CANMET Energy Technology Centre - Ottawa

COMMUNITY ENERGY PLANNING

A Guide for Communities

Volume 2 – The Community Energy Plan

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Table of Contents

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Executive Summary

The Community Energy Plan considers the supply and use of energy as the currency of the planning process, driving the decision making process towards the goal of a reduced energy footprint. A Community Energy Plan therefore becomes a high level schedule that retains long-term continuity and consistency between its many, more detailed documents and programs. Its presence should simplify the development of the future Official Plan and the secondary plans by describing the many interactions between those plans.

The philosophy behind community energy planning lies in the fact that the impact of energy use within a community extends beyond the consumption of energy to include the effect of spatial design of permanent infrastructure within the built environment.

This methodology is the second of a series of documents that are intended to aid communities in the development of their own long-term strategy. By working steadily through the guides, community members can raise awareness and promote sustainable living in their community.

Volume 1 – Introduction: discusses the concept of Community Energy Planning and its relationship with existing planning process. The document also discusses sustainability and its definition in terms of communities.

Volume 2 – The Community Energy Plan: details the process of developing the Community Energy Plan, allowing communities to understand the process and thereby achieve a greater level of community buy-in. The support of the community at large is essential for any community plan to be successful.

Volume 3 – Program and Project Ideas: contains ideas and examples of initiatives that have been undertaken throughout Canada and the world, focusing on the reduction of energy and greenhouse gas emissions. These examples can be used to form the basis for further programs and projects.

Introduction

Achieving a high quality of life in a community is a complex initiative. In every community there exist a multitude of players/stakeholders, each striving to meet their own agenda. However, no one agenda dominates and the results from each will invariably impact other players and stakeholders, as well as the community as a whole.

The primary intent of the Community Energy Plan is to find an optimum energy supply / demand scenario for a pre-defined location and hence identify mechanisms by which this solution may be achieved. The scenario is the vision of the community – perhaps a rustic, rural lifestyle or a high tech, mobile, suburban existence. Whatever the chosen vision, sustainability is indicated by the balance between the lifestyle and the price to be paid. This balance is reflected in the hard fiscal costs, and also the environmental costs and the social costs of the proposed actions.

Chapter 1: The Community Energy Planning Methodology

A *Community Energy Plan* (CEP) is a long-term and high-level method of evaluating land use and community design options for the more efficient consumption of energy. Since the supply and use of energy will be factors in every community's future, planning for energy and resource use helps the community to advance and to reach a sustainable high quality of life.

In this guide, the CEP process will be explored as a five-step framework. While this framework is similar to that of the standard planning process, in the case of the CEP each of the five steps will specifically relate to how your planning team can prioritize energy and energy systems in the development and scheduling of community projects.

For background information on the importance of prioritizing energy in a community plan and the rationale for adopting a CEP for your community, please refer to *Volume 1 - Introduction* of the Community Energy Planning Methodology.

The Community Energy Plan – a five-step framework

1. Develop a Community Vision
2. Ascertain the Status Quo – Where are we now?
3. Quantify the Vision – What do we need?
4. Develop Programs and Projects (and a Schedule)
5. Implement and Monitor

Examples of other approaches to Community Planning:

Environment Canada, for the Atlantic Coastal Action Program
Vision Building & Setting Goals (i.e. Develop a Vision)
Environmental Quality Assessment (i.e. Ascertain a Status Quo)
Choosing Remedial, Conservation and Prevention Measures (i.e. Determine the Requirements to fulfill the Vision, Develop Actions to attain those Requirements)
Writing the Plan (i.e. Draw together a Schedule for the Actions, Implement the Actions)

The Community Energy Association[1]*:*

1. Build the energy team
2. Clarify community goals
3. Draw the energy profile
4. Take the message to the community
5. Identify Energy Opportunities
6. Create Planning Options
7. Evaluate & Select a Preferred Plan
8. Make an Action Plan
9. Monitor the Results

In Saskatchewan:

Inventory existing natural, social and physical resources of the community and document its relationships with the community/regions ecosystem.
Develop a community value system that encompasses the environment, the economy and social justice that is based on the rights of the present and future generations (values, principles, vision).
Develop sustainability criteria, and create a sustainable community vision.
Identify goals for environmental quality, economic progress, social equity that would lead to the realization of the community vision.
Identify driving forces and develop alternatives for achieving sustainable community goals.
Select the optimum alternatives for implementation.
Prepare action plans and implement chosen alternatives, identify policy and institution gaps and try to fill them.
Monitor the results; respond to the feedback, and revise/adapt the sustainable community plan

As can be seen, details of the process may vary between practitioners but the circular approach remains: Vision – Data – Implement – Feedback.

Chapter 2: Developing the Community Energy Plan

Planning Advisory Committees, present in many municipalities, are ideal bodies through which to develop the Community Energy Plan. Planning Advisory Committees currently review and provide feedback to local government on proposed activities and, if necessary, suggest new or alternative possibilities. Their role is to bypass the detail associated with "day-to-day" planning and instead focus on the future potential of the community. *Municipal Councilors*, m*unicipal planning departments* or *community associations* are also capable of developing a CEP.

A Planning Advisory Committee consists of representatives from a variety of stakeholder groups: the more diverse the representatives, the more comprehensive your CEP plan will be.

The Federation of Canadian Municipalities[1] (FCM) suggests, in the development of their Local Action Plan, a large and diverse spectrum of representatives:

- ☑ Local business and industry, including industry associations and unions
- ☑ Utility companies
- ☑ Educational institutions
- ☑ Community and non-government organizations
- ☑ Local media
- ☑ Interested residents

It is also a good idea to include a representative from City Hall. These representatives can bring to the committee their expertise in the process of municipal planning, as well as credibility and support within City Hall.

Hint: To avoid mega-committees, divide the committee into two levels:
-A *working committee* with municipal staff, utility staff, community association volunteers, architects, and so on, who meets regularly, to collect and analyze data

-A *steering*, or *review committee* with majors, councilors, building owners, and so on, who meets less frequently to ensure the community is kept aware of the process and that the working group are moving consistently in the same direction.

One of the initial tasks of your community will be to select the number and type of representatives for your planning committee. Depending on available funding and other resources (see Appendix A), these members may be: volunteers, paid staff, independent consultants and academics professionals, students, and so on.

[1] Federation of Canadian Municipalities and Centre for Sustainable Community Development, *Citizen Participation and Community Engagement in the Local Action Plan Process: A Guide for Municipal Governments*

This guide has been designed to guide the Planning Advisory Committee and other individual planners or planning groups through the process of developing a community energy plan.

Elements of Successful Planning

Developing an energy plan is not a technically difficult task – but the challenge lies in determining just how can a community make sure that the plan will be a living document that achieves real results rather than a plan that just 'sits on the shelf'?

The key is to develop a flexible and affordable CEP that combines the technical expertise of your planning team with the collective desires of your community members. The following are three elements designed to help your community achieve its goals for sustainability. These three elements should be understood before the planning process begins.

1- The Feedback Loop

Flexibility in the Community Energy Plan is achieved through the development of a complimentary feedback loop. The Feedback Loop allows learned information to be used to improve the effectiveness of the CEP and to establish the direction of future CEP processes.

The CEP vision and its direction will invariably undergo change during the planning process in response to: the results from gathered data, unplanned events, funding availability, involvement of stakeholder groups, and results from monitoring and evaluation. Feedback will help you stay on track and include any information collected along the way.

Feedback loops can be incorporated at any time during your CEP process. Figure 1 demonstrates the feedback loop by using it at three times during the 5-step CEP framework. A feedback loop is first used when quantifying your vision. Data is collected and reviewed against the goals of the vision to provide the objectives and targets. New information gathered during the initial data collection process is incorporated into the CEP, and may modify the direction of the CEP. The next feedback loop is used when developing the Programs & Projects to meet the objectives and targets. The vision is reviewed at this stage in order to design programs and projects that will lead your community towards your vision of sustainability. The third stage involving a feedback loop is after the implementation of the projects. Data that is collected (project indicators) is reviewed against the vision to determine the ability of the CEP in achieving sustainability. Depending on the results, a new CEP with a new direction may have to be

developed. This new CEP will incorporate information and lessons collected from the feedback loop.

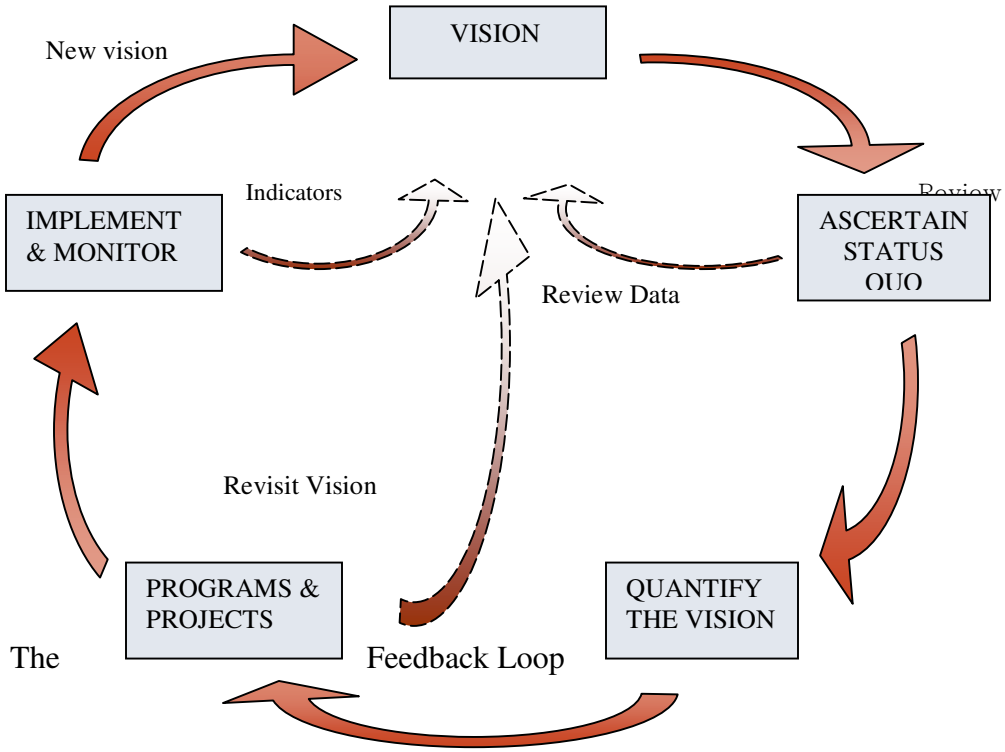


Figure 1: The Feedback Loop

2 - Funding the CEP Planning Process

Many community projects are initiated by a drive, an enthusiasm, for a certain change or as a response to an immediate problem. As a result, the long-term and sometimes bureaucratic planning of fundraising initiatives can get shuffled aside to the end.

Discussion with the financial sector indicates that the priority level for project funding ought to be raised and preliminary fundraising initiatives begun once the basic concept of the CEP has been developed.

Starting the fundraising process before you begin to develop the CEP will allow the financier to provide insight into possible financing models. It may also reduce the amount of time and effort required to establish financing at later stages.

Appendix A offers a compendium of potential funding programs.

3 - Community engagement

A Community Energy Plan (CEP) needs consensus on the steps and direction of the CEP in order to create a plan that is a benefit to everyone. A Community Energy Plan (CEP) must reflect *the collective desires and ambitions of the community* as much as those of the elected officials. This is especially true when one remembers that *it is the community that must invest in the product*, either in the built environment or in lifestyle changes.

A plan that is a benefit to everyone needs the participation of traditional decision-makers and stakeholders, as well as members of the general public.

The Canadian Rural Partnership suggests the following model for when to involve the community in the planning process[2].

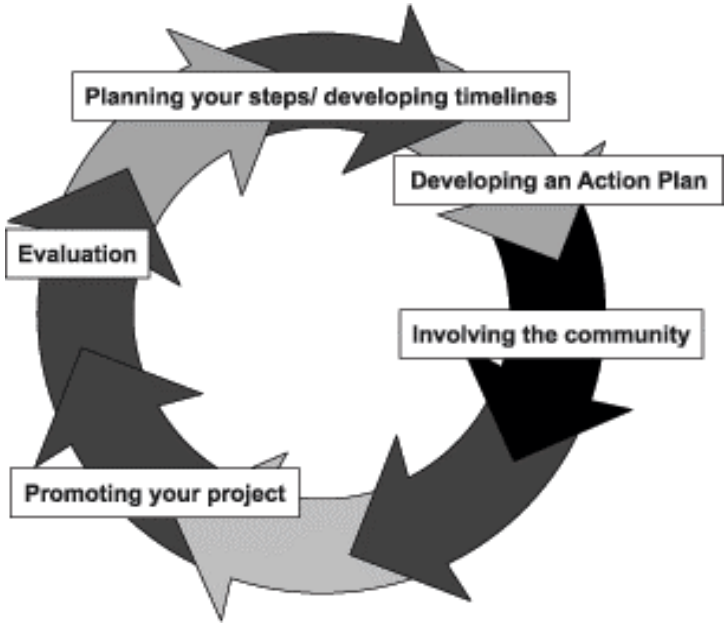


Figure 2: Involving the community in project development

In relation to our Community Energy Plan framework, the public involvement process might look like the following:

[2] Canadian Rural Partnership, *Community Project Planning & Evaluation Guide*

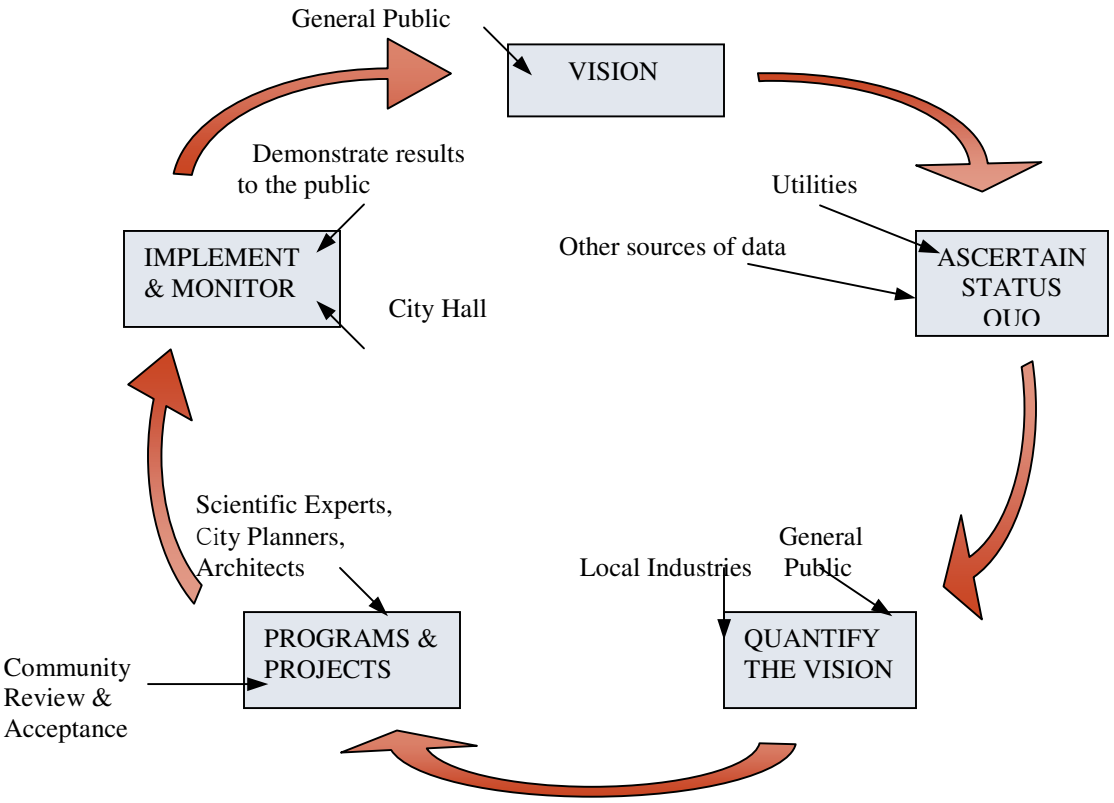


Figure 3: Community Engagement

Studies demonstrate that while most community members indicate an interest in being consulted on the decision-making process, most do not get involved unless it is an issue that affects them in some meaningful way[3]. To encourage members to become involved, there are a number of communication mechanisms that can be used to grab their attention.

Every community member will have other obligations in his/her life, and therefore will tend to prioritize their time around what they feel is important. A CEP can often be perceived as long and technical in nature. While this style may be useful for planners, it is perhaps not so for other community members.

To encourage community members to become involved in the CEP planning process it is important that energy concepts and measurements be converted into easily understandable terms in user-friendly formats that help attract the audience to the project.

[3] White, Michael, *Public Involvement in Municipal Priority Setting: the City of Vancouver's Public Involvement Review*

The best way of doing this is to match formatting-style to the level of interest of each audience group (e.g. industry trustees, city councilors, the general public, students, etc)[4].

Popular Mechanisms for communication include

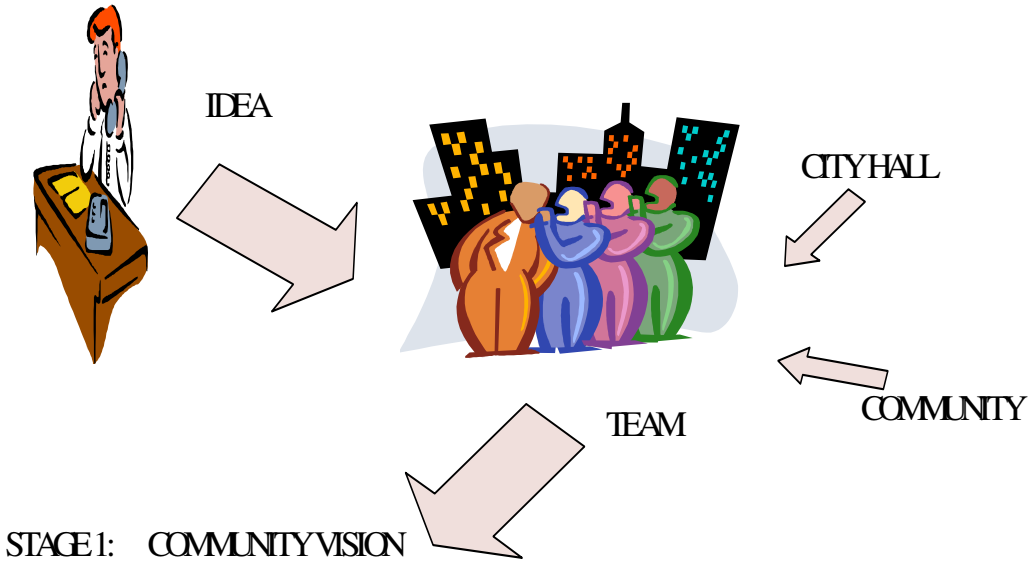
- News releases for local newspapers, television stations, and radio stations
- Reports, brochures, websites, speeches, videos, scripts, and newsletters
- Surveys and polls to conduct formal and informal research to determine public opinion and attitude as a basis for planning and action
- Answer public and new residents request for information
- Plan news conferences, convention exhibits, new facility and anniversary celebrations, contest and award programs, tours, and special meetings
- A small flier or an invitation to a meeting or 'open house', included with the monthly bill from the utility sector to the public
- Communication is a two-way street: listen to your intended audience

Examples of Communication tools

- User-friendly information that matches the level of interest and addresses the specific needs of the intended audience.
- Layout and formatting of information materials using attractive colour schemes, text boxes, and images to help the reader stay interested in the text information.
- Comparative examples to explain technical issues in terms that relate to the audience interests. For example, if you wish to explain to the general public the rate at which urban sprawl decimates agriculture land, a measurement may not have the same impact as a comparative example using everyday concepts: "urban sprawl eats up 3½ football fields in 1 year, which means that 200 kilos of potatoes and 150 kilos of butternut squash has been taken out of local production permanently

[4] Alexander, Don et al, *Public Participation Process for Community Energy Planning*
Cantou, Karen, *Public Relations*

Chapter 3: Step 1: Develop the Vision



The initial stage in developing a Community Energy Plan involves the development of a long-term Vision that defines the future state of the community. A picture, the vision, needs to be created that shows the community in its new form. Your community may imagine a self-sustaining, back-to-nature reserve, or it may desire a modern high-tech community with leading edge facilities. Whatever your community sees as its future state, the vision will be your end goal that you will work towards.

The Strategic Planning and Program Planning for Nonprofit Groups program define the*Vision* as describing the "future destination; it provides an image in words of what success would look like. It is built on reasonable assumptions about the future"[5].

Communities without a long-term vision drift on the political & economic tide!

Community Visions in themselves are not new. However, it is surprising just how many communities do not have one. It is often easy to tell, when meeting with community leaders, whether a vision has been established – and more importantly whether the community believes in that vision - there is drive, enthusiasm, and purpose to their actions.

[5] Environment Canada and Health Canada, *Planning for Change*

In a CEP, energy and energy systems are recognized as the mechanism for achieving this future picture. Developing a vision for your CEP helps your community stay on track as it creates programs and projects designed to reach the end goal of sustainability.

Community Visions and Long-Term Timeframes

The Visioning process requires a long-term timeframe. Present day infrastructure often has a lifetime exceeding 60 years. For example, commercial buildings can last 30 to 50 years, and public transit rolling stock is expected to last well more than 20 years.

Planning timeframes that reflect sustainability must reflect the lifecycles of the infrastructure it affects so as to enable changes in thinking and technology to be realistically incorporated.

Short-term timeframes limit change to expensive retrofit projects. Attaching a long-term approach to your vision will help you make substantive changes to the built environment as the opportunities arise. Energy projects will follow the long-term schedule developed under the CEP process and integrate new projects into your community's existing built environment.

North Vancouver District Energy:
In their plans to rebuild a brownfield site in North Vancouver, the City Council approved a bylaw that required all new building construction to incorporate heating systems that would be compatible with a future district energy network. The City will then invest in underground piping, awaiting the day when a critical building mass became available to support the district energy system.

Planning for Sustainable Development in your Vision

Your community must define its own vision for sustainability, based on its priorities and desires.[6]

In defining your 'code of sustainability', the community must ask itself a number of questions, each of which relate the community to its energy needs and desires.

It is possible to define the goal of sustainability in a city as the reduction of a city's use of natural resources and production of wastes, simultaneously improving its livability, so that it can better fit within the capacities of local, regional, and global ecosystems - Sustainability and Cities, Newman and Kenworthy, Island Press 1998

[6] Lachman, Beth E, *Linking Sustainable Community Activities to Pollution Prevention*

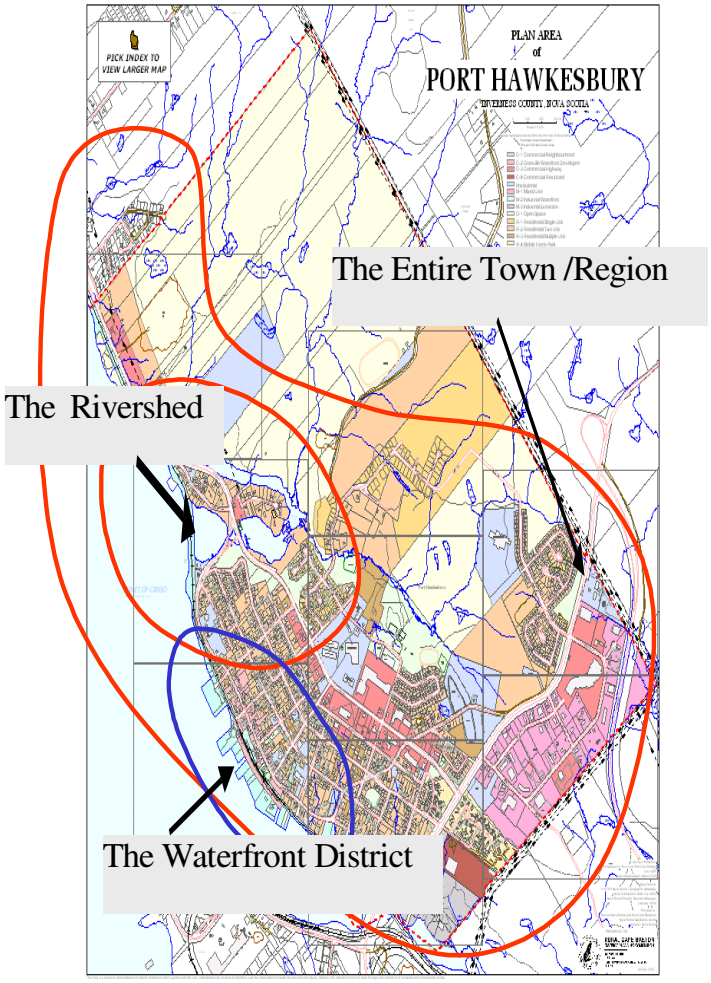
In its plan, the City of Calgary proposes the following guiding criteria[7]:

- Is it in keeping with the community's responsibility to protect the broader public interest – socially, economically, and environmentally?
- Does it provide a mechanism to implement community wide social, environmental, and economic objectives?
- Is it sufficiently flexible to allow landowner/developers to respond to prevailing market conditions yet exercise creativity and innovation in design?

