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The Case for Coordination and Collaboration in Sustainable Community Indicators and Reporting

Rationale for a common community information system in Canada

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"Never doubt that a small, group of thoughtful, committed citizens can change the world.

Indeed, it is the only thing that ever has."

– Margaret Mead

Abstract

As growing populations concentrate in urban areas, it has become apparent that many global problems are a cumulative reflection of unsustainable practices at the local level. Correspondingly, there has been an increasing need to monitor and manage sustainable community growth, which includes a balance of environmental, economic, health, and social measures.

Throughout the last decade, the community indicators movement has intensified, fuelled by a growing need for information for municipal management purposes, to guide policy decisions, and as a way to demonstrate accountability. This growing demand for information, combined with an increasing number of different frameworks and approaches to indicator development has resulted in a mass of information, which is becoming unmanageable.

This research examined the factors contributing to what has resulted in an increasingly uncoordinated mélange of information, which threatens to become counter-productive in making progress towards community and regional sustainability.

Focusing on Canadian experiences, the research identified patterns that have emerged for common information requirements, and suggests a framework for coordination that may provide direction to current initiatives. Potential partners to be involved in the creation of a common community information system are identified, and potential barriers to a collaborative effort are discussed. These recommendations are supported by a strong call for coordination from community indicator practitioners, and examples of collaborative initiatives from other world regions.

Keywords: sustainable community, indicators, collaboration, local, municipal monitoring, reporting, urban assessment tools

Executive Summary

As increasing human populations concentrate in urban areas, it has become apparent that many global problems are a cumulative reflection of unsustainable practices at the local level. Correspondingly, there has been an increasing need to monitor sustainable community growth, which includes a balance of economic, environmental, health, and social measures.

This thesis reflects upon the intensive growth of the sustainable community indicators (SCI) movement over the last decade, and presents a discussion of the factors which have led to such an explosion of divergent community indicators and reporting initiatives, including:

- Increasing information needs, as aspects of the environment are broken down into smaller pieces of complex systems;
- Technological advancements which allow volumes of information to be generated and disseminated at an unprecedented rate;
- Increased demand for accountability of local governments, which necessitates reporting on a variety of aspects;
- Increased community activism, which has resulted in numerous organizations collecting information on various specific causes or issues;
- The development of a number of different frameworks and tools, which diversify the development of sustainable community indicators.

At the same time, measures of "progress" have evolved from strictly economic factors, to recognize the importance of natural and social capital. This has generated further demand for data on a range of aspects related to environmental, health and social well-being. Growing similarities have emerged among these various reporting initiatives, as conventional understanding of sustainable development has shifted from merely recognizing the significance of non-economic measures, to the realization of how strongly these aspects are inter-connected. This has resulted in an increasing overlap in data requirements, as previously sectoral initiatives strive to achieve a more balanced, holistic, systems approach to sustainability monitoring.

The result of these cumulative forces is an increasingly uncoordinated mélange of information that threatens to become counter-productive in progress towards community and regional sustainability. However, the situation also presents an opportunity to be capitalized upon, through coordination and enhanced information-sharing among community indicators efforts.

This thesis addresses the call for collaboration, which has been echoed by well-respected and influential groups such as: the National Round Table for Environment and the Economy, The Pembina Institute, Redefining Progress, The Canadian Policy and Research Network, Environment Canada's National Indicators and Reporting Office, the Canadian Sustainability Indicators Network, and the International Institute for Sustainable Development.

Focusing on Canadian experiences, this research identifies a need that has emerged for common information requirements, and coordination in community reporting. Several programs at different geographical and governmental scales were reviewed, and found to cover similar themes. In a comparison of 70 local-level reports, it was determined that from a total of 925 indicators, there was no one which was included in all the reports, and that only 5

of the 35 top indicators were used in more than in 30% of the reports. However, the themes and issues can be categorized into 9 areas: air, economic, energy, health, land use, natural resources, social, waste, and water.

This thesis contributes to the current dialogue in the SCI field, by addressing the need for collaboration and coordination, and suggesting a model for coordination that may provide direction and weight to current initiatives. The proposed Common Community Information System (CCIS) would facilitate information-sharing among several organizations, and help to establish standardised collection of core data sets for communities across Canada.

Core Indicators are needed to maintain data consistency, and to ensure that all communities are taking the responsibility to monitor basic, agreed-upon measures to assess progress towards sustainable community development. Data consistency has been noted as a limitation in many reporting initiatives, and establishing a set of core indicators allows trends to be identified over time, community progress to be gauged more accurately, and results to be compared against established benchmarks. **Flexible indicators** are also needed to accommodate the diverse realities experienced in different communities and the reality of changing needs and priorities over time. Flexible indicators also allow more advanced communities to "raise the bar" beyond the basic measures included in the core set. Most importantly, the process of developing community-specific indicators encourages participation and learning, as community members develop a common vision of what is important to them.

Other recommended characteristics of a collaborative model include to:

- Ensure it is aligned with other reporting initiatives at provincial, national, and international levels;
- Draw data from existing sources as to not duplicate resources;
- Respect individual project needs and diversity;
- Design a dual-purpose framework which includes a core set of common indicators, yet accommodates flexibility to address community-specific needs;
- Recognized and build from existing collaborative efforts;
- Ensure quality of data through a partner agreement and establishment of protocols;
- Create a web-based system to enhance data accessibility across geographically diverse users.

A coordinated, collaborative system would benefit communities through:

- Increased data availability, which has been acknowledged as one of the major limitations in the indicator selection process;
- Better organized data in a centrally distributed system;
- Cost reductions through information-sharing and diffused expenses for data collection and maintenance;

- Improved efficiency of community development projects, through data accessibility and reduced costs for information gathering;

- Less biased information, as narrow political agendas may be diffused through the collection of generally-applicable information.

Historically, a few organizations in Canada have attempted to drive the coordination of SCIs, but most of these efforts have not achieved the necessary level of momentum to culminate in any nation-wide, lasting result. It is the author's opinion that several factors, both project-specific as well as universal issues such as timing, technological possibilities, political alliances, community awareness, and available funding, have limited the scale of the impact of these initiatives.

Of note, is the Sustainable Community Indicator Program (SCIP) led by Environment Canada and the Canadian Mortgage and Housing Corporation, which aimed to create a common, yet flexible approach to help communities select, create, and use indicators for monitoring local sustainability; to promote the use of comparable indicators; and to encourage the sharing of indicators and data, both among municipalities and with other levels of government through a web-based system. The goals of this initiative met the needs identified through this research quite precisely; yet in practice, the project has experienced many challenges, and remains unrealized to the extent originally intended.

The key to achieving success in a collaborative community monitoring initiative, appears to be the combination of a strong impetus from the communities themselves, coupled with an established coordinating body, to facilitate this self-organization. The Quality of Life Reporting System is coordinated under the leadership of the Federation of Canadian Municipalities (FCM) and involves 21 municipalities across Canada. The QOLRS initiative represents the first time that municipal governments in Canada have worked together to develop a national policy and planning system for quality of life issues and the first time that a nationally consistent collection of local data has occurred. This initiative demonstrates how participating communities have achieved a balance between national consistency and local relevance.

Examples of collaborative efforts from other regions, including the European Common Indicators project, ICLEI's Cities21 project, and Common Environmental Reports on the Internet (CEROI), provide significant support to the case for collaboration. These initiatives demonstrate that even communities with diverse cultural and geophysical circumstances can agree on a common set of core indicators, important to sustainable community monitoring. Local partners of the National Neighbourhood Indicators Program, led by the Urban Institute in Washington, D.C. operate under the theme *democratizing information*, and have overcome an important barrier to collaboration, as authorities have agreed to release information readily to the public. The NNIP has also demonstrated that it is possible for communities to build advanced information systems with integrated and recurrently updated information, and to operate these on an ongoing basis at the locally self-sustaining level.

The most striking conclusion of this research is the important role FCM has in supporting a CCIS initiative in Canada. Their limited engagement/political support in past collaborative SCI attempts may be considered a significant barrier, which impeded wide-spread success. Taking a leadership role in the development of a CCIS would be a natural fit, as FCM houses the most comprehensive database of nation-wide information on municipal contacts and runs a number of programs, including the QOLRS which addresses several key social, economic

and environmental issues, as well as the Partners for Climate Protection program, which tracks municipal GHG emissions.

Other organizations that have demonstrated competence and interests in line with the goals of a Common Community Information System include:

- Environment Canada and the National Indicators and Reporting Office, who have a strong presence in managing current environmental monitoring programs nationwide, and invested heavily in the SCIP initiative;

- The Canadian Mortgage and Housing Corporation, also partners in the SCIP initiative, who have established the largest information database on housing statistics, and continue to conduct extensive research on tools which help improve sustainable community development;

- The Canadian Sustainability Indicators Network, a community of practice which includes indicator practitioners with valuable expertise;

- The Canadian Council for Ministers of the Environment, who have established principles to guide cooperative agreements on environmental monitoring and reporting;

- Statistics Canada, The Centre for Sustainable Transportation, The Canadian Community Monitoring Network, International Centre for Local Environmental Initiatives, and the International Institute for Sustainable Development.

A partnership formed by these organizations would create a strong resource-base to facilitate the development of a nation-wide Common Community Information System.

As the trend for sustainable community reporting continues to grow, the need for coordination of municipal statistics has emerged as a priority. The arguments presented in this thesis indicate that there is a strong case for a comprehensive, collaborative SCI initiative in Canada. Examples of collaboration in other regions of the world indicate that such an initiative may be feasible. With the momentum that has been building in the indicators movement over the last decade, with the current cumulative expertise gained by Canadian communities in reporting initiatives, with advances in technology, and the current movement to consolidate data and make it accessible via web-based systems, the usefulness of a coordination effort similar to the SCIP concept resonates even more strongly.

The time is right to engage Canadian municipalities in discussions to re-launch an initiative with goals similar to those of SCIP; and the Federation of Canadian Municipalities could provide an important service to its membership, by taking on a leadership role in facilitating this dialogue.

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1. Introduction

This section provides an overview of the thesis research, including background information, the purpose of the research, a description of the research methodology, and information on the format of this thesis.

1.1 Background

As increasing human populations concentrate in urban areas, it has become apparent that many global problems are a cumulative reflection of unsustainable practices at the local level. According to recent UN estimates, more than fifty percent of the world's population will reside in urban areas by the year 2005 (CEROI, 2001). Canada is ranked among the most urban societies in the world, with nearly 80 percent of the population living in municipal regions (Saunders, 2002). This trend clearly illustrates the sharply increasing demands placed on local governments, and underlines the importance of their role in managing our environmental, economic and social well-being. Many internationally respected organizations, including the International Council for Local Environmental Initiatives (ICLEI) have emphasized that policy decisions made at the local level, hold a potentially enormous effect on global progress towards sustainable development (APA, 2000; ICLEI, 2000; IISD, 1999; UNEP, 2002; Wackernagel, Rodgers, Thomas, & Youngblood, 2002). With this growing responsibility, local governments must monitor their management decisions to ensure that progress towards more sustainable community development is being achieved.

While the debate on how to define – much less achieve a sustainable society – is unending, there seems to be agreement that the proper usage of indicators will play a key role in our endeavours to progress towards sustainability (Innes & Booher, 1999). At the Rio Summit in 1992, 178 national governments supported the Agenda 21 document, which identified sustainability indicators as a strategic goal, necessary to assist decision-makers and policy-makers at all levels (UN, 1992).

Throughout the last decade, the community indicators movement has intensified, fuelled by a growing need for information for municipal management purposes, to guide policy decisions, and as a way to demonstrate accountability to taxpayers. As governments, business, and grassroots leaders seek better ways to measure progress, an increasing number of tools and approaches to facilitate the SCI development process have emerged. Yet despite the growing number of indicators projects, there has been relatively little communication among them (RP, 2001). The difficulties encountered by first and second generation reporting initiatives have highlighted the need to consolidate, and to provide better direction in the measurement of sustainable development performance, and in the management of this information (Mitra, 2003). The International Institute for Sustainable Development notes: "Looking beyond the current diversity of practice, it is important to identify common patterns in the initiatives dealing with the assessment and measurement of progress towards sustainability. Over time, this may result in better harmonized indicator sets, but perhaps more importantly improved coordination among measurement and assessment processes." (IISD, 2003)

1.2 Research Purpose

This thesis explored the growth and evolution of various tools designed to monitor community progress, as well as related sustainability and environmental reporting initiatives. The research examined the factors contributing to what has resulted in an increasingly

uncoordinated mélange of information that threaten to become counter-productive in progress towards community and regional sustainability. Focusing on Canadian experiences, the research identified patterns that have emerged for common information requirements, and suggests a framework for coordination that may provide direction to current initiatives.

The research stemmed from a project for the Centre for Sustainable Community Development (CSCD) at the Federation of Canadian Municipalities. As part of a new initiative under the Green Municipal Funds program, the research was designed to discover if an existing tool, which sufficiently accommodated the specifications of the CSCD[1], could assess a community's "progress on the path towards sustainability". The thesis evolved through action research, as the author, immersed in the experience of working with an organization, tried to make sense of the world of sustainable community assessment tools, indicators, and reporting initiatives. In the process of gathering information on various approaches and tools, and identifying which aspects of these existing initiatives could be useful in the CSCD's development of a new tool, the focus of the research shifted to the broader implications of developing such a tool for Canadian municipalities.

As the author noticed a strong pattern emerging in the demand for similar information from municipalities across Canada, regardless of which 'tool' or framework was being used for assessment, it became powerfully evident that collaboration between these various initiatives could save much time, effort, and resources for many organizations. Such increasing and divergent efforts were creating both a drain on municipal resources, and leading to an information-overload that was not particularly useful in further applications. The researcher began to focus on the evolution of reporting initiatives, the increasing overlap in what indicators were being measured, and consequently, upon the need for coordination of these various information demands. Correspondingly, the research evolved to address the following questions:

> RQ1: What factors have led to such an explosion of divergent community indicators and reporting initiatives?
>
> RQ2: What are the various indicators and reporting initiatives currently being used in Canada, and how do these efforts overlap?
>
> RQ3: Would it be possible/necessary/beneficial to collect community data consistently, at the municipal, regional and national levels?
>
> RQ4: What efforts have been made to coordinate municipal reporting initiatives within Canada, and other geographical regions? What can be learned from these collaborative examples?

The following questions were considered for discussion:

> DQ1: What benefits and challenges might a coordinated, collaborative municipal reporting initiative present?

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[1] The tool would focus on assessing municipal infrastructure areas which are typically considered to have strong potential for green house gas (GHG) reductions: water, waste, transportation, energy, and urban planning. For more information on the CSCD and the The Sustainable Communities Integrated Demonstration Program (SCIDP), refer to Appendix A – Appendix D.

DQ2: What characteristics might be suggested for a Common Community Information System?

DQ3: What might be the best approach to initiating/coordinating a collaborative process in Canada, and which organizations might best contribute to this process?

1.3 Research Justification

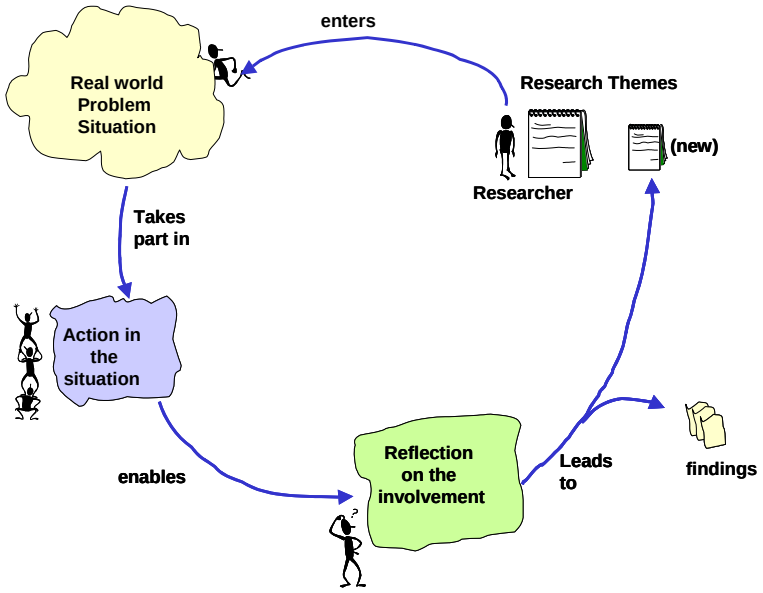
This thesis evolved from a practical application, which was to provide background research for the development of a new community assessment tool for the Centre for Sustainable Community Development. Several reports and sources have noted that there is much work to be done on sustainable community indicators, to analyse and make sense of the many divergent efforts which have emerged (Anielski & Winfield, 2002; IISD, 2003; Mitra, 2003; RP, 2001). Attention to the need for coordination and collaboration became evident to the author, and was strongly echoed by indicator practitioners (see section 5.1). This thesis contributes to this line of discussion, and may be used as a platform for dialogue on future indicator activities.

1.4 Methodology

This thesis followed Action Research methodology, deemed appropriate when:

- Describing an unfolding series of actions over time in a given group, community, or organization;
- Understanding as an insider how certain actions can change or improve the working of the system or its parts;
- Understanding the process of change or improvement in order to learn from it (Mirata, 2003).The author embarked on the Action Research process (Figure 1-1) and completed two iterations of the cycle.

Figure 1-1 Description of the Action Research Process

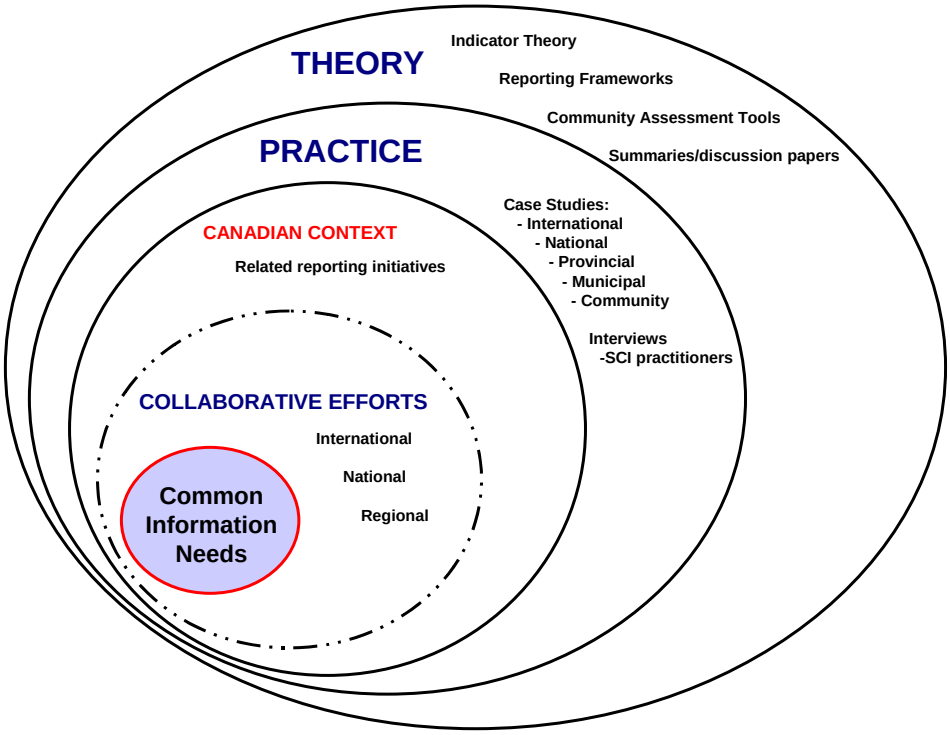


source: (Mirata, 2003) modified from (Checkland & Holwell, 1998)

The first research theme examined theoretical and practical aspects of sustainable community indicators, and explored related reporting initiatives in Canada. The first 'problem' was to identify an appropriate assessment tool for communities. The action taken was the research performed, which provided a basis for further development. The author reflected upon the findings, and the implications of developing a new tool. This reflection continued to shape the research, as a second theme emerged: the lack of coordination among SCI reporting projects despite common information needs. This has lead to the problem of duplicated efforts, information overload, and resulted in confusion and ineffective use of resources. The second round of action consisted of additional research on collaborative community reporting efforts, and the development of a conceptual solution, derived from both observation and reasoning. The proposed solution was then 'tested' against other works that proposed similar ideas, and by soliciting the opinions of indicator experts. The final proposal was further revised, according to the feedback given.

The process to formulate the research framework (Figure 1-2) developed gradually, beginning with broad-based, contextual issues, and then narrowing as a focus emerged for the need for coordinated collaboration and information sharing. The methodology can be seen as working from the outer ring inward, to gather information to form the knowledge base and to finally produce recommendations on how to address the common information needs for SCI reporting.

Figure 1-2 The Research Framework: Focusing on Common Information Needs, Supported by Background Research on Collaborative Efforts, Canadian Experiences, and Indicator Theory



The research process was divided into six main phases; Phase I was the most intensive, to collect the background information, which further shaped the direction of the research. Phase II included an analysis of the information collected - the identification of patterns and a common need for information. Phase III consisted of further investigation into collaborative efforts in the coordination and collection of information. Phase IV produced recommendations on how to address this need, Phase V involved presenting these recommendations to authorities on SCIs, and Phase VI involved further refining the ideas and making final recommendations.

1.4.1 Phase I: Background Research on SCIs

In order to establish a solid understanding of sustainable community indicator (SCI) and reporting initiatives, a familiarization with both indicator theory, and how indicators were being used in practice, was needed. The author then reviewed literature on indicator theory, handbooks on how to develop and evaluate SCIs, and summary/discussion papers on various municipal indicators and reporting initiatives. The lessons derived from this theoretical research are summarised in section 2. Various frameworks for SCIs were examined [2.3] and an assortment of tools and approaches used to help communities assess their progress towards sustainability were reviewed [2.4].

In order to obtain an understanding of how SCIs are applied in practice, a number of case studies and indicator reports from communities around the world (primarily the United States of America, Canada, and Europe) were reviewed. Semi-structured interviews were conducted with SCI practitioners to gain knowledge of 'favoured' frameworks and approaches and general insights on the SCI process. Their opinions on the growing diversity of reporting initiatives in Canada were also queried.

The author also participated in a stakeholder consultation session that was being conducted for an emerging local indicator effort (Ottawa2020). These practical applications reinforced the theoretical literature and provided further insight into the SCI development process, and the benefits and challenges communities experienced [2.2.5]. Familiarization with municipal, and related provincial and national reporting programs in Canada, provided an understanding of current and planned initiatives that might affect the development of a new assessment tool, and provided information on potential data sources [3].

1.4.2 Phase II: Analysis of Information Overlap

In the process of gathering the background information, the author noticed an increase in the number and diversity of reporting initiatives, and the corresponding increase in demand for information from municipalities. It was also inferred that duplication in the information being demanded from these various assessment and reporting initiatives would create an unnecessary burden on municipal staff, and result in an unmanageable mass of data. Various factors that have contributed to this increase in information were considered, and how the evolution of reporting initiatives has contributed to the current overlap in information demands was examined. The relationship between local, regional, provincial, national and international initiatives was also explored [4]. Further investigation targeted the inefficiency created by duplicated efforts and addressed the need for collaboration and coordination among Canadian initiatives.

1.4.3 Phase III: Research on Collaboration

Information was collected from reports, and interviews on the history of previous collaborative attempts in Canada, and possible reasons for their lack of success were identified [5.1]. Through a review of recent conference proceedings, discussion papers, and other documentation, including an (unpublished) draft 'national strategy' for indicators and reporting, it was discovered that this concern for coordination was echoed strongly by indicator practitioners in many countries and especially within Canada [5.1]. A review of collaborative community reporting efforts in Europe and the USA provided insight on how such projects were being designed [5.3].

1.4.4 Phase IV: Development of Recommendations

This research culminated in a broad understanding of the community indicators and reporting scene in Canada, which allowed the author to evaluate past, current, and planned efforts, and to provide recommendations for a model for collaboration and a path forward how this might be achieved [6]. A link was made to the important role of the Federation of Canadian Municipalities in leading such collaborative efforts [6.3.1]. Other organizations which have been involved in sustainable indicators and reporting, and who might lend expertise to a successful collaborative effort were also identified [6.3]. The benefits and challenges of developing a common community information system were discussed.

1.4.5 Phase V: Validating Recommendations

After these preliminary recommendations were formed, they were presented to indicators experts and representatives of the FCM who reviewed the proposal and provided comments.

1.4.6 Phase VI: Refining Recommendations

Based on the advice and feedback given from indicators practitioners and related authorities, the recommendations were further revised. Many of the author's views were also reinforced and validated by reports, found later, which presented similar ideas.

1.5 Scope and Limitations

Although several studies and indicator initiatives from other areas (Europe and the United States) were reviewed, the focus of this thesis was on the Canadian experience. There are a plethora of initiatives and approaches for measuring community progress, in a variety of contexts (economic vs. social, etc.); the list of tools and indicator projects covered in this thesis is not comprehensive, but provides a varied selection of key approaches.

Given the time frame allowed, the scope of this research was quite ambitious, covering a broad range of topics, to contextualize and provide the necessary background information for the research focus. This, in turn, necessitated a compromise on the depth of understanding of the various frameworks, tools, existing initiatives, and collaborative efforts. Further research on these aspects is recommended. Also due to limitations, municipal officials were not interviewed directly, which represents an important gap in this research. However, their opinions may be considered to be represented among the views of indicator practitioners and members of groups such as the Canadian Sustainability Indicators Network (CSIN). Inferences were also made from literature, which provided insights into community experiences.

1.6 Thesis Outline

Section 1 of this thesis introduces the reader to the purpose and methodology of the research.

Sections 2 reviews the theoretical background on indicator development, established from literature and case studies, including common frameworks for reporting and select community assessment tools.

Section 3 introduces various environmental and sustainability reporting initiatives in Canada, from the national, regional, and local levels.

Section 4 provides an analytical discussion of the factors contributing to increased information needs, the evolution of reporting initiatives, and the resulting increased overlap in common information needs.

Section 5 provides strong evidence of the call for collaboration amongst various indicators and reporting initiatives in Canada, and reviews examples of past collaborative efforts in Canada, analysing their strengths and challenges. Examples from other geographical areas are presented, to illustrate how other regions have approached this issue.

Section 6 introduces a model for collaboration in Canada, outlining the recommended characteristics of a Common Community Information System (CCIS) and possible partners in such an effort. The benefits and barriers to implementation of this concept are also reviewed.

Section 7 reviews the research questions, summarises the conclusions, makes some general observations, and suggests areas for further research.

2. Theory

To establish a common language and understanding for the reader, this section first reviews some of the basic terminology used [2.1], and then provides an introduction to indicator theory [2.2]. The process of developing Sustainable Community Indicators is discussed, as well as SCI application, benefits and challenges. Common frameworks for indicators and reporting are reviewed [2.3], and a description of select tools for assessing a community's progress towards sustainability is provided [2.4]. This review of various approaches to indicators and development is important to set the context for this thesis.

2.1 Terminology Review

2.1.1 Urban Sustainability

According to the Government of Canada, "**urban sustainability** involves the complex and difficult task of finding balances among social, economic, and environmental pluses and minuses, between short- and long-term considerations, and between the immediate interests of a part of the population and the more diffuse interests of everyone" (V. W. Maclaren, 1996). In April 2002, the *Melbourne Principles on Sustainable Cities* were formulated, providing cities with a high-level framework as a starting point to develop a consensus around sustainable development policy and programs. Table 2-1 presents more specific features of sustainable community development.

