissions).

1.6   Project Process

The project was conducted over a three-month period from late December 2007 to the end of March 2008.

The work was conducted in tandem with a number of other related CEEI projects led by other consulting firms, including a scan of B.C. community energy and emission inventory practices to-date, a brief review of similar inventory practices and protocols in other jurisdictions, a 'user needs' survey of B.C. local governments concerning energy and greenhouse gas emissions information, 'data requirements' and 'system needs' reports towards establishing a provincially-sponsored community energy and emissions inventory system, and a report that explores a 'green rating system' for B.C. communities.

For this project, a series of two workshops were conducted (one in Victoria and the other in Vancouver) with representatives from the CEEI Working Group, other provincial representatives, local government staff, and non-governmental organizations. The purpose of the workshops was to review a draft set of CEEI indicators.   Additional detail on the process is described in Section 3.

1.7   Definitions

The following are a set of terms that are used in this report, and definitions to provide clarity for the reader.

Indicator   A quantitative measure of the state or condition of an area that reveals a condition, trend or emerging issue over time.

Outcome Indicator   An indicator that directly measures energy use and greenhouse gas emissions. Example: GHG emissions per year, GHG emission, per residence.

Influence Indicator Also known as intermediate indicators, these are quantitative characteristics of the community that have an influence on the outcome indicators (i.e. energy and GHG emissions). Examples include: transit passenger trips per year, portion of new dwellings built to green standards, length of bicycle facilities constructed, number of persons accessing an energy conservation or efficiency incentive program per year, etc.

Context Indicators Important indicators that provide context for the other indicators, but in themselves are fully outside the sphere of influence of local government. Example: Population, energy prices and the carbon intensity of electricity.

2 INDICATORS AND REPORTING GEOGRAPHIES

2.1 Indicators and their Importance in Monitoring

An indicator is a measure that reveals a condition, a trend, or an emerging issue through quantification of some condition of the environment. In this context, indicators are desired to reveal the direction the community is moving in. More specifically, indicators can show if the community is moving towards meeting GHG reduction goals or away from them. Indicators are tools that help track changes over time and are a yardstick for measuring future change relative to a baseline.

Indicators also provide an opportunity to identify and address policy gaps, shortfalls in implementation, or trends that may affect energy and GHG reductions. The communication of indicators and trends help decision makers, businesses, and residents to see where changes are needed and desired.

Monitoring is a critical activity as it shows changes over time and identifies things that are working (what we should celebrate and protect), and areas where we are not making progress (where we need to direct more resources). Indicators provide feedback on how the community is doing through ongoing monitoring and feedback. Feedback in itself does not facilitate change as it merely indicates past performance. Learning from the feedback is required to allow the community to "correct its course" by modifying and adjusting its actions as it goes forward.

> **"What gets measured tends to get done. If you don't measure results, you can't tell success from failure. If you can't recognize success, you can't reward it. If you can't recognize failure, you can't learn from it."**
>
> David Osborne and Ted Graebler (Reinventing Government, 1992) suggesting why indicators are important for making progress.

2.2 Local Government's Spheres of Influence

A key consideration to local governments for using indicators of GHG emissions is that communities do not have control over all the factors that are required to achieve the desired result of reduced GHG emissions. This can be envisioned as 'spheres of influence' (see Figure 2) in which the local government has the greatest influence over its own corporate activities, some influence over the community activities through its planning and land use authority, and almost no influence over broader systems such as energy supply or market forces. [Note that this project is not addressing corporate energy consumption and emissions].

If all community energy and GHG emissions were completely within the local government's control, then a set of outcome indicators alone could be used to define the progress of local governments towards action.

Since there are a range of activities and influences that the local governments cannot control (e.g. Figure 1), then a set of secondary indicators can be used to help measure progress towards getting the right outputs which will result (we assume/believe/know/or hope) in an improvement in the outcome indicator.
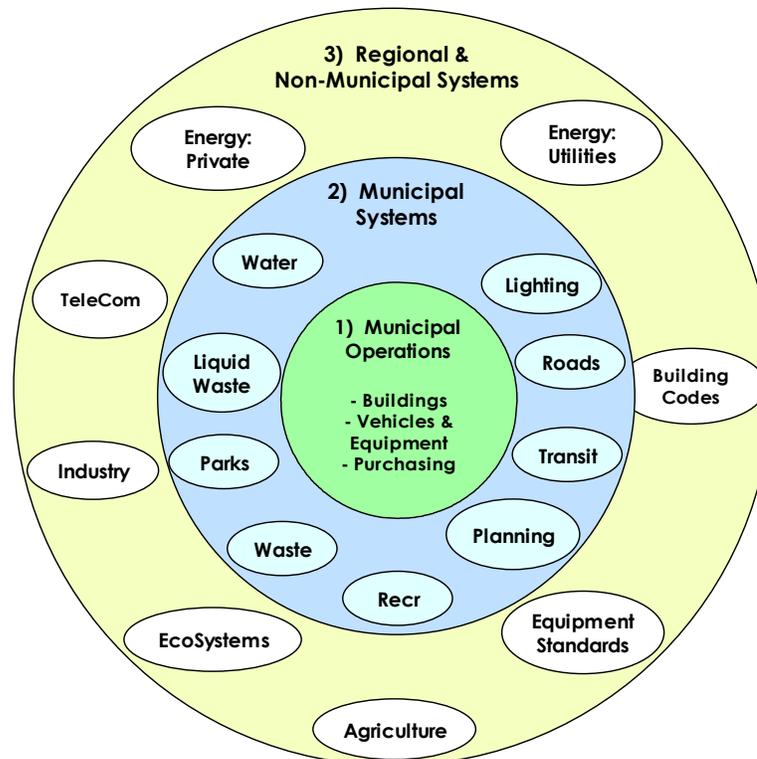
Figure 2: Municipal Spheres of Influence

2.3   Reporting Geographies

There are various reporting geographies that are used in the proposed monitoring program. The specific geographic area to use for reporting the indicator results depends on the nature of the indicator and data sources. The CEEI indicators are intended to be reported at the municipal level and the regional district level. There are currently 28 regional districts in B.C. covering the entire Province. In 2007, there were 153 municipalities. Some indicators, such as ones that provide per capita or percentage results, will be reported at the provincial scale and used for general comparative purposes - or possibly at the regional level.

2.4   Baseline Year and Reporting Years

The baseline year for the CEEI Initiative is 2007. The Province has set this as the baseline year for measuring change in GHG emissions.   As much as possible, this would be a desired year.