Defining the Development Area for your Vision

One of the first decisions to be made in any visioning process will be a definition of the physical planning area – what defines the study area?

In a community, actions are interlinked. Undertakings in one area of town affect those in another. For example it would be simple to eliminate concern over solid waste from a new development by assuming collection and disposal as 'somebody else's problem'. However, the design and operation of the proposed community is a driving factor in the generation of solid waste. Generation and disposal must be considered as part of the overall planning process.



The Sustainable Communities Program, operating in Saskatchewan and Manitoba found that for a rural area a regional approach is more practical with planning areas becoming self-defining. Instead of political imposed boundaries, planning limits became based on local resources, watersheds, or even areas relating to the Regional Economic Development Agency and the local economy.

A clear boundary is required for the area under consideration and an understanding

[7] City of Calgary, *CFB East Community Plan*

of the scope that the study entails – a housing development, a downtown community, a complete village, etc. This will lead to a definition (later) of the data collection requirements and the need for additional committee members.

In one Saskatchewan initiative[8] communities joined together to examine their resource issues and used their watershed as a boundary for the study.

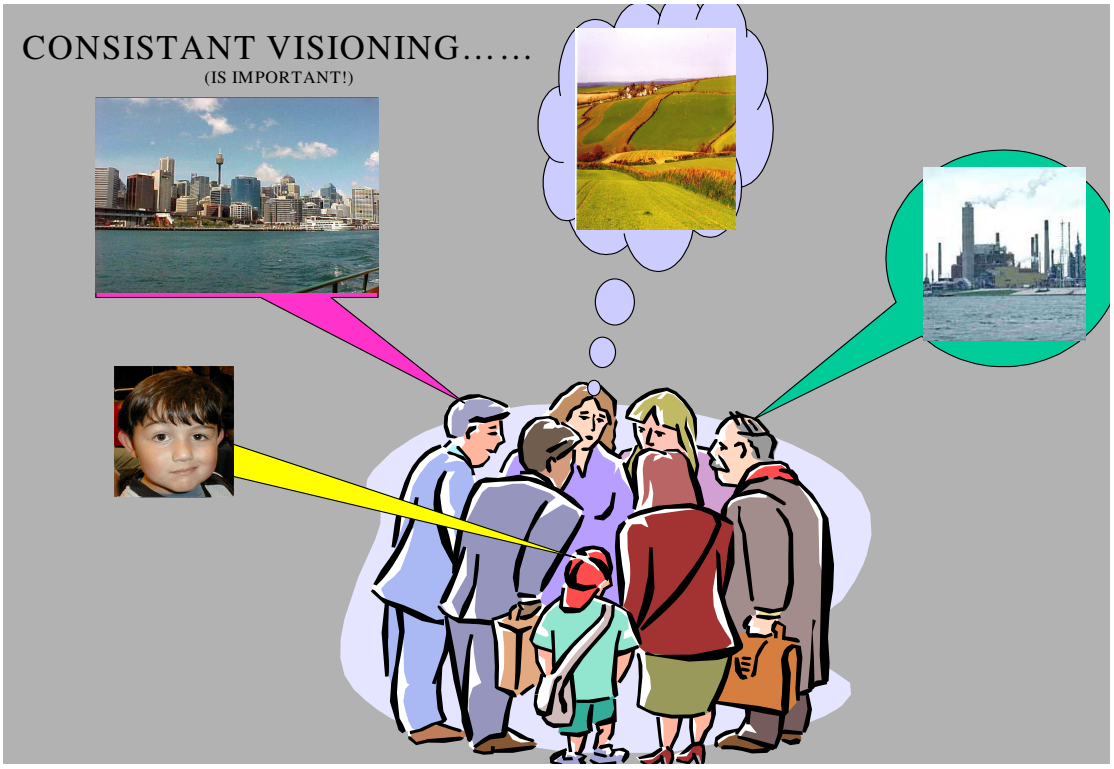
Similarly, in the Maritimes where studies were aimed at cleaning up the local coastline, the boundary to the study was related to the watershed feeding the coastal area. For other communities, roadways, political or other electoral boundaries might be suitable or even the boundary of any regional economic development organization.

Public Engagement in the Visioning Process

Once you have defined the study area, it is now time to develop your Vision. In the CEP process, the Advisory Planning Team could be responsible for developing this vision; however, you may decide to create a sub-group, specifically for the visioning process.

The Vision must reflect a solution to a problem and not be seen as the promotion of a specific viewpoint. As discussed earlier in Chapter 2, the CEP methodology promotes public involvement in the visioning process because it is the community that must invest in the product, either in the built environment or in lifestyle changes.

[8] Sustainable Community Planning Program, *Saskatchewan Environment*



The community of Hornby Island, British Columbia defines its visioning process as[9]:

> 'Workshops and meetings designed to engage various sectors of the community in "visioning exercises". These sessions will allow the community to "think outside the box" and imagine what the community could look like in 20 years based on what people want rather than what they think is possible.'

The Atlantic Coastal Action Program notes that the Vision can be developed in a number of ways - through group discussion and brainstorming, graphically or pictorially[10]. Chapter 2 discussed promotional techniques to inform the public on community initiatives and inspire their participation in community planning. These methods can also be used to great success in the visioning process.

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[9] Hornby Island Community Economic Enhancement Corporation, *Visions for Hornby Island*
[10] Environment Canada, *Sharing the Challenge*
Cornell Rural and Community Development Institute, *Community Visioning Notebook*
Saskatchewan Environment, *Sustainable Community Planning Program*
Community Energy Association, *Toolkit for Community Energy Planning*
Pembina Institute of Appropriate Development, *Community Eco-solutions Program*
Future Search, *The Method*

There are a number of mechanisms for collecting input from the general public. A series of Open Houses is one such mechanism. Arranged at times and locations accessible to the general public, open houses can be an opportunity for two-way communication between the general public and the visioning team. Web-based portals are a less interactive mechanism but can be more accessible to the public and can be used to promote the success of the visioning process to other communities.

Design charrettes offer a holistic and integrated approach to visioning. A charrette can provide a forum for the planning team to meet with the general public to explore visioning options. Appendix B is a summary of the guide 'Sustainable Community Planning and Development: Design Charrette Planning Guide' developed by the Canadian Mortgage and Housing Corporation. This easy to follow guide has been designed to help communities plan for and run a charrette.

To ensure a smooth flow of discussion during the development of the vision, many committees avail themselves of the services of a facilitator. He or she is an unbiased participant who coordinates the discussion and leads it through the process of vision making. He or she is also responsible for drawing ideas from people, keeping the discussion focused and producing some form of finished statement or report. Facilitators should be persons with no personal involvement in the process – the world of academia has produced many such respected and unbiased individuals.

Facilitators can also be useful in maintaining compromise and avoiding potential conflicts between the views of the various stakeholders involved in the visioning process.

A number of communities have already begun to use their own visioning process. The Cornell Community and Rural Development Institute in their 'Community and Economic Development Toolbox', suggests two suggested processes to community-designed visioning.

The Academy for Educational Development suggests the following tools to be used by a facilitator:

- Encourage silent members
- Use open-ended questions
- Divide team into smaller groups:
    - Some individuals are more comfortable sharing their opinions in smaller groups
- Use team-building activities:
    - Help members become better acquainted. When a good rapport is developed, the level of tension lessens when a conflict does arise, as members are more likely to listen to a friend.
- Set ground rules:
    - Basic rules such as: all views will be heard and no one will make personal attacks.
- Search for agreement

Charting uses a core group of individuals to identify a larger working group (30 -40 people) within the community who have been identified as principle stakeholders. These 30 -40 citizens then proceed through the "charting" process – a basic SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis – focuses on consensus building and goal identification, and then action plans to achieve those goals. It is generally assumed that the process will take between 3 to 6 months - depending upon how quickly the "core" group comes together and can get the required commitment from the other participants.

Community Economic Renewal, developed by the Rocky Mountain Institute, is similar to the charting process except this model encourages a broader community participation - not limiting the number of participants, but basing much of it's success on average citizen participation and hence, community capacity building. The process encourages community surveys, numerous meetings, small group dynamics, and ultimately, group actions to achieve the identified project's success. There is no set time frame. The level of participation and the commitment of the citizens determine the length of the process.

Developing the Vision

Once you have begun your community engagement campaign, it is now time to work with the citizens to develop the vision. Visioning need not be a lengthy process. However, it is recommended that the process be as detailed as possible to ensure that the Vision created is clearly defined. The Vision must be clearly defined so that its direction is understood and followed throughout the CEP process.

Two Rules to Remember when developing the vision:

- It is important that the initial visioning group reflect the community!
- That the intent is not to develop the plan but to implement the actions!

While it would be ideal that the same members be on the planning committee throughout the CEP process, the reality is that at least some of the members will have other obligations in their lives that will prevent them from being involved from the vision stage through to the implementation & monitoring stage, and then onto the next CEP process. Therefore, it is important that the members of the visioning stage clearly define the vision so that members of later stages can easily follow the same direction.

A comprehensive vision statement would convey both an external and internal vision for the organization.

An *external vision* focuses on how the world will be improved; changed, or different if the organization achieves it purpose.
"All people with AIDS get the appropriate care they need in a comfortable, accessible setting, and that we see the day soon when AIDS is no longer a killer in our community."

An *internal vision* describes what the organization will look like when it's operating effectively to support the external vision.
"The sea otter society will be recognized as a credible national organization that will have a well informed, and active membership in each province and territory of Canada."

There are many ways to achieve this clarity. The workshop 'Planning for Change', hosted by the Community Animation Program and the Community Mobilization Program in Atlantic Canada discusses one possible technique for public-participation visioning. While this process was designed to assist non-profit organizations, communities can also make use of the principles and framework provided in this document.

Goal: Together identify a realistic but challenging vision.

A useful exercise is to have flipchart paper posted with a question written at the top. Each person then has 10 minutes to write down their three most important thoughts under each question.

If an idea is already recorded a check can be used to show that two people had the same idea. The comments will be reviewed as a group.

- How would the world be improved, changed or different if our organization was successful in achieving its purpose?
- What are the most important services that we should continue to provide, change, or begin to offer in the next three years?
- If we could only make three changes that would significantly affect our ability to provide quality services, what would they be?
- What do users consider the most important part of our work?
- What makes us unique?

Then each person can take five minutes to identify three elements they would like to see in their vision. Similar concepts will be grouped together. As a group, review the elements and draw up a common vision. It might require further refinement. A group or an individual can be appointed to finish this work. The vision could be communicated in words, video, or images.

When the vision is completed, ask: Does our vision challenge and inspire us?

Guiding Principles/Shared Values are priorities that guide the organization in making decisions on how an organization conducts itself and what values it wishes to operate under.

Examples:

- Making decisions by consensus
- Youth involvement
- Diversity
- Equitable distribution of resources
- What do members and staff, believe in?
- What are the organizational values of people, process, programs? For example how will the groups make decisions?
- What are the roles for group members?

The end result to the visioning process is a vision statement that reflects the needs and desires of the entire community as it strives to reach sustainability. The following is an example of a community vision.

Appendix C gives more examples of Visions and their processes.

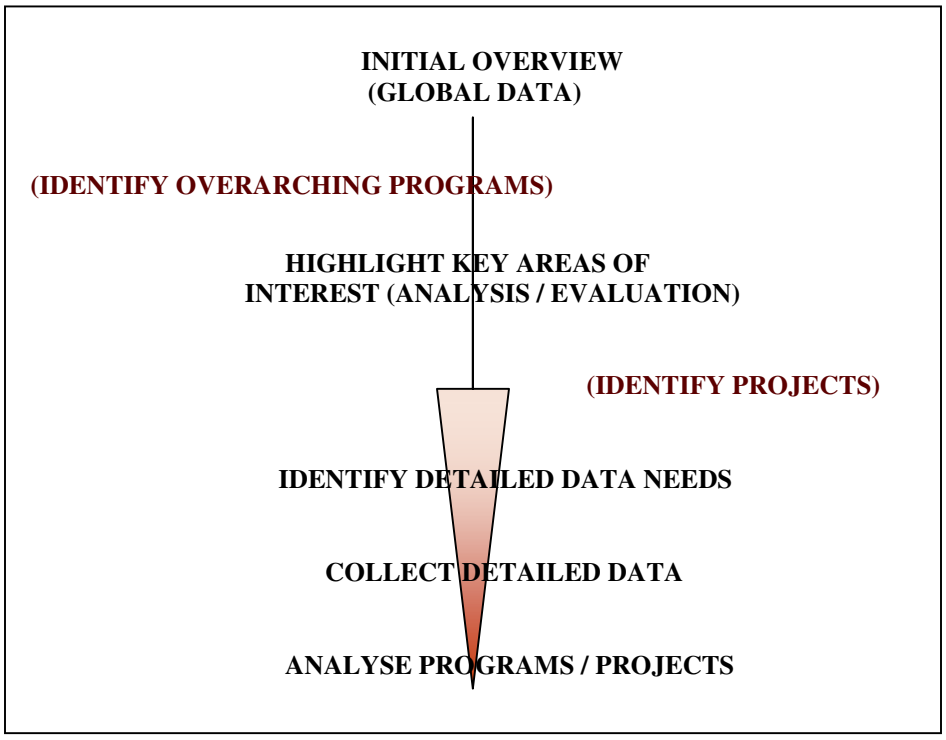
Hornby Vision Statement Summary
"Hornby Islander's have envisioned a future based on our community strengths and our desire to remain a diverse, sustainable and viable community. Central to this vision are the values that we share as a community – creating a balance with the natural world, working together co-operatively and peacefully, taking personal and collective responsibility for the well-being of the community, and celebrating the special spirit and energy of this unique island and its people."

Chapter 4: Step 2: Ascertain the Status Quo

Baseline conditions

Before projects can be designed to help you accomplish your Vision, it is important to first develop an understanding of your baseline condition. The baseline condition is the initial (current) condition of your community. The baseline for your community or chosen area of study is found by taking a data inventory of the current situation. The baseline data presents a snapshot of your community that can be used to spot trends and areas of high energy/resource use.

The Concept of Data Gathering and Analysis



Collecting data to determine your baseline condition is best done in a planned manor. At first, a high level assessment will highlight hot spots where problems may exist. For these areas collect general data. This allows for an overall picture to be developed relatively quickly at the outset. Later, an increased level of detail in data from the entire community can be collected that will be able to highlight the specific areas of concern or interest in your area(s) of study.

Beware - many consultants will encourage a detailed analysis of the entire community at the outset. THIS IS NOT ALWAYS NECESSARY – but it will always guarantee confusion – paralysis by analysis!

As data collection proceeds, the data that will be collected reflects the goals and targets proposed by the Vision. If the Vision shows support for renewable energy then information will be required on solar conditions, wind characteristics, geological/hydrological formations, etc. Likewise, if the vision looks more towards high-tech and transportation then more detailed data may be required covering demography, traffic movement, communications, etc. A recent report "Sustainable Community Planning" published by Canadian Mortgage and Housing Corporation[11] outlines a process for decision-making in such circumstances.

Steps for data collection

Data is first collected to provide an outline of your area(s) of study. The initial scan will identify all resources that cross the study area's boundary line, whether on the surface, underground, or through the atmosphere. Quantifying underground and atmospheric flows may not be easy or possible. A realistic estimate may instead be developed using the most appropriate resource pathways.

An initial scan provides an awareness of the community at large. Gross data indicates areas of excessive energy consumption or other resource usage problems. Gross data will also allow a community to establish its baseline conditions in their priority areas: energy, emissions, water, employment, waste, etc. When collecting the initial data set, it is important to ensure that the basic data reflecting the community boundary makes sense before beginning the stage of detailed data collection. Do the energy streams entering equal (roughly) the energy streams leaving? If not, is there a reasonable explanation? Maybe there is a resource stream that has not been accounted for. Gaps in knowledge at this stage must be identified since they will only magnify and may lead to incorrect conclusions.

The next steps in data collection actually occur later in the CEP process, but are discussed in this section to demonstrate how they fit within the overall data collection process. Data is next collected during the Program & Project development stage (Chapter 6) where energy profiles and public opinions are collected to support the development of specific projects under each umbrella program.

Data is collected again when programs are implemented and monitored (Chapter 7). This stage involves the collection of data to be used to evaluate and monitor the success rate of projects through the use of indicators.

[11] Canadian Mortgage and Housing Corporation, *Sustainable Community Planning*

Approach to Data Gathering[12]

The data required for the initial assessment is varied in nature and, depending on the size of the study area(s), the depth of detail can sometimes be quite extensive. The use of a collection team is often the easiest and least time consuming approach to data collection. As with the visioning process, the Planning Advisory Committee may choose to create a Data Collection Team. The team leader for this new team would evaluate the capacity and expertise of each team member, so that tasks can best be matched with skills. If necessary, the team leader should also provide team members with the authority to collect the data. Often this can be in the form of a letter, duly signed by the head of the Planning Advisory Committee (e.g. the Mayor).

Hints to keep in mind for the Data Collection Team:

☑ It is important to make sure that all data collection team members have a clear understanding of the goals of each step before they begin. This way they avoid getting swamped, collecting more data than is necessary.

☑ Accessibility to the required data will vary depending on the type of data itself. For example, energy consumption data for individual residential units is considered confidential to the building owner and not normally released by the utility. However, *the Block Approach* is a method of releasing consumption patterns while maintaining individual household confidentiality. Using street blocks or postal codes, average energy consumption patterns for an area can be calculated. Appendix D provides an outline for how to perform such calculations.

☑ Regular meetings should be held between the data gathering team to discuss findings. Regular discussion maintains interest in the process, avoids duplication of collection efforts, and allows for prompt corrective measures to be taken should inconsistencies arise. Also, in the event that multiple sets of data are required from a single source but for different purposes (e.g. water consumption and energy demand from the water treatment plant) meeting regularly can mean the exchange of information rather than different members approaching the same client for similar data.

☑ Make sure to answer all questions and concerns; ignoring questions, or accepting guessed answers defeats the purpose of the exercise and will invariably lead to incorrect conclusions.

[12] Much of this chapter is based on the approach promoted by the Environment Canada ACAP program

☑ Be selective in collecting data. In the process of developing a plan for a small community in northern Ontario (population 535) the band manager collected "all data relating to the village". The index for the collected data ran to 81 pages of small type. Evaluation of the data was exhausting!

Data Types

There are three main types of data involved in data collection:

Active data is used in the execution of energy saving projects and over which the community has some level of control, e.g. peak heating loads, electrical usage, building design code, spatial arrangement.

Passive data relates to the use of energy within the community but that the community has little or no control over, e.g. design temperatures or oil & gas pricing.

Supportive data has little apparent relevance to the CEP but provides background to the understanding of how the community functions, e.g. climatic data, geographic data, and employment levels.

A compendium of typical data and the areas in which it may be collected is described in Appendix E.

Units

A data point does not have meaning unless it has units associated with it. It is important to establish a consistent set of units that all team members are comfortable with *before* collecting the data. It becomes very confusing for readers to have to move between metric, imperial and American units. Choose one system and stick to it.

In the metric system of measurement there are just 7 base units, of which 4 are of immediate interest -

Quantity	Unit	Symbol	Unit	Symbol
	(metric)		(imperial)	
Length	metre	m	foot	ft
Mass	kilogram	kg	pound	lb
Time	second	s	hour	h
Temperature	Kelvin	K	Fahrenheit	F

Heat	Joule	J	British Thermal Unit	BTU
Power (electrical)	Watt	W	BTU per hour	BTU/h
Flow	Liters/second	l/s	Gallons/min	gpm[1]

Prefixes are used to indicate powers of ten. For example, with the metric system:

Giga	1 000 000 000	G
Mega	1 000 000	M
Kilo	1 000	k
Milli	0.001	m
Micro	0.000 001	µ

And for the imperial system:

Thousand	1 000	m
Million	1 000 000	mm

Data Analysis

The analysis process should (initially) highlight trends and anomalies. The level of the trend or the size of the anomaly will indicate whether the area under study is in a good or bad condition, growing or shrinking, sustainable or otherwise.

Eventually, these trends will form the basis of an indicator set that the community would then use to monitor the effectiveness of all implemented plans and projects.

Asking questions of data is an ideal way to highlight trends:

- Are there areas within the community where certain activities dominate?
- Are there areas of high-energy consumption, waste discharge, water consumption, high transportation needs, cooling, etc?
- Are these areas consistent with a date of construction?
- Are these areas consistent with a building type, employment regime, or other activity?

Answers should be noted for further investigation

Once the team is satisfied that the initial data is a fair representation of the study area, the next step is to analyze the data against how it appears to the community. Data is

synthesized in order to understand its significance and implications. Once the data has been collected, it is important to synthesis the information using appropriate methods of filtering and manipulation. Finally data presented in the form of indicators is analyzed against the baseline condition to determine the level of change proposed by the CEP process.

Tools for Data Analysis

The Role of Software

Software packages are analytical tools that can undertake precise calculations to provide an analysis of current energy trends. However, it should be remembered that software packages are merely tools and (as yet) can neither design nor interpret data. That remains the task of the analyst – i.e. you!

Appendix F describes a study undertaken by Marbek Resource Consultants that evaluates 18 software packages and assesses them in terms of expense, scope and user expertise[13].

Mapping

Displaying data on maps is an excellent tool for project visualization. Memory tends to stretch and shrink distances but a map organizes data and allows for trends in usage to emerge.
When selecting maps for your project:

- ☑ Check the age of the map. Look for the publication date and key local landmarks in order confirm that you have selected the most recently updated map of your study area.
- ☑ Check for errors. Errors on maps can, and do, exist. For example, modern topographical maps are derived from aerial photographs and receive only spot checks after their production. Anyone who has canoed in northern rivers knows that rapids are not always marked!
- ☑ Check for hidden features. Depending on their age, some maps may include hidden features such as underground tunnels, sewers or discarded oil tanks that may influence future plans.

Tips for creating your map:

- ☑ Represent only the data collected. For example, include locations of: industries, municipal buildings, institutions, boiler plants, power grids, boundaries and lot lines, etc – actual data not “where you think they are”.

[13] Environment Canada, *Analysis and Categorisation of Sustainable Urban Planning Models*

☑ Use different but consistent symbols and colours to represent features.

Sankey Diagrams

The Sankey diagram offers a graphical balance sheet for the community's energy pathways, identifying both energy type and quantity. Many people find this diagram easier to understand than a numerical table, appreciating the relative magnitudes and impacts of the energy streams. From the diagram communities are able to see where to focus future efforts.