Table 2-1 Common features of sustainable community development

- Ecological Protection (protection of green spaces, wildlife habitat, native species, etc.)
- Transit-Supportive Urban Design (transit- and pedestrian-friendly urban designs, higher density)
- Urban Infill and Village Centres (development in serviced areas as opposed to greenfields)
- Healthy Local Economy (reduces the need for residents to commute)
- Sustainable Transportation (encourage alternatives to cars, dedicated bicycle lanes, etc.)
- Affordable Housing
- Liveable Community (ensuring community facilities for tots, youth, seniors)
- Low-Impact Sewage and Storm water Treatment
- Water Conservation
- Energy Efficiency
- The 3 R's (reduce, re-use, recycle)
- Planning (consider a systems perspective, which links neighbourhood with municipal and regional goals)

Adapted from: (Peck & Tomalty, 2002)

2.1.2 Indicator Frameworks and Tools

An **indicator** is a single quantity or parameter that, tracked over time, can represent or summarize trends in social, economic, and environmental conditions (Ditor, O'Farrell, Bond, & Engeland, 2001). Indicators are a simplification of complex phenomena that shed light on a set of interactions among various components in a system. A comprehensive set of indicators should include measures of stressors associated with human activities and natural events, the state of the biophysical and human environment, as well as policy responses (V. Maclaren, 2001a).

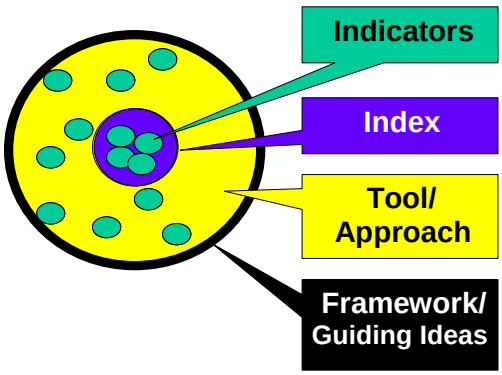
Several indicators can be amalgamated into an **index**. Indices are deemed effective communication tools, as they are less overwhelming and easier to grasp, uncluttered with many details. The GDP is currently the most well known index, conventionally applied to demonstrate economic progress. However, indices often do not provide a great view of the whole picture, or the underlying factors that influenced it (Meadows, 1998). For example, the GDP does not differentiate between positive economic transactions, and monies spent to deal with poor health, crime, or damages caused by natural disasters or spills.

When developing and/or tracking a several indicators, an **approach** or **tool** is used to facilitate this **process**. A tool may be conceptual, such as using a specific methodology or participating in a workshop process; or a tool may be a tangible item, such as a workbook, survey, or checklist.

A **framework** is a set of ideas, facts, or circumstances within which something exists (Hart, 2000). The framework or purpose defines the context within which the information is viewed, and influences which indicators are used, and how they are organized. For example, if the context is air quality, then the amount of air pollution is the state of the environment[2] and the pressures affecting this state would be the number of cars being driven. However, if the context is transportation, the state becomes the number of cars driven and the pressure may by the distance between where people live and where they work (Hart, 2000).

The relationship between indicators, indices, tools, and frameworks is represented in Figure 2-1 (see also Figure 2-3). It is worth noting that in practice, it is common to combine various frameworks, to capitalize on their strengths and dilute their respective weaknesses. Some frameworks have also developed tools to assist users in applying their ideas. For this reason, the distinction between frameworks and tools is sometimes blurred, and the terminology used interchangeably.

Figure 2-1 The Link between Indicators, Indices, Approaches, and Frameworks

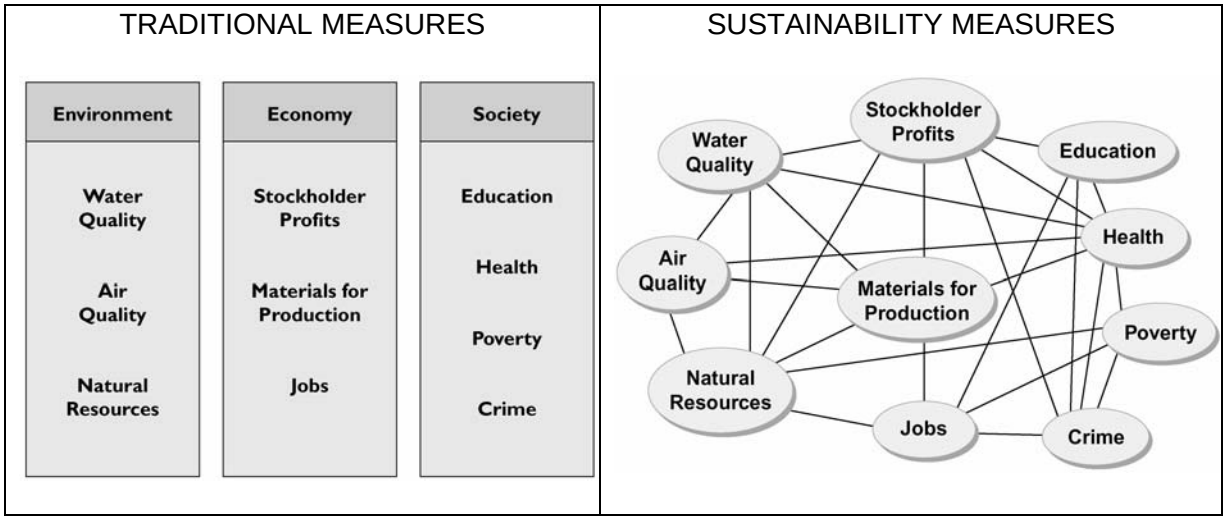


It is also important to note the difference between **traditional indicators**, which may provide measures of economy, environment and society in isolated categories, while **sustainability indicators** consider the interactions between these areas from a whole systems perspective. When measures are examined in isolation, proposed solutions often

[2] See 2.3.1 for an explanation of the Pressure-State-Response framework.

work at cross-purposes with each other (Hart, 2000). This difference is depicted in Figure 2-2.

Figure 2-2 Traditional Measures vs. Sustainability Measures, which consider a whole-systems perspective



source: (Hart, 2000)

Sustainability requires an integrated view of the world, and multidimensional indicators that show the links among a community's economy, environment, and society. For example: The natural resource base provides the materials for production, which influences both jobs and stockholder profits. Employment and profits affect the poverty rate, which is also related to crime. Health is affected by air quality, water quality and materials used for production. Health problems, whether due to general air quality problems or exposure to toxic materials, affect worker productivity and contribute to the rising costs of health insurance, which reduces stockholder profits (Hart, 2000).

There are a variety of **reporting** initiatives, which (as discussed in following sections) have developed into more or less similar types of assessments of the social, economic, and environmental state of the community. "Benchmarking, Indicators, Quality of Life Indexes, or Report Cards — call them what you will — they all have one thing in common: Communities want to understand the big picture" (Bray, 1999). The words used to describe these reports will most likely contain some combination of the words listed in Table 2-2.

Table 2-2 Words used to describe local sustainability reporting

Spatial	**Content**	**Product**
Community	State of…	Report
Neighbourhood	Environment/Eco-	Assessment
Local	Quality (of Life)	Report Card
Municipal	Health	Barometer
Urban	Sustainability	Signals
City	Vitality	Snapshot
Watershed	Performance	Indicators

2.2 Sustainable Community Indicators and Reporting

If sustainability is a journey, indicators are the signposts that show where we came from, where we are, and which help us to understand where we may be heading in the future. Without such indications, it is impossible to know whether particular policies are working and whether organizations, regions, sectors, or communities are heading in the right direction. Following this analogy, a report may be considered like a driver's handbook, a critical device to interpret the signs and establish a common understanding of their meaning (CSIN, 2003).

2.2.1 Purpose and Application of Indicators

Most indicators projects have been initiated by governmental organizations, but projects initiated by grassroots groups have also emerged[3]. There are several reasons to develop indicators, including:

- monitoring change over time;
- measuring the outcomes/results of specific projects or initiatives;
- for advocacy and lobbying efforts;
- to demonstrate accountability;
- to comply with mandated reporting requirements (e.g. OECD commitments);
- as a way to involve, educate, and communicate with various stakeholders in the community;
- to direct policy decisions;
- to foster community pride and attract new businesses and residents;
- to benchmark communities and to establish and promote best practices (e.g. Ontario's OMBI program[4]).

Despite the fact that there is some debate over the cost-benefit and appropriate use of the information that has been collected, developing sustainable community indicators (SCIs) has proved to be an excellent way to engage community members in a dialogue about the future, and to shape community outcomes. Politicians continue to emphasize the importance and need for improved indicators to accurately monitor community progress, and to educate the public. During a recent discussion in the Canadian House of Commons, Member of Parliament Joe Jordan commented:

> One of the paradoxes that confronts governments is that some of the decisions they would have to make transcend an election cycle, which means there has to be an informed public that will support some tough decisions over the course of five to ten

[3] Sustainable Calgary is an example.

[4] For more details on this program see section 3.2.2.

> years. The public must have confidence that the government has taken the steps that will result in the outcomes that are being predicted. I think a set of tracking indicators would be the first step and the first step only to putting in place a structure where if governments are serious about addressing energy efficiency or energy usage in this country, if they are serious about attacking problems, such as illiteracy and poverty, then we need a way to demonstrate to Canadians that the policies that are being supported by their tax dollars are actually making the situation better instead of worse.
> I would argue that one of the problems we have now is that we do not have such a tracking mechanism (NN, 2003).

At the March 2003 conference "Sustainable Community Development: What Works, What Doesn't, and Why," chairman Alan Greenspan emphasized the economic importance of local indicators:

> Since most community development initiatives focus on urban areas, data on socioeconomic trends in central cities may offer some insight into the influence of local economic and social programs…By consistently and reliably measuring outcomes, and thus helping current and prospective investors better assess their risks and predict their returns, community development organizations can attract more funding. Such accountability is crucial for any organization, regardless of its size. (Greenspan, March 28, 2003)

A study of SCI projects in England and Wales noted that the process has been very helpful in developing inter-departmental relationships in the local authority, as well as improving relationship with other stakeholders in the community. As cross-sector initiatives and partnerships are high on the sustainable development agenda, these are extremely valuable contributions (Higginson, Walker, Terry, & Robbins, 2003).

2.2.2 The Process of Indicator Development

How to best measure progress towards a vaguely defined concept such as sustainability, is something we are still learning about and experimenting with. Developing indicators is only part of the process: "Indicators don't guarantee results. But results are impossible without proper indicators…the process of finding, implementing, and improving sustainable development indicators will not be done right at first. Nevertheless it is urgent to begin" (Meadows, 1998).

An indicator system should be designed with the purpose to inspire change, not just to monitor trends. Depending on the expertise of the organizing committee, and the breadth and level of stakeholder engagements, the process of developing community indicators can take several months or more. The stakeholder engagement process is time-consuming and involved, but all indicators projects have cited this as one of the most beneficial aspects of the entire process. One of the key lessons is that, to be useful, indicators must be developed with the participation of those who will use and learn from them (Innes & Booher, 1999).

A mix of indicators should measure not just the results of the problem, but also some of the causes and leverage points. To be most effective, a selection of indicators geared towards the public, should be personal and compelling, and related to carrying capacity. For example, rather than simply reporting water use rates, select an indicator that compares water use per person to the water available (Hart, 2000).

One of the most referred to documents guiding indicator development, is *The Bellagio Principles*, developed during a meeting of sustainable indicators practitioners. The principles are reproduced in Table 2-3.

Table 2-3 The Bellagio Principles: Guidelines for Practical Assessment of Progress Toward Sustainable Development

1. GUIDING VISION AND GOALS Assessment of progress toward sustainable development should: • be guided by a clear vision of sustainable development and goals that define that vision.
2. HOLISTIC PERSPECTIVE Assessment of progress toward sustainable development should: • include review of the whole system as well as its parts; • consider the well-being of social, ecological and economic subsystems, their state as well as the direction and rate of change of the state, of their component parts, and the interaction between parts; • consider both positive and negative consequences of human activity in a way that reflects the costs and benefits for human and ecological systems, both in monetary and non-monetary terms.
3. ESSENTIAL ELEMENTS Assessment of progress toward sustainable development should: • consider equity and disparity within the current population and between present and future generations, dealing with such concerns as resource use, over-consumption and poverty, human rights, and access to services, as appropriate; • consider the ecological conditions on which life depends; • consider economic development and other non-market activities that contribute to human and social well-being.
4. ADEQUATE SCOPE Assessment of progress toward sustainable development should: • adopt a time horizon long enough to capture both human and ecosystem time scales, thus responding to current short-term decision-making needs as well as those of future generations; • define the space of study large enough to include not only local but also long distance impacts on people and ecosystems; • build on historic and current conditions to anticipate future conditions: where we want to go, where we could go.
5. PRACTICAL FOCUS Assessment of progress toward sustainable development should be based on: • an explicit set of categories or an organizing framework that links vision and goals to indicators and assessment criteria; • a limited number of key issues for analysis; • a limited number of indicators or indicator combinations to provide a clearer signal of progress; • standardizing measurement wherever possible to permit comparison; • comparing indicator values to targets, reference values, ranges, thresholds or direction of trends, as appropriate.

6. OPENNESS

Assessment of progress toward sustainable development should:

• make the methods and data that are used accessible to all;

• make explicit all judgments, assumptions and uncertainties in data and interpretations.

7. EFFECTIVE COMMUNICATION

Assessment of progress toward sustainable development should:

• be designed to address the needs of the audience and set of users;

• draw from indicators and other tools that are stimulating and serve to engage decision-makers;

• aim, from the outset, for simplicity in structure and use of clear and plain language.

8. BROAD PARTICIPATION

Assessment of progress toward sustainable development should:

• obtain broad representation of key grassroots, professional, technical and social groups, including youth, women and indigenous people to ensure recognition of diverse and changing values;

• ensure the participation of decision-makers to secure a firm link to adopted policies and resulting action.

9. ONGOING ASSESSMENT

Assessment of progress toward sustainable development should:

• develop a capacity for repeated measurement to determine trends;

• be iterative, adaptive and responsive to change and uncertainty because systems are complex and change frequently;

• adjust goals, frameworks and indicators as new insights are gained;

• promote development of collective learning and feedback to decision-making.

10. INSTITUTIONAL CAPACITY

Continuity of assessing progress toward sustainable development should be assured by:

• clearly assigning responsibility and providing ongoing support in the decision-making process;

• providing institutional capacity for data collection, maintenance and documentation;

• supporting development of local assessment capacity.

source: (Bossel, 1999)

2.2.3 Criteria Selection

It is important to have a limited number of indicators, to be able to communicate them in a meaningful way, and not overload the user/audience with information. The list of potential sustainability indicators is endless; it is therefore quite practical to select indicators that may be representative of several factors. For example, the average percentage of income required to pay for housing, reflects the cost of living, availability of affordable housing, and also has implications towards the state of the economy, employment and homelessness.

In a study of 30 community reports across Canada, the most influential factor in indicator selection by far, was the availability of data (V. Maclaren, 2001a). The personal views and agendas of the selection committee participants also influence which indicators are chosen; some indicators are omitted because government officials do not want to be held responsible for managing such aspects (Crilly et al., 1999 in V. Maclaren, 2001a). Commonly cited selection criteria for indicators are found in Table 2-4.

Table 2-4 Commonly used indicator selection criteria

Meaningful • Concrete (measurable) • Clear (clearly and consistently defined, unambiguous) • Understandable • Context of the measure is explained
Relevant • Relates to objectives • Significant and meaningful to the community; attractive to the media • Attributable to activities and behaviours which can be changed • Informs decision-making
Comparable • Supports benchmarking and comparison over time or with other organizations, activities, or standards
Reliable • Accurately represents what is being measured (valid) • Data required can be replicated (verifiable) • Data and analysis are free from error • Not susceptible to manipulation • Balances (complements) other measures
Practical • Data is available • Financially feasible • Timely

Adapted from: (Bell, 1999)

2.2.4 Reporting

A well-designed summary of the findings should be communicated to all relevant audiences in a meaningful way. The agenda of the organizing committee will strongly influence which indicators are included in the report or publication. A balance between positive and negative indicators is often presented, to not portray such a negative picture of the community. It is also important to convey both absolute and relative changes, as well as total and per capita numbers, to provide the total picture (V. Maclaren, 2001a). Printing limitations, and attempts to simplify the message conveyed in reports can often lead to incomplete representations of the true state of the community.

An indicators report typically communicates the following:

- What is happening? (state)[5]
- Why is it happening? (pressures)
- How does it compare? (to previous years, to other jurisdictions)
- What is being done/what can you do? (response)

2.2.5 Challenges

The process of developing SCIs is time-consuming, and expensive. Many projects are limited by the availability and accuracy of data, which is more costly and difficult to collect on smaller, local scales. Sometimes information is collected, but not made available for public release, or is collected on irregular intervals. Ensuring that the definition of the indicator is clear, and that the results will be interpreted accurately is also a challenge (V. Maclaren, 2001a). Cities are not always easily able to provide accurate data on topics, which are not under their jurisdiction, nor do they always have the human or financial resources to prepare data sets (ICLEI, 2000). The effectiveness of SCIs is limited when the process of indicator development is separate from the policy-makers. User-involvement has been cited as an important factor, but there is often a lack of resources and dedicated staff in relation to indicator use (Higginson, Sommer, & Terry, 2003).

2.2.6 The Link between Sustainable Community Assessment Tools, Indicators, and Reporting Initiatives

Having examined a number of approaches, (as described in the previous sections) the author was challenged to distinguish between sustainable community assessment tools, indicators and reporting initiatives. The author's view is that these aspects are all inextricably linked, as variances in each stage have the potential to affect the outcome significantly. This interpretation of the sustainable community assessment (SCA) process is illustrated in Figure 2-3.

Figure 2-3 Critical Stages of Influence in the Sustainable Community Assessment (SCA) Process

The community assessment process begins with a fundamental purpose, framework or specific guiding ideas belonging to the selection committee members; these factors form the

[5] Please refer to 2.3.1 for a complete explanation of the Pressure-State-Response framework.

conceptual basis for the initiative, and permeate the entire process. An approach or tool then guides the process of selecting indicators and gathering information. If the all of these activities do not culminate in a report that is communicated widely and effectively to audiences within the community in a way that *will impact behaviours and decision-making*, the effort has not been successful. The success of the report will be determined by the relevance and accuracy of the indicators selected, and the indicator selection process will be guided by tool or approach and guiding ideas. Each aspect influences the outcome of the other steps in the process.

2.3 Common Frameworks for Indicators and Reporting

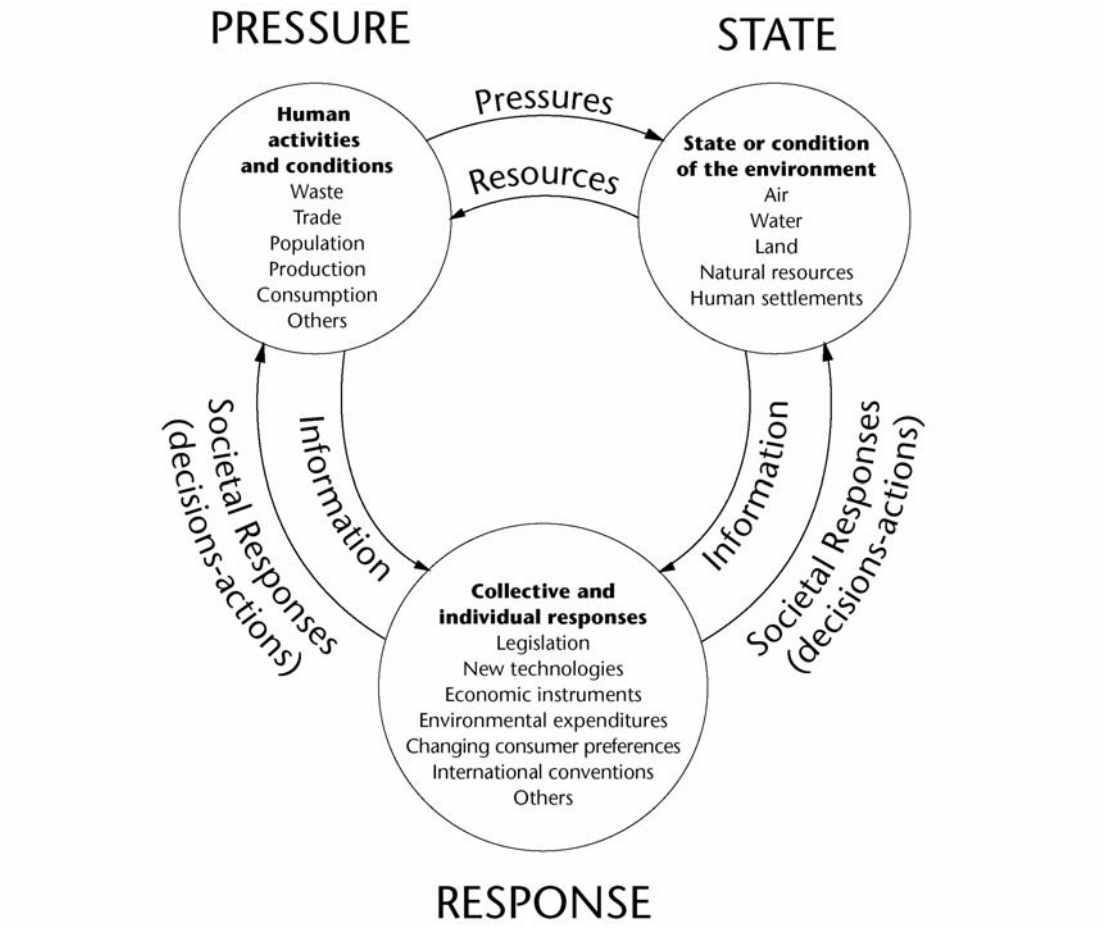
This section reviews a selection of sustainability reporting frameworks, which represent a broad range of approaches, and which have achieved a significant recognition in the literature reviewed.

Just as the Gross Domestic Product (GDP) will never be an accurate or perfect measure of true economic progress, there is no one system or framework that is deemed to report progress towards such an elusive concept such as sustainability. A hybrid format which combines the strengths and dilutes the weakness of the frameworks may provide an optimal solution (V. W. Maclaren, 1996).

2.3.1 Pressure-State-Response

The Pressure-State-Response (PSR) framework was developed by Anthony Friend in the 1970's, and has been widely applied in environmental and sustainability reporting by organizations such as the United Nations, the OECD's State of the Environment group, and Environment Canada. In principle, this model traces a cause-and-effect chain of events, but has been criticized for neglecting to consider multiple feedback loops and the complexity of dynamic systems (Bossel, 1999). Derivatives of this model include the Driving-force-State-Response (DSR) or Driving-force-Pressure-State-Impact-Response (DPSIR), which breaks the chain of events down into greater detail. The PSR framework is depicted in Figure 2-4.

Figure 2-4 Chain of Effects in the Pressure State Response Framework



source: (Pintér, Zahedi, & Cressman, 2000)

2.3.2 Theme-based

Theme-based frameworks examine specific environmental themes and sub-themes, which can be delimited in several ways. A few examples include: by sector (industry, residential, energy, etc.), policy field (climate change, air pollution, water, etc.), or biophysical aspects (water, air, land, etc.). This approach is often used in combination with other frameworks.

2.3.3 Goal-based or Progress to Target

The progress to target framework identifies a goal related to the community's vision, and then develops an indicator that will reflect the community's progress towards that goal (Tencer & Peck, 2002). When the effectiveness of government or non-governmental actions is evaluated against quantitative targets, they are referred to as Performance Assessment Measures. A report entitled "Implementing Sustainable Community Development: Charting A Federal Role for the 21st Century" (Peck, Tomalty, Hercz, and Dauncey, 2001 in (Peck & Tomalty, 2002) identified the lack of quantified measures as a key barrier to making progress in sustainable community development.

A goal-oriented reporting initiative usually includes seven core elements:

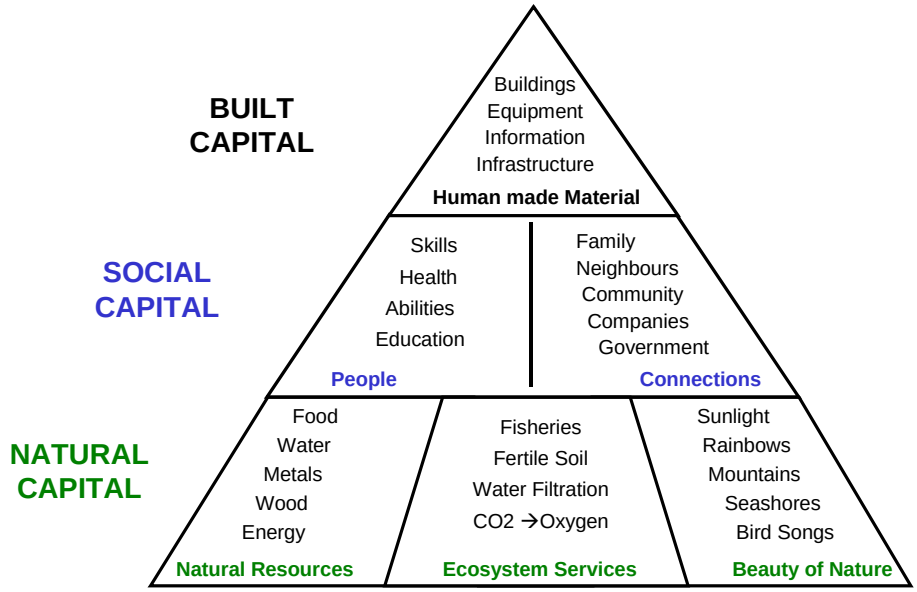
1. A set of policy goals or objectives;
2. A set of measurable indicators chosen to represent the policy goals or objectives;
3. Baseline data to describe current or historical conditions;
4. A set of numerical targets representing a desired future state;
5. A time frame for achieving the targets;
6. An action plan for implementation;
7. A reporting framework.

   (Peck & Tomalty, 2002)

2.3.4 Capital-based

The capital-based framework (as illustrated in Figure 2-5) denotes that all aspects of existence are based on natural capital. Nature provides us with raw materials to make food, shelter, and clothing, and also provide essential services such as air to breathe, protection from UV light, rain to water our crops, and wetlands to filter water and prevent flooding. Human and social capital make up the second level, which refers to the people that make up a community and the connections among them; the way people work together to solve problems, volunteerism, participation, and governance of community affairs. Education, skills, health, and wellness are also part of human capital. The top level, financial and built capital, consists of human-made structures such as roads, bridges, and buildings in the community. It also includes the manufactured goods, the information resources, and the credit and debt in the community. All three types of capital are equally important to a community (Hart, 1999). One major shortcoming of this model is that it does not mention economic measures. An expanded model was proposed in 1997 by the World Bank, which included economy as a subset of human capital (Farsari & Prastacos).