However, for other indicators that rely on Statistics Canada Census data, 2006 is used as the baseline year. This includes indicators concerning land use, modal share for commuting, commuter trip distance, and the percentage of dwellings and occupied jobs located within a certain proximity of a transit route with quality and frequent service.

While not explored here, there should be the opportunity for communities to reference historic data on a voluntary basis when the establishment of a data base is defined. This could be useful for establishing long term trends quickly where the data is available, or for acknowledging early efforts that have made significant improvements prior to the 2007 baseline year.

2.5   The Limitations of Indicators

There are limitations to the use of indicators. A community or region comprises many subsystems with complex relationships and interdependencies. Indicators can only show one thing within an individual system and therefore are simplified. They do not explain the workings of a system, causality or the reasons for a particular condition or trend. Many of the indicators are too crude to capture any type of site-specific condition or qualitative condition. They also rely on "after-the-fact" information. As such, they are useful for basic information provision, but should be supplemented by observation, studies, survey research, and more detailed assessment and analysis.

3 CEEI MONITORING INDICATORS

The proposed set of CEEI secondary indicators focuses on the influence indicators. The intent has been to focus on the secondary indicators, though some of the measures derive from the outcome indicators.

Currently, HES Ltd is conducting a data need's report. This will document the data needs to define the outcome indicators.

3.1 Influence Indicator Review Process

The influence indicators are non-energy and GHG indicators and therefore come from a wide array of data sources. An indicator review and screening process was used to identify these indicators as described below.

Review of Energy and GHG-related Indicators Used by Local Governments

Using the sectors as an organizing framework (land use, buildings, transportation, solid waste, and agriculture), a long list of indicators was developed. A variety of relevant indicator data sets were reviewed, including indicators used in municipal jurisdictions such as regional growth strategy monitoring programs (e.g., CRD, Metro Vancouver, Regional District of Nanaimo, and Portland Region's Land-use and Transportation Performance Measures), community energy plans, municipal indicator reporting, the cities^{PLUS} project, recent / current development projects (e.g. Dockside Green and South East False Creek), as well as broader indicator project that covered more than one community, including the Transportation Association of Canada's Urban Transportation Indicators project and the 2004 BC Sprawl Report (Smart Growth BC). A long list of indicators was compiled from these sources.

Develop Long List of CEEI Specific Indicators

Our process to develop the long list of CEEI indicators was as follows:

1. Reviewed the background reports to identify indicators.

2. Organized the indicators into sectors.

3. Conducted working sessions with members of the consultant team to identify and select indicators based on our professional judgement.

4. Developed a long list of indicators and an indicator selection matrix for selecting indicators, based on this review and the meetings.

The long list of indicators was organized into two categories: "Recommended and ""Future consideration".

- Recommended indicators are those that meet the selection criteria.
- Indicators for future considerations provide a meaningful measure, however, data are not currently available. When this data becomes available, these indicators will be recommended.

Refine Long List of Indicators

The long list of indicators was then shortlisted, initially by the consultant team. A set of selection criteria was used to work through the shortlisting process.

The set of selection criteria that was used to evaluate each indicator and for considering the addition of new indicators, including whether the indicator was:

- Within the influence of local government?
- Meaningful?
- Measurable and data are available (or could be developed if the indicator is very important)?
- Easily and affordably measured?
- Easily understood by a broad range of readers and audiences?
- Comparable to indicators used by other municipalities or by regional districts and agencies?
- Focused on ends rather than means?

The indicators are organized by each of the sectors. An indicator code was assigned to each indicator consisting of a code for the sector and a number. For example, the LU-1 is the indicator code for the first indicator in the Land Use sector.

Based on the review process, a short list for discussion at the workshops was developed.

Workshop Review

The short list of recommended indicators was reviewed at two workshops held in March 2008 in Victoria and Vancouver. Representatives of the CEEI working group and local government representatives, as well as a few people from non-governmental organizations and the academic community (see Acknowledgements section towards the front of the report for the list of participants) attended the workshops.

The key messages from the workshops were:

- Participants were generally supportive of the initiative and acknowledged that this it is a challenging exercise to select this list of indicators.

- The methodology of the inventory should be explained with appropriate caveats.

- Do not be limited by indicators that can be currently calculated based on existing data sources but rather define those that would be useful and indicate what data must be collected.

- Place less importance on the energy and GHG indicators for the purpose of reviewing the indicators at the workshop. Keep focused on the secondary indicators that can help the audience understand the data.

- Do not include sustainability indicators that are not directly related to energy and GHG emissions.

- Different indicators may be required – and different targets may be appropriate – for different community 'typologies' such as rural, suburban, urban, resource, resort, and large vs. small communities.

- Substantial uncertainty of what the implications of selecting indicators would mean for the Green Communities Rating System. Specifically, participants were reluctant to endorse or reject any specific indicator because of how it might be used in the Green Communities Rating System.

- Additional consultation beyond the two workshops is recommended and suggested that existing technical local government committees could provide feedback (e.g., Metro's Technical Advisory Committee or the CRD's Regional Development Planning Advisory Committee).

- Uncertainty and concern was expressed about how any particular indicator would be presented in the CEEI inventories, and how/whether it would help to clarify or explain the data presented.

- Is data downloadable and obtainable for subsequent processing and analysis?

- Desire for a balanced / complete set of indicators.

- Do communities get acknowledged for earlier GHG reductions – i.e. not just activities since the 2007 baseline year?

- Desire for some form of land use diversity indicator, while acknowledging that no commonly accepted ones exist.

- Local energy supply from renewable sources is an important indicator that should be included in the monitoring program.

Conclusions from the Indicator Compilation and Workshop Review

Our conclusions from the workshop are:

- A complete suite of influence indicators will require additional data input from local governments (possibly annually) – such as a joint CEEI and check-list survey (e.g., Green Communities Rating System). Note that we found that the Transportation Association of Canada's Urban Transportation Indicators survey is a good model for combining survey data with indicator data.

- The CEEI indicators and data should be framed as data and activity monitoring, and should be separated as much as possible from policy activities (e.g., funding).

- Not all desired indicators are currently calculable – revision to some data collection systems is required.

- The end product should be both a readable report (e.g. a PDF document of 2-4 pages) and a data summary (e.g., downloadable Excel spreadsheet) that is available on the Internet.

- Differences in the communities should be identified – for example, all the data may be collected for all communities, but at the outset, different data or subsets of the data would be shown for different community types (e.g., communities without public transit would not include public transit indicators).

- Trends should be apparent and not just comparing the "current year" to a baseline year.