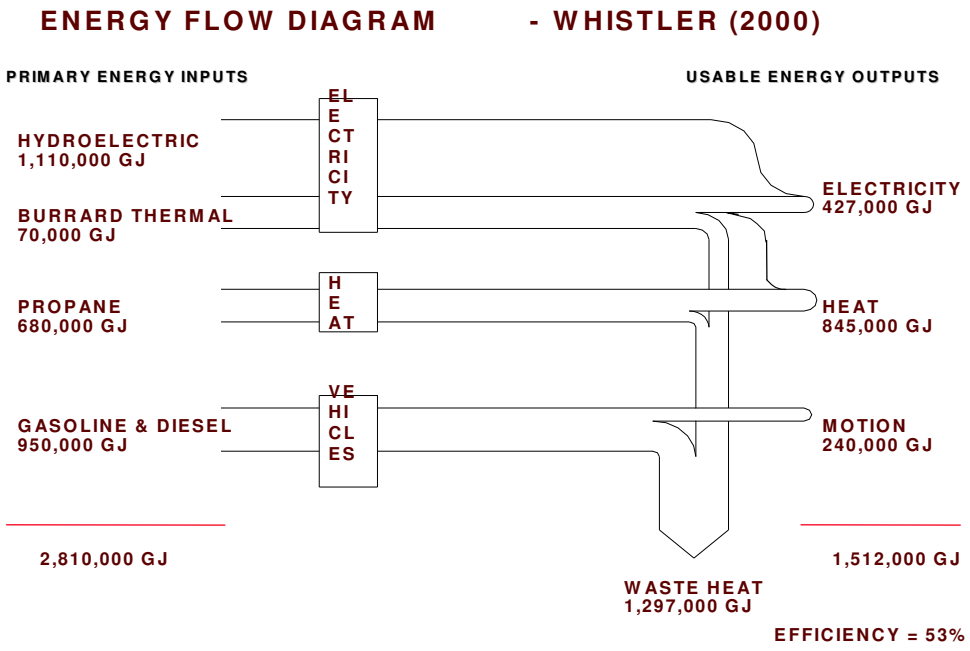


Figure 4: Sankey Diagram – Whistler, BC (courtesy – Sheltair Group Inc.)

Figure 4 is a simple version of a Sankey diagram. Despite its simplicity in format, the diagram demonstrates a number of key features.

- The electrical energy used throughout the town originates primarily from hydraulic stations belonging to BC Hydro (70% efficient water turbines). Only peaking power is developed from fossil fuel plants (34% efficiency).
- Heating within the community uses both propane and electricity in a ratio of 54% propane and 46% electricity.
- The average vehicle is effectively 25% efficient

- Although the community uses 1,512,000 GJ of energy each year it is responsible for 2,810,000 GJ of emissions.
- If the economics were suitable there may be an opportunity for a local high efficiency combined heat and power plant to generate electricity to displace the low efficiency electricity from Burrard inlet and heat to displace propane.
- The large amount of energy used in transportation reflects the tourism aspects of the community and supports investigation of mass transit of some form.

Interpreting Data

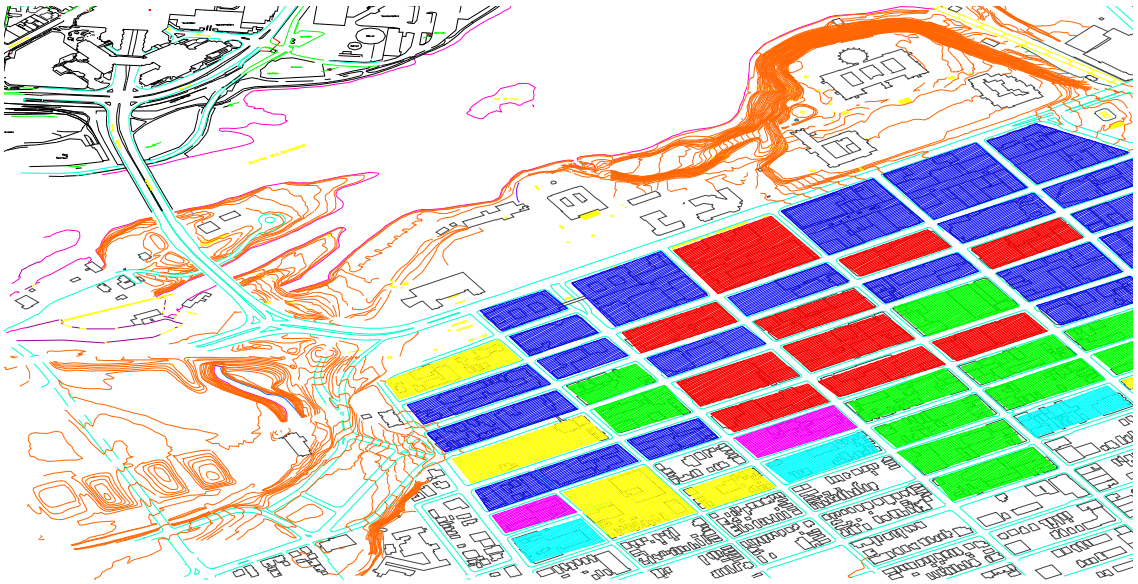


Figure 5: Downtown (Courtesy City of Ottawa and BOMA[14])

In figure 5, the use of colour indicates energy consumption per unit surface area. In this graph red indicates high levels of energy consumption, blue moderate and yellow & green lower levels of consumption per unit surface area. The energy consumption per block of building allows a map of energy density to be visualized. Components of these areas - building stock, transportation, etc – can now be compared to the CEP target. For example, the block-by-block energy consumption data for the high occupancy buildings seen in the downtown core should be compared with a target estimate for the year. Higher than average might suggest a building retrofit program and rationalize this decision with an estimate of the potential savings.

[14] Building Owners and Managers Association, *Standard Method For Measuring Floor Area in Office Buildings*

Evaluating energy on a global scale is a relatively straightforward process. With a visual assessment of the buildings, it is possible to develop a feel for the areas of over-consumption or under-utilization as these become highlighted on a map and may warrant a closer inspection.

For more detailed data collection, or when actual data is not available, software can be used to compare building construction against advanced construction standards. EE4 from Natural Resources Canada allows a building design to be compared with the Model National Building Code and enables an evaluation to be made of possible retrofit opportunities. The software is available free of charge from the Buildings Group website http://buildingsgroup.nrcan.gc.ca/.

Analysis Output

The process of data collection and analysis should provide:

- ☑ A clear understanding of trends and areas of high energy and resource use
- ☑ Maps, sankey diagrams, and other visual displays highlighting areas for improvement

The result of the Data Collection stage is a summary report that represents the community's current situation. The baseline data contained in this report will be used during the subsequent CEP stages.

Chapter 5: Step 3: Quantify the Vision

At this point your community has undertaken the visioning process and an assessment of the baseline condition for the community resources has been developed. In total you should have information on:

☑A long-term vision for the future – somewhat more than "a nice place to live".
☑A timeframe over which this vision is to be achieved – 20, 30, 50 or more years.
☑A breakdown of primary energy users and consumption patterns within the community
☑A list of "areas of concern" that seem to be using a disproportionately high level of resources, creating a disproportionately large level of pollution, etc
☑A team of people, keen on moving the issue forward.

Now it's time to set some goals and targets...

Establishing the goals and targets can seem daunting, especially when the subject matter or the potential for change is unfamiliar. Therefore, you will need to develop a clear understanding of what is possible to achieve and realistic for your community.

Goal Setting

Goals are designed quantify the community vision into activities that lead to a positive change. In this context, it is important to clarify how the goals will regulate these activities[15].

Traditionally, vision statements express goals in the form of qualities and desires. A CEP takes the vision statement one step further by including quantifiable actions or a set of qualifying criteria in the form of goals.

Whitehorse - Qualities
- Sense of community,
- Quality of customer service
- Fiscal responsibility
- Environmental awareness.

At this point, it is not necessary to quantify issues in the vision itself but the statements made must be such that they can be quantified at some stage.
The City of Regina goes one step further than many municipalities by inserting quantifiable goals into their community vision.[16]

[15] Edvardsson, Karin and Ove Hansson, *Environmental goal-setting and efficiency – project plan*
[16] City of Regina, *A Vision for Regina*

Regina - Qualifying Criteria (Goals)

- A city of 250,000 citizens, within a region of 300,000;
- A city where people grow together;
- A city recognized for its economic, social and environmental sustainability;
- A city that is the hub of a region of diversified economic growth;
- A city that is people centered;
- A city of inclusiveness, that celebrates its cultural diversity;
- A city where Aboriginal people participate fully in economic and community affairs;
- A city where people are drawn to because of its quality of life;
- A city that is attractive, generous, affordable, accessible, compact and competitive;
- A city where seniors can retire in security and young people can thrive in opportunity;
- A city that is plainly " a good place to live."

To its credit, Thunder Bay[17] addresses long-term goals and objectives into their community vision.

- Quality of life/healthy community/implementation of the plan will be measured regularly and changes reported to the community.
- Community pride and our marketable quality of life will be packaged and promoted.
- Thunder Bay will promote itself as an environmentally friendly, clean and green city.
- Thunder Bay will develop the natural attributes of the City such as the waterfront, lakes, rivers and trees for residents and tourists to enjoy. A priority is the implementation of The Next Wave, with the first major initiative being the implementation of Portside.
- Alternative transportation corridors will be developed by:
- Thunder Bay will develop safe neighbourhoods and greenspaces as important attributes of a watchful, caring community.
- Thunder Bay will actively work toward respecting diversity, and building stronger relationships within the community

Arguments can be made that in a perfect state of affairs not all goals will be achieved due to their interaction[18]. Through project development and scheduling it may be found that not all goals will be feasible for the community to achieve.

[17] City of Thunder Bay, *Fast Forward Thunder Bay*
[18] Berlin, Isaiah, *On the Pursuit of the Ideal*

Other goals may only be achievable in the future.
For example, if solar energy is more desirable but is currently too expensive and requires the development of more infrastructures, the community may choose to continue to use the fossil fuel in the short term.

If the economic situation becomes more sustainable, then medium-term goals can be developed to slowly introduce solar technologies through the replacement of old fossil fuel infrastructure, and so on.

Short, medium, and long-term goals are required so as to facilitate a smooth transition.

Approaches to Quantifying your Community Vision

Quantifying the vision uses the baseline condition of the community to set targets and indicators.

Community Consultation is generally used when scientific data is limited, such as in the case of social issues. Instead, a focus group is used to discuss possible actions and consequences of a project. The advantage to this approach is that results may be obtained inexpensively and in a short period of time. The primary disadvantage is the level of accuracy and reliability of the result. Unless extensive background information is available, discussion may be based on emotional views and possible misconceptions.

Calculations approach analyzes trends observed for the baseline condition to predict the future condition of the community.

Cities[PLUS]
A long term planning exercise for the Greater Vancouver area evaluated their energy needs based on variety of issues including: availability of fossil fuel, demographics and lifestyle changes, climate change, and technological advances in building design and power generation.

For example, the use of water within a community may be limited by the capacity of the local watershed. Assuming that a preset rate of growth is envisioned then a target of water use must be set that allows this watershed to provide the associated water supply.

Consideration must also be included for the eventualities attributed to issues beyond the control of the community (upstream communities, industries, etc).

Benchmarking uses baseline data sets to describe current conditions within the community. The regular measurement of indicators, when compared

Greenhouse Gas Inventory:
The Partners for Climate Protection program of the Federation of Canadian Municipalities focuses on a 20% reduction in greenhouse gasses and therefore proposes the development of a greenhouse gas baseline inventory for 1994 as an initial step of their program.

to that baseline condition, will highlight improvements (or otherwise) caused by decisions and actions taken.

Peck and Tomalty[19] describe such a benchmarking process, referring to the process as *Performance Assessment Measures*.

"When quantitative targets are used in combination with indicators for the purpose of evaluating the effectiveness or efficiency of government and non-governmental actions, we refer to them as performance assessment measures (PAMs). PAMs are usually developed in the context of community sustainability initiatives that include policy goals and programs or other initiatives designed to achieve those goals. Thus, a community sustainability initiative involving PAMS usually has seven core elements:

- A set of policy goals or objectives (e.g., improve water conservation).
- A set of measurable indicators chosen to represent the policy goals or objectives (e.g., litres/person).
- A baseline set of data to describe current or historical conditions (e.g. 300 litres/person/day).
- A set of numerical targets representing a desired future state (e.g., 200 litres/person/day).
- A time-frame(s) for realizing the target (e.g., 250 litres/person/day in five years and 200 litres/person/day in 10 years).
- An action plan or series of steps that need to be implemented to achieve the target.
- A reporting framework (e.g., public status report every 3 years)."

At the community level, the use of benchmarking (or PAMs) provides several benefits.

- Opportunity to develop a competitive spirit between the municipalities. It is generally accepted that the spirit of competition is an ideal mechanism to encourage both social and economic development.
- Encourages continuous and consistent action
- Induces an understanding of just what is possible within a range of resources

Establishing Objectives and Targets to meet Goals

An *objective* is a quantifiable goal.

A *target* is a quantifiable requirement to achieve the objective.

[19] Peck, Steven and Ray Tomalty, *Theory to Practice: Lessons Learned From The Use of Performance Assessment Measures To Implement Sustainable Communities*

For example, the Australian Greenhouse office, investigated a target of 2% renewable energy for electric retailers to meet the requirements of the objectives:

- To accelerate the uptake of renewable energy in grid-based applications, so as;
    - To reduce greenhouse gas emissions as part of the broader strategic package to stimulate renewable energy, provide an ongoing base for the development of commercially competitive renewable energy; and
    - To contribute to the development of internationally competitive industries which could participate effectively in the burgeoning Asian energy market.

Establishing the targets, or the timeframes of change, can be intimidating, especially when the subject matter or the potential for change is unfamiliar. Numerical targets are by far the most demanding when it comes to developing realistic and understandable values that will be used at a later date to calculate the rate of success for the project. Decision makers who develop the numerical targets require a clear understanding of what amounts are possible to achieve and what is a realistic expectation for the community. This information can be obtained through a number of pathways including discussion with experts and the general public, and information sharing with experiences from other communities.

For example, in Tucson, Arizona, numerical performance targets were developed based on reducing resource consumption within the project compared to the average new home in the City of Tucson and generating infrastructure cost savings. The original targets were as follows:

- Energy Conservation 75% reduction
- Water Conservation 65% reduction
- Solid Waste 90% reduction
- Air Pollution 40% reduction
- Employment Create 1 job for every 2 residences

Initially, uncertainty existed about the nature of the targets and their role in determining how the development should proceed (e.g. were these minimum standards or general goals?). This in turn created problems amongst planners, suppliers, developers, builders, etc and even to some degree hindered the City's ability to attract developers to take on projects. To fix this problem, a Technical Advisory Committee was established to facilitate the process of creating clear and workable development standards for the development. The Committee, comprised mostly of academics and engineers, was guided by two basic principles:

- The standards must be both exemplary and feasible.
- The standards must foster creativity and innovation in construction.

Chapter 6: Step 4: Develop the Programs & Projects

Programs are issues that cannot be overcome by a single recovery or retrofit project. They encompass a series of projects scheduled to move the community, or specified area of study, from its current position to a more sustainable future. These programs are based on areas of concern indicated by the data inventory. Such areas of concern may include: airborne emissions, solid waste, or even agricultural runoff caused by unsustainable farming practices.

The purpose of developing programs and projects is to achieve the reduction levels identified in the community vision.

How Do Programs Work?

Each program must address the aims of the community vision and contain realistic approaches for the community to attain the level of change required by the overall plan. In the event that the community feels uncomfortable with the program targets or approach, the goal should be revisited and its timeline reassessed.

Program Content

Often, the content of energy program is divided into categories such as:

- Private Sector activities
- Public Sector activities
- Individual activities

Division into categories enables programs to be tailored around specific issues and to specific sectors. For example, energy efficient programs may be targeted at institutions if it is seen that the energy consumption within educational facilities is excessively high. Similarly, a program to increase public transit rider-ship may involve policies and regulation specific to the public sector.

How Are Programs Developed?

The meeting together of experts or interested parties provides the backdrop to the development of comprehensive programs[20].

Cities[PLUS]: GVRD Integrated Design Workshop
The IDW brought together over 50 participants for three intensive days to graphically explore this concept. The event consisted of three charrette teams: two on a local scale, and one on a regional. These three teams participated in the charrettes and worked independently and in concert with each other; testing local scale decisions against regional implications and visa versa. Each team was comprised of participants from diverse backgrounds, disciplines and expertise; including various representatives from the 18 Cities[PLUS], urban system teams, some of Greater Vancouver's top architects, representatives from local governments, as well as students.

What is a Project?

Projects are created using a series of targets to meet the objectives set out in the Vision. Depending on the scope of the targets, projects may be implemented under a program in the short term, the intermediate, and into the long term.

[20]Canadian Mortgage and Housing Corporation, *Sustainable community planning and development: design charrette planning guide*

Creating an energy plan for a project under a program:

- Title of project
- Goal of project
- Description of project
- Responsible party
- In-house resources required to implement activity
- Associated / complementary projects, actions and parties
- Is technology available?
- Estimated cost to implement
- Estimate of total impact if implemented successfully,
- Estimated take-up rate by population
- Estimated rate of results
- Time to completion
- Sustainability of project / Requirement for follow-up

Case in point: Bus passes for municipal employees:

- Title of project: Employee Transit Pass
- Goal of project: 50% of municipal staff to use transit 50% of the time during employment hours
- Description of project: Staff survey, correlation with transit schedule, economic evaluation of discounted cost of passes, awareness campaign, improved bus shelters, flexible work hours, etc
- Responsible party: human resources
- In-house resources required for implementation: 2 persons interdepartmental committee to initiate project
- Associated / complementary projects, actions and parties: management committee, transit authority, etc
- Is technology available: No additional technology required
- Estimated cost to implement: 10% of bus pass for 250 persons
- Estimate of total impact if implemented successfully: 250 persons at 20 kilometer commute each per day. Equivalent to 1,000,000 person kilometers or 184 tonnes per year, 2,555 GJ, or 71,000 litres of gasoline

- Estimated take-up rate by population: 20 persons / month maximum
- Estimated rate of results: faster in spring and summer
- Time to completion: 3 years
- Sustainability of project / Requirement for follow-up: 1 person to monitor rider-ship and report

Appendix G offers a list of various program types.

How to develop a project that is right for your community?

The vision, status quo, and targeted area of concern will be unique for each community. Therefore, the development of project(s) will vary between communities. Unfortunately, there is no blueprint or 'textbook case' to follow. Instead, it is the task of your community to develop the most appropriate project(s) that best suits your needs, conditions, and vision in order to achieve future sustainability.

Energy has both a quantity and a quality. The quantity aspect of energy is its consumptive ability – it's energy content. It is related to the design of the house, the distance driven, or the type of industry located in the community. The quality aspect however relates to the type of work that the energy can perform. A light bulb, for example, needs electricity; it does not work with gas or oil. Similarly, radiators do not work with natural gas; they need hot water. Unfortunately, the fuel used in many applications today has been selected, not by its suitability, but more by its marketability and convenience. Using a high quality energy source for a low quality job is simply wasting energy, and costing you money.

A counter to this argument is the fact that although electricity is the most costly and valuable energy to produce, it is nevertheless the least expensive to transport. The decision as to which is the most appropriate energy supply to be used transforms itself into one of "first cost" versus "through life cost". To date the compartmentalizing approach taken in urban development separates the capital cost from the operating costs.

Figure 6 illustrates the connection between an energy source, its means of conveyance, and its end user. Scientists refer to this as an entropy pyramid.

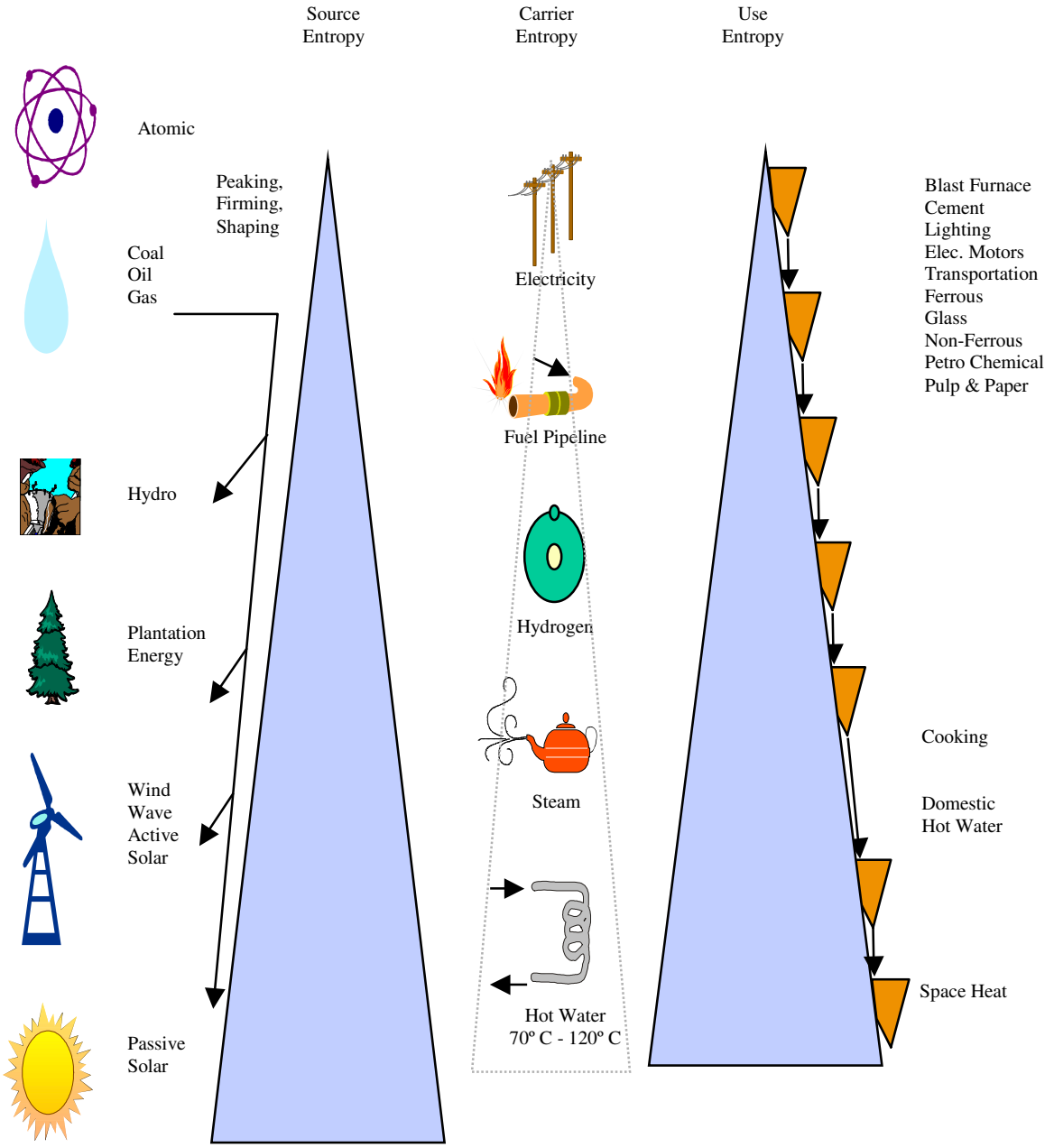


Figure 6: Energy Relationships (courtesy, BC Hydro)

Electricity is at the top of the ladder, requiring the most amount of energy input. Hydro is the most valuable and should be considered the most expensive; in the same vane, warm air is at the bottom. Furthermore, it is important to consider that while electricity is the most expensive to produce, it is also the least expensive to transport. The decision as to which is the most appropriate energy supply to be used transforms itself from the perspective of "first cost" to "through life cost" consideration.

For example, consider the typical low-income housing development where the developer / builder has no responsibility for the upkeep of the house. His aim is the lowest first cost to ensure salability. Invariably electric resistance heating is fitted since this is less expensive to install than other types of energy. The low-income homeowner consequently faces high monthly hydro bills.

A CEP would consider the lifecycle cost over the initial cost of installation where the developer would work in conjunction with the builder and the local municipality, perhaps to create a "lease to buy" program for the tenants.