Figure 2-5 Capital-based Framework



source: (Hart, 1999)

2.4 Tools and Approaches Used to Assess Community Progress Towards Sustainability

The author has made a conceptual distinction between frameworks, and approaches or tools for assessing sustainable community progress (see Figure 2-1). Though in practice, this distinction becomes blended, and there is sometimes little difference in how the terminology is applied. The tools and approaches presented in this section each provide a means for a community to assess their progress towards sustainability in different ways. The variety of existing approaches is relevant to this discussion, as they each include some aspect where indicators are applicable. How different tools and approaches influence indicator selection is further discussed in sections 2.2.6 and 4.2.5.

2.4.1 The Natural Step

The Natural Step (TNS) approach was developed by Swedish oncologist Karl-Henrik Robèrt; and has continued to evolve since its inauguration in 1989. Through a series of consultations with the scientific community, he managed to achieve consensus on four broad, non-overlapping principles of sustainability. The TNS framework consists of three elements: i) the funnel, a metaphor for describing the progressive decline of productivity of the life-sustaining ecospheric/societal systems, ii) the four system conditions/principles for sustainability, and iii) the ABCD model for planning. TNS doctrine holds that systematic violation of the principles will result in society "hitting the walls" of the funnel, and that by working within the principles, sustainability can be achieved.

The TNS principles state that:

In a sustainable society, nature is not systematically subject to systematically increasing:

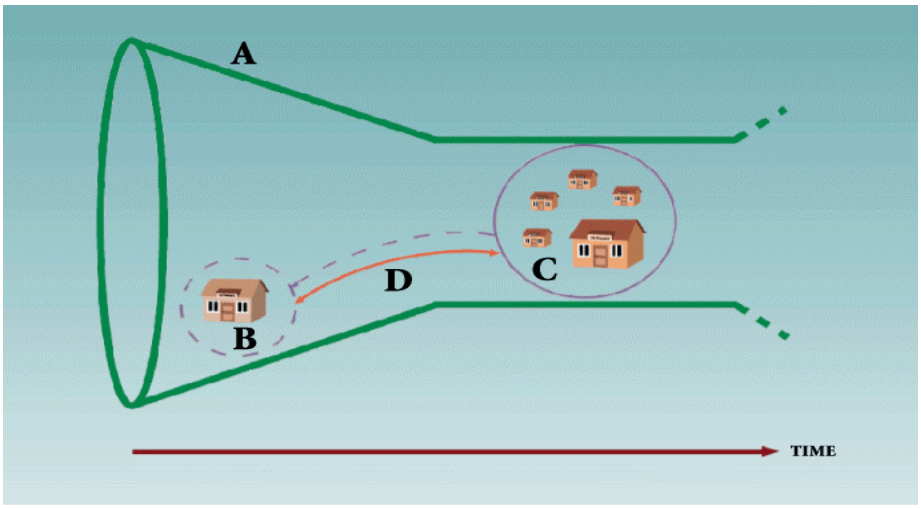
1. ... concentrations of substances extracted from the Earth's crust;
2. ... concentrations of substances produced by society;
3. … degradation by physical means (over-harvesting or other forms of ecosystem manipulation);

and that in society…

4. …people are not subjected to conditions that systematically undermine their capacity to meet their basic human needs (Robèrt, 2002).

These principles serve as guidelines to organizations, allowing them to assess the sustainability of their actions, and to direct their actions by operating within the principles. The ABCD model is depicted in Figure 2-6, where the first step of the process, (A) represents Awareness - utilizing the TNS framework to align the organization around a common understanding of the situation; (B) represents Baseline Mapping - to understand how current activities are unsustainable; (C) means developing a Clear Vision of future sustainable operations as they would look like working within the 4 system conditions; and (D) Down to Action - where small, flexible steps are outlined and prioritised to work towards achieving this sustainable vision. The (B) baseline mapping stage of the ABCD approach, lends itself to the application of indicators.

Figure 2-6 The Natural Step ABCD Approach to Assessing Sustainability



source: (Robèrt, 2000)

A type of sustainability assessment tool, was developed for MacDonald's in Sweden, but such a tool has not been adapted for to communities. Several communities in Sweden have adopted the framework as a planning tool. The American Planning Association[6] has also

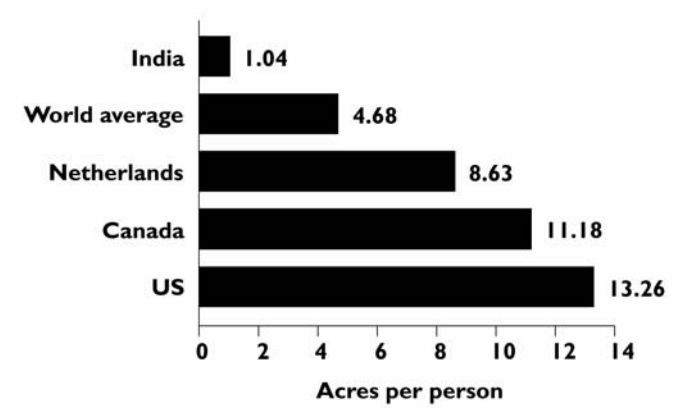
[6] The APA is a public interest and research organization committed to urban, suburban, regional, and rural planning.

integrated the TNS principles into their *Policy Guide on Planning for Sustainability* (APA, 2000). In Canada, the community of Whistler has undergone extensive consultations based on the TNS framework and at the time of publication, the communities of Okotokes and Canmore have also worked with TNS.

2.4.2 Ecological Footprint Assessment (EFA)

The Ecological Footprint concept originated in the early 1990's, from discussions on Healthy and Sustainable Communities at the University of British Colombia. William Rees and Mathis Wackernagel further developed the concept. The premise behind the EFA is carrying capacity; it converts the consumption of goods into units of the biologically productive available land, which would be necessary to provide such functions. The EFA addresses the impact of our local consumption and provides a compelling representation of the consequences that consumption habits and demands have globally. EFA captures the essence that consumption and resource-use is a major issue of sustainability and is an especially good tool to highlight the disparity between developed and developing societies (Wackernagel & Rees, 1996; Wackernagel et al, 1997 in Farsari & Prastacos). The EFA provides an easy-to-understand reality check that resonates at an individual level and can inspire personal commitment to reduce consumption. As seen in Figure 2-7, the lifestyle of an average Canadian results in a relatively large ecological footprint, compared to the world average, and exceeds the available land per person[7] by more than 5 times.

Figure 2-7 Comparison of Ecological Footprints of Different Nations



source: (Wackernagel & Rees, 1996)

The EFA is a good tool for broad-level monitoring of social behaviours, but does not account for the full breadth of issues which must be balanced under the sustainability concept; more detailed information is needed to influence sectoral policies (Farsari & Prastacos). Current ecological footprint estimates err on the conservative side. Cautious figures have been consistently used; areas for the protection and treatment of water have not been included; and areas for the absorption of wastes, pollutants and toxic materials, with the exception of carbon dioxide, have been omitted. The current biological productivity of a given piece of land is assumed to continue into the future. Practices that will reduce future soil productivity, such the use of chemical pesticides and fertilizers, soil compaction, clear

[7] Considering current available-land estimates and population statistics, the planet can accommodate 2.5 hectares per person.

cutting, and other non-sustainable harvesting methods have not been considered (Wilson & Anielski, 2003).

NRTEE and some regions in Canada have applied the Ecological Footprint; Toronto conducted an EFA in 1997. FCM's Quality of Life Reporting System included EFA as a new indicator in 2003, using expenditure data at the household level, sourced from Statistics Canada[8], and the National Energy Board (Wilson & Anielski, 2003).

2.4.3 Healthy Cities

The Healthy Cities movement resulted from a presentation given by Trevor Hancock and Leonard Duhl at a 1984 conference in Toronto called "Beyond Health Care," which recognized that most things affecting the present and future health of citizens are influenced by factors beyond the control of the health sector. The Healthy City approach is a multi-stakeholder process, which uses visioning, analysis and action to support integrative decision-making as described in Table 2-5. In practice, this approach is applied differently according to community needs.

[8] Including surveys on food and family expenditures, spending patterns, "Food Consumption in Canada", "Canadian Economic Observer" and the "Report on Energy Supply-Demand In Canada."

Table 2-5 Healthy Communities principles, process and practices

Healthy Communities are based on the following principles:

- health is a state of complete physical, mental and social well-being. Social, environmental and economic factors are important determinants of human health and are inter-related
- people cannot achieve their fullest potential unless they are able to take control of those things which determine their well-being
- all sectors of the community are inter-related and share their knowledge, expertise and perspectives, working together to create a healthy community

A Healthy Community process involves:

- wide community participation
- broad involvement of all sectors of the community
- local government commitment
- creation of healthy public policies

Qualities of a Healthy Community include:

- clean and safe physical environment
- peace, equity and social justice
- adequate access to food, water, shelter, income, safety, work and recreation for all
- adequate access to health care services
- opportunities for learning and skill development
- strong, mutually supportive relationships and networks
- workplaces that are supportive of individual and family well-being
- wide participation of residents in decision-making
- strong local cultural and spiritual heritage
- diverse and vital economy
- protection of the natural environment
- responsible use of resources to ensure long term sustainability

source:(OHCC, 2003)

The OHCC created a workbook entitled "Signs of Progress, Signs of Caution" which guides communities in the process of creating a progress report card using indicators to assess their health and sustainability (Hellman, 1996). A formal Healthy Cities network developed in Europe, supported by the World Health Organization, including 23 national networks and over 7,500 towns and cities worldwide. The Ontario Healthy Communities Coalition (OHCC) began informally in 1986, with a broad coalition of provincial associations interested in promoting Healthy Communities. A provincial secretariat was founded in 1993 with support from the Ministry of Health (OHCC, 2003).

2.4.4 Environmental Management Systems (EMS)

An environmental management system (EMS) is a set of management processes that allow an organization to analyse, control and reduce the environmental impact of its activities, and operate with greater efficiency. The EMS process has been formalized through the International Standards Organization (ISO) 14000 program. Most commonly applied to corporations, the use of EMS in public organizations has increased in recent years.

The EMS helps organizations mobilize staff around environmental issues, and approach performance improvement in a systematic way. Phase III and IV of the EMS process (Table 2-6) are relevant to indicator development.

Table 2-6 The EMS Process

Phase I: collecting baseline data; training an EMS implementation team; securing top management involvement; establishing communication with external stakeholders; conducting a gap analysis; developing process maps for their "fenceline" operations.
Phase II: implementing an environmental policy; identifying significant environmental aspects; developing procedures for identifying legal and other requirements.
Phase III: establishing environmental objectives and targets and management programs to achieve objectives; defining roles and responsibilities.
Phase IV: monitoring established performance indicators to track progress toward achieving their objectives; ensuring proper checking and corrective action elements are in place such as internal audits and management review.

source: (GETF, 2003)

The US Environmental Protection Agency (USEPA) ran the *Environmental Management System Pilot Program for Local Government Entities* in 1997. The program was deemed to be successful, and to date, over 20 cities and towns in the US have used EMS (GETF, 2003). In 1999, The City of Calgary began implementing an organization-wide environmental management system, to identify the potential impacts for every area of civic operations, and outline procedures to manage and evaluate environmental performance. Toronto investigated the option of conducting an EMS/SMS[9] in 2000.

2.4.5 Atkisson Accelerator

The Atkisson Accelerator was developed by Alan Atkisson, a pioneer in the urban sustainability indicators movement, and co-founder of the Sustainable Seattle initiative. The Accelerator consists of three core tools: the Compass, a tool used to develop indicators; the Pyramid, a tool to link indicators with actions; and the Amoeba game, an exercise in innovation diffusion (Atkisson, 2003).

Atkisson introduces 3 basic conditions, similar to TNS, but in layman's terms (adapted from: (Trout, 2002)):

1. You can't use up resources faster than they actually replenish themselves.
2. If you use stuff that will run out and you depend on it for basic necessities, you need to figure out way to invest non renewable stuff into the development of renewable stuff.
3. You can't dump garbage into nature faster than nature can absorb this refuse without nature going haywire.

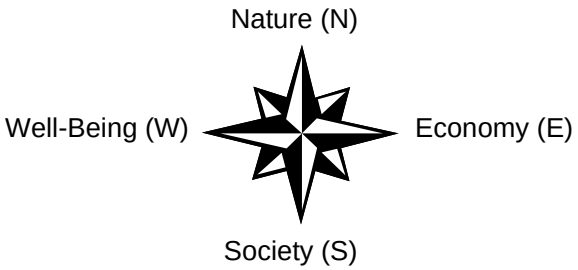
[9] Sustainability Management System

Seven principles of sustainable planning are also introduced:

- Think long term
- Understand systems
- Recognize limits
- Protect Nature
- Transform business as usual
- Practice fairness
- Embrace creativity

The Compass (Figure 2-8) creates a framework for indicator development, viewing the community from four perspectives: Nature (ecosystem health, environmental quality and resource issues); Economy (business, infrastructure, production, consumption, value creation); Society (social cohesion, social development, social and cultural institutions); and Well-Being (individual health, development, satisfaction and fulfilment). The Compass model has been adapted from the theoretical work of Herman Daly (Daly's Pyramid) as modified by Donella H. Meadows (AtKisson & Hatcher, 2001).

Figure 2-8 Atkisson Compass of Sustainability



Atkisson's approach has primarily been used in the US[10] and Europe.

2.4.6 Sustainability Accounting System (GPI)

The Genuine Progress Indicator (GPI) was developed as an alternative to the GDP for the United States in 1995 by Clifford Cobb of Redefining Progress (San Francisco).[11] While the GDP actually reports the costs of fixing social problems or environmental disasters as a positive signal, the GPI uses personal expenditures as a baseline, but then adjusts for numerous factors, such as adding the value of non-monetized activities such as parenting and volunteer work, and subtracting regrettable expenses such as the costs of crime and accidents. (Baker, 1999).

Under the leadership of Mark Anielski, and the research team at the Green Economics Program of the Pembina Institute for Appropriate Development, Alberta become the first region in the world to have a fully-constructed set of GPI accounts, which added to the original model by including a revised balance sheet, to show the physical state of human, social, natural and produced capital.[12] GPI adjusts GDP to account for the depreciation costs

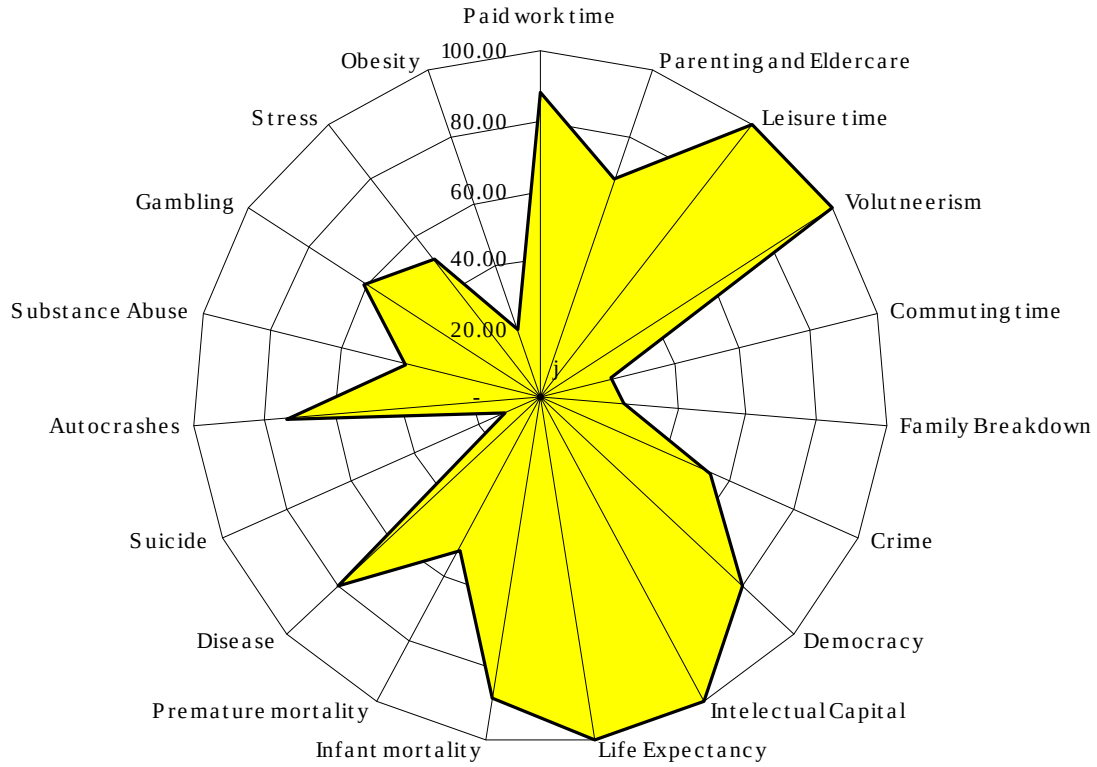
[10] Including cities such as Nantucket, Pittsburgh, and Seattle.

[11] The GPI was derived from the Index for Sustainable Economic Welfare (ISEW) first published by Herman Daly, John Cobb Jr. and Clifford Cobb in their book "For the Common Good" in 1989.

[12] Please see Appendix E, Appendix F, and Appendix G for more details.

of human, social and natural capital, and nets out other regrettable social and environmental costs, as a kind of adjusted income statement. The GPI is constructed using a number of accounts, derived from indicators chosen to reflect important aspects of community sustainability. The value of each account then determined, with the raw data being converted to an index expressed in terms of a scale from 0 (worst condition) to 100 (best condition) among the comparative years. Other time series data are then compared with this maximum or optimum benchmark year. In some cases predefined benchmarks or targets are used, such as reduction targets for greenhouse gas emissions relative to 1990 levels. Some indices use a lower bound or minimum that requires establishing a reasonable and informed threshold for worst performance. Optimum scores would touch the outside edge of the GPI sustainability circle, while those in poor condition or health would appear closer to the centre of the circle (see Figure 2-9). All of the GPI account scores can be combined to create a total picture; this data can then be compared over time to track the trend in *Genuine Progress* (Anielski, 2001a).

Figure 2-9 Example from Alberta's GPI: Society Sustainability Circle



source: (Anielski, 2001a)

At least a dozen countries have recalculated their gross domestic product using the GPI (Baker, 1999). In Canada, the first prototype GPI accounting framework was developed for the Yukon in 2000, before the Alberta GPI Accounts were completed in 2001. GPI Atlantic is presently engaged in a number of GPI-related studies for Nova Scotia.

3. Practice: Canadian Environmental and Sustainability Reporting Initiatives

This section reviews a number of Canadian initiatives, where sustainability indicators are being put into practice. Though this list is not all-inclusive, relevant national, provincial, and local initiatives are outlined, as well as the information being collected under these programs. This review forms a foundation for the discussion on how many diverse-yet-related indicators initiatives are ongoing in Canada, and how these may be linked in a collaborative effort. The collection of consistent data at the community level could also enhance many of these programs.[13]

3.1 National Programs

3.1.1 Canada's National Environmental Indicator Series

The first State of the Environment Report (SOER) for Canada was produced in 1986, and in 1988, Canada established a formal SOER reporting program under the direction of Environment Canada and Statistics Canada. The preliminary set of indicators followed the P-S-R framework, and measured 43 indicators in 18 issue areas, based on existing information and monitoring efforts. The indicators have, and will continue to be refined over the years, to fill data gaps and to find better ways to communicate relevant and compelling information to Canadians (EC, 2003b). The measures included in the 2003 report are listed in Table 3-1, several of which relate to the municipal level.

Four themes provide the context for Environment Canada's national environmental indicator program. The first three centre around principal goals for sustainable development: assuring the maintenance and integrity of ecological life-support systems; assuring human health and well-being; and assuring natural resource sustainability. The fourth theme recognizes that population, lifestyle, and consumption patterns affect these goals (Ditor et al., 2001).

Table 3-1 Canada's National Environmental Indicator Series 2003

Area	**Measure**
Introduction	Change in population, GDP, and energy use
Biodiversity and protected areas	Total and strictly protected land in Canada
	Number of strictly protected sites in Canada in each size range
	Change in status of reassessed species at risk, 1985–2001
	Strictly protected eco-regions in Canada, 2001
	Number of endangered and threatened species, subspecies, and populations in each of Canada's eco-zones, May 2001
Toxic substances	Percent change in emissions of 15 CEPA toxic substances with matched data from 1995 to 2000
	Canadian atmospheric emissions of mercury
	Substances identified as toxic – listed on schedule 1 under CEPA
	Contaminant levels in Double-crested Cormorant eggs

[13] Please refer also to section 5.2 for additional examples.

Acid rain	Sulphur dioxide emissions for eastern Canada
	Nitrogen oxide emissions in Canada
	Trends in lake sulphate levels, 1981–1997
	Trends in lake acidity, 1981–1997
	Wet sulphate deposition, four-year mean
	Wet nitrate deposition, four-year mean
Climate change	Canadian greenhouse gas emissions
	Global greenhouse gas emissions
	Carbon dioxide concentrations
	Change in Canadian temperatures from 1961–1990 mean
	Change in global temperatures from 1961–1990 mean
	Number of weather-related disasters in Canada, 1900–1999
Stratospheric ozone	Average annual ozone levels
	Atmospheric concentrations of chlorofluorocarbons 11 and 12
	New supplies of ozone-depleting substances in Canada
	Global chlorofluorocarbon production
Municipal water use	Daily per capita municipal water use
	Total daily municipal water use
	Canadian municipal population with and without water meters
Municipal wastewater treatment	Municipal population on sewers with secondary and/or tertiary treatment
	Total estimated phosphorus loadings to Canadian waters from municipal wastewater treatment plants
	Level of treatment of municipal wastewaters in Canadian coastal and inland receiving waters, 1999
Urban air quality	Levels of ground-level ozone in Canada
	Levels of total suspended particulates, nitrogen dioxide, sulphur dioxide, and carbon monoxide in Canada, as percentage of maximum acceptable levels
	Average annual ambient concentrations of fine particulate matter
	Emissions of non-methane volatile organic compounds, across Canada from all sources 1980–2000
Forestry	Strictly protected forest area in selected forested ecozones
	Population status of forest bird species in selected forested ecozones, 1968–2000
	Total area harvested
	Number of forest fires in Canada and area burned
	Consecutive years of spruce budworm defoliation, 1980–1996
Agricultural soils	Reduction in number of bare-soil days on agricultural land between 1981 and 1996
	Changes in residual nitrogen levels between 1981 and 1996
	Agricultural land subject to unsustainable water erosion
	Prairie agricultural land subject to unsustainable wind erosion
	Prairie agricultural land subject to unsustainable salinization
Energy consumption	Canadian energy consumption
	Canadian fossil fuel consumption

	Global fossil fuel consumption
	Secondary Canadian energy use
Passenger transportation	Passenger travel, by mode
	Fossil fuel use by automobiles, vans, and light trucks
	Fuel efficiency of new vehicles
	Urban automobile and transit use
Municipal solid waste	Per capita non-hazardous solid waste disposal and recycling/reuse
	Total non-hazardous solid waste disposal and recycling/reuse

source: (EC, 2003b)

3.1.2 NRTEE's Environment and Sustainable Development Indicators

The National Round Table on the Environment and the Economy (NRTEE) was created to "play the role of catalyst in identifying, explaining and promoting, in all sectors of Canadian society and in all regions of Canada, principles and practices of sustainable development" (NRTEE, 2003b). In February, 2000 NRTEE and Environment Canada received $9 million to work with Statistics Canada on the Environment and Sustainable Development Indicators Initiative (ESDI). The mandate of this three-year program was to develop a small set of credible and understandable indicators, which would supplement existing economic indicators such as the GDP to help track whether Canada's current economic activities threaten the way of life of future generations. The Canadian Minister of Finance at that time (now soon to be Prime Minister) announced the initiative saying: "We must come to grips with the fact that the current means of measuring progress are inadequate. [These indicators] could well have a greater impact on public policy than any other single measure we might introduce" (NRTEE, 2003c).

The ESDI final report was released on May 12, 2003 identifying six key indicators of natural and human capital (listed in Table 3-2). These measures were developed by a group of 30 representatives from organizations involved in developing indicators of sustainability, non-governmental organizations, business and financial organizations, universities, and government.

Table 3-2 NRTEE ESDI Indicators

Area	**Measure**
Air Quality Trend Indicator	Tracks air quality across Canada, weighted by population; ground-level ozone (O_3) exposure.
Freshwater Quality Indicator	Provides a national measure of whether water is of sufficient quality for aquatic habitat, recreation, agriculture and other uses.
Greenhouse Gas (GHG) Emissions Indicator	Tracks Canada's total annual emissions of greenhouse gases, including carbon dioxide (CO_2), methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride.
Forest Cover Indicator	Tracks changes in the extent of Canada's forests, including a satellite-based measure of forest cover.
Extent of Wetlands Indicator	Tracks changes in the total area of wetlands in Canada, as a proxy for biodiversity. Although there is no information currently to calculate this indicator, it could be constructed in two years from satellite remote-sensing data.
Human Capital Indicator (Educational Attainment)	Tracks the percentage of the population between ages 25 and 64 with educational qualifications beyond the secondary school level.

source: (NRTEE, 2003a)

3.1.3 Canada's System of National Accounts

Traditionally, the System of National Accounts has focused on measuring income dynamics, based on a narrow definition of wealth (GDP). As a result of NRTEE's recent work, the Environmental Accounts and Statistics Division of Statistics Canada has proposed to expand the definition of wealth to include measures of both natural and human (social) capital. These additional accounts would be reported by the Minister of Finance in each federal budget, as a demonstration of Canada's commitment to monitoring the "triple bottom line" of sustainable development (Lemire, 2003). Motion-385, recently passed in the House of Commons on June 3, 2003. The motion states that "the government should develop and report annually on a set of social, environmental and economic indicators of the health and well-being of people, communities and ecosystems in Canada." This affirms that community monitoring is on the national agenda. A steering committee will be formed to further investigate and recommend a framework for this reporting scheme, but the dialogue implies quite strongly that the indicators will be built after the GPI model[14] (Jordan, 2003).

3.1.4 National Pollutants Release Inventory

The National Pollutants Release Inventory (NPRI) was established in 1992, and is a legislated, publicly accessible inventory of the release and transfer of 268 key pollutants to air, water, land, and off-site transfers for disposal or recycling. The online database[15] is searchable by postal code. A communities portal is being created to help the public understand, access and interpret the information contained in the NPRI (EC, 2003a).

The NPRI is legislated under the Canadian Environmental Protection Act, 1999 (CEPA 1999) and requires companies exceeding established pollutant levels to provide details of their releases on an annual basis. On June 23, 2001 Environment Canada declared ammonia, inorganic chloramines and nonylphenols and their ethoxylates, toxic under CEPA. This means that municipal sewage treatment plants are required to provide assessment reports for those substances to the NPRI, and to prepare and implement pollution prevention plans as of June 23, 2003.

3.1.5 The National Air Pollution Surveillance Database

The National Air Pollution Surveillance (NAPS) Network was established in 1969, and consists of more than 152 stations in 55 cities across Canada. The network is run jointly by the federal and provincial governments, and provides the basis for evaluating air pollution control strategies, identifying urban air quality trends, and for warning of emerging air pollution issues. NAPS supplies the principal ambient air exposure data base for 14 CEPA Priority Substances. Both the number of monitoring stations and the list of substances monitored have increased over the years. A list of NAPS measures is presented in Table 3-3.