- Trends over time within a community are more important than comparisons to other communities; however, inter-community comparisons are unavoidable once the data has been released.

- Municipalities should only be benchmarked against the region that it is located in and the B.C. average. Benchmarking should be limited in scope (small set of indicators) as it may distract from the intent of the influence indicators.

- The report should clearly indicate that year-to-year progress is being monitored and not comparative progress to other communities.

A comment has been received that inventories should have provisions for regional aggregation of data. This may be possible for the final outcome indicators in some situations. For most of the influence (secondary) indicators, conducting a roll up from the local governments to the regional level would not be possible.

3.2   Proposed Sectors to Include in CEEI Indicators Report

Based on our research and discussion, the following sectors are proposed to be included in the CEEI indicators:

- Land Use

- Buildings

- Transportation (road and public transit)

- Solid Waste

The following sectors, while certainly relevant to many components of community sustainability, are suggested as not appropriate for inclusion in the CEEI secondary indicators.

- Land Use / Land Cover Change (Afforestation and Deforestation),

- Selected industrial facilities and processes (e.g. large final emitters),

- Wastewater,

- Agriculture, and

- Other Transportation (marine, aviation, and rail).

These sectors and subsectors are more appropriate to report at the provincial level or by other agencies.

4 PROPOSED SECONDARY INDICATORS

Based on the literature review, indicator shortlisting process, and the two workshops, a proposed set of indicators has been developed.   These are presented here.

Several indicators are recommended for future consideration. The future indicators are those that cannot be currently estimated due to a gap in data collection, or where detailed input would be required from local government.

This section presents the indicators by sector. At the end of the section is the list of indicators for future consideration.

4.1   Context Indicators

Indicator	Measurement Units	Data Source	Update Frequency	Comments
CTX-1: Annual Energy Prices	Benchmark energy prices for: a) Natural gas: $/GJ b) Electricity: $/KWh c) Gasoline: $/L d) Fuel oil: $/L e) Propane: $/GJ	a. Terasen Gas – cost of gas per GJ (currently $11.002/GJ for the Lower Mainland and includes commodity, delivery, & midstream charges per GJ), does not include basic charge. b. BC Hydro – Electric Tariff Schedule 1101 rate, residential rate, currently $0.0655 per kWh, does not include basic charge, or other rate riders. c. Gasoline – no government-archived reliable data source available d. Fuel oil – see c. e. Propane – see c.	Annual	Use base residential rates (e.g. lower mainland) to maintain simplicity. No current accepted benchmark source for fuel oil, propane or gasoline at present. Utility energy has many different rate tariffs. Since the objective here is to provide an indication of longer term trends, residential rates are the most broadly familiar. Suggested not to make prices inflation adjusted but to keep in absolute terms. This could be revisited if required.

Indicator	Measurement Units	Data Source	Update Frequency	Comments
CTX-2: Carbon Intensity of electricity consumed in B.C.	tonnes CO_2e/GWh	BC Hydro	Annual	Measures progress towards provincial policy that all electricity will be GHG neutral by 2016. An indicator that affects all electricity-related GHG indicators. Expected that the Province (through, or in partnership with the Western Climate Initiative) will provide intensity data.
P-1: Total Population and Population Growth Rate	Population and % change (annually and since baseline year)	BC Stats (or Statistics Canada Census if only want to do every 5 years)	Annual	Indicator is for trends, and overall data is reasonably reliable. Some data discrepancies can occur, including: (i) undercounts in Census data (up to 2%), (ii) population for resort municipalities does not represent the 'burden' of visitors (e.g. could use a visitor adjusted population like Whistler does), and (iii) second home ownership in some communities (no population is attached to these but they consume energy), and (iv) (possibly) seasonal homes ands industries. If these issues are relevant to a community, then they should be noted when reporting all per capita indicators.

4.2 Land Use

Indicator	Measurement Units	Data Source	Update Frequency	Comments
LU-1: Residential Density in Urban Areas	Gross dwellings units / ha	Census of Population custom data order from Statistics Canada: Dwelling count by Block Face captured by defined urban areas (see comments) (requires preparation of a GIS polygons file of all the urban areas and then Block Face geocoding by Statistics Canada)	5-year	Calculate area excluding parks and protected areas, ALR, crown land, forests, unincorporated areas and electoral areas. Ideally would be calculated based on a spatial definition of the urban area provided by each municipality. Could also use the Census of Canada definition of "urban areas". An urban area has a minimum

Indicator	Measurement Units	Data Source	Update Frequency	Comments
				population concentration of 1,000 persons and a population density of at least 400 persons per square kilometre, based on the current census population count. All territory outside urban areas is classified as rural.
LU-2: Diversity of Housing Types	Simpson Diversity Index	Statistics Canada Census of Population	5-year	Simpson Diversity Index Score = 1- $\sum$ (n/N)^2 (higher is better from a diversity point of view), where

n=the total number of dwellings in a single category, and

N=the total number of dwellings in all categories.

Suggest using the Statistics Canada Census definition for the dwelling structural types (8 categories). Could also use categories based on B.C. Assessment Authority data (however there are issues regarding accurate counts in non-stratified buildings). See LEED New Development Prototype (June 1997) Indicator for Diversity of Housing Types for alternative typologies (there are 16 types used in the prototype LEED ND system). |
| LU-3: Median Commuter Trip Distance | Km.
Also track the standard distances from the Statistics Canada Census: Less than 5km, 5-9.9km, 10-14.9km, 15-19.9km, 20-24.9km, 25-29.9km, 30km and greater | Statistics Canada Census of Population | 5-year | Commuting only captures a portion of total trips. The distance is calculated as the straight-line distance between the residential block representative point and the workplace location representative point (source: Census of Canada). Crossing water boundaries is not factored into the trip distance calculation which is an issue for some communities, and underestimates the trip distance. |
| LU-4: Proximity of Dwelling Units to Transit Stops (or Routes) with Quality Transit Service | % of dwellings within 400m of a transit stop (or route) with quality transit service within specified period (e.g. PK Peak Period, or 15-hour during the Fall): | Census of Population custom data order from Statistics Canada – Dwelling Count file by Block Face captured by 400m around transit stops (or around transit routes). Requires providing Stats Canada with buffer file of custom area polygons and they will conduct the Block | 5-year | Transit not available in all communities. Level of service differs substantially between different communities.