Example: Green Acres Housing Development – Vermont
Green Acres is a 50-apartment, family-housing complex owned by the Public Housing Authority in Barre, Vermont. Developed in 1970, the buildings were equipped with electric heat and, with the rapidly increasing energy costs in the 1980s, resulted in heating costs rising to the $US200–$US300 range per apartment during the winter months, beyond the ability of many tenants to afford. Vacancies resulted and caused the Barre Housing Authority to seek a more economical alternative.

In 1991, the Housing Authority converted from electric baseboard heat to a hot-water heating system with a central woodchip-fired heating plant. The combustion system and fuel reserve were set up in a separate building. Insulated, underground hot-water heat distribution lines ran to each of the eight apartment buildings.

Today, customers of the Green Acres District Heating System are achieving major savings. When the biomass-fired district heating system became operational in 1991, costs dropped to $US28 per apartment per month – a dramatic reduction.

Costs have remained stable since that time. Green Acres' tenants have not experienced the spikes in energy costs that users of oil and, to some extent, natural gas have felt during the Gulf War or in the fall of 2000, for example.

The local sawmill that supplies woodchips to the Green Acres District Heating System has also benefited from the revenue it has received.

Selecting the best energy technology and system option is based on a number of criteria, not the least of which are the following[21]:

Which energy sectors are the largest consumers, and what appears to be future trends?

How do local consumption patterns compare with usage in similar communities?

How flexible is the action plan to the development of plans?

What are the financial, environmental, and social costs and benefits of various energy technologies? (Can they be integrated holistically into the community?)

Which energy sources are available locally, and which have to be imported into the community?

Which energy technologies and systems help the community to reach its vision?

As a method of studying energy technologies, energy profiles are sometimes supportive. Energy profiles include all relevant information about a technology (see figure 7) and resemble the following[22]:

[21] Wates, Nick, *The Community Planning Website*
[22] Helsinki Energy, *District Heating in Helsinki*
International District Energy Association, *Technology*
International Energy Agency, *District Heating and Cooling*

Energy Profile – District Heating and Cooling

How Does This Technology Work?

- The distribution of heating (hot water, steam) and cooling (chilled water) from a central energy production source, to meet the diverse thermal energy needs of residential, commercial and industrial users.
- Spent water is re-circulated to the central source where it is re-heated and re-distributed.

Uses:

- Space heating.
- Domestic hot water heating and air conditioning.

Requirements (for service area):

- Floor space density is the ratio of the floor air per unit of total surface of the service area and the total surface from a map. Optimum floor space density ranges between: 1.0 and 0.25
- Optimum service area is a medium density service area with mixed building types.
- Outdoor design temperature.
- Domestic hot water consumption.

Costs Involved

- Pipes: depends on the diameter of the pipe. The diameter of the pipe depends on the demand, temperature difference between the supply and return pipe, maximum velocity, pressure, and the density.
- Ground conditions: can affect excavation and restoration costs.
    - Condition 1: loam, loamy, sandy, practically free from roots, boulders or other obstructions, a field. Easiest for excavation and restoration.
    - Condition 2: ordinary clays and ordinary soils with few roots, rocks, or other obstructions.
    - Conditions 3: fairly hard or tough clays, ordinary clay with some loose rock or shade.
    - Condition 4: mixture of clay and loose rocks, soft shale and hard and tough clays, difficult excavation with elaborate restoration, e.g. in a downtown area.
    - Buried service pipes, such as sewer, water, or telephone cables.
    - Ground water table and bedrock

Figure 7: Typical energy profile

Selecting the Best Project for your Community

Choosing the most suitable energy technology and system for your community is a complex undertaking. Energy types are matched with the baseline data collected in *Chapter 4: Stage 2 – Ascertain the Status Quo* to evaluate if the energy type can be incorporated successfully into the community.

Example 1
In 2003, the City of Quesnel, British Columbia commissioned the Pembina Institute to develop a report on energy planning options for the community.

Figure 8 is a list of energy reduction project options for the following programs: Land Use and Planning, Energy Efficiency, Renewable Energy, and Sustainable Transportation[23]. It would be the responsibility of your community to choose the criterions for your community.

From figure 8, the Pembina Institute was able to make the following recommendations to the City of Quesnel under each program heading. An example of the evaluation of a program from this report illustrates this process as:

Energy and Emissions Management Options: Land Use and Planning:
The report recommends that Quesnel's current exemplary land-use policies be retained; that energy-aware policies be expanded within Quesnel's revised Official Community Plan (OCP); and that much attention be given to the effective implementation of existing and additional policies within the OCP, given strong pressures to increase local economic development through automobile-oriented development. It is further recommended that Council direct that the schedule for the 2004 revision of the OCP be coordinated so that it can incorporate policy recommendations developed within the community energy planning process.

[23] Pembina Institute of Appropriate Development, *City of Quesnel Community Energy Plan Options Report: Energy and Emissions Baseline Assessment, Targets, Policy Review, Sustainable Energy Options, and Next Steps*

# = large positive effect + = positive effect 0 = no effect x = negative effect	Enhance economic development	Improve air quality	Stabilize/reduce energy costs	Enhance downtown core	Increase energy security	Reinforce City-industry cooperation	Reduce greenhouse gas emissions	Embody holistic approach	Leadership
Land Use and Planning Options									
Encourage mixed land uses downtown and in commercial centres	+	+		#			+	+	+
Increase density downtown and in commercial centres	+	+		#			+	+	+
Favour infill		+		+			+	+	
Offer developers density bonuses	#	+		#		+	+	+	
Be flexible in zoning	#	+					+	+	+
Energy Efficiency Options									
Building energy efficiency upgrades	+	+	#		#		#	+	+
Energy-efficient new construction	+	+	#		#		#	+	+
Renewable Energy Options									
Biomass heating: residential woodstoves		X or +	+		+		+		
Biomass heating: inst., commercial, and industrial buildings	+	X							
Biomass cogeneration: district heating	#	X or #	#	#	#	#	#	#	#
Ground-source heat pumps (earth energy systems)		+	+		+		+	+	+
"Waste energy" heat pumps		+	+		+	#	+	+	#
Solar thermal hot water		+	+		+		+	+	#
Solar air heating		+	+		+	+	+	+	#
"Green power certificates" or "green" electricity	X or #		x or +		+	= or #	#	+	#
Sustainable Transportation Options									
Sustainable transportation fuels	+	+					+	+	+
Enhanced city bus service	+	+	+	+			+	+	+
Enhanced intercity bus service		+	+	+			+	+	+
Transportation clearinghouse		+	+				+	+	+

Figure 8: Planning Options

Selecting Sustainable Projects in your Community

While most options will 'get the job done'; not all project options will meet the community's idea of sustainability.

It is therefore important to select the best energy type and system for your project to provide an overall benefit to your environment, local economics, and social well-being; and therefore lead your community to a sustainable high quality of life.
To assist in selecting projects that meet your targets and objectives, as defined by the Vision; a sustainability checklist can be developed and used to evaluate each option.

- ☑ Does the development attempt to minimize its energy consumption?
- ☑ Does it recycle or utilize alternative waste reduction techniques?
- ☑ Does the practice encourage the use of local resources and the retention of wealth within the community?

Example 1

The City of Regina, Saskatchewan proposes the following criteria for its checklist[24]:

- ☑ Will it enhance the fairness and equity of distribution of economic and social benefits to the community?
- ☑ Is it sensitive to public health and safety?
- ☑ Does it respect and preserve the biophysical environment and the diversity of species?
- ☑ Does it conserve non-renewable resources and protect reproductive systems for renewable resources?
- ☑ Will it yield future benefits, which justify the intergenerational transfer of financial and operational obligations?

These criteria are based on the city's long-term vision.[25]

Example 2

The Four Capital Approach is a method of measuring or estimating the impact a single project will have on the community. Based on the four capital areas specified by the National Round Table for the Environment and the Economy, Natural Resources Canada's Four Capital Approach to community project assessment evaluates potential impacts of proposed projects.

[24] Councilor Clipsham of the City of Regina*, Private communication*
[25] City of Regina, *A Vision for Regina*

In this approach, proposed projects are evaluated based on a holistic cost/benefit assessment of the four areas describing community wealth:

- Produced
- Natural
- Human, and
- Social

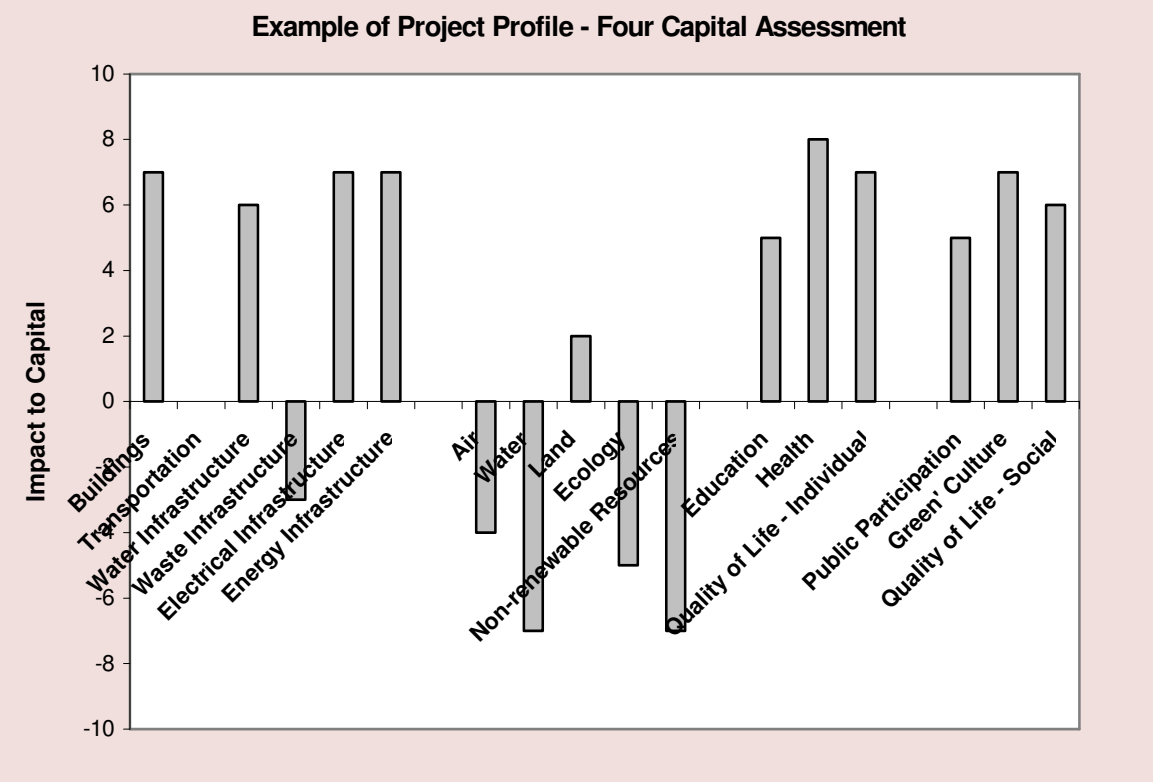


Figure 9: Sustainability Scale

Figure 9 illustrates the relative benefits and disadvantages according to the four capital areas. Under each capital area, the assessment team creates their own benchmarks. These benchmarks are then evaluated on a relative basis for each project against the 'sustainability scale' seen in Figure 9.

Example 3
The Balance Sheet is another method that evaluates the sustainable development impact of various project scenarios to see which ones will have the ability to influence sustainable high quality of life for the community.

Figure 10 is one version of a Balance Sheet.

Balance Sheet: District Heating: Costs & Benefits

Environmental Benefits:

- Estimates show that CO_2 emissions are reduced annually by 3,500 tonnes, SO_x by 32 tonnes, NO_x by 4.5 tonnes and particulate matter by 4.2 tonnes.
- It is an extremely flexible technology that can make use of any fuel including the utilization of waste energy, renewable energy and, most significantly, the application of combined heat and power (CHP).
- The chilling equipment contains no CFC's.
- Air emissions from the plant are much lower than the combined emissions from plants in individual buildings.
- Cooler water is produced by melting ice, enabling the customers' conditioning system to work more efficiently and effectively.

Social Benefits:

- The district heating and cooling system enhances the attractiveness of the city's urban core as a location for development.
- It is a reliable source of energy. Most district energy systems operate at a reliability of "five nines" (99.999 percent) and have back-up systems. To IDEA's knowledge, there have been no rolling "heat-outs" related to district energy systems.

Economic Benefit:

District energy systems can use a variety of conventional fuels such as coal, oil and natural gas, whichever fuel is most competitive at the time.

Buildings connected to district energy systems also have lower capital costs for their energy equipment because they don't need conventional boilers and chillers. Building space is saved for more valuable purposes.

Economic Costs:

- Heat losses and high electricity costs are due to oversized boilers, district heating pipes and electric pumps, vents, etc.
- Technical deficiencies in the technical interface between district heating grid and individual house heating systems. This interface (heat exchanger, regulation, pipings) is not a part of the BMDH plant.
- Depending on factors of the service area, the initial construction cost can be high.

Environmental Costs:

- Initial disruption and loss of land for local ecology, ecologically sensitive areas, water systems, and so on during the construction stage.

Social Costs:

- Initial disruption to traffic and noise pollution to residents near the construction site.

Figure 10: Sustainability Scale

The balance sheet for district heating lists all positive and negative aspects of the three main pillars of sustainable development: economic growth, environmental health, equality in social well-being. These Balance Sheets can also easily be compared to each other when deciding which project(s) to implement over others.

Finalizing Projects to Implement

Not all projects that have been selected can be implemented. This is because the scope of projects is limited by operational parameters such as:

- Opportunities and barriers
- The amount of funding and time that it is available
- Potential scheduling conflict with concurrent projects
- Community desires for a specific technology

a) Opportunities & Barriers

Example 1

The Remote-Community Energy Workbook offers an easy-to-follow methodology for determining suitable community project(s)[26]. By answering a series of pertinent questions and completing worksheets, your community can develop a clear picture of opportunities and barriers. The worksheet can be adapted for use by communities of various sizes.

Figure 11 is a reproduction of Worksheet 15, Appendix 3, The Remote-Community Energy Workbook

[26] Robinson, Andrew, *Remote-community Energy Workbook*

Project Idea Title: _____

1. What would the project achieve? What barriers would it overcome?

2. Who would the project benefit?

3. Who would the project effect?

4. What will it take to make the project a reality?
   - Technical assistance?
   - Funding?
   - Time?
   - Political support?
   - Equipment and materials?
   - Skills and expertise?
   - Partnerships/joint efforts?
   - Investment (guess)
     - No / low costs?
     - Large investment / long-term payback?
     - Small investment / quick payback?
     - No idea?

5. How will this project improve the energy picture?
   - Directly save energy?
   - Make it easier to save energy?
   - Replace oil based energy with renewable energy?

6. How will the project help the economy?
   - Free-up money previously spent on energy?
   - Create demand for energy-saving products and services?
   - Keep money in the community?
   - Create new jobs?

7. Will the result of this project be seen in? (circle one)
   - Short term (less than 1 year)
   - Mid-term (2-3 years)
   - Long-term (more than 4 years)

Figure 11: Remote-Community Energy Worksheet

b) Financing

The amount of funding and the time it will be available plays a key role in shaping the development and selection of certain energy technology and systems.

c) Scheduling

It is important to avoid creating a schedule that is too rigorous and extensive in design since much of the data is still unknown. It is also important to avoid creating schedules that are too optimistic in their timelines – and too aggressive for your community. It is easy to lose credibility if the schedule is unrealistic! Schedules should be designed to balances projects of different timelines in order to spread out project deadlines.

The schedule (e.g. Figure 12) provides the reader with a certain level of confidence as to whether the project timelines are entirely realistic. The output from the scheduling process is traditionally a report that lays out the schedule and identifies the proposed plans, their areas of interest, resource requirements, etc.

There are several steps to developing a schedule:

1. For each proposed program and set of possible projects:
    a. Use the community inventory to determine programs that are precursors to others (i.e. pipes and other equipment need to be constructed before a district energy system can be introduced). *Refer to Chapter 4: Stage 2: Ascertain the Status Quo.*
    b. Identify the major criteria necessary for the project to operate successfully within the community and to help the community achieve its long-term goal of sustainability. *Refer to Chapter 6: How to develop a project that is right for your community?*
    c. Identify proposed benefits resulting from the implementation of each program. *Refer to Chapter 6: Selecting the Best Project for your Community.*
    d. Prioritise the short-term goals versus the long-term objectives. *Refer to Chapter 5: Establishing Objectives and Targets to meet Goals*

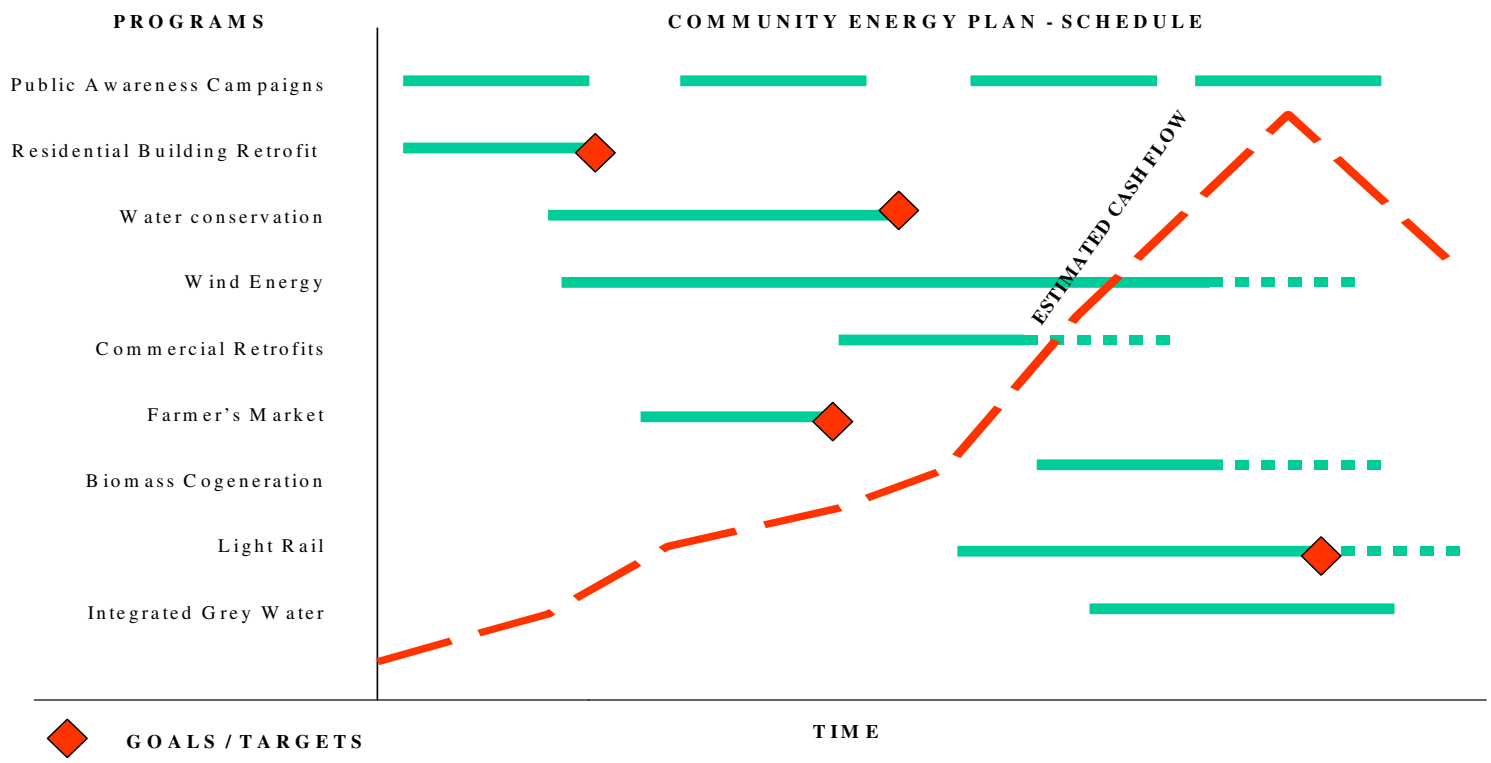


Figure 12: Community Energy Plan Schedule

2. Identify critical points and deadlines that must be met. Is there equipment or construction that is near the end of its usable life? For example, the Montreal Protocol required that certain refrigerants be phased out by 2005.
3. Identify any forthcoming development plans that City Hall has in its current Official Plan.
4. Align projects in order of available resources (e.g. staff) so as to be compatible with existing levels.
5. Estimate the level of resources and funding required for the implementation of the first several years.

d) Community Priorities

Communities such as Kelowna, British Columbia[27] have identified key issues within their community that must comply with the standards as specified within the Official Plan.

The geography of the Kelowna area causes air inversions and poor air quality specifically during the summer months. Similarly, the reliance by a large number of communities on Lake Okanagan for both water supply and disposal places the body of water in a highly critical position. To better manage the disposal issue, Kelowna is attempting to organize a watershed approach, coordinating all communities that function within the same watershed.

Kelowna Priority List
Air Quality
Water Quality / Quantity
Transportation Planning

In the case of the City of Vancouver[28], activities taking place generate an array of environmental impacts that affect a much broader range of people and territory. The results from their 'City Plan' process indicate that of these impacts, citizens were most concerned with air pollution.

The report "What's Stopping Sustainability" by Jennie Moore provides comment on the barriers to sustainability implementation in the Greater Vancouver area.

From her surveys, she highlights the following:

- Surveys have demonstrated that the quality of Vancouver's environment represents the highest value and greatest concern of the resident population...
- Concerns have recently been expressed about deterioration in some aspects of the natural stock, in terms of air quality (subject to growing pollution,

[27] City of Kelowna, *Current Projects Areas*
[28] Moore, Jennie Lynn, *What's Stopping Sustainability?*

> especially from automobiles, which generate about 80 percent of atmospheric pollutants)....

Policies and regulatory frameworks both at the local and regional levels of administration are being adjusted in order to arrest this deterioration, but there are indications that significantly higher levels of effort and expenditure will be needed to ensure that succeeding generations will enjoy similar levels of environmental quality as the present.

In the interest of health and sustainability both in the immediate area and for the planet as a whole, it is important that these issues of negative environmental impacts caused by the activities of citizens of Vancouver be addressed.

e) Community Values

The City of Whitehorse sets itself a series of "Corporate Values":

1. Sense of Community

- We value and share the needs, aspirations and diversity of our community – they exemplify our Yukon Spirit and are the foundations of our vision.
- We believe we need a safe and healthy community in order for our citizens and businesses to prosper.
- We aspire to a vibrant quality of life. We believe in community involvement.
- We promote teamwork within our community as the basis of shared success; diversity is our strength. We believe anything can be accomplished by working together.

2. Quality Customer Service

- Our teamwork and co-operative spirit reaches out to the customers – we include the customer in our team.
- We treat everybody as a customer; including our colleagues.
- We provide fair, honest, and consistent customer service.
- We identify, understand, and respond to our customers' needs.
- We measure our customer service, looking for opportunities to improve.

3. Fiscal Responsibility

- We are the caretakers of our City.
- We believe implementing our community vision requires careful financial planning and accountability to our citizens.

- We are fair and prudent and our expenditures are affordable.
- We save for our community's future.

4. Environmental Awareness
   - We are proud of our land. Its fragility and the resources it provides us deserve our respect.
   - We believe preservation, protection and rehabilitation of our natural environment are important factors in our decision making process.

f) Conflicts of Interest

Often community groups form over a desire to solve a specific issue. While public involvement should always be encouraged, it is important to avoid undue influence of public opinion and assess the options using a Project Development Methodology as you would for any other. If the technology is deemed unsuitable for the project and the community in terms of sustainability, a conflict of interest may arise between the specific section of the public and the planning committee.