[14] Please refer to 2.4.6 for an explanation of this model.

[15] http://www.ec.gc.ca/pdb/npri/npri_online_data_e.cfm

Table 3-3 National Air Pollution Surveillance Measures

Mandated by CEPA	To Support Priority National Air Issues
• Sulphur dioxide (SO_2) • Carbon monoxide (CO) • Nitrogen dioxide (NO_2) • Ozone (O_3) • Total suspended particulates (TSP)	• Smog (Ground-Level Ozone) • Nitric oxide • Nitrogen oxides • Volatile organic compounds (VOCs): aromatics, aldehydes and ketones • Semi-volatile organic compounds: polycyclic aromatic hydrocarbons (PAHs), dioxins and furans • Suspended particles (PM_{10} and $PM_{2.5}$) • 50 elements (including toxic metals such as arsenic, lead and mercury) • 14 inorganic and organic anions • 11 inorganic cations

source: (EC, 2003c)

3.1.6 Canadian Information System for the Environment

The Canadian Information System For the Environment (CISE) task force was established in 2000, as part of the national government's commitment to improve environmental decision-making and accountability. The group produced a vision and a design for an integrated national system for environmental information, which will include the collection, management, assessment, and communication of environmental information that responds to the needs of a broad range of users. CISE will be linked to existing and planned information systems for economic, health, and social information (EC, 2001). This concept of centralizing and making data more accessible to a wide audience is very relevant to the foundation of this thesis.

3.2 Provincial Programs

3.2.1 Provincial SOE Reporting

Most provinces in Canada have completed State of the Environment reports since the early 1990's and some have even passed Acts requiring SOERs on regular intervals (usually 2-3 years). The content of these provincial reports varies from a more classical focus on environmental issues (see Table 3-4 for example) to a more balanced coverage of health, environmental, social and economic indicators. As discussed in section 2.4.6 some regions have developed GPI accounts, as a form of provincial reporting.

Table 3-4 Issues Covered in British Columbia's 2002 SOE Report

Area	**Measure**
Human Health and Environment	Air Quality
	UV Index
	Pesticide Use
	Mercury Concentration in Trout
Water	Surface Water Quality
	Groundwater
	Surface Water Use
Toxic Contaminants	Toxic Substance Releases
	Chemicals in Wildlife
Climate Change	Greenhouse Gas Emissions
	Change in Air Temperature
	Vehicle Sales
Stewardship	Mitigation of Impact
	Municipal solid waste disposed of and recycled
	Number of lead-acid battery units recycled
	Waste Oil Re-refined
	Energy Consumption and Intensity
	Certified Organic Producers
	Environment Industry Employment
	GDP Generated by Parks
Biodiversity	Protected Areas
	Species at Risk
	Habitat
	Fish
	Wildlife

source: (*Environmental Trends in British Columbia 2002*, 2002)

3.2.2 Ontario's Mandatory Performance Measurement Program

In October of 2000, the Ontario Ministry of Municipal Affairs and Housing implemented a mandatory performance measurement program (MPMP), dictating that all Ontario municipalities report annually on 35 measures in nine core service areas annually. These measures (see Table 3-5) were selected as data which is relatively accessible for most municipalities, and which relates to service areas representing ~80 per cent of municipal operating budgets. The goals of this program are: to promote better local services, continuous improvement in service delivery and clear government accountability; improve taxpayer awareness of municipal service delivery; and to compare costs and level of performance of municipal services both internally, year to year, and externally among municipalities. The Ontario Centre for Municipal Best Practices collects, compares, and publishes the information from the MPMP process. The results are also used for the Ontario Municipal CAO's Benchmarking Initiative which encourages municipalities to share performance statistics and operational best practices (OMBI, 2003).

Table 3-5 Ontario's MPMP requirements

Area	Measure
Water	Operating costs of water treatment and distribution; continual supply of quality water
Sewage	Sewer-main backups; outcomes of monitoring tests at treatment facilities
Garbage	Operating costs of waste collection; outcomes of applicable monitoring tests.
Fire services	Operating costs of fire services; fire loss.
Police services	Operating costs of police services; cases cleared.
Social services	Percentage of people participating in welfare-to-work activities; number of people receiving social assistance under Ontario works.
Local government	Operating costs for municipal administration and for council members.
Land-use planning	Percentage of new lots created in settlement areas; percentage of agricultural land retained in an agricultural designation.
Transportation	Operating costs for conventional transit; adequacy of roads for summer.

source: (OMMAH, 2000)

Nova Scotia also mandates performance reporting for municipalities; Quebec and British Colombia are in the process of implementing a mandatory reporting scheme (Gergley, 2003).

3.2.3 Alberta's Measuring Up

In 1994, the Government of Alberta created a framework for government accountability entitled "Measuring Up" which used a progress-to-target framework to outline goals to work towards sustainability. The program established 23 core indicators for goals in three broad categories, as listed in Table 3-6.

Table 3-6 Alberta's Measuring Up Indicators

Area	Goal
PEOPLE	Fostering life-long learning
	Providing excellent schools, colleges, universities, and technical institutes
	Building a healthy society with accessible health care
	Providing basic support and protection for those in need
	Working with others to support families
PROSPERITY	Creating a dynamic environment for growth in business, industry and jobs
	Ensuring that Alberta has a highly skilled and productive workforce
	Providing effective government that lives within its means
	Building an efficient system of roads, highways, utilities, and public spaces
	Promoting new ideas, innovation and research
PRESERVATION	Fostering strong communities
	Ensuring a safe society where justice prevails
	Maintaining a clean environment
	Promoting pride in Alberta and strength within Canada
	Protecting values and culture

source: (SMN, 2002)

3.3 Municipal Initiatives

3.3.1 State of the Environment/State of the City Reporting

In the early 1990's many provincial SOERs were developed, and by 1994 more than a dozen municipalities had completed SOERs (Campbell & Maclaren, 1995). After nearly a decade of research, Dr. Virgina Maclaren has published a database online, providing a content analysis of 70 municipal SOER reports in Canada. The 925 different indicators used in these reports can be categorized into 9 common areas, as presented in Table 3-7.

Table 3-7 Main Grouping of Indicators Used in Canadian Municipal SOE Reports 1992 – 2001

MEASURE	# of Indicators Used
Air	84
Energy	13
Economic	86
Health	59
Land Use	200
Natural Resources	30
Social	194
Waste	45
Water	214

source: (V. Maclaren, 2001b)

3.4 Federation of Canadian Municipalities Programs

The Federation of Canadian Municipalities (FCM) has been the national voice of municipal governments since 1901, and is an association dedicated to improving the quality of life in Canadian communities through the administration of various programs and lobbying efforts. The FCM consists of more than 1000 municipal governments representing 80 percent of Canada's population (FCM, 2003a).

3.4.1 FCM's Quality of Life Reporting System

FCM's Quality of Life Reporting System (QOLRS) was initiated in 1996, in response to Federal cuts to social welfare funding. The basis for the initiative was to create a monitoring system that could provide tangible results to the federal government and support lobbying efforts. The QOLRS network currently includes 21 municipalities monitoring a range of 76 indicators under 11 domains (listed in Table 3-8)[16]. Last year, the group decided to include environmental indicators and underwent a consultative process to research and define several new indicators, within the Natural Environment domain.

[16] Please see Appendix H for a complete list of the QOLRS indicators.

Table 3-8 Domains used in FCM's Quality of Life Reporting System

Area
Demographic Background Information (DBI)
Personal Financial Security (PFS)
Personal & Community Health (PCH)
Personal Safety (PS)
Affordable, Appropriate Housing (AAH)
Local Economy (LE)
Natural Environment (NE)
Education (ED)
Employment (EM)
Civic Engagement (CE)
Community and Social Infrastructure (CSI)

Main data sources for the QOL include: Statistics Canada, NAPS, MUD, and 10 supplementary surveys created and distributed by members of the committee in their respective municipalities. Consultants synthesize the data into a report, which is primarily numerical, though efforts will be made this year to include more interpretative commentary and make it more user-friendly (Welke, 2003).

3.4.2 Partners for Climate Protection: GHG Inventory

The Partners for Climate Protection (PCP) is managed by FCM's Centre for Sustainable Community Development, and is the Canadian version of ICLEI's Cities for Climate Protection Program. The PCP program currently involves of 108 municipalities nationwide, representing 61 percent of the population of Canada (ICLEI, 2003). The CSCD has developed an Inventory Quantification Support Spreadsheet tool, to assist municipal governments in the calculation of their eCO_2 (equivalent CO_2) emissions. The measures included in the PCP program are listed in Table 3-9.

Table 3-9 Information collected in FCM's Partners for Climate Protection Program

Area	**Measure**
Energy	Energy Costs and eCO_2 Emissions by Sector: - Residential, commercial, industry, and transportation, community waste
	Energy Costs and eCO_2 Emission by Source - Energy type: electricity, natural gas, district energy, fuel oil, diesel, propane, etc.
Waste	The total amount of waste hauled to landfill
	Percentage composition of waste
	Estimate of the percent of methane recovered
Fleet	Vehicle kilometres traveled by vehicle type
	Estimates of Fuel Efficiency (L/100 km) for each vehicle type
Optional Information	Population, total number of households, total commercial sector employment, total industrial sector employment, total commercial building floor area, and total industrial sector building floor area.

source: (FCM, 2003b; Torrie-Smith, 1999)

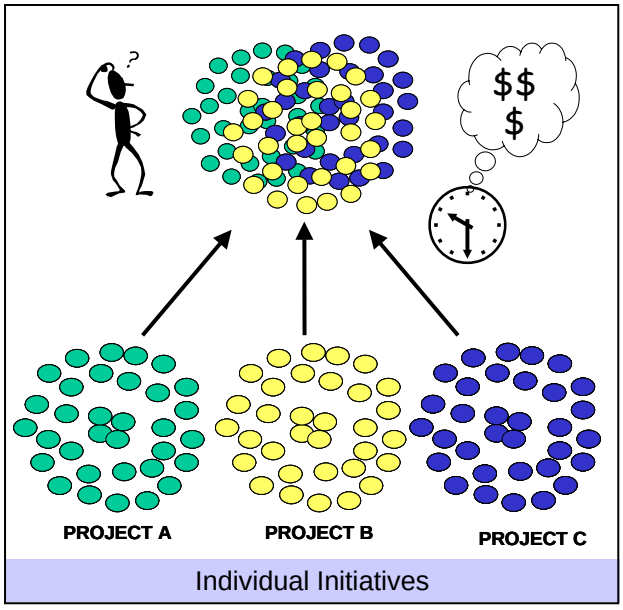
4. Common Information Needs

This section identifies the increasingly disorganized mass of information used in community assessment activities as a problem to be addressed [4.1]. The cumulative factors that have contributed to an increase in information overload are identified [4.2] and the increasing overlap in information needs, via the evolution of various reporting initiatives, is discussed [4.3]. Finally, the overlap that can be seen among Canadian initiatives is presented [4.4]. The opportunities to be realized through these common information needs are discussed in further sections.

4.1 Information Overlap: an increasing problem or opportunity?

As a growing number of organizations, using different tools, each develop indicator sets for their unique purposes, it becomes quite obvious how quickly the number of community indicators can multiply. The process of indicator selection and data collection will likely be different for each organization, even though it is very time consuming and costly. As these efforts produce a number of indicators, using slightly different measures, or inconsistent methodologies for data collection, the amount of information generated becomes overwhelming (see Figure 4-1). In the end, citizens, policy-makers, and other target audiences for these initiatives, are less likely to be able to filter through such an increasingly disorganized mass of information. The result is an information-overload that is not particularly useful or effective.

Figure 4-1 How Different Tools and Frameworks Contribute to the Information Overload



There is a need to manage the information being generated more effectively; to develop commonly agreed upon protocols and standards for information collection to ensure the validity of the data, and also to make this information more accessible to various parties. Such actions would benefit many organizations (compare to Figure 6-1) as discussed in section 6.

4.2 Factors Leading to the Generation of More Information

4.2.1 Increasing Information Needs in a Complex Society

Human beings, by nature, possess a persistent inquisitiveness; we are compelled to explore, measure, and categorize everything in our environment down to the minutest scale. However, as much as we have managed to discover and document the world of our ancestors, our own lives have become increasingly complex. We have continued to segment the world into so many pieces that it has become overwhelming to capture all the knowledge we have accumulated. We are caught in the paradox of "the more you know, the more you realize you don't know"; and so we continue to develop more measures, and different approaches to measures, to try and better understand and monitor the way various systems work. Thus, we are caught on a never-ending treadmill of information collection, in the face of an increasingly complex environment.

4.2.2 Technological Advancements

Technological advancements, in all fields, are causing our world to change at an exponentially faster pace. Information is needed to support these new developments, and technology has made it possible to generate increasingly higher volumes of information at an unprecedented rate. As the need for information has increased, computers have served as invaluable tools that allow us to process and manage data. E-mail has facilitated information-sharing across the globe, with the press of a button. The development of the Internet, search engines, and on-line database technology has made more information available than any human mind can possibly process.

4.2.3 Increased Demand for Accountability

Local governments must comply with various reporting requirements from provincial and federal agencies, as well as international organizations they may be affiliated with. Citizens have also placed increasing demands on officials to demonstrate accountability for their tax dollars spent. Local governments must respond to these demands by tracking such information and generating reports on a number of relevant issues. This increased demand for accountability results in the increased generation of information as proof of their activities.

4.2.4 Increased Community Activism

The volume of information produced today leads to increased citizen awareness of contentious issues within a community. Consequently, there are a growing number of community-based-organizations (CBO), each dedicated to a specific cause (e.g. noise pollution, light pollution, homelessness, healthcare, toxic-watch, to name a few). These organizations also collect information and statistics to champion their respective cause, and lobby various orders of government to respond to their needs. "In traditional indicator reports, the primary authors were governments. In the new indicator movement, indicator reports have varying levels of community input in their development and a wide range of authors, including: local governments, community groups, non-government organizations, academics and collaborations of two or more of these" (V. Maclaren, 2001a). The growing number of activist groups contributes to further generation of information.

4.2.5 Increased Variety of Approaches

As reviewed in sections 2.3 and 2.4, an increasing number of reporting frameworks, approaches, and tools, which affect the indicator development process, have been created.

Depending on the purpose of the organization conducting the study, and the tools they choose, each combination will yield a different indicator selection as illustrated in Figure 4-1.

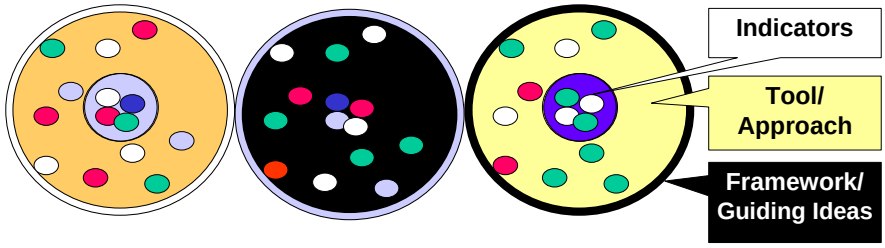


Figure 4-2 How the use of different frameworks and tools results in different indicator selection

All of these factors accumulate – level upon level of diverse purposes, and approaches – resulting in an increased generation of information, which, if not manage effectively, deteriorates into a chaotic, counter-productive, information-overload.

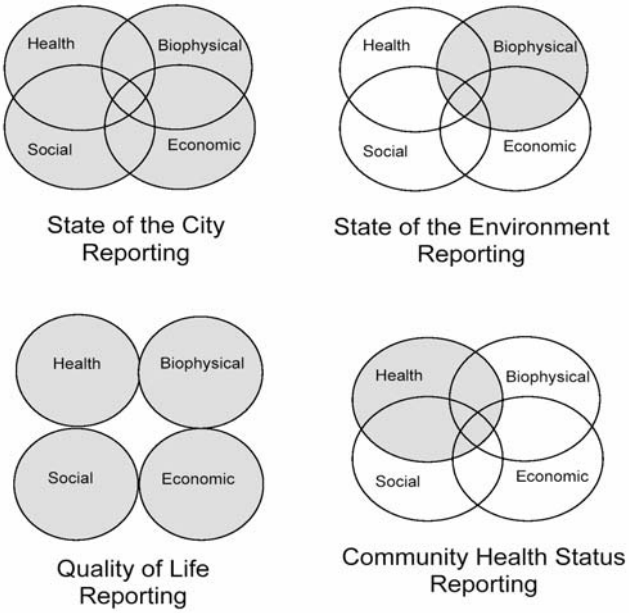
4.3 Factors Leading to Increasing Overlaps in Information

As a result of the growing realization that traditional measures of success (mostly economic) fail to capture many relevant concerns of citizens today, alternative assessment tools have emerged, including measures of health, quality of life, and the environment (Bossel, 1999; Campbell & Maclaren, 1995; Hart, 2001; V. W. Maclaren, 1996; Meadows, 1998).

4.3.1 Growing Similarities Between Reporting Initiatives

A 1995 study on SOE reporting in Canada (Campbell & Maclaren, 1995) included a diagram illustrating the differences in focus and format between State of the City, State of the Environment, Quality of Life, and Community Health Status reporting, as seen in .

The report also commented that the scope of most environmental reports had expanded over time and hypothesised that the distinction among different types of environmental reporting would continue to become blurred. A recent example of this trend is the 2002 decision of FCM's QOLRS group to expand their measures to include environmental indicators. The group hopes to further expand the data set in future years, as resources become available to do so (Welke, 2003).



source: (Campbell & Maclaren, 1995)

Figure 4-3 Linkages Within Environmental Reporting

4.3.2 The Evolution of Measures of Success

To discuss the evolution of reporting, we step back half a century. As depicted in Figure 4-4, traditional measures of "progress" and "success" were strictly economic (i).

Manson, Willms and Gilbert (1991) noted that the entire concept of social indicators emerged in North America after WWII, to improve public decision-making and accountability (McMullan, 1997). As the negative effects from relentless 'pursuits of profit' became more apparent, interest and concern about social and environmental values surged. Correspondingly, there was a growing awareness that the economy is part of a broader system (including well-being, society, and nature[17]) that led to other key measures being acknowledged (ii).

It was also increasingly recognized that these sectors are interdependent and that the economy may be affected significantly by fluctuations in other parts of the system (iii). I.e. the success of business also demands an abundance of natural resources for material inputs, and healthy employees within a functional social system.

Over time, people working with these sectoral areas have become increasingly aware of their interdependence, and the need for an integrated, 'whole systems' approach has been promoted widely. Though in practice, this reality is often too complex to be addressed effectively, efforts are being made to develop more integrated measures of 'sustainable progress' using a holistic perspective (iv).

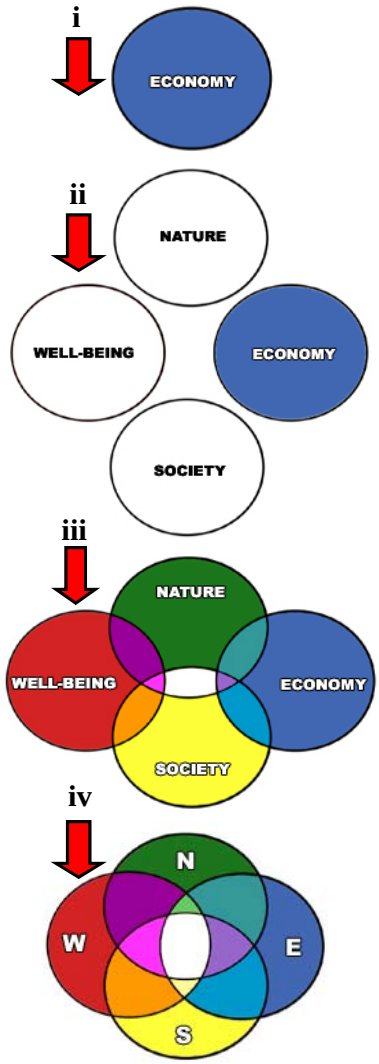
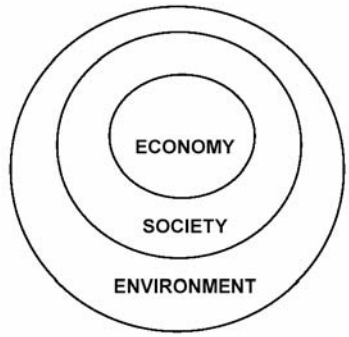


Figure 4-4 The Evolution of Reporting

This line of thought has sparked a new generation of models for sustainability, which recognize the complexity, and interrelatedness of various systems. Known as Hierarchy Theory (Allen and Starr, 1982; Ahl and Allen, 1996), this addresses the "growing comprehension that sustainability issues must always be examined within their broader context. Every system is a component of another system and is, itself, made up of systems" (Boyle, Kay, & Pond, 2001). Hopwood, Mellor & O'Brien (2000) maintain that the common, three-sector view of sustainability (economy, society, environment) is a weak and limited model, as it propagates the idea that trade-offs can be made, and encourages a sectoral approach to sustainable development. The model suggested by Hopwood et al (Figure 4-5) represents the 4 sectors finally meshing into one system, as the last stage following (iv) Figure 4-4.

[17] While Campell & Maclaren divide community indicators and reporting initiatives into four broad categories: Health, Biophysical, Social and Economic, Alan Atkisson's similar categorization is perhaps more intuitive, as points of a "Compass" of sustainability: Nature, Economy, Society, Well-being. These four categories will be used in these, and further diagrams.

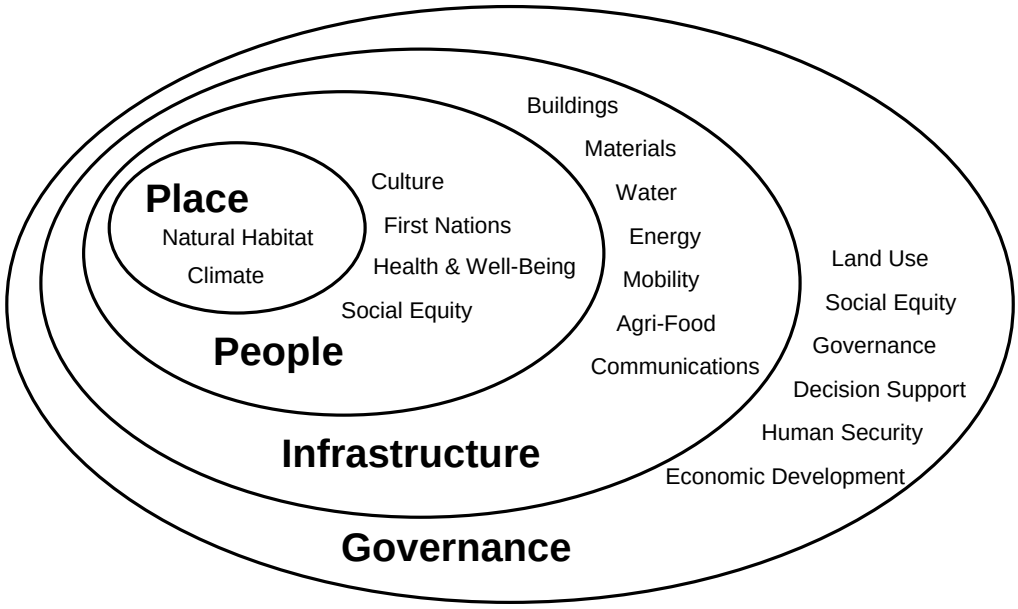
Figure 4-5 Integrated Systems Model of Sustainability



source: (Hopwood, Mellor, & O'Brien, 2000)

This model can be likened to Daly's Pyramid (the Capital Framework model, further developed by Meadows, Atkisson, Hart and others - see 2.3.4) from an aerial view. Other similar models, such as the One Systems Approach (Moffatt et al, 2003) used in the award-winning CitiesPlus initiative, capture the integrated system concept, but use a different categorization and focal point for the aspects of sustainability identified (see Figure 4-6).

Figure 4-6 The One Systems Model of a Sustainable System



adapted from: (*CitiesPlus Planning Documents*, 2003)

This growing realization of the interdependence of sectoral measures of success, has manifested itself in, for example, health organizations taking an interest in environmental issues (see 2.4.3). This phenomenon is another significant driver, contributing to the information overlap between initiatives.

4.4 The Increasing Overlap of Canadian Indicator Initiatives

Virginia Maclaren's database of State of the Environment/State of the City initiatives in Canada, contains 70 reports, including a total of 925 different indicators. In her comparison of these various initiatives, Maclaren found that there is no one indicator in all the reports, and that only 5 of the 35 top indicators are used in more than in 30% of the reports. However, the themes and issues covered are extremely consistent, and can be loosely grouped into 9 categories: air, economic, energy, health, land use, natural resources, social, waste, and water (NIRO, 2003).[18]

As reviewed in section 3, there are numerous Canadian indicator and reporting initiatives, and the number has continued to grow over the years. Table 4-1 summarizes Canadian initiatives that collect data relevant to sustainable development.[19]

Table 4-1 A Sampling of Indicator and Reporting Initiatives in Canada

Local – Level	**Provincial/Regional – Level**	**National – Level**
SOE/SOC reports	Provincial SOE Reporting	National Environmental Indicator Series
Vision 2020 Initiatives	Genuine Progress Indicators (GPI) – Alberta, Atlantic, Yukon	NRTEE - ESDI
Community "Snapshots"	Ontario Healthy Communities (OHC)	MUD
Community "Report Cards"	The Ontario Quality of Life Index	NPRI[20]
Ecological Footprint (EFA)	State of the Great Lakes Report	NAPS
FCM's QOLRS	State of the Fraser Basin Report: A Snapshot on Sustainability	CISE
ICLEI Cities 21 pilot	St. Lawrence Action Plan Georgia Basin – Puget Sound ecosystem indicators report	CPRN's QOLIP
PCP GHG Inventory	Mackenzie River Basin Board State of the aquatic ecosystem report	EMAN
MPMP	Western Boreal Ecosystem Initiative	SCIP
CCMN	Northern Ecosystem Initiative	(GPI)
	Pacific and Yukon Region Environmental Indicators	
	Atlantic Coastal Action Program	

The National Indicators and Reporting Office (NIRO) recognizes the increasing burden that these various reporting initiatives place on municipalities: "A lot has been done, but it's all been done slightly differently. We are creating a mélange of information that isn't necessarily useful. There is both information-overload and survey-request-overload. We shouldn't be collecting data over and over again – there is a lot of repetition in data collection and monitoring" (O'Farrell, 2003).

[18] Refer to Table 3-7 for relative porportions of which areas include the most indicators.

[19] Please refer to section 3, which includes a more detailed description of many of these programs.

[20] NPRI – municipalities are required (as of June, 2003) to submit P2 plans for MWWE.

To illustrate the overlap in demands placed on Canadian municipalities, FCM's QOLRS communities must each complete 10 unique sub-surveys to supplement existing data drawn from StatsCan, CMHC, NAPS, and the Audit Bureau of Canada. Table 4-2 reviews other reporting initiatives that QOLRS communities participate in.