Consult with TransLink and B.C. Transit on buffer distance to use (400m = ¼ mile and used in several indicator reports). However, TransLink has also been using 450m. Also consult |

Indicator	Measurement Units	Data Source	Update Frequency	Comments
	a) 10 minutes or better b) 15 minutes or better c) 20 minutes or better d) 30 minutes or better	Face geocoding. BC Transit TransLink		been using 450m. Also consult on the frequency of service (and over a specified time period) to use for the various community typologies.
LU-5: Proximity of Occupied Jobs to Transit Stops (or Routes) with Quality Transit Service	% of occupied jobs within 400m of a transit stop (or route) with quality transit service within specified period (e.g. PK Peak Period, or 15-hour during the Fall): a) 10 minutes or better b) 15 minutes or better c) 20 minutes or better d) 30 minutes or better	See LU-4 BC Transit TransLink	5-year	See comment for LU-4. Also note that requires aligning to the 2006 Road Network File (to coincide with the 2006 Census data) for both LU-4 and LU-5. Suggest obtaining modal split and place of work – place of residence data as well.

4.3   Buildings

Indicator	Measurement Units	Data Source	Update Frequency	Comments
B-1: New Energy Efficient Residential Units	Number of new units built annually Note: Energy efficiency to be defined against relevant energy standards (e.g. -BuiltGreen, R-2000, EnerGuide 80, LEED certified).	BC Home Builders Association Canadian Green Building Council Local Governments	Annual	Shows uptake rate of green building practices in the residential market. Provides a measure of action. Suggest not calculating as a % of total new dwellings as total new dwellings is not tracked in all municipalities and would be challenging to calculate annually for all communities.

Indicator	Measurement Units	Data Source	Update Frequency	Comments
B-2: New Energy Efficient Commercial/Institutional Buildings	a) number of new buildings built annually b) total new floor space built annually Note: "Energy efficient" means either LEED Certified or higher	Canada Green Building Council; Occupancy Permits from the Municipality, if available, if not available, use Building Permits, B.C. Assessment Authority data	Annual	Shows uptake rate of green building practices in the commercial market. Provides a measure of action.
B-3: Existing Home Energy Evaluations	Number of existing homes evaluated for EnerGuide rating through Federal EcoEnergy Initiative	EnerGuide data base at NRCan	Annual	Existing homes are a key area for reducing energy consumption and this indicator helps capture this. Note that while a home may be evaluated, this does not indicate that the homeowner has conducted energy retrofits (but this is more difficult to track)
B-4: Dwellings on Renewable Energy District Heating Systems	Number of dwellings on a district energy system with a renewable energy source (e.g. biomass) or geo-exchange.	Requires contacting providers of individual systems (e.g. district energy system providers), as there is no central reporting capability. The B.C. utilities commission will have data on regulated district energy systems, but there are a number that are self regulated (e.g. Lonsdale), or not regulated at all (e.g. Halcyon). Geoexchange B.C. might have some information for geo-exchange systems.	Annual	Related intent to LES-1. If data is available, would provide an indication of the uptake of a relatively new to B.C. technology. Solar Domestic hot water systems (single dwelling) may be tracked as the Provincial Climate Change Plan (June 2008) includes a 100,000 solar roofs initiative.

4.4   Transportation

Indicator	Measurement Units	Data Source	Update Frequency	Comments
T-1: Registered Passenger Vehicles Per Capita	Vehicles (break out by vehicle class)	ICBC	Annual	Breakdown by vehicle size/weight/efficiency class if data are available. Depending on the data

Indicator	Measurement Units	Data Source	Update Frequency	Comments
				archiving, it may be possible - though likely much more difficult to develop statistics such as "number of homes with more than 2,or 3 vehicles. This analysis might be problematic due to the issues like secondary suites etc.
T-2: Transit-seat kilometres	Transit-seat kilometres	BC Transit and TransLink	Annual	An indicator of transit supply.
T-3: Transit Ridership Per Capita	Transit ridership per capita or transit trips per capita	BC Transit and TransLink	Annual	An indicator of transit performance. Note that the transit service area may not correspond to the regional district boundary (e.g. for the CRD, the transit service area is smaller)
T-4: Commuting trips by mode of transportation: - Walking - Cycling - Public Transit -Driver -Passenger in Vehicle)	% of journey-to-work trips	Statistics Canada Census of Population, every five years	5-year	Excellent measure of transportation choices and performance. However, only covers commuting trips, not all trips. Data every 5 years since 1996.

4.5   Solid Waste (Municipal)

Indicator	Measurement Units	Data Source	Update Frequency	Comments
SW-1: Solid Waste Disposed Per Capita	Tonnes of total MSW (measured in tonnes) sent to disposal (landfill or waste to energy) /capita	May be calculated by municipality or region, depending on resources	Annual	Small communities may not have disposal data (e.g. resident drop off waste is often not measured) but could be estimated.

Indicator	Measurement Units	Data Source	Update Frequency	Comments
SW-2: Composting at Centralized Facilities	Tonnes of total organic material process in a composting facility	Regional Districts or operators of centralized composting facilities.	Annual	Would be impossible to measure backyard composting accurately. Measuring centralized facilities provides a simplified data source. The real measure desired would be "organics fraction indisposed waste ". This would require extensive waste composition analysis which is not commonly done - and in particular for dozens of municipalities.

4.6   Local Energy Supply

Indicator	Measurement Units	Data Source	Update Frequency	Comments
LES-1: Local and Self-sufficient Energy Supply	Metric to be determined (see comments).	To be determined IPPs BC Hydro	Annual	Desire was expressed for an indicator to identify and acknowledge local and self-sufficient initiatives in the community (e.g. micro-hydro, small scale hydro, run-of-the-river, biomass, district heating systems, solar panels, etc.) No quantification measure is currently able to be compiled, but it is recommended that a placeholder metric be included in the CEEI. Realistically this would be very tricky to define that would capture all the types of local energy supply. In the short term it might be possible that this simply be left as a text field (for example in a survey or web-based data collection) and that local governments could submit their actions and activities.

4.7   Interpretive and Per Capita Indicators

There is often a benefit to normalizing a metric to a per capita value in order to make the number understandable or for factoring in population growth. Per capita reductions may be achieved but population growth may be such that the total emissions increase. The atmosphere requires real absolute value reductions. In the area of GHG emissions, per capita values are often looked upon with suspicion.

Regardless, per capita indicators may still be informative to policy makers. Some potentially informative indicators are described here.