However, it is the task of the planning department to remember that the purpose of the CEP initiative is to achieve a net benefit for the community as a whole. Therefore, it is the responsibility of the planning committee to either work with the public through surveys, interviews, and discussion groups, to determine an energy project that the community values and that is feasible to implement; or to promote through public education an alternative energy project developed by the planning committee.

Computer Simulations and other Software tools

Software tools are excellent resources to compliment the process of project development and selection. Software tools are used during project development to help planners analyze options for design features and energy technologies to be used in a project. Appendix F offers examples of useful software tools.

It's not always easy to visualize what two-dimensional plans or a development proposal will look like when built. Computer simulations can be used to help your planning team translate design and energy technologies into a projection of what your study area may look like after the CEP has been implemented. Computer simulations, such as Computer Aided Drawing and Design (CADD) and Geographical Information Systems (GIS), make it possible to produce highly accurate simulations faster and relatively inexpensive

images that can be easily adapted to design changes[29]. An architect's rendering, in contrast, may have to be completely redrawn.

Computer simulations are generally used after the design features and technology options have been chosen. Computer simulations allow community members to see differences in proposed design styles and development patterns, and allow decision-makers to evaluate potential impacts of proposed developments and make specific modifications where necessary.

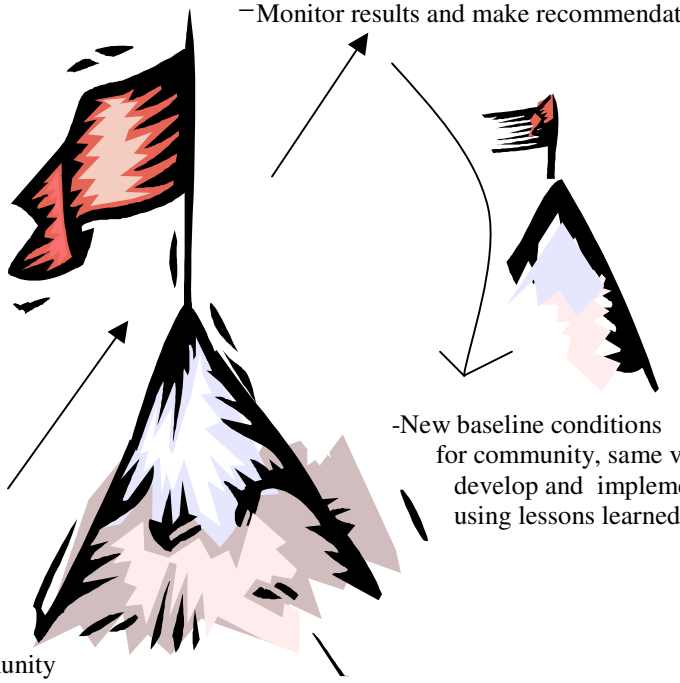
Before

After

Figure 13: LeDroit DC Revitalization Project (Simulations provided by Urban Advantage, Berkeley, CA)

[29] Local Government Commission, *Participation Tools for Better Community and Land Use Planning*

Chapter 7: Step 5: Implement & Monitor



(Note: As discussed in Chapter 3, the baseline is your starting point)

Implementing the CEP

While this guide has focused much of its intention on developing the plan, it is important to remember that the true intention of the CEP is its implementation.

The Association for Better Communities suggests the following features for implementing the plan into action[30]:

- Monitor results and celebrate success
- Market and celebrate annual results
- Adapt and Stay on the Community Agenda
- Develop Leadership and Plan for Transitions
- Anchor CEP in Local Organizations

[30]Alexander, Don et al, *Public Participation Process for Community Energy Planning*

The South Carolina State Government[31] offers a hypothetical example of an implementation schedule. In their schedule, strategies represent the projects required to meet the needs of the goals and objectives.

Goals/Objectives		Participants	Time Frame for Completion
Objective 1.1.	Encourage mixed-use development		
Strategy 1.1.1.	Develop an incentive program for Developers in targeted areas	Planning commission City/County council Energy advisory committee Planning staff Economic development staff	Jan. 1, 2001 to Mar. 31, 2001
Strategy 1.1.2.	Develop promotional/educational materials for developers and the public	Planning commission Energy advisory committee Planning Staff	Mar. 1, 2001 to May 31, 2001
Strategy 1.1.3.	Amend zoning and land development regulations to allow and encourage mixed-use development	Planning commission City/County council Planning staff Utility providers Economic development staff	Jan. 1, 2001 to June 30, 2001
Objective 1.2.	Encourage infill and redevelopment		
Strategy 1.2.1.	Develop an incentive program for developers	Planning commission City/County council Energy advisory committee Planning staff	Jan. 1, 2001 to Mar. 31, 2001
Strategy 1.2.2.	Develop promotional/education materials for developers and the public	Planning commission Energy advisory committee Planning Staff	Mar. 1, 2001 to May 31, 2001
Strategy 1.2.3.	Amend zoning and land development regulations to allow and encourage infill and redevelopment	Planning commission City/County council Planning staff	Jan. 1, 2001 to June 30, 2001
Strategy 1.2.4	Seek partnerships and funding to develop a brownfield reclamation program	City/County council Planning staff Economic development staff Energy advisory committee	Jan. 1, 2001 to Dec. 31, 2001
Objective 2.1.	Reduce energy use through street and parking design		
Strategy 2.1.1.	Amend zoning and land development regulations to allow reduced required road widths and turn-arounds	Planning commission City/County council Planning staff	Jan. 1, 2001 to June 30, 2001
Strategy 2.1.2.	Amend zoning regulations to adjust parking requirements to be more realistic and specific to particular land uses	Planning commission City/County council Planning staff	Jan. 1, 2001 to June 30, 2001
Strategy 2.1.3.	Provide incentives to developers to construct narrower streets	Planning commission City/County council Energy advisory committee Planning staff	Jan. 1, 2001 to June 30, 2001
Strategy 2.1.4.	Amend zoning and land development regulations to require connected street patterns within new developments whenever feasible	Planning commission City/County council Planning staff	Jan. 1, 2001 to Dec. 31, 2001

[31] Matheny Burns Group, *Preparing an Energy Element for the Comprehensive Plan*

Goals/Objectives		Participants	Time Frame for Completion
Objective 2.2.	Provide a multi-modal transportation system		
Strategy 2.2.1.	Amend zoning and land development regulations to require the inclusion of sidewalks and greenway connections within new developments	Planning commission City/County council Planning staff	Jan. 1, 2001 to Dec. 31, 2001
Strategy 2.2.2.	Seek partnerships and funding to develop an inter-connected greenway system throughout the community	City/County council Planning staff City/County recreation department or commission Developers Energy advisory committee Neighborhood associations	Jan. 1, 2001 to Dec. 31, 2001
Strategy 2.2.3.	Amend zoning and land development regulations to remove requirements that make walking, biking or transit use difficult	Planning commission City/County council Planning staff	Jan. 1, 2001 to June 30, 2001
Strategy 2.2.4.	Seek partnerships to promote walking and biking for transportation purposes	Planning commission Energy advisory committee Planning staff Neighborhood associations	Jan. 1, 2001 to Dec. 31, 2001
Strategy 2.2.5.	Amend zoning and land development regulations to allow and encourage mixed-use and compact development	Planning commission City/County council Planning staff	Jan. 1, 2001 to Dec. 31, 2001

Figure 14: Hypothetical Implementation Plan

Monitoring and Evaluation Process

Monitoring and evaluation process uses the feedback loop system discussed in *Section 2, Chapter 1 The Community Energy Planning Methodology* of this guide. The Government of Australia, in its *Cool Communities* program suggests a feedback loop system for monitoring and evaluating projects[32]:

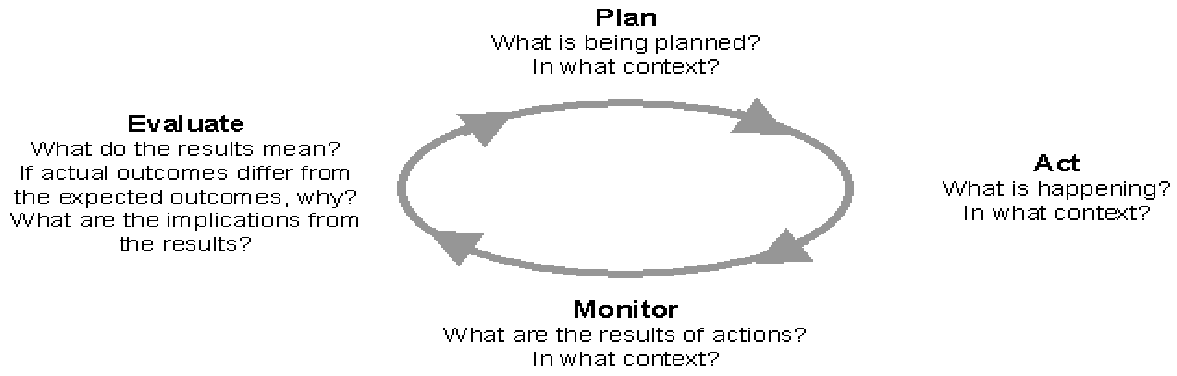


Figure 15: Feedback Loop for Monitoring and Evaluation

[32] Australian Government, *Motivating Home Energy Action*

Evaluating the Success Rate of the Project

The evaluation process must be transparent and comprehensive so that you can effectively evaluate if the implementation of the projects has been successful. To avoid biased information it might be best to retain an external consultant to co-ordinate the evaluation process. The evaluation process would use indicators to determine if the targets of the projects have been met.

Indicators

An indicator is a tool for monitoring change to the baseline condition when the CEP is applied to reach the vision[33]. Indicators provide accurate and relevant measures of performance for each desired outcome on a timely basis. Since it is impossible to measure all aspects that affect the outcome of a CEP, indicators are used to compare the baseline data set with the outcomes.

Criteria for Indicators

Indicators should be [34]

- ☑ Relevant to the issues of the community
- ☑ Feasible to implement (practical and cost effective)
- ☑ Credible and supported by scientific data
- ☑ Clear and user-friendly to the community
- ☑ Comparable to the baseline data sets for demonstrating changes

Types of Indicators [35]

Indicators can either directly monitor conditions or can monitor activities that affect conditions. Indicators that directly monitor conditions are preferred.

> For example, timber harvesting may have an affect on wildlife, but the condition of wildlife cannot be easily assessed based on the level of timber harvesting activity. Rather, wildlife should be assessed on the basis of indicators that measure conditions such as the amount and quality of habitat and population health and viability.

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[33] Government of British Columbia, *Strategic Land Use Plan Monitoring Procedures*
[34] Jolette, Deni and Ted Manning, *Developing Performance Indicators for Reporting Collective Results*
[35] Government of British Columbia, *Strategic Land Use Plan Monitoring Procedures*

Indicators can be either quantitative or qualitative.

> For example, annual volume of timber harvested in a particular area can be measured in quantitative units of cubic metres whereas quality of wildlife habitat may be measured in qualitative terms such as high, medium or low capability.

The Federation of Canadian Municipalities, through their Quality of Life Indicator[36] (QOL) program have established a preliminary set of municipal indicators that reflect the ability of a community to deliver a high quality of life to its citizens. They have defined the need for these indicators as a tool to:

- Identify and promote awareness of issues affecting quality of life in Canadian communities
- Better target policies and resources aimed at improving quality of life
- Support collaborative efforts to improve quality of life
- Establish municipal governments as a strong and legitimate partner in public policy debates in Canada

In their report, the FCM states " the QOL measures presented in this report are not limited to areas of municipal jurisdiction because there are important changes taking place in municipal governance, especially in large urban communities. Canadian municipal governments have assumed a wider rage of responsibilities, particularly in provinces where provincially administered services have been realigned to municipal governments."

Evaluation Process

The evaluation process begins with data collection. Data is collected with both a qualitative and quantitative focus.

Qualitative Data Collection[37] collects feedback from the stakeholders and key groups who have been impacted by the project. There are a number of methods of information collection. Popular methods include:

- *Interviews and open-ended interviews* can be time-consuming but can also provide detailed information.

[36] Federation of Canadian Municipalities, *Quality of Life Reporting System*
[37] Australian Government, *Motivating Home Energy Action*
Saskatoon Board of Education*, Strengthening Our Learning Community*
University of Nevada, *Your Gateway to Community Needs*

- *Group discussions or focus groups* at workshops are excellent for gathering data quickly and for stakeholders to share their views of the program with others. Group discussions are expensive and not as reliably represented
- *Surveys* are useful for determining stakeholder opinion on information such as community acceptance of a new energy technology or the level of trust and awareness in an energy type or provider. However, surveys can sometimes produce inaccurate results because respondent's memory may be faulty or may offer socially-acceptable responses. For example, persons often report lower-than-actual thermostat settings, even when they know that their settings are being recorded.[38]

Quantitative evaluation collects data to be analyzed to assess the project's success:

- Rate of financial savings in energy and other costs
- Amount of pollution prevention (Balance sheet approach, Chapter 6)

Next, compare your indicators to both the qualitative and quantitative data. What does this information tell you about the outcome of your project? Were the objectives of your indicators met? If not, why? What could you do differently? To help you answer these questions, use a feedback loop to review the goals set out in the Vision.

Finally, a progress report is often developed and distributed to planning officials, advisory committees, and funding groups. It is also important to distribute results in user-friendly reports that are accessible to the public and other community stakeholders.

Monitoring the CEP

Monitoring the progress of your CEP before and after Implementation, can improve results by:

- Minimizing costly mistakes of an inappropriate projects
- Maximizing the effectiveness of the CEP
- Developing an ongoing knowledge base for your future CEPs and to share with other communities

[38] Lutzenhiser, L, *Social and Behavioural Aspects of Energy Use*

Monitoring Process

The following framework has been adapted from BC Energy Aware in its well-designed toolkit for the Community Energy Planning Process[39]

1. Establish timelines for monitoring each indicator
2. Assign accountability for achieving targets
3. Collect data using an evaluation process
4. Use the results of the first three steps to identify which projects are successful
5. Revise the action plan based on the results of step 4

The City of Canmore, Alberta, has developed an excellent community monitoring process:

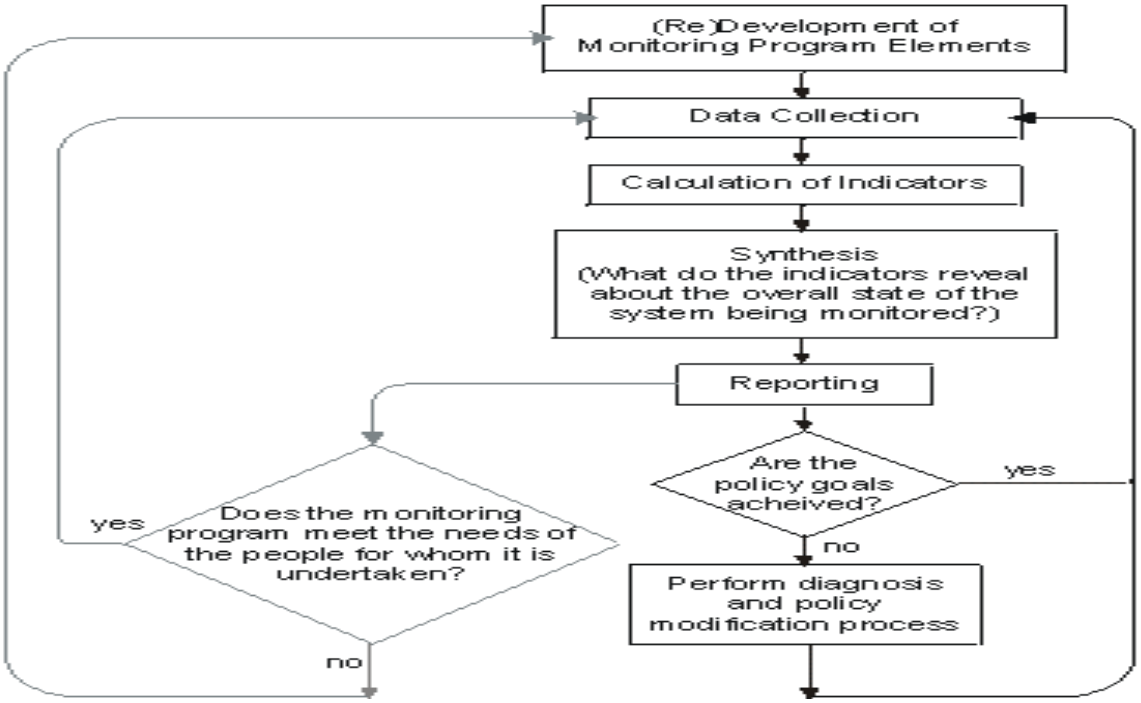

Figure 16: City of Canmore monitoring process[40]

Since the CEP is a lengthy process, and can potentially span over decades. It is recommended that monitoring occur at least a few times during the lifetime of the CEP schedule.
It is also recommended that monitoring occur more frequently at the onset of the Implementation stage. This way, discrepancies and problems can be recognized and hopefully potential conflicts can be avoided. After you have finished the monitoring

[39] Alexander, Don et al, *Public Participation Process for Community Energy Planning*
[40] Ellis, Robert, *Canmore Community Monitoring Program Report: 2003 Report*

process, you may find that the community is growing into something quite different then what was envisioned. By revisiting the CEP methodology, you can develop a new CEP. Using the results of the monitoring from the original CEP, the original Vision can be modified and projects (along with their scheduling) can be altered to accommodate the new set of conditions for your community.

The end goal of following the CEP methodology is to achieve a sustainable high quality of life. Section 3 of the Community Energy Planning Methodology will discuss case studies from various communities in Canada who have planned for the efficiency of energy use in their area.

Concluding Statements

Chapter 1:

A Community Energy Plan is a long–term and high-level method of evaluating land use and community design options for the most efficient consumption of energy.

The CEP follows a 5-step framework. The five steps are: Develop a Vision, Ascertain the Status Quo, Quantify the Vision, Develop Programs & Projects (and schedule them), and Implement & Monitor.

A Feedback Loop should accompany the CEP planning process to help you maintain the direction of the CEP and make use of learned information in order to modify the vision or plan for future CEPs.

It is suggested that a plan for fundraising be developed before the CEP planning process is set into motion. This way, you will have a better idea of the amount of money that will be available for project development.

In this methodology, community involvement is encouraged to compliment your planning process. There are a number of community mechanisms that exist which can be used to encourage community participation.

Chapter 2:

Planning Advisory Committees are ideal bodies through which to develop a CEP.

Such groups are made-up of representatives from a variety of stakeholder groups. The more diverse the group, the more comprehensive your CEP will be.

Chapter 3:

A Vision is a picture of what you want your community to look like. Visions need to look far enough into the future so that projects will be integrated with a built environment that is ready to accommodate.

A Vision must be sustainable. In defining your community's 'code of sustainability' the community must ask itself a number of questions that relate the community to its energy needs and its vision for future energy systems.
Developing the vision includes public engagement. There are a number of mechanisms designed to promote public participation, such as open houses, web-based portals, and charrettes.

The end result to the visioning process is a direction that will lead the development of the CEP. The visioning process should be detailed and comprehensive enough to guarantee that the direction of the CEP will be easy to follow by future members of the planning team.

Chapter 4:

Before projects can be designed to help you achieve your Vision, it is important to first develop an understanding of your current situation. Data is collected that represents your community's baseline condition. The baseline condition is used to present a snapshot of the community that can be used to spot trends and areas of high energy and resource use. Later in the planning process, these trends will form the basis of an indicator system.

Data is collected in a consecutive, step-wise manner. The data that is collected will be specific to your area(s) of study and will focus on the objectives set out in the Vision.

The first step in data collection is to take an initial analysis to form the baseline condition. Next, more detailed data is collected when projects are developed, such as energy profiles of different technologies and social preferences to certain energy systems. The third step in data collection happens during the monitoring stage, where information is collected to determine the success rate of the CEP.

A second round of data collection occurs later in the planning process, but are discussed in this chapter to see how they fit into the data collection process.

The make data collection easier, you may want to break-up the Planning Advisory Team into a Planning Team. This sub-group is formed of professionals who can each take-on task that suit their individual skills.

There are a number of tools available for data analysis. Software packages can calculate and predict future trends in energy use. Visual diagrams such as maps and Sankey diagrams can also aid in helping analyzers spot consumption patterns.
After you have collected your data, you should have a clear understanding of trends and areas of high energy and resource use. A summary report should be developed for later reference.

Chapter 5:

Quantifying the Vision means developing goals and targets to meet the requirements of the Vision.

Goals are designed to quantify the community Vision into actions that lead to a positive change in the community. A CEP takes the Vision Statement one step further by

including quantifiable actions in the form of goals. Goals should be long-term and flexible in nature in order to adapt to future changes in technologies, the built environment, etc.

To meet the objectives of goals, targets are created. A target is a quantifiable requirement to meet the objectives of the goal.

Chapter 6:

Programs address the goals of the Vision and are based on areas of concern indicated by the initial data inventory taken in Step 2 of the CEP.

Projects are developed using a series of targets to the meet the objectives of the goals from the Vision.

There is no blueprint to creating projects. This is because each community is unique and therefore will require its own project development process. Therefore, when developing your projects, it is helpful to focus on how each will fit into the community and how each can contribute to the end goal of sustainability.

Not all projects that are found to be suitable will be able to be implemented. This is because of such factors as: opportunities and barriers, the amount of funding available and the time that it is available, potential scheduling conflicts, and community desires for a specific technology.

Chapter 7:

While this guide has focused much of its attention on developing the plan, it is important to remember that the true intention is the implementation stage.
After Implementation, it is important to monitor the rate of success of the CEP process. An indicator is a tool for monitoring the rate of success after the CEP is set into motion.

Indicators are monitored using an evaluation process. For the evaluation process, qualitative and quantitative data is collected. Next, the findings are compared to the indicators to see if the targets were met and a feedback loop is used to link the findings back to the original goals of the Vision. This information is then summarized into a progress report, with ideas on why certain targets weren't met and what could be done for the next CEP.

Monitoring the progress of the CEP process is an affective way to detect potential conflicts in their early stages. Monitoring should be done frequently at first so that the information gathered can be used as lessons learned that could modify the direction of the CEP.