Table 4-2 FCM QOLRS Communities participating in other reporting programs[21]

				Established ✓ ~ Underway
QoLRS Community	**PCP**	**Ontario QOL**	**Provincially Mandated (e.g. MPMP)**	**SOE/SOC Report (by City or CBO)**
British Columbia				
Burnaby	✓		~	✓
Vancouver	✓		~	✓
Alberta				
Calgary	✓			✓
Edmonton	✓			✓
Saskatchewan				
Regina	✓			✓
Saskatoon				
Manitoba				
Winnipeg	✓			✓
Ontario				
London	~		✓	✓
Kingston	✓	✓	✓	✓
Hamilton	✓	✓	✓	✓
Halton	~		✓	✓
Niagara			✓	
Ottawa	~	✓	✓	✓~
Peel	~	✓	✓	~
Sudbury	~	✓	✓	✓
Toronto	✓		✓	✓✓~
Waterloo		✓	✓	✓
Windsor	~		✓	
York Region	~		✓	✓
Quebec				
Montreal	~		~	✓
Nova Scotia				
Halifax	✓		✓	✓

An overlap is created when a community participates in many initiatives, which collect similar information (e.g. the city of Toronto has developed an Ecological Footprint Assessment,

[21] This table has been created according to the author's best (current) knowledge.

reports to Ontario's Mandatory Performance Measurement Program, participated in ICLEI's Cities21 initiative, and is a member of FCM's QOLRS program). Considering that there are likely additional initiatives, which may not be formally recognized, the number of communities participating in several reporting initiatives is significant enough to suggest that coordination and collaboration to share this information may save valuable time and resources for many organizations. Please see 6.2 for a further discussion of the benefits of collaboration.

5. Collaboration in Community Reporting

As opposed to the current situation, with limited coordination and information/resource-sharing amongst various sustainability reporting initiatives, a collaborative effort could help provide direction and weight to the sustainable community indicators movement. Evidence of this growing need for collaboration is presented [5.1]. A review of past collaborative efforts in Canada, and a discussion of the reasons these initiatives have had limited impact on the SCI scene in Canada is presented [5.2]. Finally, examples of current collaborative initiatives from other areas of the world are described, to provide examples of other experiences that may inform the development of a Canadian model [5.3].

5.1 A Need for Improved Collaboration in Canada

The need for coordination and enhanced information-sharing for community indicators has been echoed in reports issued by well-respected and influential groups such as: the National Round Table for Environment and the Economy, The Pembina Institute, Redefining Progress, GPI Atlantic, The Canadian Policy and Research Network, Environment Canada's National Indicators and Reporting Office, the Canadian Sustainability Indicators Network, and the International Institute for Sustainable Development.

The recently released draft of *A National Strategy for Environmental Indicators and State of the Environment Reporting in Canada* observes:

> There is currently an explosion of environmental indicators and SOE reporting work in Canada — in terms of number of environmental indicator initiatives and SOE reports, number and type of organizations involved, as well as styles and frameworks used. Yet, there is a lack of synthesis across Canada. Much of this work is unconnected, indicators are based on a small information base and sometimes provide contradictory messages, and gaps remain for important environmental issues (Bond, Ironside, & Smith, 2003).

A report entitled *A Conceptual Framework for Monitoring Municipal and Community Sustainability in Canada* by the Pembina Institute states:

> In our examination of existing conceptual community sustainability indicators, we were overwhelmed by the number and diversity of reporting efforts across Canada at the national, provincial, and local levels. While a diversity of indicators and reporting systems may be a strength, reflecting the unique needs of each community for indicators, it also presents a significant challenge for common or standardized definitions of sustainability, sustainability indicator framework, database development, data gathering protocol, and reporting protocols (Anielski & Winfield, 2002).

There is also a strong recognition by such organizations for the need to develop complimentary systems from the local level up to national and international scales, and that the coordination of sustainability indicators should integrate various levels of government.

> There are many different scales of analysis, from local to global, that are important. In the ideal, each should be used to inform the others (IISD, 1999).

> Much of Canada's environmental information is incomplete and of surprisingly poor quality in some areas. Environmental information collected in different parts of the country is not comparable or consistent in many cases. There are very few nationwide databases that are regularly updated, even for basic environmental matters such as water quality. As a result, few regularly updated national indicators are possible, because of a lack of corresponding information systems (NRTEE, 2003a).
>
> A plethora of largely unconnected and diverse work is occurring in Canada on environmental indicators and State of Environment Reporting. A more cohesive approach would help jurisdictions and practitioners to identify common challenges, exchange shared experiences, build on lessons learned, and better support Canada's international reporting obligations (Bond et al., 2003).
>
> …despite more than 10 years of indicator development, the emergence of a commonly accepted national framework for community/municipal sustainability indicators and reporting systems is still a good distance from becoming a reality. We believe what is required is a commitment to a process that engages all levels of government, in consultation with measurement experts and citizens, to develop a prototype CSSI[22] sustainability measurement and reporting framework (Anielski & Winfield, 2002).
>
> Governmental and nongovernmental organizations at all levels should work to integrate their indicator efforts with other scales and across sectors and disciplines in a way that engages stakeholders at all scales and results in a nested set of sustainability indicators that relates the scales and recognizes the importance of local scale (Hart, 2001).

The quotations presented above, from such a variety of respected sources, indicate a very strong case for the need for collaboration and coordination of SCIs in Canada, and the importance of integrating various initiatives into one coordinated system.

5.2 History of Canadian SCI Coordination Efforts

A few organizations have attempted to drive the coordination of SCIs at the local level, but due to various reasons these efforts have not achieved the necessary level of momentum to culminate in any nation-wide, lasting result (discussed further in section 5.2.7). The only prominent Canadian example of coordination is the QOLRS (see 3.4.1).

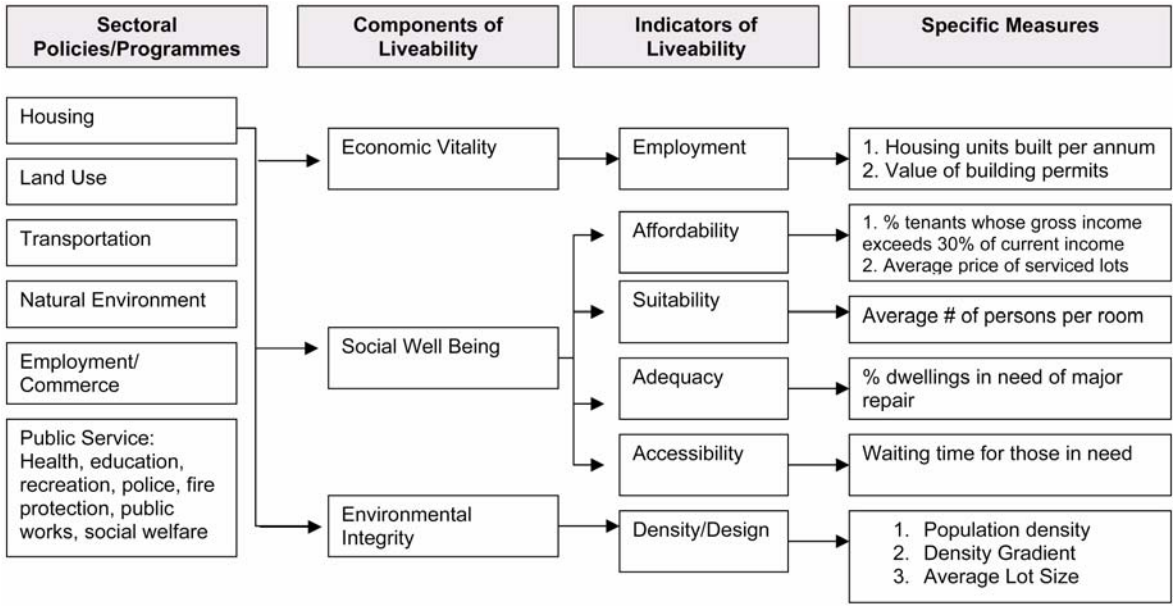
5.2.1 The Community-Oriented Model of the Lived Environment

The Community-Oriented Model of the Lived Environment (COMLE) was developed by Murdie et al. in 1992, and is the earliest example of an indicators template designed for the local level (V. Maclaren, 2001a). The COMLE model uses a list of policies and programs that are typical of most cities, either as separate departments, or within the general realm of municipal government. As seen in Figure 5-1, the Components of Liveability include: economic vitality, social well-being, and environmental integrity. The model recognizes that cultural congruence, defined as the degree to which things match societal norms and

[22] Conceptual Community Sustainability Indicators

expectations, moderates the effects of the other three components (CMHC, 1993). The framework consists of over 100 indicators in 10 issue areas, related to each program.

Figure 5-1 The Community Oriented Model of the Lived Environment: Example for Housing Sector



source: (Sherwood, 1993)

In 1993, The Canadian Mortgage and Housing Corporation (CMHC) ran a pilot test of the COMLE framework in Quebec City, Toronto, and Fort McMurray. The final report deemed COMLE as a practical, affordable, adaptable, and useful model, which promoted an improved understanding of sustainability within communities (Sherwood, 1993). Despite the report's recommendations for further development, other criticisms (Sénécal, 2002) may provide a clue as to why the tool disappeared.

5.2.2 The Sustainable Community Indicators Program

The Sustainable Community Indicators Program (SCIP) was conceived by indicator practitioners at Environment Canada and CMHC as a response to a call by cities, non-government organisations and others for the Canadian government to provide access to indicators and guidelines to help communities develop and use sustainable development indicators (O'Farrell, 2003). The goals of SCIP included: to create a common, yet flexible, approach to help communities select, create, and use indicators for monitoring local sustainability; to promote the use of comparable indicators; and to encourage the sharing of indicators and data, both among municipalities and with other levels of government. SCIP proposed to provide a how-to guide for municipalities through the development of an interactive indicators software package. In 1996, Westland Resource Group helped define the conceptual basis for the software and develop a suggested list of indicators. In 1997, the partners began to develop the prototype software tool that enables municipalities to develop, compare and share their indicators. In 1998, FCM's QOLRS group became limited partners in the project, providing indicator profiles and data, and piloting the developed software. The software was revised and made available for distribution (NIRO, 2001; O'Farrell, 2003).

At one point, the scope of the SCIP project aspired to create a centralized, online database, which would capture and maintain community information across Canada. Unfortunately,

progress has been slow and difficult, with insufficient resources, changing technical opportunities, parallel efforts that need to be integrated, and the challenge of matching local requirements with a standardized tool (O'Farrell, 2003). The user-acceptance and convenience of an online tool was underestimated, and that aspect of the project was shelved. The online SCIP tool currently serves as an information guide with some templates available for municipalities to use or adapt to their own needs. The SCIP software divides indicators into 5 core areas, as seen in Table 5-1.

Table 5-1 Indicators used in the SCIP Guidelines

Area	**Measures**
Environmental Health	biophysical aspects and natural areas e.g. habitats as well as air, water and soil quality, air quality/emissions, atmospheric change, etc.
Resource Consumption	use of natural capital, waste production/management, energy use and consumption patterns.
Settlement Patterns	urban sprawl, land use and housing diversity.
Human Well-Being	quality of life issues, such as human health, happiness, fulfilment, community participation, government, cultural and social services.
Employment and Commerce	economic activity, business sustainability, people's livelihood

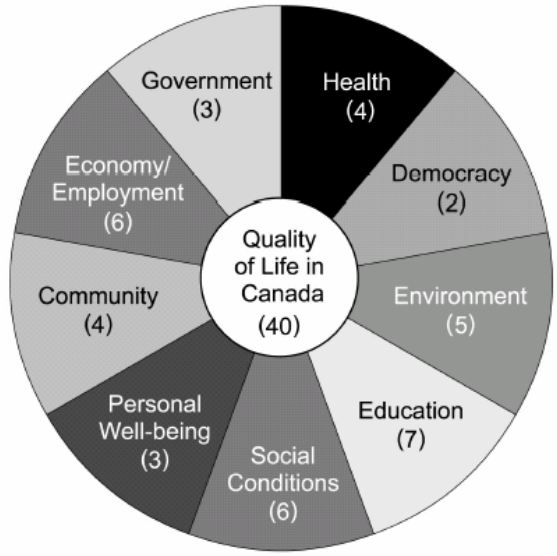
Source: (Ditor et al., 2001)

5.2.3 The Canadian Policy Research Networks QOL/SIP Project

The Canadian Policy Research Networks (CPRN) began a project in late 1999, which aimed to coordinate a national-scale citizen engagement process and to develop a prototype set of indicators that reflected a range of issues that truly matter to citizens. The exercise aimed to create a common language for dialogue among and between the public, private and voluntary sectors, leading to a more balanced discussion of public priorities that takes account of social, economic, environmental, and other dimensions (Zagon, 2001). This initiative represents an important departure from the indicators developed by municipal representatives, and provides perhaps a more accurate view of SCI that are valued by *citizens*. However, when approached about the project, FCM's QOLRS group rejected CPRN's proposal, viewing it as a duplication of their work. Nevertheless, in the fall of 2000, 350 Canadians took part in 40 different dialogue groups in 21 towns and cities across Canada to discuss quality of life issues. The results of these focus groups led to the production of a prototype set of national QOL indicators, consisting of nine themes and forty indicators (see Figure 5-2).[23]

[23] Please refer to Appendix I for a detailed list.

Figure 5-2 CPRN's QOL Prototype Set of National Indicators



source: (Zagon, 2001)

In September 2002, *Quality of Life in Canada: A Citizens' Report Card* was released, reporting how Canadians have fared over the last ten years with respect to each of the 40 indicators. The Report Card utilized a variety of data sources, including: the Canadian Council on Social Development, the Conference Board of Canada, the Federation of Canadian Municipalities QOLRS, GPI Atlantic, the Pembina Institute, Statistics Canada, and the Treasury Board (Zagon, 2002).

5.2.4 The Ecological Monitoring and Assessment Network

Environment Canada created the Ecological Monitoring and Assessment Network Coordinating Office (EMAN CO) in 1994. EMAN's role is to facilitate cross-disciplinary and inter-jurisdictional assessment of ecosystem status and trends, and to develop a community of practice, promoting common techniques and protocols for monitoring. Through the integration of reports and information, their goal is to progress towards a common distributed data management system, which can provide timely information to decision makers, and inform the Canadian public. They also prioritize collaborating with international frameworks (EMAN, 2003).

5.2.5 The Canadian Community Monitoring Network

The Canadian Community Monitoring Network (CCMN) was formed out of a partnership between EMAN and the Canadian Nature Federation. Starting in 2001, the group ran a pilot program, involving 31 communities across Canada, to develop and test a model for nationally coordinated community-based monitoring initiatives. CCMN's priorities include building local capacity for monitoring programs, and contributing to nationally standardized data sets. Current programs include worm-watch, frog-watch, plant-watch, and ice-watch (CCMN, 2003). CCMN's grassroots approach to collaboration and peer-teaching is commendable; they have partnered with schools and groups such as the BoyScouts of Canada to sustain regular monitoring efforts and involve community residents. However,

their monitoring focus is extremely limited, and these specific eco-system indicators may not be a priority for all communities across Canada.

5.2.6 The Ontario Quality of Life Index

The Ontario Social Development Council and the Social Planning Network of Ontario administer the Quality of Life Index, with funding from Health Canada. The report presents a composite quality of life index, by aggregating 12 indicators in four theme areas listed in Table 5-2. The group has released seven reports to date, tracking data from 1990 onwards. Twenty-one cities and community groups participate in the program (OSDC, 2002).[24]

Table 5-2 Issues Covered in Ontario's 2002 QOL Report

Area	**Measure**
Social	Admissions to Child Welfare
	Social assistance beneficiaries
	Public housing wait lists
Environmental	Tonnes of Waste Diverted to Blue Boxes
	Spills reported
	Air quality
Economic	Bankruptcies
	Labour force working
	Labour force unemployed
Health	New cancer cases
	Low birth weight babies
	Long term care wait lists

source: (OSDC, 2002)

5.2.7 Why Previous Collaborative Efforts Have Had Limited Impact

Due to limitations in the scope of this thesis, it was not possible to thoroughly investigate the circumstances surrounding the efforts outlined in sections 5.2.1 through 5.2.6. in terms of the exact reasons why these initiatives have not had a larger impact to coordinate the Canadian SCI scene. It is the author's opinion that several factors, both specific to the initiatives as well as universal issues such as timing, technological possibilities, political alliances, and available funding, have limited the scale of the impact of these initiatives. Table 5-3 presents a summary of both the strengths of these efforts, which may be capitalized upon, and the challenges that limit the initiative's contribution towards the goal of a national-scale coordinated SCI program.

[24] See Appendix J for a list of participating communities and coordinator contact information.

Table 5-3 Strengths and Challenges of Past/Present Collaborative SCI Efforts in Canada[25]

Initiative	Strengths	Challenges[26]
COMLE	- framed around municipal management categories (intuitive, this data is being monitored by sector, anyways) - customisable - positive feedback from the pilot tests	- "before it's time"? - limited promotion?
SCIP	- core + flexible framework - guidelines for consistency, as needed - online shared information concept (though not realized)	- software not user-friendly, and would require intensive training efforts. - limited participation of community groups in the development - limited promotion of the tool
CPRN's QOL/SIP Project	- citizen involvement - ongoing workshops	- may inform SCI efforts, but individual citizen-focus has not connected to particular groups (i.e.: municipal management team) who will realistically implement a monitoring of their indicators at the local level
EMAN/The Canadian Community Monitoring Network	- strong focus on developing common protocols, national consistency, capacity-building, collaboration with ongoing initiatives - grassroots approach and partnerships to sustain regular programs	- limited, eco-system focus, which may not be considered a priority measure for all municipalities - "brand new"
The Ontario Quality of Life Index	- using only a few key indicators facilitates participation	- scope limited to Ontario

5.3 Recent Collaborative Initiatives in Other World Regions

Agencies in other areas of the world have been actively exploring the coordination of community indicators and have found that this has been greatly facilitated through the use of on-line databases. A few examples, which may provide guidance and insight to a Canadian initiative, are explained briefly in the following sections.

5.3.1 ICLEI Cities 21: Assessing Mutual Progress Toward Sustainable Development

ICLEI's Cities21 initiative began in the fall of 1998, to create a common framework for local government members to evaluate their local, joint, or cumulative progress towards sustainable development. The development of the indicators set was coordinated by ICLEI with the assistance of thematic working groups comprised of a network of municipal experts. The final indicators were refined, based on data availability as determined by the participating cities, and harmonized with urban indicators used by key international agencies. The final list

[25] FCM's QOLRS is not mentioned here, as it is elaborated in more detail in 6.3.1.

[26] Please note that these are deemed to be challenges in the context of a municipal-level coordination.

of 70 core indicators[27] covered the three areas of mutual concern: Governance, Water, and Climate Change. A project-specific database was developed to facilitate on-line data collection, and 30 participating local governments from all over the world (including developing countries) collected data for the indicators. Users could post and change data, ask questions about the indicators, and compare the values of their indicators to those of the other participants (ICLEI, 2000).

5.3.2 Cities Environment Reports on the Internet (CEROI)

The CEROI Programme was initiated by UNEP/GRID-Arendal in 1996, with the goal to bring together a network of cities to make information about their environment available on the Internet in an easy-to-understand, well-structured, and internationally comparable format. To guide the project, an advisory committee was formed, including leaders from UNEP's Regional Office for Europe, the European Environmental Agency (EEA), the Healthy Cities Project of the World Health Organisation (WHO), the Global Urban Observatory of UNCHS/Habitat and ICLEI. After being piloted with 25 cities from around the world, CEROI was implemented in 1998, and continues to grow. The concept provides city authorities with an efficient tool to produce and present an SOE report on Internet; it includes a template with standard indicators and a tailor-made software for easy presentation of graphs, maps, photographs and text. The reports follow the DPSIR framework (see 2.3.1), and are segmented into approximately 10 different themes. A number of core indicators are selected for presentation of each theme.[28] The CEROI web site functions as a gateway to municipal SOE reports, allowing members to benefit from the exchange of information on experiences and efforts in other cities. CEROI also hosts an Indicator Encyclopaedia, which offers detailed information about individual indicators such as measurements, protocols, references and examples (UNEP, 2002).

5.3.3 European Common Indicators (ECI)

The European Common Indicators project started in 1999, and involved various organizations at different levels, working together to establish comparable data and a better understanding of sustainability in local communities across Europe. The ECI has 144 signatories in 22 European countries, including both local and regional authorities. A highly integrated set of indicators was selected, using a bottom-up process where community members reviewed over 1000 indicators, selecting only those which met at least 3 of the six principles of urban sustainability (Table 5-4).

[27] Please refer to Appendix K for a complete list.

[28] The core indicators used by CEROI can be viewed in Appendix L.

Table 5-4 Guiding Principles of Sustainability Used in the European Common Indicators Selection Process

1. **Equality and social inclusion** (access for all to adequate and affordable basic services, e.g. education, employment, energy, health, housing, training, transport);
2. **Local governance/empowerment/democracy** (participation of all sectors of the local community in local planning and decision making processes);
3. **Local/global relationship** (meeting local needs locally, from production to consumption and disposal; meeting needs that cannot be met locally in a more sustainable way);
4. **Local economy** (matching local skills and needs with employment availability and other facilities, in a way that poses minimum threat to natural resources and the environment);
5. **Environmental protection** (adopting an eco-systems approach, minimising use of natural resources and land, generation of waste and emission of pollutants, enhancing bio-diversity);
6. **Cultural heritage/quality of the built environment** (protection, preservation and rehabilitation of historic, cultural and architectural values, including buildings, monuments, events, enhancing and safeguarding attractiveness and functionality of spaces and buildings).

source: (Berrini, Bono, Ferrari, Tarzia, & Merola, 2003)

The final indicators (listed in Table 5-5), were strongly linked to the guiding principles, and complementary to existing local, national, and sectoral indicators. The group continues to test and refine the indicators based on the pilot experiences. Used in combination with other indicators and other evaluation methods, the European Common Indicators can serve as a foundation for a comprehensive local or regional monitoring strategy.

Table 5-5 Linking the ECI Indicators to the 6 Guiding Principles

Towards a Local Sustainability Profile – European Common Indicators		Principle n°					
	Issue/Indicator	1	2	3	4	5	6
1	Citizens' Satisfaction with the Local Community	✓	✓		✓	✓	✓
2	Local Contribution to Global Climate Change (and/or local Ecological Footprint)	✓		✓	✓	✓	
3	Local Mobility and Passenger Transportation	✓		✓	✓	✓	✓
4	Availability of Local Public Open Areas and Services	✓		✓		✓	✓
5	Quality of Local Air	✓				✓	✓
6	Children's Journeys to and from School	✓		✓	✓	✓	
7	Sustainable Management of the Local Authority and Local Businesses			✓	✓	✓	
8	Noise Pollution	✓				✓	✓
9	Sustainable Land Use	✓		✓		✓	✓
10	Products Promoting Sustainability	✓		✓	✓	✓	

source: (Berrini et al., 2003)

5.3.4 The National Neighborhood Indicators Partnership

The National Neighborhood Indicators Partnership (NNIP) was initiated in late 1996 as a collaborative effort among 6 partner cities, and led by the Urban Institute in Washington, D.C. and. The goals of the project include: to facilitate the development of local indicators; the dissemination of indicator information; to encourage indicator use in community-building and local policymaking; to create a National Neighbourhood Data System (NNDS);

to analyse neighbourhood change; and to provide networking and technical assistance to local partners. The NNIP partners operate under the theme *democratizing information* to facilitate the direct practical use of data by city and community leaders, rather than preparing independent research reports on their own (NNIP, 2003).

All of the original NNIP partners have built advanced information systems with integrated and recurrently updated information on neighborhood conditions in their cities, demonstrating that such systems can be operated on an ongoing basis at a locally self-sustaining level. This success was possible due to cost reductions made through advances in information technology, and after overcoming the resistance of local public agencies to release administrative data (Kingsley, 1998). The Urban Institute has also developed a set of profiles for the 100 largest metropolitan areas in the United States. This data will support research on neighbourhood change processes, and also serves as a 'starter kit' for new cities to join the NNIP (Kingsley, 1999). Following the success of the program, in 2000 the program rapidly expanded to include 20 partners[29]; new applications are currently on hold while the organization copes with the expansion.

5.3.5 The Global Reporting Initiative

The Global Reporting Initiative (GRI) was established in response to the growing practice of "triple bottom line" reporting[30] to create international standards for corporate sustainability reporting. The project was started in 1997 by the Coalition for Environmentally Responsible Economies, but since 2002 has independent status as an official collaborating centre of the United Nations Environment Programme (UNEP). A multi-stakeholder process was used to generate a set of globally applicable Sustainability Reporting Guidelines, which help to ensure the consistency, rigour, comparability, and credibility expected of financial reporting. Over 300 organizations in 31 countries have used the GRI guidelines to date (GRI, 2003). An initiative such as the GRI, implies that such standards or guidelines could be applicable to municipal corporations.

As the trend of municipal reporting has continued to grow, the need for coordination of municipal statistics has emerged as a priority. The issues outlined in this section indicate that there is a strong case for a comprehensive, collaborative SCI initiative in Canada, and examples of collaboration in other regions of the world indicate that such an initiative is feasible. With the momentum that has been building in the indicators movement over the last decade, with the current cumulative expertise gained by Canadian communities having completed SOE/QOL reporting initiatives, with advances in technology, and the current movement to consolidate data and make it accessible via mechanisms such as CISE (see 3.1.6), the usefulness of a coordination effort similar to the SCIP concept (see 5.2.2) resonates even more strongly. The time is right to engage the municipalities in discussions to re-launch an initiative with goals similar to those of SCIP: to provide a centralized, web-based information sharing tool that would facilitate municipal reporting and information-sharing with organizations that require municipal data. How to further develop this concept is elaborated in the following section.

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[29] Atlanta, Baltimore, Boston, Camden, Chattanooga, Cleveland, Denver, Des Moines, Hartford, Indianapolis, Los Angeles, Miami, Milwaukee, New Orleans, Oakland, Philadelphia, Providence, Seattle, Sacramento, and Washington.

[30] Triple bottom line refers to reporting on environmental and social impacts as well as financial performance.

6. A Model for SCI Collaboration

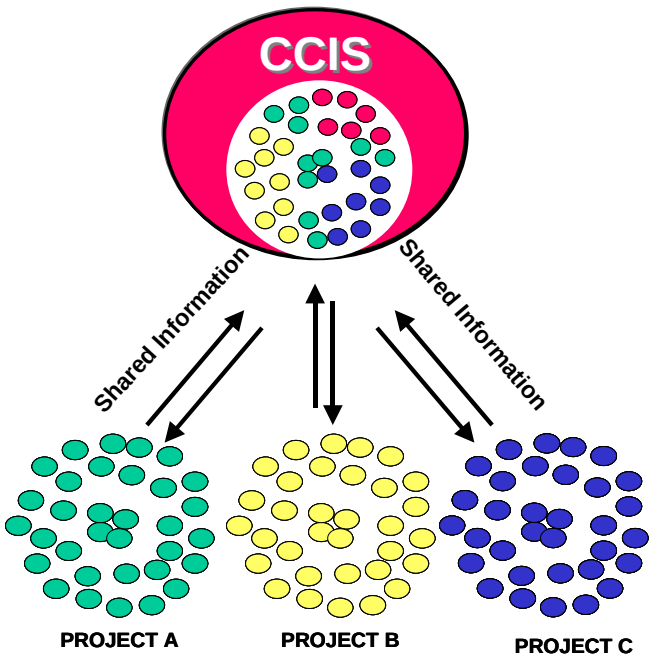
This section presents a response to the evident need for coordination among SCI initiatives, and outlines recommended characteristics for a collaborative approach to community monitoring [6.1]. The benefits to be achieved through collaboration are highlighted [6.2] and the contributions and strengths of potential partners to be involved in a Canadian effort are considered [6.3]. The section concludes with a discussion of potential barriers to collaboration and how these may be overcome [6.4].