Indicator	Measurement Units	Data Source	Update Frequency	Comments
Int-1: Annual Energy Consumption Per Capita	GJ/capita	Outcome Indicator for annual energy consumption. Context indicator for population	Annual	Note that the sum of all local governments' data would not be equal to the provincial total.
Int-2: Annual GHG Emissions Per Capita	tonnes CO_2e/capita	Outcome Indicator for annual GHG emissions. Context indicator for population	Annual	Note that the sum of all local governments' data would not be equal to the provincial total.
Int-3: % Change in GHG emissions since baseline year	% change since baseline year (i.e. 2007)	Derived from above indicators	Annual	Provides comparison to the provincial target to reduce GHG emissions to 33% below 2007 levels by 2020. Providing a comparison to the population change provides the context to understand the change over time. The Province will also be adopting targets for 2012 and 2016 and a longer-term emissions reduction target for 2050 that can also be used for community comparisons. Note that some data only goes back to 2003 (natural gas) and electricity data goes back to 1995. This should not be an issue as the Provincial reduction targets are based on year 2007.
Int-4 Estimated Community Energy Expenditures Per Capita	Total $/year and $/capita/year	E-6a divided by population	Annual	See above

4.8   Indicators for Future Consideration

There are a number of indicators that were identified in the process that would useful but are not suitable at this time as an indicator or for the basic reporting, and instead should be reconsidered at some point in the future. The indicators for future consideration are those that cannot be currently estimated due to a gap in data collection, or where detailed input would be required from local government.

These indicators have a number of issues that result in them not being recommended in the basic CEEI reporting framework. For example, a data source for a certain indicator may not available, or the data does not cover all communities in B.C. Another issue is where custom GIS data would be required from the municipalities and regional districts, which may be difficult to obtain and has additional time and cost implications for the Province and local governments, as well as consistency with developing custom geographies. Lastly, an indicator may only be relevant to some communities, such as the agricultural indicators.

Note that it is not recommended to include the agriculture sector in the basic CEEI reporting. However, if the Province chooses to also report on agricultural for rural communities as supplemental reporting, a number of agricultural indicators could be considered for future consideration.

Table 3-2: Indicators for Future Consideration

Category	Indicator	Measurement Units	Potential Data Sources	Comments
Land Use	Employment Density and Percentage of Occupied Jobs located in Central Business District or Town Centres or Employment Centres in Transit-Accessible Locations	Occupied jobs/ha	Census of Population custom data order from Statistics Canada. Municipalities would be required to provide definition of these areas Custom area polygons would be sent to Stats Canada for block face geocoding	Measures how much of the employed labour force has a job located within the CBD or a Town Centre or an employment centre in a transit-accessible location. Requires municipalities to define these areas as a polygon coverage in GIS

Category	Indicator	Measurement Units	Potential Data Sources	Comments
Transportation	Annual Vehicle-kilometres Travelled for Passenger Vehicles	Total VKT and VKT/capita	ICBC	Transportation consumption is measured in one of three ways: (1) Traffic modeling: data is limited and available only for some areas. (2) Fuel sales data: Can be skewed and have incomplete coverage (3) Vehicle registrations: Currently based on 'estimated kms traveled annually'. This could be improved through recording individual vehicle odometer readings periodically. Some of this data is collected through AirCare, but not for all vehicles and not annually, and not all regions. Other regulated programs, such as distance-based vehicle insurance would provide a mechanism for tracking this.
	Length of infrastructure: cycling (lanes and multi-user pathways), HOV lane-kilometres (normalized by ratio to arterial roads)	km or lane-km	Survey of municipalities and regional districts	An indicator of infrastructure supply for cycling and HOVs.
Agriculture	Total GHG emissions from agriculture	tonnes CO_2e	Province	Not able to get this data at a smaller level of geography than the provincial scale. Would not be possible to calculate for municipalities and probably not at the regional district level either.
	Number of Livestock by type (cattle and calves, pigs, sheep and lamb, poultry, other)	Number of livestock	Statistics Canada Census of Agriculture	Source of methane production
	Amount of land where composted manure is incorporated into soil, by land use applied to	ha by type (manure applied to field crops, manure applied on hay and pasture, manure applied on other land)	Statistics Canada Census of Agriculture	Source of methane production. Manure management is critical. Only shows amount of land that manure has been applied to, not the management practices.
	Net Change in Land Area of Agricultural Land Reserve (since baseline year)	ha	Agricultural Land Commission	The ALR that is being excluded or included may not be used for agriculture or already used for agriculture. Not an indicator of actual agricultural production.
	Land in Agricultural production	ha	Statistics Canada Census	

4.9 Indicators for Consideration in Supplemental Studies or Tracking (not part of the core CEEI secondary indicators)

Through the workshops many desires for additional indicators were expressed. These are documented here for possible development in the future, but not for the basic CEEI reporting. Many of these indicators are currently incalculable except perhaps on a special study basis and so would not be suitable for tracking as an indicator trend. These include (in no specific order):

- Parking indicator

- Length of cycling facilities / alternative transportation infrastructure

- Energy use per unit floor space (commercial) - periodically evaluated through B.C. Hydro and Terasen Gas reviews. Issue with obtaining floor space data for some dwelling types from BC Assessment Authority

- Average floor space of residential units by dwelling type (average size of units getting larger). Note issue with obtaining floor space data for some dwelling types from BC Assessment Authority.

- Average fuel economy of vehicles (passenger).

- Normalizing building energy consumption for heating degree days. While weather does affect the heating requirements, the link between total energy consumption and heating degree-days is not precise as many other factors are included. To acknowledge this, it is recommended to be very careful with year-to-year changes and to only make conclusions from longer trends.

- Distance to landfills and associated transportation GHG emissions.

- Organic diversion effectiveness (e.g., capture rate). Since we cannot track backyard composting, indicator was defined as centralized composting. It was acknowledged that this only tracks part of the composted material.

- Landfill gas capture. This will be most likely measured provincially, not at the local community level, and new regulations may be coming forth to define more landfill gas capture.

4.10   Use of Targets

A target is a desired level of performance that is established in advance for a particular indicator to be achieved by a specified point in the future. Targets are a way of determining progress from a baseline year, in measurable terms. For example, the Province has set a target to reduce greenhouse gas (GHG) emissions by 33% by 2020 over 2007 levels.

Local governments will also be required to set targets as outlined by the Province. Measuring progress through the annual CEEI indicator reports can help answer whether the local government is on track to meeting its target(s) or not. However, the actual indicators and target levels are not stipulated by the Province and will require each local government to select its own indicators and associated target levels.

To ensure consistency in the development of targets for, it can be useful to define a set of criteria to select and set targets. A number of approaches can be used, however, the SMART approach has been used successfully in a number of regions.