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Appendix A: Funding Programs

Alternative Funding Programs and Resources Guide – Federation of Canadian Municipalities, 2003 FCM funding guide FINAL.pdf

Green Municipal Enabling Funds – Federation of Canadian Municipalities
http://www.fcm.ca

Green Municipal Investment Funds – Federation of Canadian Municipalities
GMIF Overview borrow En.pdf

Buildings Energy Technologies Program – Natural Resources Canada
http://www.nrcan.gc.ca/es/etb/cetc/cetc01/htmldocs/funding_programs_betp_e.html

Industry Energy Research and Development – Natural Resources Canada
http://www.nrcan.gc.ca/es/etb/cetc/cetc01/htmldocs/funding_programs_ierd_e.html

Renewable Energy Technologies Program – Natural Resources Canada
http://www.nrcan.gc.ca/es/etb/cetc/cetc01/htmldocs/funding_programs_retp_e.html

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http://www.sdtc.ca/en/about/index.htm

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Canadian Foundation for Innovation – Government of Canada
http://www.innovation.ca/programs/index.cfm?websiteid=53

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http://www.oee.nrcan.gc.ca/neud/dpa/policy_e/programs.cfm

Canadian Adaptation and Rural Development – Agriculture Canada
http://www.agr.gc.ca/progser/card_e.phtml

The Canadian Agricultural Rural Communities Initiative – Agriculture Canada
http://www.agr.gc.ca/progser/carci_e.phtml

Canadian Rural Partnership – Agriculture Canada
http://www.agr.gc.ca/progser/crp_e.phtml

Rural Water Development Program – Prairie Farm Rehabilitation Administration
http://www.agr.gc.ca/pfra/rwdp_e.htm

Shelterbelt Tree Program - Prairie Farm Rehabilitation Administration
http://www.agr.gc.ca/pfra/sbcprog_e.htm

Prairie Grain Roads Program - Prairie Farm Rehabilitation Administration
http://www.agr.gc.ca/pfra/pgrp_e.htm

Supporting Communities Partnership Initiative – Human Resources & Development Canada
http://www18.hrdc-drhc.gc.ca/programs/homelessness/desc.asp

Job Creation Partnership - Human Resources & Development Canada
http://www18.hrdc-drhc.gc.ca/programs/jobcreation/desc.asp

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http://www.infrastructurecanada.gc.ca/index_e.shtml

Canada Strategic Infrastructure Fund (2002 – 2007) – Infrastructure Canada
http://www.infrastructurecanada.gc.ca/index_e.shtml

Border Infrastructure Fund – Infrastructure Canada
http://www.infrastructurecanada.gc.ca/index_e.shtml

Rural Economic Development Program - an Ontario Small Town and Rural (OSTAR) Development Initiative – Ministry of Municipal Affairs and Housing, Government of Ontario http://www.mah.gov.on.ca/userfiles/HTML/nts_1_11073_1.html

Climate Change Connection – Government of Manitoba
http://www.gov.mb.ca/est/climatechange/schools/index.html

R2000 – Manitoba – Government of Manitoba
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http://www.cd.gov.ab.ca/funding_partnerships/index.asp

Canada / BC Infrastructure Program – Government of British Columbia
http://www.ei.gov.bc.ca/InfrastructureProgram/

Revitalizing the Forest Economy – Government of British Columbia
http://www.for.gov.bc.ca/mof/plan/#information

Partnering for Success – BC Buildings Corporation
http://www.bcbc.bc.ca/Community_Reach/Projects/

Power Smart / Green IPPs – BC Hydro
http://www.bchydro.com/info/ipp/ipp956.html

BC Transit
http://www.transitbc.com/corporate/transitplus/other_programs.cfm

Community Sponsorship Program - Columbia Power Community Sponsorship
http://www.columbiapower.org/content/fundform.html

Agricultural Environment Management Initiative – Government of New Brunswick http://www.gnb.ca/0173/10/0173010001-e.asp

Incentive Programs for Mining – Government of New Brunswick
http://www.gnb.ca/0078/minerals/incentives-e.asp

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Appendix B: Running a Charrette[41]

RESEARCH HIGHLIGHTS

June 2002 Socio-economic Series 103

SUSTAINABLE COMMUNITY PLANNING AND DEVELOPMENT: DESIGN CHARRETTE PLANNING GUIDE

Introduction

Design charrettes are becoming an increasingly popular part of the urban planning process. They bring together a diverse range of expertise—such as architects, landscape architects, engineers, planners, content specialists, educators, students, community representatives, governmental staff and civic leaders—to collaborate on creating innovative design solutions that embody multiple objectives and mutual interests. Design charrettes give visual form to ideas and policies and are effective in generating creative solutions to difficult problems in the least amount of time. Typically, a design charrette lasts three to four days and involves the same logistical work as required in planning a conference.

All too often, buildings, sites, neighbourhoods, communities and regions have been planned or even zoned according to policies and codes with little visual or contextual input. Planning decisions are argued on a case-by-case basis in what is, for the most part, an adversarial hearing process. Such approaches are counterproductive to sustainability planning, which requires tools that deliver a holistic, strategic and integrated planning approach.

Design charrettes are one such tool. They provide a forum for diverse groups of participants to explore, understand, create and evaluate possible and preferred options. They encourage discussion beyond conventional thinking, and can address the opposition so often typical of conventional planning and zoning proposals. Charrettes, which are often linked to larger planning initiatives, help to build consensus and inspire community initiative and ownership in development planning.

Done well, a charrette can

- increase community learning about complex issues
- evoke greater understanding and support of plans
- inspire greater involvement in furthering the journey towards creating and maintaining sustainable communities

A sustainable community design charrette focuses on specific issues and details of a given site in relation to the surrounding community and ecosystem, using the broad concepts and goals of sustainability to focus and guide discussions.

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[41] Canadian Mortgage and Housing Corporation, *Sustainable Community Planning and Development: Design Charrette Planning Guide*

Sustainable Community Planning Design Charrettes

Charrettes offer a holistic, integrated approach for addressing a complex set of issues:

- land use
- transportation
- public and private space
- density
- mobility
- urban form
- resource use (materials, energy, water, finances)
- waste generation and handling
- marketability, aesthetics

Other activities can be useful precursors to a full charrette, or even serve in place of one. Community planning forums, design assistance teams, discussion forums, expert panels, multi-stakeholder brainstorming sessions, open houses and participatory mapping exercises are a few examples. These are particularly useful when budget, time or other constraints prohibit a full-scale charrette.

A sustainable community design charrette is no small undertaking. A multitude of issues must be addressed and decisions made. Charrettes require considerable preparatory and follow-up work, as well as significant resources, especially in terms of people.

To assist with this work, Canada Mortgage and Housing Corporation (CMHC) funded the development of a guide for those who are interested in hosting or otherwise initiating a sustainable community planning design charrette. *Sustainable Community Planning and Development: Design Charrette Planning Guide* covers the four phases involved in planning, organizing and holding a charrette: 1) the work that needs to be done before even committing to a charrette; 2) the advanced planning and logistical arrangements to be made; 3) the event itself, from on-site signage and registration to setting the tone and handling predictable challenges; and 4) post-event reporting. The guide also provides a summary of the concepts and issues relevant to sustainable development, sustainable communities and design charrettes in general.

For those interested in a fuller discourse on sustainable community planning, CMHC's *Sustainable Community Planning: Participation Tools and Practices* serves as a good companion document. This guide is summarized in CMHC's *Research Highlight* February 2001, Socio-economic Series, Issue 97.

2

The four phases

Beginning the journey

Before committing to a charrette, or seeking support or approval, you need to do some homework. You must be familiar with the charrette approach and the concepts of sustainable community planning, and you need to know who are likely to be the key decision makers, your potential allies and the resources required. You will need to demonstrate how a charrette will contribute to creating a better community, make your municipality more prosperous, respond to community interests, address specific problems related to a site, enhance sponsor's credibility or speak to other key interests.

Keep in mind that charrettes are resource intensive and that they tend to involve important projects, which means they attract attention and can become politically sensitive.

This section of the guide will help you build support for a charrette and develop a formal proposal. It also includes three readiness assessments, such as the one shown here. These assessments are useful in determining where you are at in the early stages of the process and if you are ready to proceed to the next step.

Readiness Assessment 1:

Are you in a position to initiate broader exploration of the charrette idea, for example, are you a key decision maker or a sponsor?

Do you know who your allies might be or where you might begin building support?

Is it likely that the organization and its members may be open to the idea?

Do you have some confidence that resources are available or could be obtained?

- If your answers tend to be "yes", you're ready for the next step.
- If you are uncertain, it's time to do some more homework and exploration.
- If you answered "no" to one or more of the questions, it's time to do a bit more thinking and planning and/or choose an activity other than a charrette.

Pre-charrette planning

This phase involves outreach, communications with people directly and indirectly involved in the charrette, business relations management, research, document preparation, program development, team selection and lots of nitty-gritty tasks—drafting contracts, venue arrangement, food planning, organization of on-site supplies and equipment, transportation and accommodation for outside visitors, and more. It may also include various planning meetings, mini-design workshops or other orientation and planning events. These can be used both to inform the charrette and to expand interest and involvement in the planning process beyond charrette participants.

Failure to inform various stakeholders and interested parties, or otherwise provide them with some form of connection to the charrette, can result in damaged relationships and questions regarding the appropriateness and credibility of the charrette, its organizers and the results.

A charrette focused on sustainability will likely be broad in scope. The consultants and facilitators engaged for the event must represent many disciplines, including process expertise as well as technical knowledge. The specific scope and terms of reference for a charrette should be specified clearly and succinctly.

The *Design Charrette Planning Guide* discusses major design issues—natural systems, built form and infrastructure—and their sub components. It notes that a design brief or program, which is provided to participants in advance of the event, should be organized around social, economic and regulatory design issues, or other issues such as land and water, the built environment, building design and performance, and cycles of growth and decay.

Suggestions regarding logistical arrangements and a discussion of predictable challenges complete this chapter. The guide provides a detailed sample list of supplies and equipment to have on hand at a charrette, as well as a pre-charrette readiness assessment checklist.

The charrette event

Next, the guide discusses the event itself in considerable detail. This section begins with some of the physical arrangements to consider, such as directional and welcoming signage, food and supplies. It discusses what you need to achieve in the first session, the tone that should be set for the event and how it could be achieved. The guide also provides insight on how to structure the sessions and the required documentation.

An important goal in the first session is to establish a common understanding of the scope and process for the charrette. Opening presentations should cover the following aspects: some general background information regarding the events and work that preceded the charrette; a review of the design brief and performance criteria; an explanation of the process and timing for the rest of charrette; and mention of the final deliverables anticipated. This first session is also an opportunity for all participants to learn a little about each other.

You should expect the main part of the event, the design sessions, to be characterized by uncertainty, creativity and chaos. Some people, particularly those new to charrettes, may become anxious about results or worry about the process falling apart. The guide offers advice on the flow and structure of activities, and it provides some insight on what to expect in the way of confusion and how to handle predictable challenges.

Post-charrette: managing and maximizing the aftermath

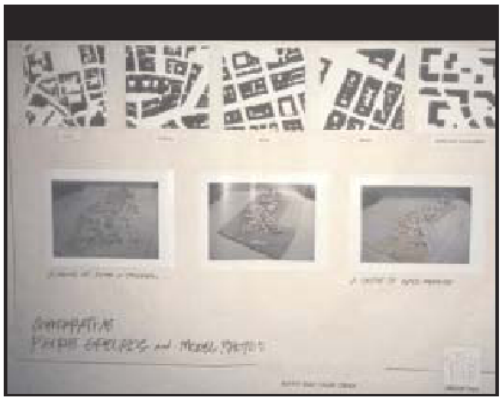
In the post-event phase, a key goal is to get information about the charrette out to stakeholders and other interested parties as soon as possible. This may be accomplished by way of quick update notes or initial posts to a project Web site. These communiqués help maintain interest and momentum, and they forestall frustrations about potential reporting delays.

Two reports should be issued, a preliminary one and a final report. The suggested content for the first includes the following items: short descriptions of the project, the process, the site (with a map), the charrette event, its

3

purpose and goals, who participated and how the teams were chosen; the text from the design brief; a summary of each team's design, with some key visuals included; a summary of the key themes and ideas that emerged; and concluding remarks on how the results will be used and the next steps in the project. This preliminary report should be completed and presented to key stakeholders as soon as possible.

The final report should also be completed and distributed to all interested parties as quickly as possible. It will build on and extend the content of the previous report, going into more detail on such aspects as the rationales for the charrette, conclusions and individual team reports. The latter should include all relevant visuals and discussions of technical issues.



Access to these results, including various data sets and drawings, by sponsors, participants, stakeholders, observers, the media and residents is critical. Following the release of these two reports, analysis and assessment of various options will likely occur for some time to come. The process must continue to be very transparent. It is important to remember that charrette results are ideas for further exploration and discussion, not endpoints in the process. In the end, how you use the ideas and momentum generated by a charrette will determine the long-term benefits.

More guidance

Three appendices provide additional help and information. The first presents the various checklists found throughout the main body of the guide. These checklists will help you with determining whether you are ready to move ahead, selecting team members, preparing briefing packages, logistical arrangements and preparing the preliminary and final reports. The second appendix presents a sample design brief in detail, along with sample cheat sheets pertaining to design objectives, performance thresholds and quantities. A sustainable urban development issues matrix, in the third appendix, provides guidance on how to focus discussions and exploration of ideas.

Conclusion

Design charrettes are a powerful tool for bringing together diverse interests and disciplinary expertise to explore options and generate visual ideas and potential solutions. They encourage discussion beyond conventional thinking. They can be an effective means for testing policies and the feasibility of design solutions that speak to multiple objectives and interests. They can also inspire and catalyze community-wide co-operation and commitment.

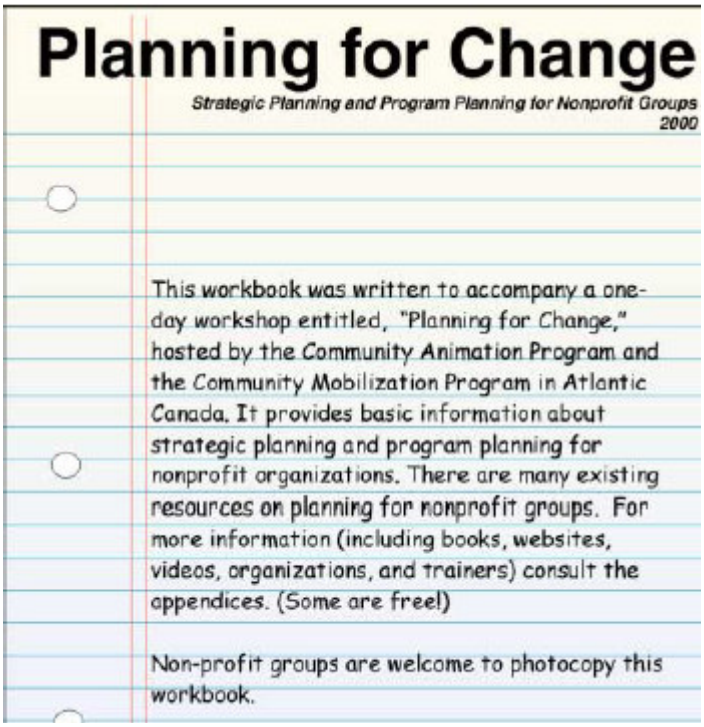
To be successful, though, a design charrette requires extensive planning, outreach, expert resources and time. The *Design Charrette Planning Guide* is a comprehensive resource book for anyone who plans to undertake a charrette or is in the process of holding one. It is also an interesting source of information on the principles and issues of sustainable community planning, and their relationship to charrette events for anyone participating in a charrette. Wherever you are at in the process, this guide will give you much insight into sustainable community planning issue areas, the benefits of a charrette, how to proceed and what to expect.

4

Appendix C: Examples of the Visioning Process

Example 1: "Planning For Change" – *Environment Canada / Health Canada*

- What is a vision statement?


Planning for Change

Strategic Planning and Program Planning for Nonprofit Groups
2000

This workbook was written to accompany a one-day workshop entitled, "Planning for Change," hosted by the Community Animation Program and the Community Mobilization Program in Atlantic Canada. It provides basic information about strategic planning and program planning for nonprofit organizations. There are many existing resources on planning for nonprofit groups. For more information (including books, websites, videos, organizations, and trainers) consult the appendices. (Some are free!)

Non-profit groups are welcome to photocopy this workbook.

A vision describes the future destination; it provides an image in words of what success would look like. It is built on reasonable assumptions about the future.

A comprehensive vision statement would convey both an external and internal vision for the organization!

1. An external vision focuses on how the world will be improved changed, or different if the organization achieves it purpose.
2. An internal vision describes what the organization will look like when it's operating effectively to support the external vision.

<u>Goal: Dare to dream the possible. Together identify a realistic but challenging vision.</u>

A useful exercise is to have flipchart paper posted with a question written at the top. Each person will then have 10 minutes to write down their three most important thoughts under each question. (If an idea is already recorded a check can be used to show that two people had the same idea. The comments will be reviewed as a group.)

How would the world be improved, changed or different if our organization was successful in achieving its purpose?

What are the most important services that we should continue to provide, change, or begin to offer in the next three years?

If we could only make three changes that would significantly affect our ability to provide quality services, what would they be?

What do users consider the most important part of our work?

What makes us unique?

Then each person can take five minutes to identify three elements they would like to see in their vision. Similar concepts will be grouped together. As a group, review the elements and draw up a common vision. It might require further refinement. A group or individual can be appointed to finish this work. The vision could be communicated in words, in video, or in images.

When the vision is completed, ask: Does our vision challenge and inspire us?

Guiding Principles/Shared Values: Guiding principles/shared values are priorities that guide the organization in making decisions on how an organization conducts itself and what values it wishes to operate under.

Examples:
Youth involvement
Diversity
What are the organizational values on people, process, programs? For example how will the groups make decisions?
What are the roles for group members?

Mission Statement: A mission statement tells why the group exists. A mission statement describes the group's goals, the people it serves, and what makes the group distinctive.

Example:
"Our mission is to protect and restore the natural environment and provide opportunities for public education to preserve regional wilderness corridors and open spaces."

Process Idea: Developing a new mission: If you already have an existing mission statement include this statement as part of the information that you will review in your situational analysis to see if the mission needs to be refined.

Before the meeting, we will send a survey asking the following key questions of group members:

Our group's main purpose is to…?
Our group is intended to help the following people…?
Our group is important because we…?
Others should support our group because?
The people who serve this group are…?

A list will be created from the survey responses before the meeting. At the meeting, each person will be given coloured dots to stick beside the statements

on the list they agree with the most. Based on the highlighted priority areas the group will be broken down into smaller groups who will use this information to create a mission statement. They will report back with comments. The mission statement might be refined later by an individual or small group.

Organizational Structure and Culture: Organizations are in a constant state of change. It is useful to identify what your organization does and what roles you play within it. There are a range of structures that an organizations can use.

Whole Group Model: Whole group operates as a team. Often used in small agencies. A team leader is not necessary; however, generally someone is needed to schedule things and lead the group so that everyone has a chance to contribute.

Hierarchical Model: Traditional hierarchical model consists of managers/supervisors with people reporting to them. Some decisions are delegated or supervisor makes decision based on input and feedback.

Team Model: Larger agencies, staff can be broken into sub-groups. Each team's functional similarly in the whole group model. The executive director coordinates the various teams.

Combination: An agency may choose any combination of the above models.

Culture: "In identifying and understanding the origins of an organization's culture, we need to investigate three elements, in addition to the desired organizational values, that are the heart of the culture: the organization's heroes/ heroines, its rites and rituals, and its cultural network."

Example 2: "Hornby Island Community Project"

How does Visioning Work?
The Hornby Community Visioning Project will take place in 4 steps:

1. Sustainable Community Education Series
- Community members to broaden their understanding of how to create a sustainable and diverse community. This will set the groundwork for the survey and visioning processes to follow.

2. Quality of Life Survey
- A research process, including a survey, to measure the current base-line for community health that can also help 5 years from now when we want to measure our progress.

3. Community Visioning

- Workshops and meetings designed to engage various sectors of the community in "visioning exercises". These sessions will allow the community to "think outside the box" and imagine what the community could look like in 20 years based on what people want rather than what they think is possible.

4. Strategic Planning
Based on the values, goals and projections articulated in the community visioning process, form "issue-specific" action groups to create manageable and clearly-defined plans for the future. These groups will be responsible for developing a road map of activities to achieve specific, strategic goals as well as the time-lines for achieving those goals, and for determining appropriate groups and organizations to oversee the successful completion the plans.

Example 3: Community and Economic Development Toolbox – Cornell Community and Rural Development Institute

Community Visioning: Most communities will face special challenges over the next decade. The world is experiencing major transitions. One of the most important changes is that the community is emerging as the "place where the action is". As a result, communities have to determine "what needs to be done" and "how to do it" to secure a successful future. Whether the issue is community revitalization, health care, education, telecommunications, economic development, or the delivery of social services, communities will be required to make far more complex decisions than in the past.

The purpose of community development is to empower communities to be in charge of their future. They can give direction to this effort by the pursuing the following activities:

- Building the social capacity for vital and healthy communities
- Developing informed citizen participation
- Developing, expanding and retaining a community's agricultural industry
- Developing the workforce
- Fostering Healthy Families
- Promoting Life-long learning
- Improving community services
- Protecting the natural environment while increasing economic vitality
- Promoting and encouraging the "sustainability" of communities

One of the largest problems facing many local governments is people-power. It takes extensive effort to build partnerships and coalitions for community action. In the past, many (if not most) strategic or comprehensive plans came about from a "top down" approach, that is, professional planners or elected officials made plans and then presented

them to their community. This had lead citizens to feel that they had no ownership or involvement in the goals.

Without this involvement, there is little or no support for implementation or completion of plans and projects.

The Alternative -- Citizen Participation: Successful community planning comes from citizen participation. Involved citizens must:

- Determine when their community is ready to engage in an action planning or visioning process;
- Create and organize a community planning process that is inclusive in nature; for all citizens, officials, and stakeholders, that focuses on community purpose, vision, action planning, and implementation;
- Develop follow-up strategies and provide assistance to sustain the community's energy and momentum as it implements short-term and longer-term strategies for creating its future.

Communities have many options as to how to design their own "visioning" process. It is important to make a preliminary assessment of the issues to be addressed. Most processes are similar in nature and in the derived outcomes; and all have plenty of room for adaptation to local needs and circumstances.

The most commonly known is "charting". This process uses a core group of individuals to identify a larger working group (30 -40 people) within the community who have been identified as principle stakeholders. These 30 -40 citizens then proceed through the "charting" process – a basic SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis, consensus building and goal identification, and then action plans to achieve those goals. It is generally assumed that the process will take between 3 to 6 months - depending upon how quickly the "core" group comes together and can get the required commitment from the other participants.

Another popular process has been developed by the Rocky Mountain Institute; a model known as Community Economic Renewal. Very similar in process, the difference lies in that it encourages a broader community participation - not limiting the number of participants, but basing much of it's success on average citizen participation and hence, community capacity building. The process actively encourages community surveys, numerous meetings, small group dynamics, and ultimately, group actions to achieve the identified project's success. A significant element of this process is that it builds in educational opportunities for the participants; about their community, about issues of community development, and about economic components of the "community renewal " process. There is no set time frame - it is determined by the level of participation and the commitment of the citizens.

Outcomes: From a visioning effort, communities or organizations will be positioned to move forward and achieve the goals and objectives they have identified. By having a clearer understanding of what they are and what they hope to be, they will have a better "road map" on how to arrive to that point.

The most critical element is to arrive at an "action plan" - a more developed idea, written down for future use, that clearly articulates the "who" will do "what" and "how". Ultimately, it is the sustainability of the community that is most important - to the organization, to the participants, and most importantly, to the citizens of the community.

Appendix D: Building Heat Load Estimation

The heating demand of a building or group of buildings can be estimated in several ways:

- building heat loss calculations
- actual building fuel consumption,
- installed boiler capacity, or
- methods based on building square meters, usage, age and weather conditions.

If exact fuel consumption data is available from the various buildings it becomes a relatively straightforward task to determine the heat demand for the community. Combustion efficiency becomes the only variable that could affect the final answer.

Boiler efficiency

Caution should be exercised when selecting a boiler's efficiency. Suppliers are notoriously optimistic about their systems and quote values that really only represent operation at full load. Cyclical operation will dramatically lower the efficiency. Seasonal efficiency of most boilers often lies between 55 and 65%.

It should be noted at the outset that no single method gives an exact answer due to the influence of uncertainty in parameters such as boiler efficiency, energy conservation, and ventilation rate. However, comparing several of these methods can bring more confidence into the estimate.

1 Building heat loss calculations

A quick way to estimate the demand of a building without the need to obtain heating data is to use its heated floor area. The method uses default relating to the type of building and its construction. This data reflects the power per square-metre needed to maintain an inside temperature at a comfortable level, and compares the known unit energy demand (Watts/Sq Meter) to other buildings of the same type. Different categories of buildings such as hospitals, office, residential etc will have different unit heating demands. An estimate of the heating demand of a community that comprising a mix of these buildings types may be done on an individual basis or aggregated using an average value and the total building floor space of the community. This overall unit heating demand is a blended average of the individual buildings heating demands.

Variation of unit heating demands will be geography dependent. It will depend on the design temperature and level of domestic hot water use within that particular community. The energy demand for domestic hot water (DWH) however, is relatively independent of the community design temperature leaving the design temperature to have the primary influence on unit heating demand value.

- Design Temperature

The design temperature for a community is the coldest temperature that a community would expect to experience during the year. Design temperatures for communities throughout Canada can be obtained from Environment Canada and range from –7°C to –53°C. Typical values for some Canadian Communities are included in Table D1.