6.1 Recommended Characteristics of a Model

The need for a coordinated, collaborative SCI initiative has been identified in previous sections. The author has developed recommendations based on a combination of theoretical background, familiarity with current ongoing initiatives, and adapted examples of practices that have been applied in other regions. The suggestions presented here are only conceptual examples of how a system may be designed. Alternative formats must be discussed and collectively agreed-upon by the participating partner organizations, to ensure success.

Figure 6-1 illustrates how various projects could cooperate to develop a type of Common Community Information System (CCIS). The concept invites voluntary participation in a common data pool, where organizations contribute and draw information. The centre group of indicators signify "core indicators" which will be collected consistently at a local level, but the data system also brings together information sourced from various other projects. Such a system would help to organize community-specific data in a structured way, reducing the current overlap in information requests to municipalities, and the confusion created by the resulting duplications in data (compare to Figure 4-1).

Figure 6-1 Information is shared by different parties within the Common Community Information System



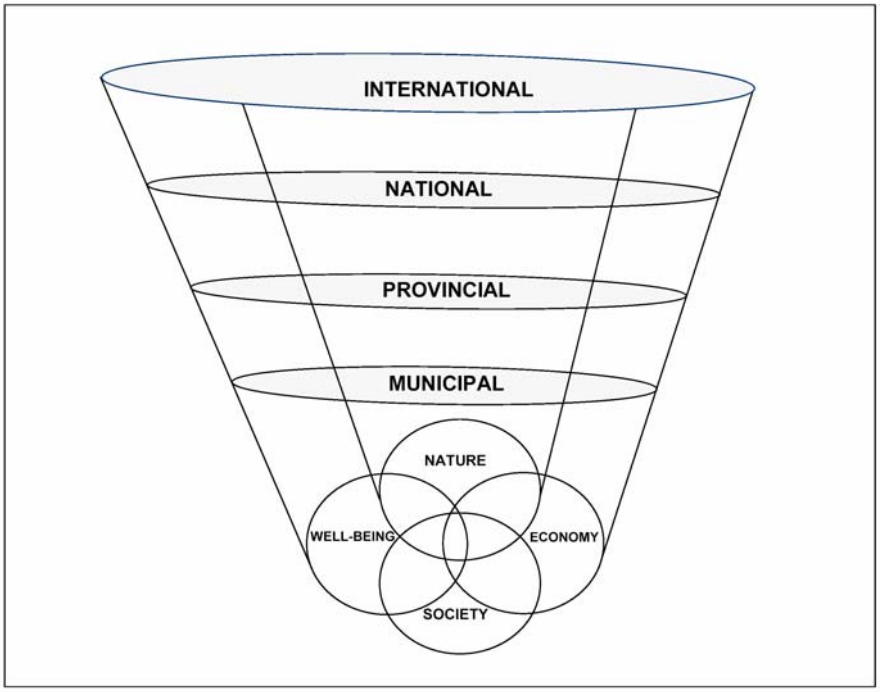
The CCIS would provide support and education to municipalities and ensure the collection of a number of core indicators. The CCIS would also be responsible for establishing

consensus and developing protocols for data collection. This model, applied to an individual community, would provide enhanced information capabilities and benefits to various community members (see Figure 6-4). Expanded to a national scale, such a CCIS would be a very large and complex database, with high maintenance demands to preserve data integrity. If administered diligently by the community partners, it could become an extremely powerful tool for community planning and development, as well as regional and national planning. Other aspects that should be considered in the design of a CCIS are reviewed in the following sections.

6.1.1 Aligned with Other Reporting Systems

Section 5.1 cited references from several expert sources, emphasising the importance of integration and compatibility of various reporting initiatives from local to international levels. Other collaborative initiatives such as ICLEI's Cities21 project and CEROI also factored existing programs into the development of their projects. Figure 6-2 demonstrates how local indicators can be "rolled-up" into broader-scale data systems.

Figure 6-2 A Model for the Integration of Various Reporting Initiatives[31]



Ensuring that a CCIS is designed with this broader purpose in mind, is practical in terms of supporting both national and international reporting commitments in Canada. A representative of the National Indicators and Reporting Office commented: "My own view is that this [concept] has tremendous potential - it could provide the impetus and process for filling some data gaps to support local and national indicators as well as data gaps to bolster and support CISE. One understated idea, perhaps, is that consistent data collected at the local level could be aggregated to support regional and national indicators that, at the moment, are unsupported by data" (O'Farrell, 2003). The information could also contribute

[31] Adapted from a model in (Campbell & Maclaren, 1995), using the intuitive and broad *Compass* categories used by Alan Atkisson.

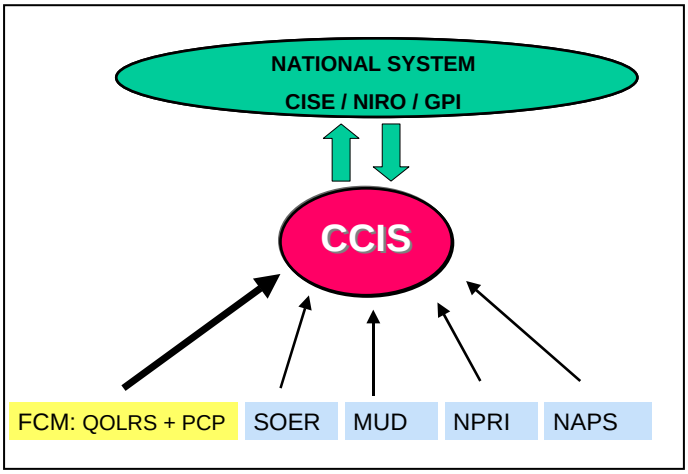
to the System of National Accounts, which will include measures of natural and social capital (see 3.1.3).

A Conceptual Framework for Monitoring Municipal and Community Sustainability in Canada (Anielski & Winfield, 2002) also presents an integrated system of capital accounts which rolls up to the provincial and national levels (see Appendix M).

6.1.2 Draw From Existing Sources

As shown in Figure 6-3, the CCIS would draw from existing information databases and also contribute to the national system being constructed under CISE. In this diagram, the CCIS appears to be the 'interface' that brings these other sources together.

Figure 6-3 Potential Structure of Common Community Indicators Interface



6.1.3 Respect Individual Project Needs and Diversity

As reviewed in Section 3, many reporting initiatives have been established in Canada for some time. It is essential to respect the distinct founding purpose and goals of these projects, as well as their unique experiences with indicator development and information collection. The CCIS model would not attempt to dominate these efforts in any way, but to draw on their strengths and act as a platform for discussion and development of common protocols and to facilitate access to community information.

6.1.4 Design a Dual-Purpose Framework

This model suggests a "Core + Flexible" approach, as the optimum framework for a common community indicator set.

Core Indicators are needed to maintain data consistency, and to ensure that all communities are taking the responsibility to monitor basic, agreed-upon measures to assess progress towards sustainable community development. Data consistency has been noted as a limitation in many reporting initiatives, and establishing a set of core indicators will allow trends to be identified over time, community progress to be gauged more accurately, and results to be compared against established benchmarks. An analysis of the various approaches to community indicators and reporting initiatives in Canada, indicates that several common aspects are being measured across Canadian communities (refer to section 3).

However, the indicator and data-collection methodology must be harmonized more precisely, on a formal basis, to ensure the accuracy and reliability of the data.

Flexible indicators are also needed to accommodate the diverse realities experienced in different communities, and the reality of changing needs and priorities over time. Flexible indicators recognize the differences between small and large municipalities, and allow communities to address unique needs, at a given time. Flexible indicators also allow more advanced communities to "raise the bar" beyond the basic measures included in the core set. Flexibility in indicator design will indulge a range of views currently under debate by indicator practitioners (see 6.4.2) and ultimately, may facilitate agreement on a core set (parties are relieved to have the flexibility to add additional measures, that may not have been included in the core set). Most importantly, the process of developing community-specific indicators encourages broader community consultation and participation. This process has been noted as one of the greatest benefits of SCIs and is at the heart of learning in the SCI development process (Innes & Booher, 1999; RP, 2001).

The importance of establishing core indicators to maintain consistency and monitor trends, emerged repeatedly in the research. SCIP proposed a set of core indicators, and the model presented by Anielski & Winfield (2000) discusses the "core + flexible" concept in terms of core and supplemental indicators (see Appendix N).

6.1.5 Build from Existing Collaborative Efforts

If the CCIS is not designed to accommodate or coordinate with existing reporting efforts, it may be difficult to get cooperation from the municipalities to participate. Building on previous collaborative accomplishments by groups such as FCM's QOL communities or the CCMN pilot group, creates continuity, and uses a framework with which several (21 and 31 respectively) of the more active communities are already more familiar with.

6.1.6 Ensure Quality of Data

CCIS partners could adopt a cooperative agreement for information-sharing like the CCME's *Statement of Principles to Guide Cooperative Arrangements on Environmental Monitoring and Reporting (2000)*[32]. Partners should be required to meet minimum acceptable levels of collection protocols, the provision of meta-data[33], and consistency to contribute to the data pool. As the fundamental purpose of the CCIS is to make data accessible, perhaps data which may not meet all standards could be classified in some way (A, B, C) according to the rigour of the data collection process.

6.1.7 Create a Web-based System

The development of Internet-based data systems has proven to be a convenient way to collect and disseminate information from geographically diverse locations. The use of a web-based system is very appropriate to share information between Canadian communities, and is supported by findings in the *National Strategy for Environmental Indicators and State of the Environment Reporting in Canada: Proposed Options* (Bond et al., 2003). A simplified, password-protected online database was also used by the ICLEI Cities21 project (ICLEI, 2000). A

[32] For the text of this document, please refer to Appendix O.

[33] Information about the data, how it was collected, special comments, and other notes.

straightforward, user-friendly system, sufficient security, and providing users with the appropriate training are essential elements to the success of a web-based system.

6.1.8 Potential Indicators to be Included in the CCIS

This section provides a couple of suggestions of frameworks, which may serve as an initial starting point for discussions in the development of a core indicators set for Canadian communities.

Many global issues have roots at the community level; Table 6-1 provides examples of national or global issues that may be relevant at the community level. These areas could be applied as broader themes or domains.

Table 6-1 Local issues that have strong global implications

- Land Use/Urban Sprawl
- Green-Space/Natural Areas/Wildlife
- Public Safety/Crime
- Natural Resource Use/Conservation
- Material Consumption
- Atmospheric Change
- Air Quality/Emissions
- Water Quality & Treatment
- Solid And Hazardous Waste
- Energy

Source : Bregha, 1991 in (Ditor et al., 2001)

At the local level, the American Planning Association lists key areas, which are a concern for urban planners in Table 6-2 (see also Table 2-1).

Table 6-2 Indicator Areas recommended by the American Planning Association

Population Growth
Population Density
Land Use (environmentally and socially destructive development patterns)
Planning Processes (growth management floodplain management, watershed planning)
Open Space and Recreation
Infrastructure
Housing & Building
Transportation
Overconsumption.
Dependence Upon Non-Renewable Resources
Pollution
Economic Development
Inequities In Resource Distribution
Education
Public Participation.

Adapted from: (APA, 2000)

See Appendix P for a more detailed sampling of sustainable community indicators. Additional lists are found and Appendix E, Appendix K, and Appendix L.

6.2 Benefits for Municipalities Participating in a Collaborative Effort

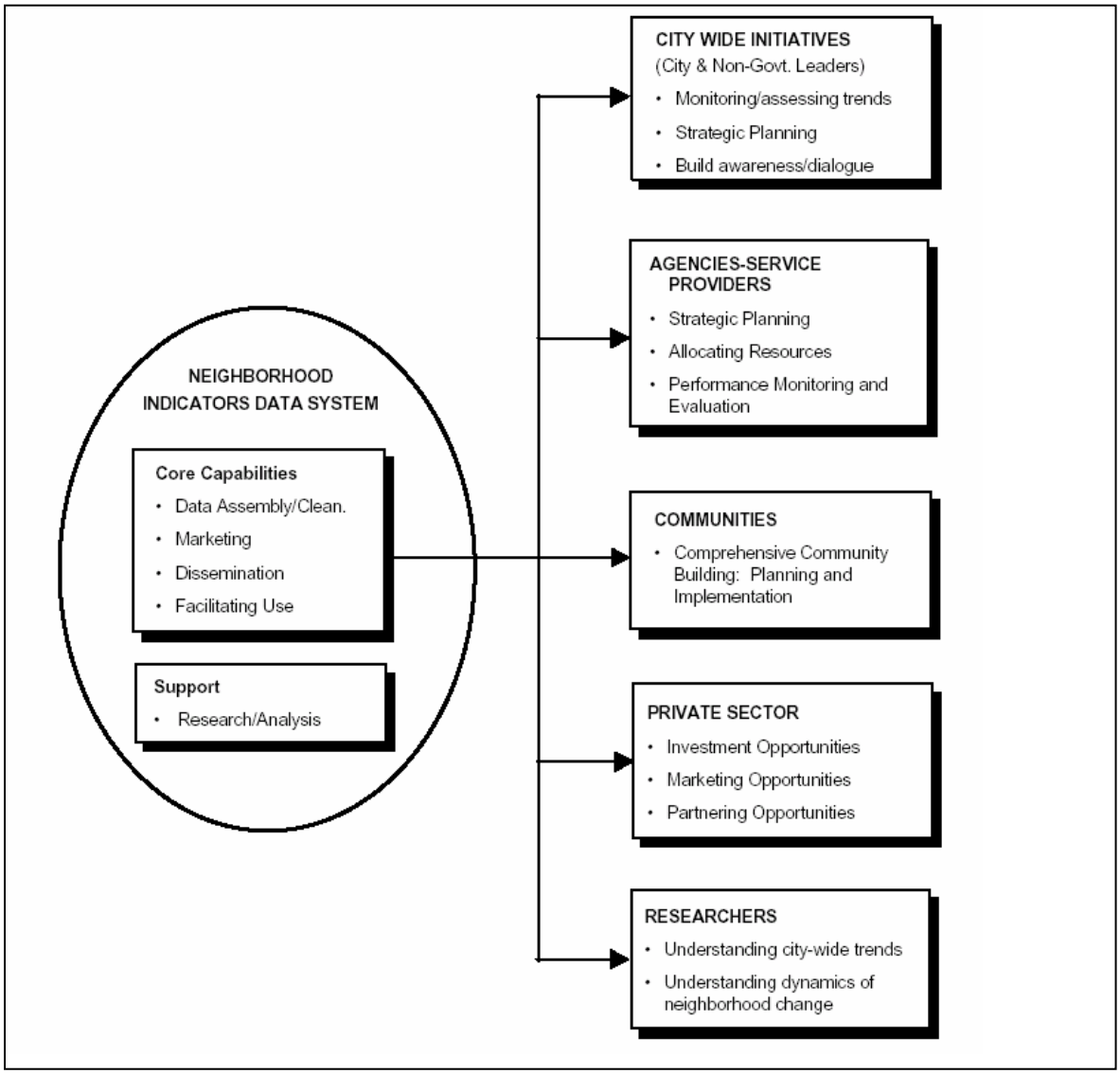
6.2.1 Increased Data Availability/Better Organized Data

The availability of quality data has been determined as the most limiting factor in indicator selection (Campbell & Maclaren, 1995; others). Information is being generated and collected by various organizations within a community for different purposes, but accessing this information may be quite difficult. The collaboration of various organizations via a central information agency could help create a data library that makes information available, and organizes it more effectively. If the system is developed in an appropriate way, this sharing of information should save various organizations time and resources, and reduce duplicated efforts. Contrary to the chaotic situation depicted in Figure 4-1, Figure 6-1 illustrates how a collaborative approach allows the information to make sense, as projects participate in a kind of information cooperative. This system would reduce confusion, and enhance projects by making information more accessible.

6.2.2 Benefits to Several Community Organizations

An example of how various agencies utilise community data is shown in Figure 6-4. Enabling local groups to collect and provide this data would be a useful service, not only to the municipal management team, but also to the various stakeholders residing within the community. This kind of collaboration and community awareness demonstrates social capital, which is at the heart of sustainable community development. A solid understanding of community trends may also help mobilize resources to deal with important issues.

Figure 6-4. Multi-Stakeholder Functions of a Community Indicators Data System



source: (Kingsley, 1999)

6.2.3 Cost-Reductions/Improved Efficiency

Naturally, information will continue to be collected by individual agencies for their unique purposes, but coordination of data-demands would provide relief to municipal staff by sparing them from currently repetitious requests for information. Facilitating access for these various organizations to common community data would reduce the survey requests, and increase the effectiveness of the various reporting efforts through saved resources in data collection costs, as well as providing a more informed, complete picture of the community situation.

Although some municipalities have developed information-tracking systems of their own, it is unlikely that a majority of municipalities have the resources to do so. A concerted effort - nationwide – would capitalize on a synchronized system, enable smaller communities access to a tool they could not afford to build on their own (the CEROI project is an example of

this). Such a tool could also provide provincial and national agencies with standardized information which can be used in further applications.

6.2.4 Less Biased Information

Having several parties involved in the indicators selection process may also ensure that the core measures are more balanced and objective, by diffusing some of the political agendas that have strongly skewed information-collection results in the past. "To ensure that there is broad acceptance of the results, it is vital to involve as wide a cross-section of the local community as possible. With the best will in the world, indicators can still be manipulated by people to support their own arguments" (Mitra, 2003). Ensuring central availability of the results and establishing protocols for data collection will also help improve data reliability.

6.3 Possible Partners in a Collaborative Effort

Given the magnitude of such an undertaking, several agencies could provide financial support and expertise in the development of such a system. The following organizations have been identified as relevant sources of expertise and/or financial resources for the CCIS project.[34]

6.3.1 The Federation of Canadian Municipalities

The leadership of FCM is crucial to the success of any collaborative SCI effort targeting the local level. FCM's Quality of Life Reporting System represents the *first time that municipal governments have worked together to develop a national policy and planning system for quality of life issues and the first time that a nationally consistent collection of local data has occurred.* As reviewed in section 5.1, one might even presume that the FCM's limited engagement/support in other past attempts to coordinate SCIs was a significant factor, restricting their success. The Partners for Climate Protection program is another good example of how the FCM's leadership has facilitated the coordination of a national effort and generated broad participation from municipalities across Canada. The potential strength of FCM's influence has been noted by indicators practitioners: "It is going to be a huge challenge, but in its indicator work, FCM has shown it can be done for the communities that it has involved to date" (V. Maclaren, 2003).

A Conceptual Framework for Monitoring Municipal and Community Sustainability in Canada notes:

> FCM's QOL indicators are entering their third iteration of reporting, and the inclusion of environmental indicators to the already impressive suite of measures of quality of life will strengthen the capacity of the FCM to provide a national, community-based profile of quality of life and sustainability. We would recommend that Environment Canada, Statistics Canada, Natural Resources Canada, and other federal and provincial agencies work in collaboration with the FCM indicators team (Anielski & Winfield, 2002).

Creating a CCIS would also be a natural fit to existing FCM programs and reporting initiatives. FCM houses the most comprehensive database of nation-wide information on municipal contacts. FCM also runs a number of programs which track information collected

[34] Many of these organizations/initiatives have been reviewed in more detail in previous sections of this document. Please refer back for specific details. This section focuses only on presenting their relevance to the implementation of a CCIS.

from municipalities (see Table 6-3). Managing the QOLRS program has also provided FCM staff with experience in working with the municipalities in the process of indicator development and information collection.

Table 6-3 Summary of FCM Programs Collecting Municipal Data

- **Quality of Life Reporting System (QOLRS)** - 21 municipalities
- **Partners for Climate Protection (PCP)** - 109 municipalities
- **Green Municipal Fund (GMF) applications**
- **GMF Project-Based-Monitoring** (under development)
- **GreenLeaf Tool** (municipal building retrofits program, currently not in use)
- **Sustainable Community Assessment Tool** (under development)

FCM is in an opportune position to facilitate the consultation process with municipalities and to ensure local level support for this initiative, and optimal design of the system.

6.3.2 QOLRS Communities

The community representatives who have been engaged in the QOLRS program (see Appendix Q) have gained invaluable expertise in the process of indicator development and data collection. They also have worked closely with key organizations including FCM, Statistics Canada, NAPS, MUD, NIRO, and other indicators practicioners. On their own initiative, the group recently expanded their indicator set (focused on social and economic issues) to include more environmental indicators. The QOL program demonstrates how participating communities have chosen a balance between national consistency and local relevance; the program is unique in that the criterion for indicator development and selection include consistency and the ability to make national comparisons (Ironside, 2003). They have participated in collaborative brainstomring and the design of surveys for custom data collection. This group is an excellent nucleus of communities to build from, as they have relevant experience and are already collaborating.

6.3.3 Environment Canada/NIRO

Environment Canada is another very relevant organization to involve, as they have "both a direct operational role in environmental reporting and a collaborative role within the larger system of environmental reporting at all jurisdictional levels in Canada and internationally" (Bond et al., 2003). EC is managing databases such as NAPS, MUD and NPRI, and has had some experience working with FCM and the QOLRS group. In addition, they developed relevant expertise in the process of initiating and developing local indicators for the SCIP program. The financial and human resources dedicated to this program also demonstrate their interest and commitment to community monitoring. The CCIS concept is also supported within the recently released draft: *A National Strategy for Environmental Indicators and State of the Environment Reporting in Canada: Proposed Options* (Bond et al., 2003).

6.3.4 Canadian Mortgage and Housing Corporation

The CMHC conducts considerable research into all aspects of national and international housing and community design and development. CMHC has invested significantly in research on sustainable community monitoring and reporting frameworks (COMLE, SCIP) and continues to develop urban analysis tools such as their GHG assessment tool for evaluating urban travel and neighbourhood sustainability, and a costing mechanism to facilitate sustainable community planning (Pollard, 2003). CMHC is also Canada's largest producer of housing information, providing ongoing data related to current and future housing trends, housing affordability, and provides monthly data on housing starts as the major indicator of national and regional economic health and activity. CMHC would be an excellent contributor to support the goals of a CCIS, as their expertise in data collection and interest in community monitoring and assessment are a natural fit.

6.3.5 Statistics Canada

Statistics Canada is the nation's official information source on many topics, and have worked with FCM's QOL group to retrieve information relevant at the local level. They have also demonstrated interest in tracking Cities Trends, and have experience with information collection and in developing web-accessible information management software.

6.3.6 Canadian Sustainability Indicators Networks (CSIN)

CSIN is a self-organizing network of indicators practictioners, from various sectors and backgrounds across Canada. The group is currently in the process of nurturing a community of practice, and may have excellent contributions to a discussion on how a concept such as a CCIS might develop. The CSIN also includes many individuals who have been members of local reporting initiatives. The international branch of this organization (ISIN) may also contribute valuable expertise.

6.3.7 The National Round Table on the Environment and the Economy

NRTEE is a relevant group, as they have been extremely involved in research for the development of indicators and measurement frameworks for Canada (ESDI, GPI, etc.). More recently, they have funded research on *A Conceptual Framework for Monitoring Municipal and Community Sustainability in Canada* (Anielski & Winfield, 2002).

6.3.8 The Canadian Council for Ministers of the Environment

The Canadian Council for Ministers of the Environment (CCME) works to promote effective intergovernmental cooperation and coordinated approaches to inter-jurisdictional issues such as air pollution and toxic chemicals. Though the CCME has no authority to implement or enforce legislation, it promotes *consistency across the country* through collectively established environmental standards, strategies and objectives. With a focus on the protection of human and ecosystem health and safety, the CCME promotes *sharing expertise to avoid overlap and duplication* (CCME, 2003). The *Statement of Principles to Guide Cooperative Arrangements on Environmental Monitoring and Reporting (2000)*[35], speaks to the development of future federal-provincial monitoring arrangements and monitoring agreements between CCME jurisdictions and other parties such as local governments, industry, academic

[35] Please refer to Appendix O for text of this document.

institutions, communities and citizen (CCME, 2000). These principles could be used as a basis for guidelines in the development of CCIS negotiations.

6.3.9 EMAN/Canadian Community Monitoring Network

The priorities of this group are very much in line with the goals of a CCIS, and include the implementation of a *coordinated approach* to ecosystem reporting in *partnership with other involved agencies and/or organizations*, and participation in international *collaborations*, improving linkages with other programs. They have already created network of 31 municipalities during their recent pilot program to monitor ecosystems, and may contribute valuable expertise in a grass-roots approach to collaboration.

6.3.10 The Centre for Sustainable Transportation

The Centre for Sustainable Transportation was founded in 1996 as a federally chartered, non-profit organization. Their goal is to establish the Centre as Canada's foremost clearinghouse and source of credible information on sustainable transportation, and to fill data gaps. A Sustainable Transportation Performance Indicator (STPI) project was completed in December 2002. It produced a set of indicators that can be used to track progress towards (or away from) sustainable transportation in Canada (CST, 2003). This group could add valuable expertise and/or resources to the CCIS initiative.

6.3.11 ICLEI

ICLEI's world headquarters are located in Toronto, making their expertise in the coordination of the Cities21 initiative quite accessible. They designed an online data-entry and reporting system, simplistic enough to be used by several countries. They also produced an appealing framework and list of indicators[36] which could serve as a useful resource.

6.3.12 International Institute for Sustainable Devleopment

The IISD is another highly relevant, international organization, based in Canada, who "on a strategic and selective basis, works with partner organizations whose objective is to establish and maintain indicator, assessment and reporting systems. The scope of these initiatives ranges from community scale initiatives to regional assessments, sectoral indicator systems or global reporting programs"(IISD, 2003).

The IISD hosts an on-line *Compendium of Sustainable Development Indicator Initiatives* with similar goals as the CCIS concept, including: to improve communication among the various stakeholders in sustainable development to promote the sharing of experiences, methods and approaches on indicator development and use for mutual benefit; facilitate the harmonization of indicator development approaches and indicator sets; avoid duplication of efforts and facilitate the integration of monitoring, data analysis and reporting activities; provide governments, NGOs, the private sector and the public with access to a pool of experts working on indicator development (IISD, 2003).

6.3.13 Other Groups

Community sustainability consulting companies, Sheltair and Quest, have (respectively) created software for municipal environmental materials management and scenario planning.

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[36] Appendix D of the *Measuring Progress:* Cities21Pilot Project Final Report provides an excellent list see: http://www.iclei.org/cities21/c21finalp1.pdf

In order to assist Canadian communities to access these software tools, they have (separately) expressed interest in creating a national-scale software which can draw data from a centralized source. As such a source does not exist at this time, consulting groups may have an interest in being part of the development of such a system as CCIS. Such parties also represent a potential market for the information that the CCIS would contain.

6.4 Barriers to Collaboration

Implementing a project with such a large scale, and involving so many partners with different priorities, would certainly be met with several challenges. This section reviews some of the key barriers to collaboration of community monitoring, and provides suggestions on how these may be overcome.