A SMART target is:

- **Specific** – each target specifies a geographic area and focuses on elements within the local government sphere of influence.

- **Measurable** – the indicator associated with the target is quantitative and measurable to enable the measurement of progress over time.

- **Achievable** – each target is thought to be achievable within the specified timeframe based on the available or anticipated resources of the organisation and its partner agencies.

- **Realistic** – the target is based on a determination of what is thought to be realistic in comparison to other similar jurisdictions, or best performers.

- **Time-bound** – the target specifies a date by when the target is to be achieved.

The number of targets set by a local government should be limited to only a few indicators. Indicators for which targets are set should be:

- Able to be influenced by the local government;

- Measurable and have a reliable, replicable, and accurate data source, either an existing data source or one likely to be developed and available in the near future;

- Easy to understand by the public, elected officials, and staff; and,

- Comparable to data from other regions where appropriate.

For the next few years, local governments will be grappling with the issue of defining GHG reduction targets within their Official Community Plans as required by the recently enacted Bill 27. While the CEEI initiative can encourage target setting, from a practical level it should avoid setting targets beyond those defined by Bill 27.

5 IMPLEMENTING THE MONITORING PROGRAM AND REPORTING

5.1 An Evolutionary Process

Developing a set of secondary indicators will be a multi year process. Over time some indicators will be dropped and new ones added. As well even with a desired indicator, there are logistical issues in assembling the information. As one reviewer noted:

> " It can take five years to put a measuring system in place….a year to figure it out, a year to get it wrong, a year to get it right, and then two more years to get a reliable baseline."

All parties involved in the CEEI project, and this secondary indicators component especially should accept that there will be several years of work to properly define the good indicators, the data systems, and so forth.

5.2 Ensuring Data Quality

It is critical to establish protocols for the data to ensure the data is of the highest quality. A rigorous process is required for ensuring data are calculated and portrayed in an accurate manner. Also, it is necessary that the same data sources, definitions and processes are used each year to ensure that the data is consistent from year to year.

For all the indicators, it is recommended that metadata be developed. Metadata is descriptive information about the data and includes:

- Data definitions
- Descriptions of data sources
- Data limitations and caveats
- Contact information for obtaining the data
- Any issues or changes with the data series (if the definitions have changed or if a geographic area has changed, such as through an amalgamation or boundary expansion)

5.3   Baseline Data

An important first step in establishing a monitoring and reporting program is the collection, tabulation and archiving of baseline data for each indicator.

The baseline year for the Community Energy and Emissions Inventory is 2007. As some of the indicators are based on Census data, 2006 is used as the baseline year.

When the baseline data is collected, it is also recommended to obtain earlier data where available, as this may be desired for additional studies. For example, modal share data from the Census of Canada goes back in 5-year increments to 1996.

5.4   Benchmark Comparisons

A benchmark is a defined value of an indicator that can be used for measuring progress or comparing against another jurisdiction. Usually it is a value obtained from another jurisdiction or community, and is used for comparison purposes, to provide feedback about what it achievable, and to highlight the 'realm of possibilities'. This context is powerful because it makes the indicator meaningful and understandable by showing how the community is performing relative to its peer group.

Individual communities should each determine for themselves which jurisdictions are most similar and therefore comparable, based on the criteria below.

Selecting a Benchmark

It is important to select appropriate benchmarks when making comparisons. Some of the criteria for selecting benchmarks include:

- Comparable data is available for the benchmark jurisdiction.
- The community or region is of a similar population size.
- The community or region is of a similar climate.
- The community is of a similar type (e.g. urban, suburban, rural, resource, resort, etc.).
- The benchmark is an area with a similar settlement pattern with a similar economic structure.

Other data sources can also be used for benchmarking, so that benchmarking is not limited to only B.C.

- Indicators based on Census of Canada data (other than the transit proximity indicators which require custom data) allow benchmarking with similar communities across Canada.
- The Transportation Association of Canada's Urban Transportation Indicators project provides transportation supply and performance indicators for key metropolitan areas across Canada.

5.5   Aggregation

Aggregation is the roll-up of smaller scale data to a larger scale number. For example, the emissions from local governments can be summed to estimate the emissions of an entire region. Aggregation is expected to be extremely difficult (if not unworkable) for the CEEI outcome indicators. This is because the local governments do not encompass an entire region so some activity will be missed. It may be that in Metro Vancouver or the Capital Region a roll-up of total emissions might be possible. Aggregating the secondary indicators might be extremely difficult.

It is left as a note for future development that some comments expressed a desire for an aggregation capability.

5.6   Reporting

One of the key aspects of the CEEI is to provide B.C. local governments with inventory baselines, ongoing monitoring and periodic reports to help inform community decision making and support provincial objectives.

It is anticipated that the Province will produce a CEEI report for each municipality and regional district in B.C. The first report would cover the 2007 data year for energy and GHG emissions outcome indicators and data for 2006 or 2007 for the influence indicators (noting that 2006 data would be for all the indicators based on Census of Canada data.

It is envisioned that the reports would be based on a standard template and be approximately four to six pages in length. The report would include a summary and then data for each of the CEEI indicators.

In terms of the reports, it is recommended that a report and data clearinghouse be established by the Province.   For each community, the following would be available on the internet:

- A PDF version of the four to six page report, and

- A downloadable spreadsheet with the current and historical data as well as the metadata for each indicator. The spreadsheet would also include additional data that is not shown in the PDF report for some of the indicators (e.g. LU-2 and LU-3).

A mock-up of a sample four to six page report is shown in Appendix A. This is a working copy and the intent is to show the elements in the mock-up; this would need to be significantly refined and formatted before being suitable for the actual reporting. The mock-up shows how the influence indicators and energy and GHG outcome indicators could be combined in a format suitable for reporting for each municipality and regional district in B.C.

The mock-up has been developed for the fictitious community of the Town of Beautiful in the Regional District of Best Place, BC. The mock-up has been partially filled in for some indicators to give the reader a sense of the type of data that would be included on these sheets.

The mock-up contains:

- Descriptive information including the name of the community

- Description of the purpose and objectives of the Community Energy and Emissions Inventory Initiative

- Contact information (for whoever would be the custodian for the updates)

- Summary sheet, providing a most recent year snapshot of the energy, population, and GHG emissions for the community

- Pie charts of the GHG emissions by sector and fuel type for the community (outcome indicators - possibly not in the form they will eventually be compiled.)

- A two-page indicator sheet that has the indicators organized by sector, showing data from 2006 / 2007 to the most recent data year for the community as well as a comparison to the Provincial average.