The total energy consumed by a community can then be estimated using this unit energy demand and a "Equivalent Load Full Hours" EFLH. EFLH can be developed using degree-day data and an estimate as to DHW energy demand to create a "Load Duration Curve". This curve is the graphical representation of cumulative load of a building or group of buildings in a specified period – any point on the curve represents the number of hours that the demand exceeds that particular load. A typical load duration curve is shown below. The area under the curve defines the energy consumed by the buildings.

EFLH
The EFLH is the number of hours that a plant would have to operate at peak conditions to produce the total energy for a building or community of buildings in a year.

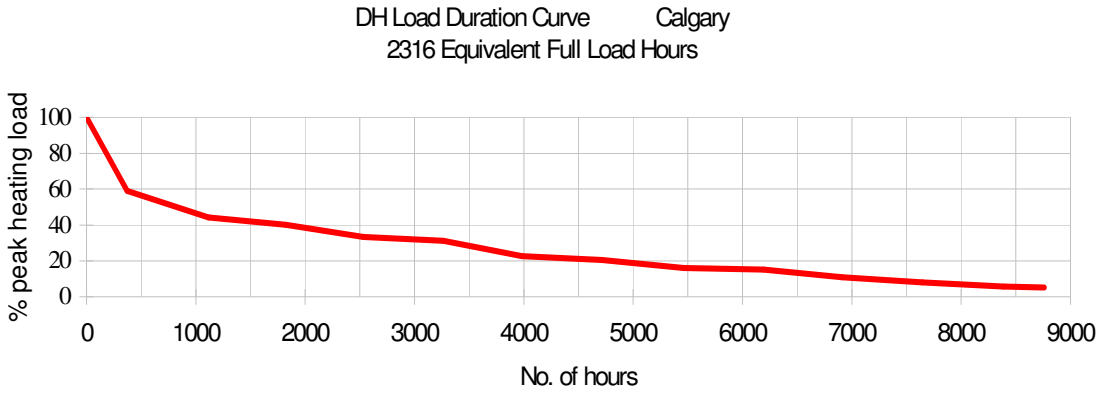


Figure D1: Load Duration Curve for Calgary

City	Degree Days	Design Temperature C	EFLH hours	City	Degree Days	Des Tempe C
Antigonish	4399	-23	2329	Nelson	3734	-2
Armstrong	7052	-42	2560	Okotoks	5303	-3
Brampton	4321	-21	2406	Ottawa	4597	-2
Brantford	3937	-19	2322	Ouje-Bougoumou	6869	-3
Burwash	8018	-46	2701	Owen Sound	4236	-2
Calgary	5365	-33	2316	Port Tupper	4336	-2
Charlottetown	4527	-22	2437	Prince Albert	6559	-4
Chicoutimi	5435	-32	2389	Prince George	5376	-3
Cornwall	4418	-25	2269	Quebec	5026	-2
Edmonton	5484	-34	2328	Regina	5877	-3
Edmunston	5271	-29	2446	Revelstoke	4256	-2
Flin Flon	6719	-40	2531	Saint John , NB	4768	-2
Fort McMurray	6661	-41	2479	Saint John's, NFLD	4824	-1
Fort Smith	7692	-45	2655	Saskatoon	5974	-3
Gaspé	5437	-25	2696	Sault Ste Marie	4943	-2
Geraldton	6753	-38	2614	Sudbury	5043	-3
Halifax	3880	-18	2325	Sydney	4541	-1
Hamilton	3772	-19	2239	Thunder Bay	5673	-3
Hinton	5679	-38	2242	Toronto	3646	-2
Inuvik	10040	-48	3180	Truro, NS	4661	-2
Iroquois Falls	6244	-36	2521	Val D'or	6199	-3
Kamloops	3751	-28	1865	Vancouver	2846	-
Kapuskasing	6454	-36	2592	Victoria	3115	-
Kenora	5938	-36	2418	Waterloo	4301	-2
Kingston	4202	-24	2215	Watson Lake	7766	-4
Lac Lacroix	5546	-35	2323	White River	6479	-4
Masset	3791	-9	2859	Whitehorse	6988	-4
Medicine Hat	4752	-34	2065	Windsor	3622	-1
Mississagua (Downsview)	3992	-22	2300	Winnipeg	5819	-3
Montreal	4198	-26	2132	Wunnumin Lake	7387	-3
				Yellowknife	8530	-4

Table D2:
Design Temperatures
for Canadian Cities

Summary:

EFLH is defined by the energy consumed over a year divided by the peak load and a reasonable approximation can also be made using following:

EFLH = (degree days per year *24) / (18-design temperature)

Peak Load (Connected Load) = (Heat Loss Factor)*(square metres of floor space)

Once the peak load is found or is known and the square metres of floor spaced known then a unit energy demand can be estimated by the following:

Energy Demand = EFLH * Peak Load

- Diversification:

In the case of an individual building the Peak Load would also be the Connected Load. However when multiple buildings are connected, as would be the case in a community application, this is not always the case. Not all buildings would need heat at the same time and this results in diversification of load. A value called the Diversification Factor must be included in the calculation.

Diversification factors range between 70% and 99% and depend upon the diversity of the building uses. Unfortunately there is no accurate method available to calculate this value. Utilities estimate using established real systems and a pinch of experience.

Diversification Factor - the percentage of the connected loads of a group of buildings that would yield a real peak load.

When incorporating a Diversification Factor, the EFLH for a community must be adjusted to be greater than the average for the individual buildings. In general, for a community of buildings:

Heat Loss Factors:

(Sum of Individual) Building Loads	*	(Individual Building) EFLH	=	(Connected) Load	*	(Diversification) Factor	*	(Community) EFLH

The table below (Table D2) lists a range of building types and their corresponding heat loss factors. The reader is responsible for assessing the standard of construction as to whether the building is leak-tight or draughty.

Table D3: Heat Loss Factors

	Regina			Ottawa			Halifax			Vancouver		
	Heat Loss Factor			Heat Loss Factor			Heat Loss Factor			Heat Loss factor		
Building Type	Low	Typ	High	Low	Typ	High	Low	Typ	High	Low	Typ	High
	watts/m^2			watts/m^2			watts/m^2			watts/m^2		
Office	60	65	70	50	55	60	35	40	45	25	30	35
Retail	65	80	95	50	65	80	30	45	60	20	35	50
Restaurant	90	105	120	75	90	105	50	65	80	35	50	65
Warehouse	45	60	75	35	50	65	20	35	50	15	30	45
School	50	65	80	40	55	70	25	40	55	20	35	50
Health/Medical	55	70	85	45	60	75	30	45	60	20	35	50
Hospital	100	115	130	90	105	120	75	90	105	65	80	95
Hotel	90	105	120	80	95	110	65	80	95	55	70	85
Residential	65	80	95	55	70	85	40	55	70	30	45	60
Food/grocery	65	80	95	50	65	80	30	45	60	20	35	50
Misc	55	75	95	45	65	85	30	50	70	20	40	60
Community Average	69	83	97	58	72	86	41	55	69	32	46	59
Design Temp °C	-36			-27			-18			-9		
EFLH	2360			2261			2325			2358		
Degree Days	5946			4606			4103			3001		
	Low = Well designed, new construction											
	Typical = Good construction, no apparent degradation											
	High = Poor construction											

In the table, the building terminology may be described as follows:

Office: Government, data processing, financial centre, post office, office with retail (except food), real estate, computer centre, etc
Retail: Strip mall, hardware store, department store, furniture store, drugstore, car dealership, multi-retail buildings
Restaurant: Full service, cafeteria, carry out, food related sales and service
Warehouse: Storage, agricultural storage, stand-alone barns, etc
School: Educational buildings, colleges, Universities, etc
Health / Medical: Medical clinic, dental clinic, veterinary clinic, out-patient care, rehabilitation centre
Hospital: Medical care hospital, mental-care facility.
Hotel: Motel, hotel, short-term residential, tourist home
Residential: Apartments, condominiums, (may be used for single family homes)
Food / Grocery: Retail food, supermarket, farmer's market, specialty food-stores
Misc: Fire/police station, library, religious assembly, amusement arcade, museum, art gallery, concert hall, theatre, gas station, jail, shelter home, civic assembly, passenger terminal, etc

Worked Example

The following is a possible methodology that a community may use to determine their energy requirements for a community district energy study.

Step 1 - determine the design temperature of the community. This may be obtained from Table D1 or through published data from Environment Canada.

Step 2 - survey of the buildings to be included in the district energy study and determine unit energy heat loss factors from Table D2. If uncertainty about the type of buildings exists then choosing a point somewhere in the middle of the range would be a good starting point. The square metres of floor space should be available from the owners or tax office.

Step 3 - estimate the total connected load in the community using the heat loss factor and the area of each building.

Step 4 – determine a diversification factor. A value between 80% and 90% would be a good first estimate for groupings of building numbering over 25. The community now has an estimated connected load and a peak load. This is the rated size of the heat supply for the community.

Step 5 – calculate the EFLH. Using Table D1 or degree-day data from Environment Canada and an estimate of DHW demand, generate a load duration curve. Resources are available at Community Energy System at Natural Resources Canada to develop one for any interested community.

Step 6 – calculate the total consumed energy. This is the energy that needs to be supplied throughout the year and will determine the economic viability of any project. If fuel consumption data is available it is a good idea to cross reference energy consumption from both methods.

Appendix E: Data Characteristics

NB: Communities should evaluate the following suggested list of data and select from it the data sets that relate to their own needs. Not all data sets are necessary for all communities.

To simplify the collection of data it is suggested that we should simplify matters by dividing the requirements into three groups. These groups define distinct areas of the community energy plan – General, Geographic, Built, and Social.

Remember, it may not be necessary to assess data from each and every section of this list and other data may be added depending upon your circumstance. The team should consider the community in terms of the questions posed by the list.

Built Environment - Buildings, Industries, Heating Systems, Local Generation, Energy Demand / Cost, Energy Distributors, Sewerage
Social Environment - Transportation, Demography, Recreational activities, Local Services, Energy Payment, Solid Waste, Financial.
Geographic Features - Geography, Climatic Conditions, Water, Waste Disposal Site

1 Built Environment:

The built environment includes all buildings, their associated infrastructure, and the infrastructure currently in place within the study area. An assessment of the community in terms of current consumption and resources will create a baseline for the plan.

Buildings – the intent is to understand the form and status of the building stock. In a small community it may be possible to inspect each and every construction in the community. However, in the majority of communities, individual inspection is impractical.

In urban areas the study can map the energy consumption according to block building density. In this way energy consumption may be provided by the utilities (gas and electric) in an aggregated manner, avoiding confidentiality issues. Assuming some degree of similarity between building stock in a single block, any trend in energy consumption pattern should be visible.

A second approach, more suited to rural communities is to group building stock into building types (i.e. single family homes, duplexes, low rise, etc). Data would then be collected as being representative of each group. ‘Typical’ data sets would thus be developed and trends identified. Oil consumption data for such buildings could be more readily obtained since specific owners could be approached and permission obtained for the use of their consumption data.

Much of the collected data can be estimated by visual inspection. The type and use of the buildings will dictate or suggest the way that the energy is consumed within the building. Typical boiler or furnace efficiency is lower than that promoted by the manufacturers. In many residential systems, seasonal efficiency (that covering the entire year's operation) can be assumed 65 percent unless better data can be confirmed. Likewise, the fuel used too, can be confirmed by visual inspection. The presence of gas meters, external oil tanks or fill pipes are immediate signs. However, cordwood is also a suggestion that a second fuel source is used within the building. The size of the woodpile and a knowledge of the local climate will suggest whether the wood is the primary heat source or supplementary.

Industries – many attempts to design for sustainability have ignored the industrial or commercial sector. Industry is a heavy user of energy, possibly the major employer and must therefore be viewed as part of the community. Industry also has a vested interest in conserving energy since for many the expenditure on energy is a significant part of the annual operating cost. It is not within the mandate of the Community Energy Plan to dictate process change to the industrial sector but the community may still partner with the industry when it is to the advantage of both. For example, low-grade energy being rejected by industry may be used as a heating medium by local premises. Similarly, wood-waste generated by the community as construction waste or tree trimmings can be used as a fuel for biomass fired boilers, etc. Organic waste from the community, too, may be used as compost for garden industries.

Data requirements from the industrial sector may be considered as proprietary by many of the industries concerned. Their participation in the project should still however be encouraged even if the resource data available is only qualitative. Typical data that should be sought includes:

- Number and type of industries within the boundary area distinguished by size and whether they use local resources (lumber, minerals, etc) or whether they are service industries such as restaurants, hotels, or couriers.
- An estimate of industry ownership – whether it is locally owned and operated or a subsidiary of an external operation.
- Size and capacity of the major industries.
- What practice is used for industrial waste – particularly agricultural waste?

Municipal Infrastructure – The municipal government is a major investor in the community, not just in terms of buildings but also in terms of roads, equipment, schools, hospitals, police, fire, ambulance, and other services. A listing of these facilities should provide insight into

Energy demand/cost – The energy audit of the community will identify the passage of energy streams into and out of the community. Once the individual stream flows are recognized and measures then an attempt to define overall system efficiency may be made. An imaginary line around the community will allow the importation of energy to be measured – for example the number of oil trucks.

- A breakdown of fuel supplies entering the community. Oil / Natural gas / Coal / Lumber (for consumption as fuel) / Propane / Electricity / Other

Energy Distributors – The end result of any action taken is to create an improvement in the standard of living. Displacing fossil fuel may appear to be a virtuous undertaking but when completed at the cost of creating unemployment then the benefit is harder to accept. The contribution of the fossil fuel distribution network must be replaced by alternative revenue generation mechanisms:

- A description of the manner by which the various fuel supplies are delivered within the community.
- How much of the energy distribution system is owned and operated internal to the community?
- Oil / Electricity / Natural Gas / Gasoline / Coal / Lumber / Propane /

Sewerage – Liquid waste and its treatment constitutes a significant portion of a municipal energy budget. Immediate costs might include pumping and aeration but indirect costs involve infrastructure and land costs. Even with a local 'honey wagon' approach the impact is the need for pumping trucks, transportation and the cost of disposal.

- What is the method of collection and disposal for sewerage within the community?
- Where is the sewage disposed?
- What level of treatment is employed?
- What is the capacity of the system and what is the average / typical level of use?

2 Social Environment:

Investigating the social environment will encompass not only the current situation but also the situation that is desired by the community. A clear understanding of the goal of the community must be known so as to allow a definition of the long term needs.

Vision – A long-term vision is an essential part of the community energy plan. The plan is not merely an efficiency plan that minimizes the energy needs of today's society but

also a plan that encourages growth, where growth is desired. Solutions must be designed to expand and grow with the community.

- What is the long-term vision for the community?

Transportation – Traditional transportation strategies however have involved measuring the traffic flow and building new roads to accommodate the increase. This was in spite of evidence that new construction simply increases the level of traffic. In London, UK, the building of the M25 motorway was to remove the traffic from the center of the city, allowing it to bypass the core. When completed, the road was at capacity within a year with no perceptible decrease in city center flows. The overall result has been deepening car dependency, spiraling infrastructure costs and worsening environmental impacts. This approach is unsustainable and many analysts recommend a move towards Transportation Demand Management (TDM).

Expenditure on vehicular traffic often comprises up to 40% of a household's expenditure. Fuel and maintenance is an issue that is often ignored in the running of a household – assumed to be negligible. To the community however, the money spent on owning and operating vehicles is money that cannot be spent on other community services. An understanding of the level of expenditure that is attributed to transport will provide suggestions as to changes in development design that can reduce the need for motorized transport and thereby retain more money within the community.

- A description of the transportation in use within the community – car / SUV / commercial truck
- An estimation of the modal split between ridership of the various transportation mechanisms
- An estimate of the vehicle count and the traffic profile

The data required that would enable TDM to be considered within the community is essentially a log of traffic movement within the study area. Typical data collected for an analysis includes:

- Before-and-after travel behavior data, such as commute mode choice and Average Vehicle Ridership.
- Information on takeback effects, such as additional vehicle trips that participants make when they telecommute, or when they have extra non-work days due to Compressed Workweeks.
- Participants' reactions, including both positive and negative feelings about the program and individual strategies.
- Problems and barriers, including unanticipated costs, spillover impacts (such as

parking problems in nearby neighborhoods), and opposition by some participants.

- Costs to participants, such as additional home heating and electricity consumption while telecommuting, and perceived benefits, such as more convenient childcare scheduling.
- Costs and benefits to employers, including program administrative costs, and effects on productivity and recruitment.
- Market information (i.e., surveys of potential participants) to help determine demand for potential new transportation services and the effects of possible transportation improvements, and to identify barriers and potential problems.
- Parking and traffic counts.

Demography - How is the community growing or declining? Decisions made now as to which route to take, which technology to install, will impact the community for a long period of time. Will the community be in a position in 5, 10, 20 years time to support such a decision? An understanding is required of the demographic distribution of population within the community.

- Population in age groups
- Trend in population shift over last five years, into and out of the area
- Estimation of the movement shift over the next five years

Recreational Activities – Expectation of the quality of life within the community will dictate how the residents invest their time and resources. The needs of an outdoor-oriented community in terms of social amenities are very different to a community of stay-at-home individuals. This section links with the vision of the community in that it describes future needs and demands.

- What are the recreational activities of the community - Physical Sports / Hunting / shooting / fishing / etc?
- What is the social center for the community?

Local services - Developing a sustainable community will depend upon the level of involvement of the members of that community. Responsibility, ownership and answerability are important. In areas where all services are provided by outside bodies or are subsidized often presents difficulty in reforming the operating structure of the community.

What local services are provided within the community?

- Who runs and who funds the Schools / Hospital / Seniors Homes / community centers / etc?
- How is the cost of energy structured within the community – per unit energy, demand charge / energy charge, subsidized, etc?
- Who pays for the energy used?
- What is the frequency of billing and what is the cost profile for each fuel type over the last 3 years

Employment – Experience in other communities has shown that the use of renewable energy offers a greater multiplier factor than the use of fossil fuel. There must therefore be opportunities for economic development associated with the plan such that the actions are seen as investing in local resources within the community.

- How many of the population work within the community?
- How many people, working within the community, live outside of the community?
- How many people are in seasonal jobs?
- Salary – in ranges

Solid Waste – Solid waste is as much an energy demand within a community as is water distribution. The disposal of garbage, whether residential or industrial, requires transport, resources and real estate. Simple landfill is capital intensive and may present health concerns (polluted water table) if incorrectly designed. A basic recycling program might offer opportunities in revenue generation from certain markets or the use of digester technologies to recover energy for use elsewhere.

- How is solid waste collected within the community?
- What is a typical volume of waste that needs to be collected?
- What is the composition of the solid waste in terms of paper, cardboard, plastic, wood, metal, organic, other?
- How is the solid waste disposed?

Financial – What is the financial state of the community and to what extent can the community accommodate development and expansion? Is the fiscal responsibility resident within the community or within some other outside body – e.g. INAC or the province?

- What is the annual budget breakdown?

- What is the debt loading for the community?
- Who is responsible for the financial operation of the community?

3 Geographic Environment:

The geographic environment attempts to define the working parameters that will constrain the scope of the plan. For sustainability to exist then the community must operate within its environmental footprint. Simply put, the community must aim to support itself on a land area equivalent to that already designated.

Geography – Enable an understanding of the terrain, the existing layout and the relationship between the building structures and the demands of the community.

- A detailed map of the community is required.
- A description of the soil type for the community, indicating the drainage potential, bedrock and construction properties
- A description of local resources such as forestry, peat, mines (abandoned), rivers, agriculture identifying the ownership (where possible) of each.

Climatic conditions – the prevailing weather conditions, etc.

- Statistical data on the local weather conditions including seasonal rainfall, sunshine, snowfall, wind – strength / direction, and other meteorological phenomena.

Water – Society, as we know it, depends upon water. The primary limitation defining quality of life is the supply of fresh water. Some communities have defined their growth capacity and the industries within their community by the capacity of their watershed.

- Where is the primary source of potable water for the community?
- Is industrial and residential taken from the same location?
- Quality of the water supply (hard / soft / turbidity)
- Has there been any water table fluctuation over the past period of time?
- What form of water distribution system is in place and how old is the system?
- What is the capacity of system and its state of repair?
- What typically is the cost of pumping for the community?
- What is the cost of water to the community?

- Who are the primary users?
- What happens to grey water?

Waste Site – the waste disposal site constitutes a dormant source of energy and energy consumption. As regards greenhouse gas emissions, methane is 21 times as powerful as carbon dioxide and its production / emission should be addressed. It also offers the potential for energy generation and/or revenue generation.

- What is the status of the waste disposal site?
- Who owns the site?
- Is the site operated according to preset plan?
- What is the capacity and age of the site?
- Estimated lifetime remaining?
- Is a fill profile available?
- Is a gas collection system in place?