6.4.1 Elusive Definition of Sustainability

One of the biggest challenges in developing a common set of sustainability indicators is that the concept of sustainability is values-based, and these values and priorities vary between cultures, and over time, making each community's vision of sustainability unique. Recent focus-groups commissioned by the Centre for Sustainable Community Development indicated that Canadian communities have a range of comprehension and perceptions about the concept of sustainability (CORUM, 2003). However, the examples of collaborative efforts presented in 5.3 demonstrate that even multinational communities have managed to agree on common, fundamental measures of community progress towards sustainablility. Dialoguing with Canadian communities, and using frameworks such as the Natural Step (see 2.4.1) which has achieved scientific consensus on 4 non-overlapping principles of sustainability, or framing the discussion around pre-established characteristics of a sustainable community (such as those presented in Table 2-1) may act as a good starting point for a constructive dialogue, and the help Canadian communities to arrive at a commonly-accepted set of indicators. Such a dialogue process would also contribute significantly to the education of communities in the topics of sustainable community development and indicators and reporting initiatives.

6.4.2 Debate on an Appropriate Approach to Indicators

Indicator practitioners hold different views on several issues, which makes it difficult to come to a firm agreement on an appropriate approach to indicator development. The areas of contention are nicely summarized by McMullan (1997) and include: the development of indicators that are easy to use and understand vs. complex and scientifically valid indicators (Brugman, 1994; Chipeniuk, 1996; Petersen, 1996); measuring processes vs. outcomes (Werna and Harpham, 1995, 1996; Poland, 1996); the efficacy of qualitative vs. quantitative SCIs (City of Toronto, 1994; Dilks, 1996); the use of local, context-specific indicators vs. global (core) indicators (Waddell, 1996; Brugman, 1994; ICLEI, 1996; Maclaren, 1996; Hayes and Manson Willms, 1990). The core + flexible framework accommodates a variety of approaches, and allows communities to cater to their unique preferences or needs. The dialogue process with Canadian communities will also help to establish some commonly accepted guidelines, or best practices in reporting.

6.4.3 Fear of Centralised Control

It must be made clear that such a collaborative initiative is not an effort to limit or control what is being measured by Canadian communities, but an effort to relieve municipalities from the burden of repetitious reporting requirements and to facilitate more consistent and

reliable information which would be applicable for general purposes. The core + flexible framework would allow communities to maintain their unique approach, but ensure that basic information is collected consistently across Canada. Leadership by the Federation of Canadian Municipalities in coordination of such an initiative, would also ensure that the community interests are central to the development of the CCIS.

6.4.4 Reluctance to Realease/Share Information

Apprehension to share information was one of the major barriers overcome in the NNIP initiative; following their approach, and having Canadian municipalities consult with NNIP participants could help to overcome this challenge. A cost-recovery system could also provide incentive for the information to be shared. Communties would be able to fund the collection and maintenance of more, and better information, if several parties share the expense. Also, the development costs for software to synthesise and maintain data will also be diffused.

6.4.5 Fear of Comparision

Municipalities have expressed concern about data being used in unfavourable ways to compare them (Fink, 2003; V. Maclaren, 2003; Welke, 2003). This apprehension may be overcome through the dialogue process, and also diminished by emphasising the number of positive benefits to be achieved from a CCIS. The goal of the system is to provide better information and to ensure accountability, by demonstrating transparancy and openness, local governments will instill greater confidence in good governance.

6.4.6 Lack of Data Consistency

Data consistency problems persist, and are difficult to overcome. For example, solid waste may be defined differently in each jurisdiction, and includes a mix of residential, commercial and industrial waste. Air quality monitoring techniques and methods of data analysis also differ somewhat. Establishing common definitions and protocols is a lengthy and involved process, but necessary to ensure data integrity. A number of technical documents have been prepared by international organizations such as the IISD, which outline protocols for common community indicators; these could help advance discussions in this area.

6.4.7 Political Challenges

The ability of CCIS partners to work together in a country as culturally and geographically diverse as Canada, presents an interesting challenge. Politics, personal differences, and contrasting views and values amongst key players could play a crucial role in the success of such an initiative. All partners should focus on the cumulative benefits of the system. A skilled mediator could be involved in the facilitation process to reduce conflicts and ensure that all parties needs are met in the best possible way.

The technological expertise for municipalities to enter and use data for decision-making purposes is also a potential barrier to the successful implementation of such an initaitive. This could be overcome by making the system as user-friendly as possible, and by ensuring sufficient resources are dedicated to proper training.

6.4.8 Sufficient Resources

A nation-wide, collaborative community effort would demand much time, effort, and resources to achieve. Potential partners would need to come to an agreement regarding the

division of responsibilities and the financing of the project. A more thorough analysis of the cost-benefit of such a system may be conducted to support investment into such a system. An credible information cooperative could also generate revenues, and recover costs by selling information to other entities. StatsCan and Environment Canada could assist in providing suggestions on realistic budget estimations.

6.4.9 Commitment to Making it Work

Such a complex undertaking as a national scale CCIS will take time to materialize and to work out the details smoothly. Partners should agree not to abandon the effort at signs of challenges, but commit to constantly improving and building a system that everyone can find useful. Apathetic or uncooperative attitudes will undermine the success of the entire program.

7. Conclusions

Many important points have been made throughout the text. This section reviews the research and discussion questions addressed in this thesis [7.1] and summarises the conclusions [7.2]. A few general recommendations are provided [7.3], and areas for further research are suggested [7.4].

7.1 Reviewing the Research Questions

Focusing on Canadian experiences, this research contributes to the current dialogue in the SCI field, by suggesting a model for coordination that may provide direction and weight to current initiatives. This thesis has covered a lot of ground, but all of the pieces form an important part of the picture. This research identified various forces that have influenced sustainable community indicators and reporting initiatives, and resulted in an increasingly uncoordinated mass of information that is not particularly useful. The author explored opportunities to address this problem, constructing a compelling case for collaboration, which supports the current lines of dialogue among indicator practitioners. This thesis addressed the research questions:

> RQ1: What factors have led to such an explosion of divergent community indicators and reporting initiatives?
>
> RQ2: What are the various indicators and reporting initiatives currently being used in Canada, and how do these efforts overlap?
>
> RQ3: Would it be possible/necessary/beneficial to collect community data consistently, at the municipal, regional and national levels?
>
> RQ4: What efforts have been made to coordinate municipal reporting initiatives within Canada, and other geographical regions? What can be learned from these collaborative examples?

The following questions were considered for discussion:

> DQ1: What benefits and challenges might a coordinated, collaborative municipal reporting initiative present?
>
> DQ2: What characteristics might be suggested for a Common Community Information System?
>
> DQ3: What might be the best approach to initiating/coordinating a collaborative process in Canada, and which organizations might best contribute to this process?

7.2 Summary of Conclusions

The factors which have led to such an explosion of divergent community indicators and reporting initiatives include:

- Increasing information needs, as aspects of the environment are broken down into smaller pieces of complex systems;

- Technological advancements which allow volumes of information to be generated and disseminated at an unprecedented rate;

- Increased demand for accountability of local governments, which necessitates reporting on a variety of aspects;

- Increased community activism, which has resulted in numerous organizations collecting information on various specific causes or issues;

- The development of a number of different frameworks and tools, which diversify the development of sustainable community indicators.

At the same time, measures of "progress" have evolved from strictly economic factors, to recognize the importance of natural and social capital. This has generated further demand for data on a range of aspects related to environmental, health and social well-being. Growing similarities have emerged among these various reporting initiatives, as conventional understanding of sustainable development has shifted from merely recognizing the significance non-economic measures, to the realization of how strongly these aspects are inter-connected. This has resulted in an increasing overlap in data requirements, as previously sectoral initiatives strive to achieve a more balanced, holistic, systems approach to sustainability monitoring.

The variety of sustainability indicators and reporting initiatives in Canada is overwhelming. Several programs at different geographical and governmental scales were reviewed, and found to cover similar themes. In a comparison of 70 local-level reports, it was determined that from a total of 925, there was no one indicator in all the reports, and that only 5 of the 35 top indicators were used in more than in 30% of the reports. However, the themes and issues can be categorized into 9 areas: air, economic, energy, health, land use, natural resources, social, waste, and water. An overlap is also created when a community participates in many initiatives, which collect similar information. The process of retrieving this information would be automatic with a CCIS.

A coordinated, collaborative system would benefit communities through:

- Increased data availability, which has been acknowledged as one of the major limitations in the indicator selection process;

- Better organized data in a centrally distributed system;

- Cost reductions through information-sharing and diffused expenses for data collection and maintenance;

- Improved efficiency of community development projects, through data accessibility and reduced costs for information gathering;

- Less biased information, as narrow political agendas may be diffused through the collection of generally-applicable information.

The proposed Common Community Information System (CCIS) would facilitate information-sharing among several organizations, and help to establish standardised collection of core data sets for communities across Canada.

Core Indicators are needed to maintain data consistency, and to ensure that all communities are taking the responsibility to monitor basic, agreed-upon measures to assess progress towards sustainable community development. Data consistency has been noted as a limitation in many reporting initiatives, and establishing a set of core indicators allows trends to be identified over time, community progress to be gauged more accurately, and results to be compared against established benchmarks. **Flexible indicators** are also needed to accommodate the diverse realities experienced in different communities and the reality of changing needs and priorities over time. Flexible indicators also allow more advanced communities to "raise the bar" beyond the basic measures included in the core set. Most importantly, the process of developing community-specific indicators encourages participation and learning, as community members develop a common vision of what is important to them.

Other recommended characteristics of a collaborative model include:

- Ensure it is aligned with other reporting initiatives at provincial, national, and international levels;
- Draw data from existing sources as to not duplicate resources;
- Respect individual project needs and diversity;
- Design a dual-purpose framework which includes a core set of common indicators, yet accommodates flexibility to address community-specific needs;
- Recognize and build from existing collaborative efforts;
- Ensure quality of data through a partner agreement and establishment of protocols;
- Create a web-based system to enhance data accessibility across geographically diverse users.

Historically, a few organizations in Canada have attempted to drive the coordination of SCIs, but most of these efforts have not achieved the necessary level of momentum to culminate in any nation-wide, lasting result. It is the author's opinion that several factors, both project-specific as well as universal issues such as timing, technological possibilities, political alliances, community awareness, and available funding, have limited the scale of the impact of these initiatives.

Of note, is the Sustainable Community Indicator Program (SCIP) led by Environment Canada and the Canadian Mortgage and Housing Corporation, which aimed to create a common, yet flexible, approach to help communities select, create, and use indicators for monitoring local sustainability; to promote the use of comparable indicators; and to encourage the sharing of indicators and data, both among municipalities and with other levels of government through a web-based system. The goals of this initiative met the needs

identified through this research quite precisely; yet in practice, the project has experienced many challenges, and remains unrealized to the extent originally intended.

The key to achieving success in a collaborative community monitoring initiative, appears to be the combination of a strong impetus from the communities themselves, coupled with an established coordinating body, to facilitate this self-organization. The Quality of Life Reporting System involves 21 municipalities across Canada and is coordinated under the leadership of the Federation of Canadian Municipalities (FCM). The QOLRS initiative represents the first time that municipal governments in Canada have worked together to develop a national policy and planning system for quality of life issues and the first time that a nationally consistent collection of local data has occurred. This initiative demonstrates how participating communities have achieved a balance between national consistency and local relevance.

Examples of collaborative efforts from other regions, including the European Common Indicators project, ICLEI's Cities21 project, and Common Environmental Reports on the Internet (CEROI), provide significant support to the case for collaboration. These initiatives demonstrate that even communities with diverse cultural and geophysical circumstances can agree on a common set of core indicators, important to sustainable community monitoring. Local partners of the National Neighbourhood Indicators Program, led by the Urban Institute in Washington, D.C. operate under the theme *democratizing information*, and have overcome an important barrier to collaboration, as authorities have agreed to release information readily to the public. The NNIP has also demonstrated that it is possible for communities to build advanced information systems with integrated and recurrently updated information, and to operate these on an ongoing basis at the locally self-sustaining level.

The most striking conclusion of this research is the important role FCM has in supporting a CCIS initiative in Canada. Their limited engagement/political support in past collaborative SCI attempts may be considered a significant barrier, which impeded success. Taking a leadership role in the development of a CCIS would also be a natural fit, as FCM houses the most comprehensive database of nation-wide information on municipal contacts and runs a number of programs, including the QOLRS which addresses several key social, economic and environmental issues, as well as the Partners for Climate Protection program, which tracks municipal GHG emissions. Managing the QOLRS program has also provided FCM staff with experience in working with the municipalities in the process of indicator development and information collection.

Other organizations that have demonstrated competence and interests in line with the goals of a CCIS include:

- Environment Canada and the National Indicators and Reporting Office, who have a strong presence in managing current environmental monitoring programs nationwide, and invested heavily in the SCIP initiative;

- The Canadian Mortgage and Housing Corporation, also partners in the SCIP initiative, who have established the largest information database on housing statistics, and continue to conduct extensive research on tools which help improve sustainable community development;

- The Canadian Sustainability Indicators Network, a community of practice which includes indicator practitioners with valuable expertise;

- The Canadian Council for Ministers of the Environment, who have established principles to guide cooperative agreements on environmental monitoring and reporting;

- Statistics Canada, The Centre for Sustainable Transportation, The Canadian Community Monitoring Network, International Centre for Local Environmental Initiatives, and the International Institute for Sustainable Development.

A partnership formed by these organizations would create a strong resource-base to facilitate the development of a nation-wide Common Community Information System.

As the trend for sustainable community reporting continues to grow, the need for coordination of municipal statistics has emerged as a priority. The arguments presented in this thesis indicate that there is a strong case for a comprehensive, collaborative SCI initiative in Canada. Examples of collaboration in other regions of the world indicate that such an initiative may be feasible. With the momentum that has been building in the indicators movement over the last decade, with the current cumulative expertise gained by Canadian communities in reporting initiatives, with advances in technology, and the current movement to consolidate data and make it accessible via web-based systems, the usefulness of a coordination effort similar to the SCIP concept resonates even more strongly.

The time is right to engage Canadian municipalities in a dialogue to re-launch an initiative with goals similar to those of SCIP; and the Federation of Canadian Municipalities could provide an important service to its membership, by taking on a leadership role to facilitate discussions for this initiative.

7.3 General Recommendations

7.3.1 Develop a Common Language

In order to facilitate commonly-accepted measures of sustainability, it is important to have a common language and understanding of the terminology used. The Natural Step framework is an excellent tool to facilitate a common language and understanding of what "sustainability" means. The dialogue process which community representatives would go through to come up with a core set of indicators for the CCIS, would help to establish at least a baseline understanding and shared perspective of sustainable community development. This dialogue would also be useful to address communities' desire for clarity on the concept (CORUM, 2003).

7.3.2 Ensure Community Needs are Addressed

While voluntary efforts, such as ICLEI's Cities21 and CEROI, indicate that such collaborative projects are feasible, pilot projects where the members disband after the "trial period" suggest that the tool was not truly designed to sufficiently meet or adapt to changing community needs. This top-down coordination should be balanced by bottom-up enthusiasm, to ensure that the tool or system that is designed can become institutionalized in the community's planning process.

7.3.3 Embed QoL Indicators in Existing Policy-Making processes

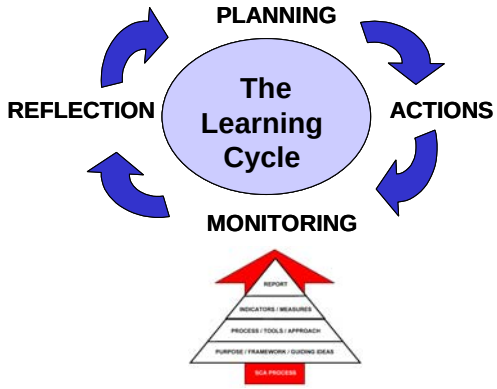
In a study of 61 communities, it was found that the potential impact of QOL indicators was diminished, as they were disjointed from the policy-making process (Higginson, Sommer et

al., 2003). By embedding the indicators in the policy process to have them taken more seriously, local governments may be motivated into action. This may also help ensure more consistent measurements are made, in order to track trends. Inness & Booher (1999) echo this statement, suggesting that there must be a requirement, not just an opportunity to publicly report and discuss the indicators in conjunction with policy decisions. Ontario has mandated performance reporting for municipalities, and other provinces are in the process of developing similar requirements; perhaps core sustainability indicators could be considered as part of the mandatory reporting issues.

7.3.4 Ensure Learning through SCIs

It is easy to become fixated on the details of the reporting process, and forget that the development of SCIs is a supportive function for learning, and the *action* that must be taken (see Figure 7-1). Indicators are most influential through the learning that occurs during the collaborative design and production process and also the process of making sense of what the indicators later show (Innes & Booher, 1999). The CCIS dialogue process could enhanced awareness and actions which influence sustainable community development.

Figure 7-1 The SCI process as part of the Learning Cycle



It is important to maintain perspective, as this phenomena has been noted:

> Having produced indicators, they thought this would be enough to start change happening...the numbers substitute for the goal…Indeed, it was not really the indicators themselves or the reports that mattered, but the learning and change that took place during the course of their development and the way that learning led to new shared meanings and changed discourses (Innes, 1990; Innes, 1988a).

7.4 Areas for Further Research

The author recommends further research to explore important aspects, outside the scope of this thesis.

A more detailed understanding of the past collaborative efforts in Canada would provide useful insights; interviews with participants and organizers from the leading organizations would yield a more thorough analysis of critical factors for success/failure and provide direction to future initiatives.

Further research on the collaborative efforts in other regions (ICLEI, CEROI, NNIP) would provide more specific direction in lessons learned, as well as an improved understanding of the web-based system design. Contacting the participating communities directly would provide valuable insight as to the benefits and challenges they experienced while participating in such collaborative efforts, and help to determine leverage points to encourage involvement of Canadian communities. Considering the strong community commitment and surge in participation of the NNIP, this is an especially interesting example to investigate further.

Focus-groups in Canada should be held with a broad range of municipalities, to assess to what extent they feel an initiative such as the CCIS concept would be useful. The barriers to collaboration, and how to deal with these, should also be explored during these consultations.

Interviews with potential partners should be conducted, to begin discussions on how collaborative effort could work, and assess the resources each party is willing to dedicate to such an initiative.

It may also be informative to evaluate how this municipal information is really being used and applied in policy decisions, to facilitate the further development of an appropriate core set of indicators.

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Abbreviations

CBO	Community Based Organization
CCIS	Common Community Information System
CCME	Canadian Council of Ministers of the Environment
CCSI	Conceptual Community Sustainability Indicators
CEPA	Canadian Environmental Protection Act
CERE	Coalition for Environmentally Responsible Economies
CEROI	Cities Environment Reports on the Internet
CISE	Canadian Information System for the Environment
CMHC	Canadian Mortgage and Housing Corporation
CPRN	Canadian Policy Research Networks
CSCD	Centre for Sustainable Community Development
CSIN	Canadian Sustainability Indicators Network
CSS	Community Sustainability Snapshot
DPSIR	Driving Force Pressure State Impact Response
EC	Environment Canada
ECI	European Common Indicators
eCO_2	Equivalent CO_2
EEA	European Environment Agency
EF	European Foundation for the Improvement of Living and Working Conditions
EMAN	Ecological Monitoring Assessment Network
EMS	Environmental Management System
ESDI	Environment and Sustainable Development Indicators Initiative
FCM	Federation of Canadian Municipalities
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GMF	Green Municipal Funds
GPI	Genuine Progress Indicators
GRI	Global Reporting Initiative
ICLEI	International Council for Local Environmental Initiatives
IISD	International Institute for Sustainable Development
ISEW	Index of Sustainable Economic Welfare
ISO	International Standards Organization
MUD	Municipal Water Use Database
NAPS	National Air Pollution Surveillance
NIRO	National Indicators and Reporting Office

NNDS	National Neighborhood Data System
NNIP	National Neighborhood Indicators Partnership
NPRI	National Pollutants Release Inventory
NRTEE	National Round Table on the Environment and the Economy
PAHs	Poly Aromatic Hydrocarbons
PCP	Partners for Climate Protection
PSR	Pressure State Response
QOL	Quality of Life
QOLIP	Quality of Life Indicators Project
QOLRS	Quality of Life Reporting System
SCI	Sustainable Community Indicator
SMS	Sustainability Management System
TNS	The Natural Step
UNCHS	United Nations Centre for Human Settlements (Habitat)
UNEP	United Nations Environment Programme
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compounds

Appendices

Appendix A – The Centre for Sustainable Community Development

The Centre for Sustainable Community Development (CSCD) is housed within the FCM and promotes sustainable community development through securing commitment, encouraging peer teaching, customer service through trust building and relationships, supporting champions, networking, and financial assistance. The CSCD also provides support to communities through the Sustainable Communities Knowledge Network[37], an online source for discussions, publications and reports. Programs running under the CSCD are listed in Table 0-1.

Table 0-1 CSCD Services to Canadian Communities

Financial Services:
•Green Municipal Funds (GMF)
•Affordability and Choice Today (ACT)
Capacity Building:
•Partners for Climate Protection (PCP)
•FCM-CH2M HILL Sustainable Community Awards
•Community Energy Mission
Tools:
•Sustainable Communities Knowledge Network (http://kn.fcm.ca)
•Environmental Management System (EMS) for small communities

[37] http://kn.fcm.ca

Appendix B – The Green Municipal Funds Program

The CSCD offers financial assistance to Canadian municipal governments through a program called the Green Municipal Funds (GMF). The fund of $250 million was established by the federal government in 2000 to help municipalities to improve their environmental performance and reduce greenhouse gas (GHG) emissions.

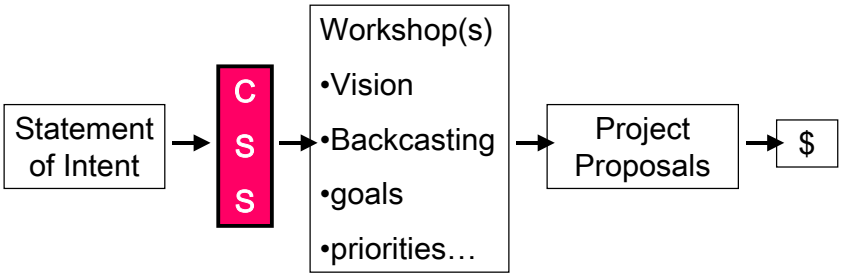
The Green Funds program focuses on infrastructure development in five program areas: waste, water, energy, transportation, and planning. These areas were recognized as typically associated with municipal projects most likely to reduce GHG emissions. The GMF is divided into 2 streams: the enabling fund (GMEF) which provides support for feasibility studies and implementation fund (GMIF) which provides funding for actual project implementation.

Appendix C – Sustainable Community Demonstration Project

Over the past year, the CSCD has decided that in addition to providing traditional support for projects based on a certain issue (e.g. water, waste, energy) they will encourage communities to adopt a more holistic approach to sustainable community development. This will be achieved through the 'Sustainable Community Integrated Demonstration Project' (SCIDP), which will provide financial assistance for communities to adopt this holistic approach, and to assist them to monitor their progress in implementing their SD projects.

In order to assess where each community begins in this process, a sustainable community assessment tool is needed to provide Green Municipal Fund and integrated GMF applicants with a tool to help them to assess their baseline performance on SD issues. Ideally, of course the same tool should be useful for Canadian municipalities to measure their success on the path towards becoming a sustainable community. The SCIDP process is outlined in Figure 0-1, highlighting where the Community Sustainability Snapshot (CSS) fits into the application process.

Figure 0-1 SCIDP process



Appendix D – The GreenLeaf Tool for Municipalities

Previous positive experience with this tool prompted the consideration of the CSS concept; like the GreenLeaf tool, but not limited to building management, and expanded to all the GMF program areas.

The Greenleaf Tool was created as part of the municipal building retrofits program in 1999 to help municipalities i) assess the preparedness of their organization to undertake an energy management program; and ii) identify and prioritise actions for implementing energy management measures. The Greenleaf Tool was developed over 8 months with consultants and TerraChoice, Canada's eco-labelling program was used as a third-party, independent auditors. The tool uses a survey-format in order to facilitate awareness and assess the management of municipal buildings. The result of the Greenleaf process is a report summarizing the state of municipal building management and recommended actions. The Green Leaf survey was seen as a useful tool, which informed the GMF application process. Two communities used the tool to apply for GMF monies and were successful. Then funding was cancelled and the program was shelved. With Canada's new commitments to Kyoto, and further funding opening up for GHG reduction programs, this program may be revived (Purkis, 2003).