By regularly reporting on the CEEI indicators, local governments and their partner agencies will be able to determine their effectiveness in taking action to meet their identified energy and GHG targets and to identify steps to refine the implementation of their action plans based on this feedback.

6 RECOMMENDATIONS

The following are recommendations for refining and finalizing the set of indicators, and moving towards developing a first set of CEEI reports for each community in B.C.

1. Review the energy and GHG emission data that will be included in the CEEI reports, and refine the energy and GHG emission outcome indicators so that they are consistent.

2. Develop a template for the four to six page CEEI indicator reports. A mock-up has been included in this report (Appendix A), which can be used to provide ideas regarding layout of data and content. 3

3. Using the template, prepare indicator reports for between 3 to 6 communities that represent different types of community (e.g. urban, suburban, rural, resource, resort municipality, small vs. Large population)

4. Customize the templates for each community typology (e.g. different limitations, data caveats, eliminate transit indicators for communities without public transit, etc.)

5. Develop the metadata (i.e. descriptive information about the data) for each indicator and prepare a technical report to ensure data quality and consistency.

6. Work with those selected communities for piloting the template and CEEI report, as well various committees to review the sample report and refine it based on their feedback (the CEEI Working Group, local government technical committees and representatives, UBCM, Fraser Basin Council, and non-governmental organizations)

7. Evaluate timelines and activities required to collect baseline and historical data and provide estimates for time to track this data in the future, including resource requirements.

8. For those transportation and land use indicators requiring long lead time (e.g. requiring a custom census data order), work with local government representatives, BC Transit, TransLink, and the CEEI Working Group to review technical issues and specifications (e.g. buffer width around bus stop or transit corridors and determine the transit frequencies to use. Obtain cost estimates from Statistics Canada and determine budget and timing to order data and coordinate GIS work.

9. Develop an automated system for generating the CEEI reports for the communities (as a spreadsheet or GIS)

10. Prepare the first set of CEEI reports using 2007 energy and GHG data, 2006 Census data and data of the most recent year for all other indicators.

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3 It is recommended that a detailed mock-up be developed (based on ideas from this one) and that the template be piloted for at least three different communities that have very different characteristics (e.g. urban municipality, rural municipality without public transit, and a regional district).

11. Review the indicators for future consideration with relevant organizations (e.g. ICBC) and identify how the Province could support this and have systems put in place for future tracking.

APPENDIX A: MOCK-UP OF A SAMPLE CEEI COMMUNITY REPORT

Community Energy and Emissions Inventory Indicators
Town of Beautiful, BC (MOCK-UP)

Year: 2010

Community Highlights

In 2010, the City of Beautiful's population was 93,000. It has grown by 9% since 2007. Total energy use for the City was 11 million GJ which resulted in 660,000 tonnes of CO2e emissions. This is equivalent to 7 tonnes of CO2e emissions per person. Buildings in Beautiful emit the majority of the GHG emissions, accounting for 55% of the total emissions. This is largely due to the use of natural gas to heat buildings. Transportation accounts 41% of the GHG emissions, and emissions from solid waste account for 4%.

There has been a dramatic 34% decline in GHG emissions since the baseline year of 2007. Currently, on a per capita basis, the City of Beautiful emits less tonnes of CO2e emissions than both the Regional District of Greatest Place (10 tonnes/capita) and the Province (8 tonnes/capita).

Community Energy and Emissions Inventory

The purpose of the Community Energy and Emissions Inventory (CEEI) initiative is to "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 B.C. local governments with inventory baselines, ongoing monitoring and periodic reports to help inform community decision making and support provincial objectives

Specific objectives of the CEEI project are to:
1) Provide all 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;
2) 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; and,
3) 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.

For further information, please contact:

[Section or Division Name]
BC Ministry of Environment
XXXXX
Victoria, BC
V0V V0V

(250) 999-9999   Last Updated: March, 2008
                                                                          Page 1

CEEI Community Summary Sheet:
Town of Beautiful, 2010

Community:	**Beautiful**
Regional District Located In:	Best Place
Total Population, 2010	93,000
Partners for Climate Change Member:	Yes, since 1995
Signatory to the Provincial Climate Action Charter:	Yes

Summary of Energy and GHG Indicators	Town of Beautiful (2010)	Regional District of Best Place (2010)	BC (2010)
Total Energy Use (GJ)	11,000,000	-	-
Total GHG Emissions (Tonnes CO$_2$e)	660,000	-	-
Per Capita Energy Use (GJ/cap)	118	200	150
Per Capita GHG Emissions (Tonnes CO2e/cap)	7.1	10.0	8.0

Town of Beautiful GHG Emissions and GHG Emissions per Capita
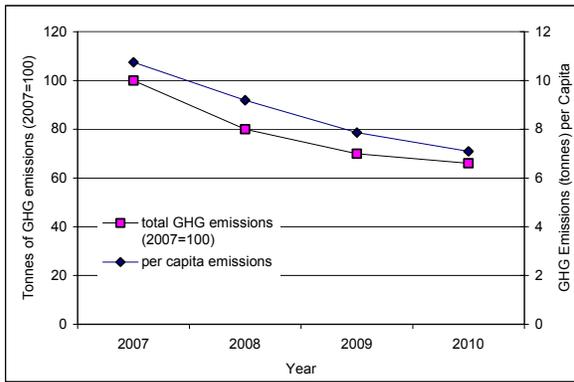
City of Beautiful Population (Normalized, 2007=100)
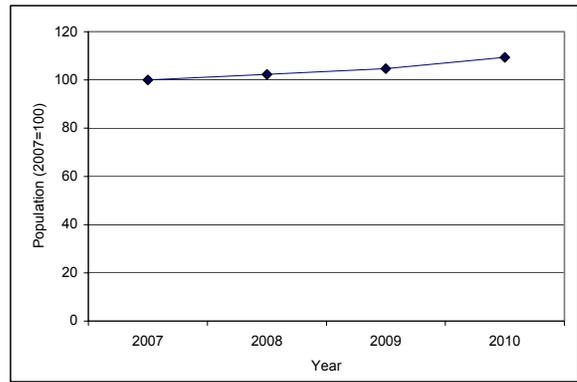
GHG Emissions by Sector (2010)
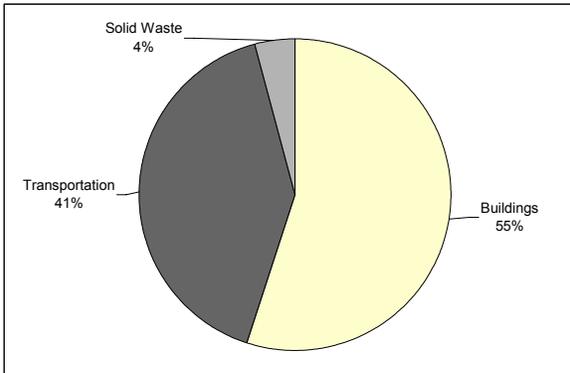
GHG Emissions by Fuel Type (2010)