Appendix F – Software tools (Modeling)

SIMPLE MODELS

Sector(s)	Model Name and Supplier	Description	Avail-ability	User Expertise	Level of Detail	Users
Transportation and Land Use Planning	SCALDS US Federal Highway Administration	SCALDS is a "a prototype model to estimate the full cost of alternative land use patterns". It is a series of interconnected spreadsheets that estimate total costs for three accounting paths. The first cost estimation path focuses on physical development, including land consumption, existing and projected housing mix, regional employment, and local infrastructure capital and operating costs. The second accounting path estimates the annual peak and non-peak cost of travel on a passenger mile travelled (PMT) basis. The third path estimates non-dollar denominated costs such as the air pollution and energy consumption. *For more information: http://www.fhwa.dot.gov/scalds/scalds.html*	Free	Inter-mediate	High	Un-known
	GHG Emissions from Urban Travel Canadian Mortgage and Housing Corporation (CMHC)	This model is based on a detailed survey conducted in Toronto (collected and maintained by the Joint Program in Transportation at the University of Toronto. The survey is done every 5 years with the next one scheduled to go this coming fall), looking at household transport behaviour under given certain conditions. The model accepts inputs on neighbourhood design (housing density, land use mix, housing types, road layout etc.), socio-economic factors (vehicles per household, household income) and locational factors (distance to node, proximity to employment etc.). It then predicts vehicles per household, VKT and public transit usage (as well as associated emissions). *For more information, contact Susan Fisher, CMHC, (613) 748-2317, sfisher@cmhc-schl.gc.ca*	Free	Inter-mediate	High	Few
	Municipal Table land use model *Energy Research Group*	As a part of their work for the Municipalities table, ERG developed a spreadsheet to estimate the energy use and emissions reduction impact of changes in land use practices. Spreadsheets estimate the energy use and emissions reduction impact of changes in land use practices. Model inputs urban form energy demand, energy load per capita, modal shares, development type and community size to calculate energy use and emissions. *For more information, contact Energy Research Group, Simon Fraser University, http://www.erg.sfu.ca/*	Custom	Inter-mediate	Medium	One

Sector(s)	Model Name and Supplier	Description	Avail-ability	User Expertise	Level of Detail	Users
Water Use	Watergy US DOE, National Renewable Energy Laboratory (NREL)	Watergy is a spreadsheet model that analyses the cost and energy savings of water conservation measures in buildings. "The spreadsheet allows input of utility data (energy and water cost and consumption data for the most recent twelve months) and facility data (number and kind of water consuming/moving devices and their water consumption and/or flow rates). It then estimates direct water, direct energy, and indirect energy annual savings, as well as total cost and payback times for a number of conservation methods." *For more information*: http://www.eren.doe.gov/femp/*techassist/softwaretools/softwaretools.html#watergy*	Free	Novice	High	Un-known
Building energy use	HOT2XP, EE4 CBIP Comply & Others NRCan Buildings Group	Natural Resources Canada offers a series of software programs to assist in the design and evaluation of energy efficient buildings. This includes software for new and existing houses, as well as commercial and institutional buildings. Most packages are offered at low or no cost. *For more information: http://www.buildingsgroup.net/home_e.html*	Comm-ercial	Inter-mediate	High	Many
	BLAST, DOE 2.1 and others US DOE, Office of Buildings	The US Department of Energy (DOE) Office of Buildings has developed a number of software tools to assist in design and evaluation. This includes DOE 2.1, an advanced engineering tool used to conduct detailed energy analysis of individual buildings. The DOE-2 "software engine" is very robust and used as an analytical basis for several other software tools. *For more information: http://www.eren.doe.gov/buildings/tools_directory/*	Commer cial	Expert	High	Many
	CEEAM Marbek Resource Consultants	CEEAM is a spreadsheet-based energy modelling application used to create market average energy use profiles of commercial buildings that take into account multiple penetration of different technologies. The main function of CEEAM is to simulate energy consumption and peak demand of all energy end-uses present in a commercial building. CEEAM calculates the building loads for both heating and cooling and accounts for interactive effects such as the increase in heating energy use and decrease in cooling energy use from lighting retrofits. CEEAM was used as the basis for analysis of all Building Table (and some Municipality Table) measures. *For more information: Marbek Resource Consultants, (613) 523-0784, www.marbek.ca*	Custom only	Expert	High	Consult -ant only

Sector(s)	Model Name and Supplier	Description	Avail-ability	User Expertise	Level of Detail	Users
Renewables	FRESA US department of Energy	Program designed to estimate impact of renewables in US federal building stock. FRESA allows energy auditors to "quickly evaluate renewable energy opportunities and energy systems options for possible inclusion in a facility's energy program. The program is a supplement to the energy and water conservation audits [...] and will flag renewable energy opportunities by facilitating the evaluation and ranking process. FRESA processes building and facility data to indicate opportunities for renewable energy applications in Federal facilities and buildings. FRESA provides uniform assumptions in the form of database weather and technology/energy cost parameters." *For more information:* *www.eren.doe.gov/buildings/tools_directory/software/fresa.htm*	Free	Inter-mediate	High	Un-known
	RETScreen Natural Resources Canada	RETScreen, a free spreadsheet-based package developed by Natural resources Canada, is a "pre-feasibility analysis model developed to help an energy project proponent prepare a preliminary evaluation of the annual energy performance, costs and financial viability of potential RETs projects located throughout the world." Package includes the computer software, a detailed user manual and an information database. *For more information: www.retscreen.gc.ca*	Free	Novice	High	Many
District Energy	Municipality Table District Energy Model Marbek Resource Consultants and NRCan	As part of its work for the Municipalities Table, Marbek and NRCan's Community Energy Systems Group developed a spreadsheet model to determine the GHG reduction impact of Combined Heat and Power (CHP) and Community Energy Systems. Calculations based on Toronto district energy study. Model inputs penetration of CES, community density distribution, energy use per capita and population to calculate emission reductions. *For more information: NRCan Community Energy Systems Group* *www.nrcan.gc.ca/es/etb/cetc/HTMLPages/ProgramsCES.html or* *Marbek Resource Consultants, (613) 523-0784, www.marbek.ca*	Custom only	Inter-mediate	Medium	One
Solid Waste Management	Integrated Solid Waste Man. Model (ISWM) CSR and EPIC	This model inputs characteristics of a MSW system (including waste composition, LFG recovery, distance to landfill, diversion ratios etc.) and assesses air emissions in terms of GHGs and CACs (SOx, NOx etc.). Model is capable of estimating impacts of changes in MSW system, and is currently being updated to include an anaerobic digestion module. The City of London has used this model to assist in environmental decision-making on changes in their MSW system. Includes some analysis of transportation impacts. *For more information: Corporations Supporting Recycling (CSR): hruska@csr.org* *Environment and Plastics Industry Council (EPIC): fedgecombe@cpia.ca*	Free	Inter-mediate	High	Few

DETAILED MODELS

Sector(s)	Model Name and Supplier	Description	Avail-ability	User Expertise	Level of Detail	Users
Integrated	Cities for Climate Protection Software Torrie Smith and Associates	Model developed to assist communities in developing local GHG reduction plans based both on actions of the "community-at-large" and "own use" municipal operations. For each category, the model establishes a baseline for buildings, industry, transportation and waste, then calculates the impact of specific measures in one or more of these areas. Currently used by over 140 municipalities in Canada, the U.S. and Australia. Torrie Smith also has software ("e-mission") to perform similar analysis for corporate clients, and is in the process of developing related software for state governments. *For more information: http://www.torriesmith.com/*	Comm-ercial ($2,500 for non-PCP)	Inter-mediate	High	Many
	QUEST Sustainable Development Research Institute, UBC	Software package developed by SDRI and Envision to encourage thinking about sustainability through an easy-to-use, "game-like" interactive interface. "The purpose of QUEST is to encourage thinking about sustainability by actually placing the user in a position of making decisions that impinge upon regional development and displaying the consequences of these decisions in an easy to understand way". QUEST is not available "off the shelf", and needs to be customised to a region, as has occurred in its first application in BC's Lower Fraser Basin. *For more information: www.sdri.ubc.ca/ OR www.envisiontools.com/site_map_main.htm*	Custom	Novice to Inter-mediate	High	Several
	Integrated Land Use/Transport-ation Environment model (ILUTE) University of Toronto	Model currently under development by Dr. Earl Miller at the University of Toronto. "ILUTE is intended to simulate the evolution of an urban area over time and space. It will include at least some land use decisions (some determination of land use may likely be external to the model), population and firm demographics, [...] and emissions and energy resulting from usage of the transportation system. Outputs will include distributions of housing and commercial building stock over time and space, population and firm distributions over time and space, travel on the transportation over time and space, and, as noted above, greenhouse gas and criteria air contaminant emissions from the transportation system." Not yet commercially available (intended demonstration in 1 or 2 years) *For more information: Dr. Eric Miller, University of Toronto, miller@jpint.utoronto.ca*	Under develop ment	Expert	High	None

Detailed Models

Sector(s)	Model Name and Supplier	Description	Availability	User Expertise	Level of Detail	Users
Integrated	Cities for Climate Protection Software Torrie Smith and Associates	Model developed to assist communities in developing local GHG reduction plans based both on actions of the "community-at-large" and "own use" municipal operations. For each category, the model establishes a baseline for buildings, industry, transportation and waste, then calculates the impact of specific measures in one or more of these areas. Currently used by over 140 municipalities in Canada, the U.S. and Australia. Torrie Smith also has software ("e-mission") to perform similar analysis for corporate clients, and is in the process of developing related software for state governments. *For more information: http://www.torriesmith.com/*	Commercial ($2,500 for non-PCP)	Intermediate	High	Many
	QUEST Sustainable Development Research Institute, UBC	Software package developed by SDRI and Envision to encourage thinking about sustainability through an easy-to-use, "game-like" interactive interface. "The purpose of QUEST is to encourage thinking about sustainability by actually placing the user in a position of making decisions that impinge upon regional development and displaying the consequences of these decisions in an easy to understand way". QUEST is not available "off the shelf", and needs to be customised to a region, as has occurred in its first application in BC's Lower Fraser Basin. *For more information: www.sdri.ubc.ca/ OR www.envisiontools.com/site_map_main.htm*	Custom	Novice to Intermediate	High	Several
	Integrated Land Use/Transportation Environment model (ILUTE) University of Toronto	Model currently under development by Dr. Earl Miller at the University of Toronto. "ILUTE is intended to simulate the evolution of an urban area over time and space. It will include at least some land use decisions (some determination of land use may likely be external to the model), population and firm demographics, [...] and emissions and energy resulting from usage of the transportation system. Outputs will include distributions of housing and commercial building stock over time and space, population and firm distributions over time and space, travel on the transportation over time and space, and, as noted above, greenhouse gas and criteria air contaminant emissions from the transportation system." Not yet commercially available (intended demonstration in 1 or 2 years) *For more information: Dr. Eric Miller, University of Toronto, miller@jpint.utoronto.ca*	Under development	Expert	High	None

Sector(s)	Model and Supplier	Description	Avail-ability	User Expertise	Users
Integrated	Community Sustainability Planning Tool R.S. Parfett & Associates	Empirical, GIS-Based model developed for the City of Ottawa to allow municipal planners to model the energy and emissions impact of their land use and transportation planning decisions. Model inputs GIS-based information on employment, land use, road networks, building data, energy consumption etc., and allows the user to define different scenarios (e.g., improved access to a shopping mall, location of services, change in public transport etc.). The model then outputs emissions resulting from specific activities *For more information: Richard Parfett, (613) 238-9746, www.rsparfett.com*	Custom	Expert	One
	Smart Places Sapient Technology	Smart Places is a GIS-based software that assists in the design and evaluation of land use scenarios. "Smart Places enhances decision maker insight for [...] land use planning, transportation systems, facilities management, environmental remediation and protection, energy forecasting, water allocation, and resource control. Smart Places is used to evaluate the implications and opportunities of plan alternatives. The system runs on a PC using ESRI's ArcView software. Smart Places provides a user-approachable set of tools for exploration, design, modification, illustration, and evaluation of alternative planning scenarios." *For more information: http://www.smartplaces.com/smart/index.htm*	Comm-ercial (over $2,500)	Expert	Many (US only)
	City Green Sheltair Group Resource Consultants	An engineering-oriented model, City Green was developed for the Fraser Valley Regional District. It is based on ArcView (GIS) with an Access database that houses data on population, housing, economic forecasts etc. to create estimates of how municipal planning decisions may affect land-use, transportation, water use, waste management etc. Allows user to visualise and identify areas for further analysis. Developed with support from NRC, BC Science Council, BC Gas. Model is used to design community growth strategies, and is currently used by six BC municipalities. Contains a good database on buildings, transportation systems, infrastructure etc. *For more information: Sebastian Moffatt, (604) 732-9106, smoffatt@sheltair.com*	Custom	Expert	Six
	INDEX Criterion Planners / Engineers	Software based on the PLACE^{3}S sustainable community design methodology. It is oriented more towards planners (social) than engineering functions. "INDEX was designed for local application and it incorporates the full spectrum of social, environmental, and economic dimensions. It has modules for characterising and analysing physical and social aspects of an area. For example, the housing module includes a housing summary, housing affordability, operating energy and energy costs, water use, and solid waste and recycling. After a base case has been loaded into the model, "what if" questions can be asked and INDEX automatically recalculates the measures of interest." A downloadable demo is available. *For more information: Eliot Allen, Criterion Planners/Engineers, (503) 224.8606, eliot@crit.com, www.crit.com*	Custom	Expert	Many (U.S.)

Appendix G: List of Examples for Community Programs

Transportation

A sustainable transportation system is one that:

- Allows the basic access needs of individuals and societies to be met safely and in a manner consistent with human and ecosystem health, and with equity within and between generations.
- Is affordable, operates efficiently, offers choice of transport mode, and supports a vibrant economy.
- Limits emissions and waste within the planet's ability to absorb them, minimizes consumption of non-renewable resources, reuses and recycles its components, and minimizes the use of land and the production of noise.

Motor vehicles are major energy consumers and sources of air, noise and water pollution. Transportation represents about 27% of total U.S. energy consumption and 70% of total petroleum consumption (ORNL, 2001). Transportation energy consumed by mode is summarized below. Personal transportation represents about 60%, and commercial transport about 40%, of total transportation energy consumption.

Demand Management strategies can be used within most communities to reduce or manage the level of traffic congestion seen in a community – and hence the energy and cost involved[42].

Distance-Based Emission Fees
Fuel Tax Increases
Freight Transport Management
Aviation Transport Management
Transport Demand Management (TDM) Programs
Pay-As-You-Drive Vehicle Insurance and Other Distance Based Fees
Market Reforms
Land Use Management Strategies.
Ridesharing.
Speed Reductions
Transit Improvements and Incentives
High Occupant Vehicle (HOV) Priority
Parking Management and Parking Pricing
TDM Marketing
Traffic Calming and Roundabouts
Car-Free Planning and Vehicle Restrictions
Tele-work
Non-motorized Transportation Improvements and Encouragement

A little excessive – but nevertheless persuasive! This picture is a US wartime advertisement to conserve gasoline.

[42] Victoria Transport Policy Institute, *Energy Conservation and Emission Reduction Strategies*

Sustainable Transportation Planning

Transit Oriented Development

Transportation planning is often considered after the community has been developed - the tail that wags the dog. Transit Oriented Development (TOD) is a solution to this problem by proposing land-use scenarios during the planning stage of new development.

The concept of Transit-Oriented Development can be defined as "The revival of the lost art of place making, i.e. the creation and restoration of compact, pedestrian-friendly mixed use neighbourhoods containing housing, workplaces, shops, entertainment, schools, parks, and civic facilities essential to the daily lives of their residents – all within easy walking distance. TOD promotes increased use of commuter and light rail transit, instead of building more highways and roads for auto travel. Transit-oriented development is essentially a city on a small scale." [43]

Transit will not be a panacea to cure all ills of a poorly thought-out design but it can assist in the bulk movement of personnel and freight at key periods of the day. In combination with other transportation systems, transit can reduce bottlenecks, smooth flow patterns and enable the movement of goods and services with reduced energy and effort.

Reference: Guidebook on Smart Growth
http://www.metrocouncil.org/planning/assistance/TODguidebook.pdf

Variable Work Hours (Flexible Working)

In the 1860s, the average workweek was 68 hours long. It wasn't until the 1930s that labor unions fought for legislation that created the 40-hour workweek. Today, this arrangement no longer works for the majority of the North American work force. The huge number of working women (including mothers of school age children), the increase in two-career families and the rise in single-parent families have forced companies to reconsider their work schedules.

[43] Day, Deborah, *Transit-Oriented Development: City of Coquitlam*

Employers have been pleasantly surprised to find that what we now call "variable work-hours" have many benefits. Companies are recognizing that employees have lives outside the workplace and that by providing the flexibility to accommodate family needs, leisure activities and other obligations, everyone wins.[44]

In this program, energy is conserved fuel consumption by decreasing the number of commuting days to work, decreasing traffic congestion as people are arriving and leaving their place of work at different hours, and a number of other benefits.

Housing

Energy Efficient Housing

Energy-efficient housing can be achieved at costs well within the accepted limits for affordability, while resulting in annual savings in operating costs that contribute to affordability over the life of the building. Energy-saving measures being considered for use in affordable housing can be evaluated using the Model National Energy Codes introduced by the National Research Council in 1997.

There are five areas in which energy savings can be achieved in new construction and major renovations:

- The building envelope
- Passive solar design
- Heating, ventilation and air conditioning systems
- Lighting and power
- Water conservation

Affordable Housing

The cost of adequate shelter should not exceed 30% of household income. Housing which costs less than this is considered affordable. However, consumers, housing providers, and advocacy organizations tend to use a broader definition of affordability. See http://www.cmhc-schl.gc.ca for more details.

- Better Buildings Program - Toronto Better Building Partnership

In January 1990, the City of Toronto made an official commitment to reduce the city's net carbon dioxide (CO_2) emissions by 20 per cent, relative to 1988 levels by the year 2005.

[44] Anderson, Stuart and David Ungemah, *Variable Work Hours: Implementation Guide for Employers*

In 1999, the newly amalgamated City of Toronto reaffirmed this CO_2 reduction goal, and remained in full support of this important issue.

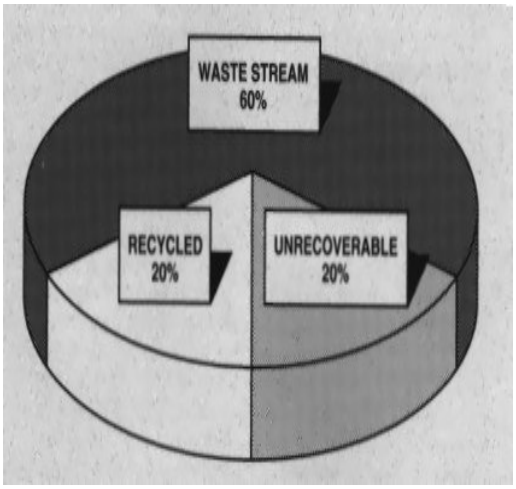
The Better Buildings Partnership (BBP) program was developed to focus on curbing CO_2 emission, and would take a lead role in the City of Toronto's overall CO_2 reduction commitment. The BBP program began in June 1996, and after the Metro wide amalgamation in 1999, the full-scale program was launched to include the entire city.

In partnership with Enbridge Gas Distribution Inc., the Toronto Atmospheric Fund, Toronto Hydro and Ontario Hydro Energy Inc. the city established the objectives and goals behind the BBP. The city also consulted with a broad range of stakeholders, including: the International Council for Local Environmental Initiatives (ICLEI), financial institutions, building owners and managers, the environmental community, trade unions, community groups, equipment manufacturers, and the construction energy/water efficiency service delivery industries.

Since the program's inception in June 1996, it has become evident that the BBP, in co-operation with the building marketplace, has the capacity and momentum to significantly increase the amount of retrofits implemented by 400-800 per cent in both dollar value and CO_2 emissions per year. The CO_2 emission reduction achieved to date represent 4.1 per cent of the former City of Toronto's 20% target. The full-scale program, could potentially achieve over 3 million tonnes of CO_2 reduction, a significantly larger portion of the amalgamated City's 20 per cent goal.[45]

Recycling

- Paper [46]



Paper and paper products account for more than one third of the materials discarded into Canada's municipal waste stream. Today, it is widely recognized that the volume of paper products we discard must be dramatically reduced and soon. Not

[45] City of Toronto, *Better Building Program*
[46] Government of Canada, *Waste Paper Recycling in Canada*

only are many communities facing a critical shortage of landfill space, but the sustainability of the forest resource is also a concern.

One obvious way to reduce the amount of paper waste being discarded, and to conserve our forest resources, is to recycle more of our waste paper. It is estimated that less than one quarter of the 6 million tonnes of paper and paperboard used annually in Canada is recycled.

Of course, not all the paper we use can be recycled: approximately 20% is unavailable for recycling, for a number of reasons. Some is destroyed through fire or permanently conserved (e.g., as books, roofing materials, etc.), and some is so severely contaminated that recycling is impossible or impractical.

However, a substantial proportion of the millions of tonnes of paper products entering Canada's waste stream every year could be recycled. Waste management is everyone's responsibility: we all have a role to play in encouraging the recycling of waste paper and the reduction of waste in general. By changing our habits and attitudes, at home and at work, Canadians can substantially reduce the amount of waste paper that is simply thrown away.

- *Used Oil*

The programs reflect provincial Waste Management Advisory Groups' principles that consumers, industry and government share responsibility for environmentally sound management of used oil materials and ensuring the viability of their used oil materials recycling programs.

- PITCH-IN programs - The National Civic Pride Recognition Program[47]

PITCH-IN CANADA's The National Civic Pride Recognition Program is the highest form of national recognition extended to those communities who have taken steps to partner with businesses and residents in year-round initiatives to encourage civic pride and improve their community's environment. These communities will be designated as a *"Partners in Civic Pride"*.

[47] Pitch-in Canada, *The National Civic Pride Recognition Program*

Energy Saving Programs

- Power Smart[48]

Advertisement used by NASA for their in-house energy efficiency program.

In 2001, BC Hydro launched a Conservation Potential Review in order to estimate the potential for electricity conservation in British Columbia. The purpose of the study was to develop a reliable estimate of the potential for electricity conservation that was realistically achievable in their service area by the year 2016, and also to estimate the potential contribution of Power Smart energy efficiency initiatives to reducing their peak capacity requirements.

The study was completed in 2002. It concludes that, by 2016, BC Hydro customers could reduce their electricity consumption by 5,800 gigawatt-hours (GWh) per year by implementing cost-effective energy efficiency measures. These savings would be equivalent to the electricity generated by a power plant with a capacity of 840 megawatts (MW), and would be sufficient to serve the electrical needs of 580,000 residential customers. Put another way, the potential electricity savings are equivalent to annual cost savings of $255 million. The study estimated that residences could achieve savings of $80 million per year, while commercial buildings and industrial plants could save $175 million per year.[49]

Water Conservation and Water Management[50]

In order to determine ways of reducing water use, you must first divide it into separate categories. This will make your task easier. Water use in any industrial, commercial, or institutional operation may be divided as follows:

- domestic water use
- industrial water use
- external/outdoor water use.

Water management options may be divided into various groups that will make it possible to pinpoint reduction possibilities.

Network monitoring - Regularly measure and record data on

[48] BC Hydro, *Electricity Conservation Potential Review*
[49] BC Hydro, *Conservation Potential Review*
[50] Government of Canada, *Water Measurement and Conservation*

water consumption, analyze trends to quickly detect major leaks, and repair damage as soon as possible.

System optimization - See that equipment, devices or systems that use water are running smoothly and ensure that they do not use too much water (regular, preventative maintenance).

System replacement - Replace or make changes to existing equipment through more effective devices or technologies for water use.

Reuse and recycling - Replace drinking water from municipal or local system used by current equipment with water that has already been used once (gray water) in your facility.

Changes in procedures and operations - Make changes to procedures that use water in your facility so that the same work can be performed with less or no water.
Water conservation awareness - Reduce water consumption by making people more aware of water conservation. This may mean persuading them to get rid of water-wasting habits.

Renewable Energy / Community Energy Systems

Green power is low-environmental-impact electricity generated using renewable energy resources and technologies. These are clean energy sources such as wind, solar, biomass and small hydroelectric facilities. Green power substantially reduces the amount of air pollution, greenhouse gas emissions and other impacts while adding to the overall sustainability of the generation systems mix.[51]

Solar thermal collectors

Wind Turbines

[51] Ontario Power Generation, *Waterloo Landfill Gas*

Sudbury District Energy System, Sudbury, Ontario


Biofuels

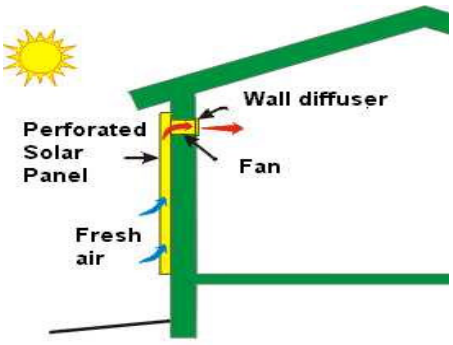

Small Hydro Plant


Ground Source Heat Pumps


Solar Paneling

Emerging Technologies:

- **Solar thermal power**
- **Ocean thermal power**
- **Tidal power**
- **Ocean current power**
- **Wave power**



Solar air heating

In Canada, “green” technologies currently contribute over 6% of Canada's energy needs - displacing 36 million tonnes of CO_2 annually. Canada's renewable equipment and service industry has grown to over 250 companies, 3,700 jobs and $1.4 B goods &

services (including $400 M exports)[52]. In time, new renewable energies and other emerging technologies will be developed and integrated into the generation mix, phasing out the more polluting energy technologies.

> Ken Ogilvie, Executive Director of Pollution Probe. "We believe that green power has the potential to supply at least 25 per cent of Canada's electricity by 2025 and 50 per cent in the long term."

An example of an emerging technology is the recovery of landfill gas. Landfill gas is a resource that many communities have access to. With correct capping and treatment the resource stream may be used for power generation using reciprocating engines or micro-turbines. Since micro turbines are relatively small in size and are self-contained, installing and operating micro turbines on landfills too small for larger plants is attractive to many[53].

[52] Government of Canada, *Renewable Energy Technology*
[53] Kinectrics, *Microturbines Using Landfill Gas*

Appendix H: Software Tools for Project Development

BC Energy Aware Committee[54] offers a library of software tools from different groups. Each software tool listed includes a brief description of the goal of each tool.

BEQUEST Toolkit For Sustainable Urban Development
Source: BEQUEST
Cities for Climate Protection Greenhouse Gas Emissions Software
Source: Torrie Smith Associates Inc.
CITYgreen Software
Source: American Forests
INDEX Planning Support System
Source: Criterion Planners/Engineers
QUEST Regional Sustainability Planning
Source: Envision Sustainability Tools
Residential Energy Efficiency
Source: U.S Environmental Protection Agency
Transportation Cost Analyzer
Source: Victoria Transport Policy Institute (VTPI)
Virtual Energy Manager
Source: Cities for Climate Protection
What if?
Source: Community Analysis and Planning Systems, Inc

[54] Community Energy Association. *Toolkit for Community Energy Planning*