Page 2
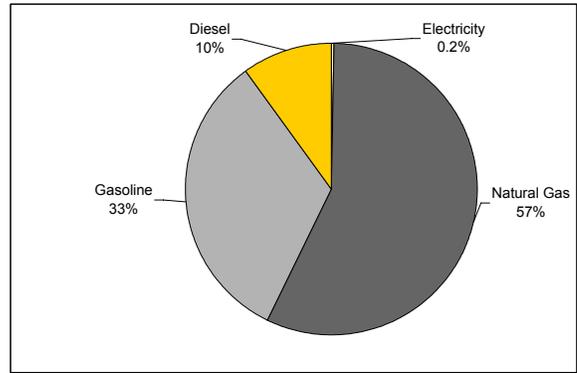
Community Energy and Emissions Inventory Indicators (Mock-up)
2010 Update

Community: Town of Beautiful
Located in: Regional District of Best Place

	Scale	2006	2007*	2008	2009	**2010** ...	2020
Context Indicators							
Inflation Adjusted Average Annual Energy Prices	B.C.						
a) Natural gas: $/GJ							
b) Electricity: $/KWh							
c) Gasoline: $/L							
d) Fuel oil: $/L							
e) Propane: $/GJ							
Carbon Intensity of electricity consumed in B.C. (tonnes CO2e/GWh)[i]	B.C.						
Population							
Total population[ii]	Community	83,000	85,000	87,000	89,000	**93,000**	
Annual Population Growth Rate (%)	Community	N/A	2.4%	2.4%	2.3%	**4.5%**	
Population Change Since Baseline Year (% since 2007)	Community	N/A	N/A	2.4%	4.7%	**9.4%**	
Energy and GHG Emissions							
Total Annual Energy Consumption (GJ)	Community	17,000,000	16,500,000	14,000,000	12,000,000	**11,000,000**	
Annual Energy Consumption Per Capita (GJ/capita)	Community	205	194	161	135	**118**	
Total Annual GHG Emissions (tonnes CO2e)	Community	1,100,000	1,000,000	800,000	700,000	**660,000**	
Annual GHG Emissions Per Capita (tonnes CO2e/capita)	Community	11.0	10.8	9.2	7.9	**7.1**	
% Change in GHG Emissions Since Baseline Year (2007)	Community	N/A	N/A	-20.0%	-30.0%	**-34.0%**	
Total Estimated Community Energy Expenditures ($ million)	Community						
Estimated Community Energy Expenditures Per Capita ($/capita)	Community						
Local Energy Supply							
Local and Self-sufficient Energy Supply (%)	Regional						
Land Use							
Residential Density in Urban Areas (units/ha gross density)	Community	10.2	-	-	-	**-**	-
Diversity of Housing Types (Simpson Diversity Index)[2]	Community	0.6	-	-	-	**-**	-
Median Commuter Trip Distance (km)	Community	7.3	-	-	-	**-**	-
% of Dwellings within 400m of a transit stop[1]	Community	30%	-	-	-	**-**	-
% of Occupied Jobs within 400m of a transit Stop[1]	Community	25%	-	-	-	**-**	-
Buildings							
Total Energy Use for Buildings (GJ)	Community						
Energy Use in Buildings Per Capita (GJ/capita)	Community						
Average Energy Use in Residential Buildings Per Capita (GJ/capita)	Community						
Total GHG Emissions in Buildings (tonnes CO2e)	Community					**363,037**	
GHG Emissions in Buildings Per Capita (tonnes CO2e/capita)	Community					**3.9**	
New Energy Efficient Residential Buildings (no. of units)	Community	3	8	9	7	**5**	
New Energy Efficient Commercial/Institutional Buildings) (no. of buildings)	Community	1	0	0	2	**4**	
Existing Home Energy Evaluations (no. of units)	Community	13	45	83	92	**85**	
Dwellings on Renewable Heating Supply Systems (no. of units)	Community	0	0	0	500	**550**	

Community Energy and Emissions Inventory Indicators (Mock-up Continued)
2010 Update

Community: Town of Beautiful

Located in: Regional District of Best Place

	Scale	2006	2007*	2008	2009	**2010** ...	2020
Transportation							
Total Energy Consumption for Transportation (GJ)[a]	Community						
Energy Consumption for Transportation Per Capita (GJ/capita)[a]	Community						
Total GHG emissions from transportation (tonnes CO2e/capita)[a]	Community					**270,256**	
GHG Emissions from Transportation Per Capita (tonnes CO2e/capita)[a]	Community					**2.9**	
Number of Registered Passenger Vehicles Per Capita	Regional						
Transit-seat kilometres	Regional						
Per Capita Transit Ridership (rides/capita)	Regional	40	41	42	43	**44**	
Commuting trips by mode of transportation (% of journey-to-work trips):	Community						
a) Walking		5.1%	-	-	-	**-**	-
b) Cycling		1.4%	-	-	-	**-**	-
c) Public Transit		8.3%	-	-	-	**-**	-
d) Personal Vehicle (Driver)		73.0%	-	-	-	**-**	-
e) Personal Vehicle (Passenger)		11.0%					
f) Other		1.0%	-	-	-	**-**	-
Solid Waste							
Total Estimated GHG emissions from Waste Disposal (tonnes CO2e)	Community					**26,824**	
Estimated GHG Emissions from Waste Disposal Per Capita (tonnes CO2e/capita)	Community					**0.29**	
Solid waste disposed per capita (kg/capita)	Community	600	550	525	500	**475**	
Composting at Centralized Facilities (tonnes)	Community	0	0	0	0	**0**	

* 2007 is the baseline year for monitoring energy and GHG emissions as identified by the Province of B.C.

Notes:

1) Good Quality Transit Service is defined as a frequency of x minutes within this specified period

2) Simpson Diversity Index Score = 1- Sum (n/N)^2 (higher is better from a diversity point of view)

3) etc.

Technical Notes:

a) Description of issues and limitations associated with transportation...

b) etc.

Data Sources:

i) BC Stats

ii) BC Hydro

iii) etc.