Appendix E – Alberta GPI Indicators by Category

Economic Well Being	**Social Well Being**		**Environmental Well Being**	
Monetary and Non-monetary Sub-account	Income Statement (Cost-Benefit) Account	Balance Sheet (Condition) Account	Income (Benefit-Cost) Account	Balance Sheet (Condition) Account
•Gross Domestic Product (GDP) •Economic diversity •Balance of trade •Personal consumption expenditures •Disposable income •Savings •Tax load •Debt (household, government, student, farm, business) •Business expenditures and investment •Government spending •R&D investment •Income and wealth inequality •Poverty (living wage) •Employment (quality) and Unemployment •Underemployment •Infrastructure (service value) • household • public •Transportation (public/private)	•Value of paid labour •Value of unpaid housework •Value of unpaid parenting •Value of volunteer time •Value of knowledge capital •Value of health & wellness spending •Cost of loss of leisure •Cost of commuting time •Value of unemployment and underemployment •Cost of family breakdown •Cost of crime •Cost of gambling •Cost of income inequality	•Time use: • Paid work • Unpaid housework • Parenting • Eldercare • Volunteering • Leisure • Commuting •Stress and hope •Family breakdown •Children well-being • Infant mortality • Low birth weight babies • Child abuse •Aboriginal well-being •Crime and family violence •Gambling •Substance abuse •Life expectancy •Premature death •Suicide •Knowledge capital •Political Democracy	Value of : • forest resources • agricultural land • carbon sequestration • wildlife • preserved spaces • ecological deficit/surplus • ecological footprint deficit or surplus Cost of: • air pollution • water pollution • ozone depletion	•Ecological Footprint •Industrial Footprint (energy and resource efficiency) •Forest resource account •Agricultural account •Oil, gas, coal, and mineral account •Fish and Wildlife account •Carbon account •Ecosystem health (fragmentation) •Wilderness account •Water account •Air account •GHG emissions •Ozone account •Toxic waste and landfill account Adapted from: (Anielski, 2001a)

Appendix F – GPI Sample Balance Sheet

Assets	**Liabilities**
Natural Capital Renewable resources - Forests - Agriculture - Wildlife and fisheries - Water - Air Nonrenewable resources - Oil and gas - Minerals Ecosystem functions - Carrying capacity - Carbon sequestration **Human Capital** Time (life-time) Health Knowledge (education) Hope and joy (job satisfaction, quality of life) Compassion	**Environmental** Ecological Footprint Industrial Footprint Toxic waste stocks **Human-Social** Equity and inequality (income, poverty) **Produced Capital** Infrastructure liabilities **Financial** Debt
Social Capital Social institutions Political processes **Produced Capital** Real estate Consumer durables Plant and equipment Infrastructure (public and private) **Financial Capital** Savings	**Net Worth (equity)** Distribution of wealth (assets)

source: (Anielski, 2001b)

Appendix G – GPI Sample Income Statement

GDP – Gross Domestic Product (expenditure-based, at market prices):

- Personal Consumer Expenditures
- Government Expenditures
- Business Investment in Inventories
- Government Investment in Fixed Capital
- Business Investment in Fixed Capital
- Exports less Imports of Goods and Services
- Intermediate Expenditures/Investment in Human , Social and Environmental Well-Being and Capital

Additions:

Unaccounted Benefits

- Value of Unpaid Work
- Volunteerism
- Parenting and Eldercare
- Subsistence Living
- Value of Services from Public Infrastructure
- Forests
- Peatlands
- Wetlands
- Carbon Sequestration
- Value of Ecosystem Services
- Value of Services from Consumer, Household, and Business Durables

Deductions:

Expenditures (regrettable)

- Cost of Crime (expenditures)
- Cost of Gambling
- Cost of Substance Abuse (Drugs, Alcohol)
- Cost of Family Violence and Breakdown
- Cost of Auto Accidents (expenditures)
- Public and Private Environmental Clean-up Costs
- Cost of Toxic Waste Management
- Cost of Household Waste Management
- Pollution Control Costs

Depreciation/degradation costs

- Cost of Loss of Farmland
- Cost of Loss of Wetlands
- Cost of Loss of Wildlife and Fisheries
- Cost of Ecosystem Service Losses
- Cost of Air Pollution
- Cost of Water Pollution
- Cost of Ozone Depletion
- 'Cost' of Income Inequality (GINI Coefficient)
- Depreciation Cost of Public Infrastructure
- Value of Loss of Leisure Time
- Depreciation Cost of Nonrenewable Resource Use
- Change in Net Financial Position (external debt)
- Cost of Unsustainable Forest Resource Use
- Cost of Long-term Environmental Damage From Fossil Fuel Use
- Depreciation Cost of Consumer, Household, and Business Durables

= Net Sustainable income (GPI)

Adapted from: (Anielski, Campbell, & DuGuay, 2000)

Appendix H – QOLRS Indicators, 2003

Demographic Background Information (DBI)	Personal Financial Security (PFS)	Personal & Community Health (PCH)	Personal Safety (PS)	Affordable, Appropriate Housing (AAH)	Local Economy (LE)	Natural Environment (NE)	Education (ED)	Employment (EM)	Civic Engagement (CE)	Community and Social Infrastructure (CSI)
DBI1 Population	**PFS1** Community Affordability	**PCH1** Low Birth Weight Babies	**PS1** Young Offenders	**AAH1** 30%+ Income on Shelter	**LE1** Business Bankruptcies	**NE1** Air Quality	**ED1** Education Levels	**EM1** Employment/ Unemployment Rates	**CE1** Voter Turnout	**CSI2** Social Service Professionals
DBI2 Foreign Born	**PFS2** Families Receiving EI/Social Assistance	**PCH2** Teen Births	**PS2** Violent Crimes	**AAH2** Vacancy Rates	**LE2** Consumer Bankruptcies	**NE2** Urban Transportation	**ED2** Literacy Levels	**EM2** Quality of Employment	**CE2** Women in Municipal Government	**CSI8** Government Health Care Expenditures
DBI3 Visible Minorities	**PFS3** Lone Parent Families	**PCH3** Premature Mortality	**PS3** Property Crimes	**AAH3** Core Housing Need	**LE3** Hourly Wages	**NE3** Population Density	**ED3** Adult Learning	**EM3** Long Term Unemployment	**CE3** Daily Newspaper Circulation	**CSI9** Private Health Care Expenditures
DBI4 Language Spoken at Home	**PFS4** Incidence of Low Income Families	**PCH4** Work Hours Lost	**PS4** Injuries and poisonings	**AAH4** Substandard Units	**LE4** Change in Family Income	**NE4** Water Consumption	**CSI3** Education Expenditures	**EM4** Labour Force Replacement	**CE4** Volunteering	**CSI10** Subsidized Child Care Spaces
DBI5 New Immigrant Groups	**CSI11** Children Living in Poverty	**PCH5** Suicides		**AAH5** Changing Face of Homelessness	**LE5** Building Permits	**NE5** Wastewater Treatment	**CSI4** Classroom Size		**CESI1** Charitable Donations	**CSI12** Social Assistance Allowances
DBI6 Aboriginal Population	**PFS6** Government Transfer Income	**PCH6** Infant Mortality		**AAH6** 50%+ Income on Shelter		**NE6** Solid Waste	**CSI5** Student / Teacher Ratio			**CSI13** Outdoor Recreation Areas
DBI7 Migration	**PFS7** Economic Dependency Ratio			**AAH9** Rental Housing Starts		**NE7** Ecological Footprint	**CSI6** Post-Secondary Tuition			**PFS5** Public Transit Costs
DBI8 Income	**PFS8** Government Income Supplements			**AAH10** Monthly Rent		**NE8** Recreational Water Quality	**CSI7** Spending on Private Education			**AAH7** Social Housing Waiting Lists
DBI9 Households										**AAH8** Rent-Geared-to-Income Housing
DBI10 Renters & Owners										
DBI11 Land Area										
	Current Municipal	Current Municipal	Current Municipal	Current Municipal	Current Municipal	Current Municipal	Current Municipal	Current Municipal	Current Municipal	Current Municipal

source: (Welke, 2003)

Appendix I – CPRN: Indicators of Quality of Life in Canada: A Citizens' Prototype

source: (Zagon, 2001)

I. Political/Democratic Participation and Rights (2 indicators)

1. Exercising democratic rights
2. Tolerance of diversity

II. Health (4 indicators)

3. Quality of health care system
4. Status of physical health
5. Status of mental health
6. Lifestyle

III. Education/learning (7 indicators)

7. Access to universal primary/secondary education system
8. Access to post-secondary education
9. Participation rates and enrolment
10. Access to lifelong learning
11. Adult literacy rates
12. Child/youth literacy rates
13. Quality of education

IV. Environment (5 indicators)

14. Water (drinking) quality
15. Air quality
16. Waste management
17. Resources devoted to developing renewable energy sources
18. Access to clean, healthy public outdoor spaces

V. Social programs/conditions (6 indicators)

19. Availability and affordability of child care
20. Adequacy of income supports in meeting basic needs
21. Poverty and child poverty rates
22. Living wages
23. Food bank usage
24. Housing affordability

VI. Personal well-being (3 indicators)

25. Personal time stress or control over time
26. Degree of social interaction, intimate connections, and social isolation
27. Sense of personal security

VII. Community (4 indicators)

28. Satisfaction with police, courts, probation
29. Sense of personal safety and changes in crime rate
30. Level of civic involvement
31. Availability of programs and services

VIII. Economy and Employment (6 indicators)

32. Unemployment and labour force participation rates
33. Percentage of involuntary part-time workers
34. Job security, satisfaction and working conditions
35. Bankruptcies (personal and business)
36. Income/wealth distribution
37. Consumer debt levels

IX. Government (3 indicators)

38. Level of public trust
39. Accountability/stewardship of public values and funds
40. Public governance

Appendix J – Ontario Quality of Life Index Project Participants

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Appendix K – ICLEI Cities21 Indicators Used

Topic	Area	Indicator	Description
Introduction	Demographic Information	Total Population	Within the boundaries of the municipality.
Introduction	Demographic Information	Percentage of Population that is Female	
Introduction	Demographic Information	Total Number of Households	
Introduction	Demographic Information	City Size	Square Kilometers (km2)
Introduction	Health	Life Expectancy at Birth - Male	Years
Introduction	Health	Life Expectancy at Birth - Female	Years
Introduction	Health	Number of Public and Private Hospital Beds	Beds located within the boundaries of the municipality.
Introduction	Health	Percentage of households without sewer connections	As a percentage of the total population
Introduction	Health	Percentage of households without electricity	As a percentage of the total population
Introduction	Health	Percentage of households without garbage collection	As a percentage of the total population
Introduction	Health	Percentage of households without potable water	As a percentage of the total population
Introduction	Water	Percentage of Total Wastewater Produced receiving Primary Treatment	Primary Wastewater treatment: First step in sewage treatment to remove large solid objects by screens (filters) and sediment and organic matter in settling chambers.
Introduction	Water	Percentage of Total Wastewater Produced receiving Secondary Treatment	Secondary Wastewater treatment: After primary treatment, removal of biodegradable organic matter from sewage using bacteria and other microorganisms, inactivated sludge, or trickle filters. Also removes some of the phosphorus and nitrate.
Introduction	Water	Percentage of Total Wastewater Produced receiving Tertiary Treatment	Tertiary Wastewater treatment: Removal of nitrates, phosphates, organochlorine compounds, salts, acids, metals and toxic organic compounds after secondary treatment.
Introduction	Water	Percentage of Total Wastewater Produced receving No Treatment	
Introduction	Water	Rainfall Statistics	Millimeters/Year (mm/year)
Description	General	Presence of Public Participation Process	

Description	General	Presence of Law Ensuring Access to Public Documents	
Description	General	Presence of Land Use Policies	
Description	General	Presence of Statutory Body Open to Appeal of Planning Decisions	
Description	General	Presence of Cities for Climate Protection Campaign	
Description	General	Presence of Local Agenda 21 Process	
Description	General	Presence of National Enabling Legislation that allows for Local Decision-Making	
Description	General	Access to Court by Local Bodies on Planning Decisions	
Description	General	Existence of Mediation Mechanisms for Environmental Disputes	
Description	General	Presence of Mandatory Emissions Testing for Vehicles	
Description	General	Ambient Levels of Nitrogen Oxides (NOx) Monitored	
Description	General	Ambient Levels of Carbon Monoxide (CO) Monitored	
Description	General	Ambient Levels of Ozone (O3) Monitored	
Description	General	Ambient Levels of Suspended Particulates (TSP or PM 10) Monitored	
Description	General	Industries Required to Pretreat Effluent before Releasing it into the Municipal Wastewater System	
Description	General	Presence of Municipal Environmental Strategy or Plan	
Climate Change	Municipal Energy Balance	Total Energy Use in Municipality from all Sources	GigaJoules (GJ)
Climate Change	Municipal Energy Balance	Percentage Total Energy Use - Electricity	
Climate Change	Municipal Energy Balance	Percentage Total Energy Use - Oil	
Climate Change	Municipal Energy Balance	Percentage Total Energy Use - Natural Gas	
Climate Change	Municipal Energy Balance	Percentage Total Energy Use - Other Fuel Types	

Climate Change	Municipal Energy Balance	Percentage Total Energy Use - Lost	
Climate Change	Corporate Management	Percentage of Total Energy Used by Municipal Corporation's Buildings	
Climate Change	Corporate Management	Percentage of Total Energy Used by Municipal Corporation's Street Lights	
Climate Change	Corporate Management	Percentage of Total Energy Used by Municipal Corporation's Operations	
Climate Change	Corporate Management	Percentage of Total Energy Used by Municipal Corporation's Other Uses	
Climate Change	Corporate Management	Percentage of the Municipal Corporation's Energy Mix Provided by Alternative Renewable Sources	eg. Solar, Wind, Photovoltaic
Climate Change	Infrastructure and Urban Form	Percentage of Green/Open Space in Municipality	
Climate Change	Protection of Human Health	Number of Respiratory Illness Hospital Visits	(eg. Asthma, Emphysema, Pneumonia)
Climate Change	Protection of Human Health	Number of Times Monitored Pollutants exceed Threshold Limits per Year	eg. "Smog Days"/year
Climate Change	Transportation	Modal Split by Commuter Type - Private Vehicle	Percentage
Climate Change	Transportation	Modal Split by Commuter Type - Public Transportation	Percentage - Bus, Train, Metro/Subway
Climate Change	Transportation	Modal Split by Commuter Type - Bicycle	Percentage
Climate Change	Transportation	Modal Split by Commuter Type - Pedestrian	Percentage
Climate Change	Transportation	Modal Split by Commuter Type - Other	Percentage
Climate Change	Transportation	Total Number of Automobiles	
Climate Change	Waste and Resource Management	Total Amount of Waste Produced Annually	tonnes/year
Climate Change	Waste and Resource Management	Proportion of Material Diverted from Waste Stream Annually	Source Separation, etc.
Climate Change	Waste and Resource Management	Amount of Methane recovered from Solid Waste Landfills Annually	Flared/Used as Energy Source

Governance	Provision of Basic Needs	Percentage of Population in Informal Settlements	
Governance	Provision of Basic Needs	Number of Beds available in Hostels/Shelters for the Homeless	
Governance	Provision of Basic Needs	Percentage of Population who fall below the National Poverty Line	
Governance	Provision of Basic Needs	Number of Homicides	
Governance	Provision of Basic Needs	Size of Labour Force in Municipality as per National Standards	Number of people
Governance	Provision of Basic Needs	Percentage of Population Unemployed (Total)	
Governance	Provision of Basic Needs	Percentage of Youth Unemployed (Portion of Total Unemployed)	Under 25 years
Governance	Provision of Basic Needs	Ratio of Average Female Wage to Male Wage	
Governance	Education and Information	Percentage of Adult Population that is Literate	
Governance	Education and Information	Percentage of Population with Secondary Education - All	
Governance	Education and Information	Percentage Population with Secondary Education - Male	
Governance	Education and Information	Percentage Population with Secondary Education - Female	
Governance	Education and Information	Number of Newspapers (including community newspapers)	
Governance	Education and Information	Percentage of Boys attending Primary School	
Governance	Education and Information	Percentage of Girls attending Primary School	
Governance	Education and Information	Average Number of Years of Formal Education	Primary, Secondary, College/University
Governance	Decentralization and Public Participation	Percentage of Municipal Budget Derived from Local Property Taxes	
Governance	Decentralization and Public Participation	Percentage of Municipal Budget Derived Locally from User Charges/Other Revenue	
Governance	Decentralization and Public Participation	Percentage of Municipal Budget Derived Locally from Transfers	

Governance	Decentralization and Public Participation	Percentage of Municipal Budget Derived Locally from Other Sources	
Governance	Decentralization and Public Participation	Total Number of Local Government Employees	
Governance	Decentralization and Public Participation	Percentage of Local Government Employees who are Women	
Governance	Decentralization and Public Participation	Number of Local Government Employees who are Women	
Governance	Decentralization and Public Participation	Percentage of Women employed by the Local Government who are in Management Positions	Including elected officials
Governance	Decentralization and Public Participation	Number of Women employed by the Local Government who are in Management Positions	
Governance	Decentralization and Public Participation	Percentage Voter Turnout at Local Government Elections	
Governance	Decentralization and Public Participation	Number of Multi-Stakeholder Groups engaged in Long-Term Relationship with Local Government	
Fresh Water	Efficiency, Conservation, Recycling and Reuse	Percentage of Total Water Distributed that goes to Residential/Domestic Sector	Percent of Total Distributed)
Fresh Water	Efficiency, Conservation, Recycling and Reuse	Percentage of Total Water Distributed that goes to Industrial/Commerical Sector	Percent of Total Distributed
Fresh Water	Efficiency, Conservation, Recycling and Reuse	Percentage of Total Water Distributed that is Leaked/Unaccounted For	Percent of Total Distributed
Fresh Water	Availability and Access	Total Volume of Water Distributed in the Municipality	Megalitres (Ml)
Fresh Water	Availability and Access	Total Volume of Distributed Water Consumed by the Domestic/Residential Sector	Megalitres (Ml)
Fresh Water	Availability and Access	Percentage of Total Households with Access to Safe Drinking Water	
Fresh Water	Availability and Access	Percentage Municipal Water Supply from Ground Water Sources	

Fresh Water	Availability and Access	Percentage Municipal Water Supply from Surface Water Sources	
Fresh Water	Availability and Access	Volume of Distributed Water Processed to Drinking Water Quality Standards	Megalitres (Ml)
Fresh Water	Availability and Access	Consistency of Water Supply	Number of hours/day water supplied during dry season.
Fresh Water	Availability and Access	Average Annual Price of Water per Megalitre in Municipality and Explanation of Price (in Comment Section)	United States Dollars/Megalitre (USD/Ml)
Fresh Water	Efficiency, Conservation, Recycling and Reuse	Volume of Distributed Water that is Leaked and/or Unaccounted For	Megalitres (Ml)
Fresh Water	Efficiency, Conservation, Recycling and Reuse	Total Volume of Distributed Water Consumed by Industrial/Commercial Sector	Megalitres (Ml)
Fresh Water	Efficiency, Conservation, Recycling and Reuse	Percentage of Water Connections Metered	
Fresh Water	Efficiency, Conservation, Recycling and Reuse	Volume of Recycled or Reclaimed Water	Megalitres (Ml)
Fresh Water	Sanitation and Water Pollution Control	Volume of Wastewater Treated to National Wastewater Quality Standards Annually	Megalitres (Ml)
Fresh Water	Sanitation and Water Pollution Control	Total Volume of Wastewater Discharged Annually	Megalitres (Ml), Includes Stormwater, Urban Runoff

Appendix L – CEROI Core Indicators Compared with other International Programs

CEROI core set	Core set (former)	ECI[38]	EEA[39]	EF[40]	ICLEI	UNCHS[41]
Access to drinking water	✓				✓	✓
Air emissions	✓	✓		✓		
Air quality	✓	✓	✓	✓		✓
City product	✓					✓
Energy consumption			✓	✓	✓	
Green areas	✓		✓	✓		
Health care						
Housing price						✓
Infant mortality						✓
Investments in green areas						
Investments to water supply systems						
Organisations using environmental audit systems	✓	✓				
Participation in decision-making					✓	✓
Participation in elections				✓		
Poor households	✓				✓	✓
Population density	✓		✓			
Population growth	✓		✓			✓
Presence of LA 21 process						
Price of water						✓
Quality of drinking water	✓		✓		✓	
Recycling	✓		✓		✓	
Rent-to-income ratio	✓					✓

[38] European Common Indicators project (see 5.3.3)

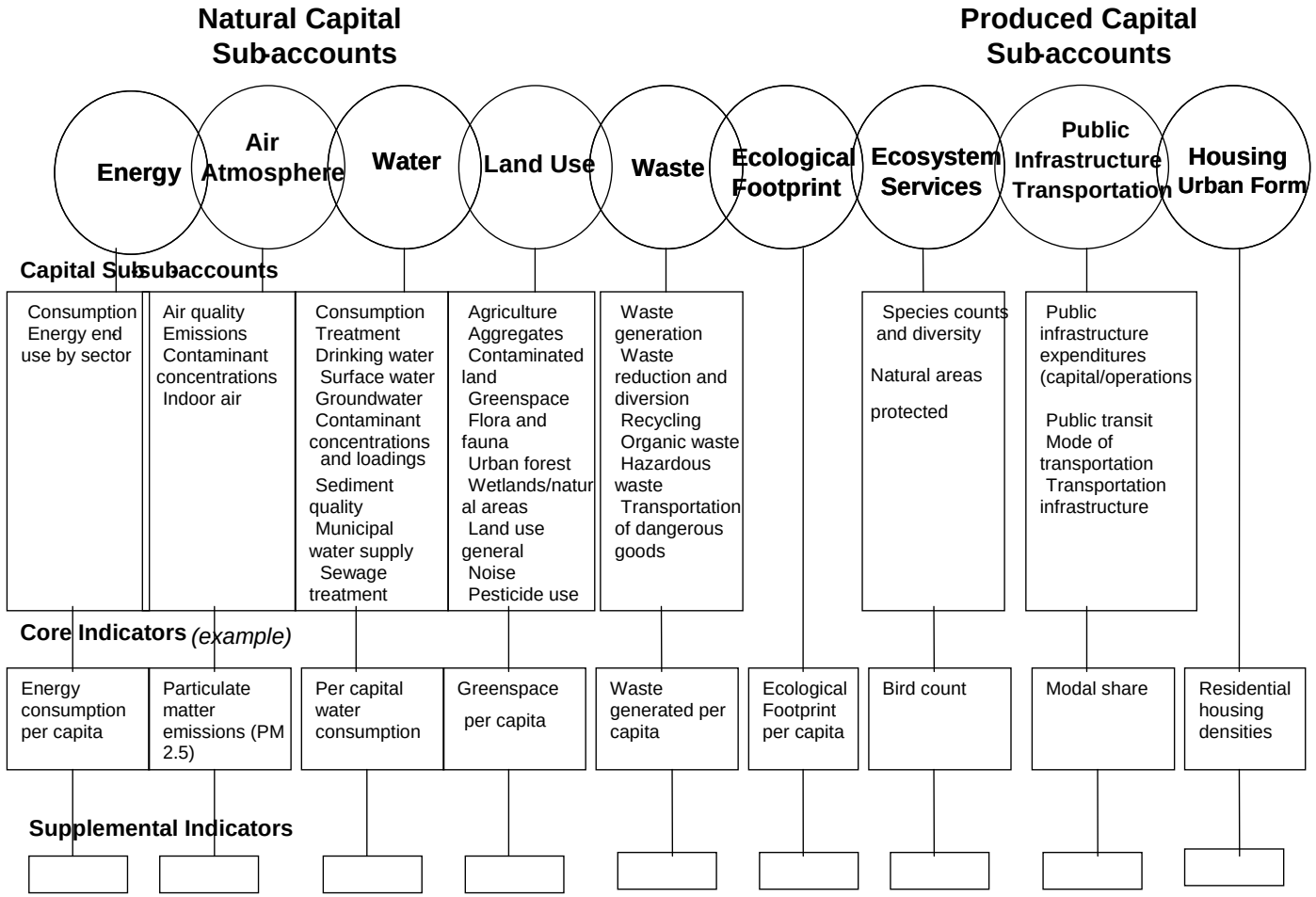
[39] European Environment Agency

[40] European Foundation for the Improvement of Living and Working Conditions

[41] UNCHS United Nations Centre for Human Settlements (Habitat)

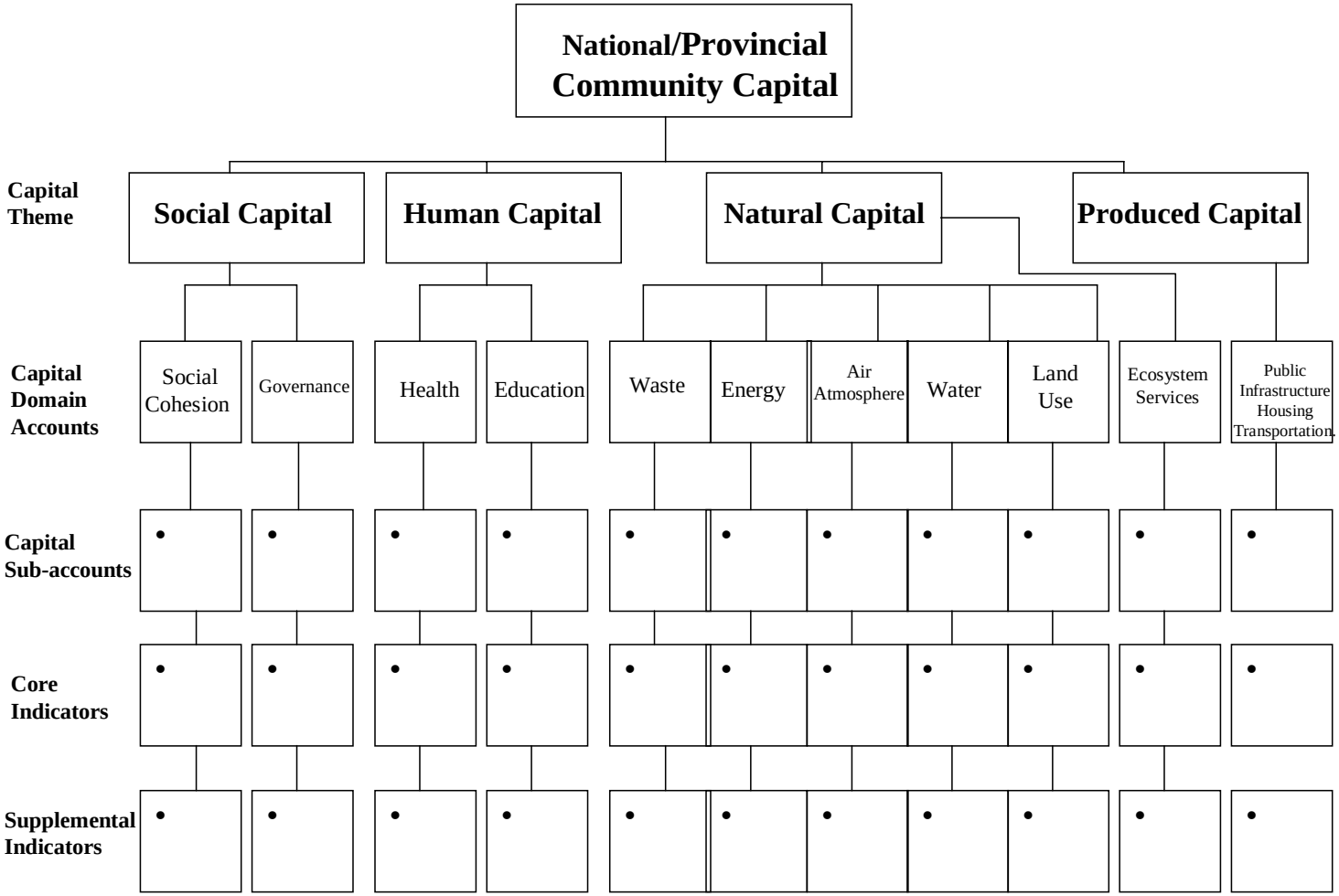
Safety	✓			✓	✓	✓
School attendance						
Transport modes	✓		✓	✓		✓
Travel times						✓
Waste production	✓		✓			✓
Wastewater treatment	✓		✓		✓	✓
Water consumption	✓		✓	✓	✓	✓

Appendix M – Model for Coordinated Structure



source: (Anielski, 2002)

Appendix N – Model for Monitoring Municipal and Community Sustainability in Canada



source: (Anielski, 2002)

Appendix O – CCME Statement of Principles to Guide Cooperative Arrangements on Environmental Monitoring and Reporting

PREAMBLE

Federal, provincial, and territorial governments undertake and use environmental monitoring and reporting to fulfill their respective mandates to:

- measure and assess environmental conditions and the health of ecosystems
- observe, record and predict environmental changes and trends
- identify and track emerging issues
- measure how well environmental objectives are being met, and
- account to the public for progress on environmental issues.

Governments work cooperatively on monitoring and reporting activities of mutual interest to access a broader monitoring network and to present a more comprehensive picture of the environment. In doing so, the federal, provincial and territorial governments not only work with one another but also work with other parties that undertake monitoring and reporting. These parties include local governments, industry, academic institutions and citizen/community organizations. The information gathered and disseminated through monitoring and reporting supports informed decision making throughout society on environmental management issues and with respect to adaptation to environmental conditions.

OBJECTIVES

The objectives of the *CCME Statement of Principles to Guide Cooperative Arrangements on Environmental Monitoring and Reporting* are to:

- facilitate informed decision-making by jurisdictions, stakeholders and the public that leads to the protection of human and ecosystem health and safety in Canada; and
- guide the negotiation of arrangements between federal, provincial, and territorial governments, and between governments and other interested parties to cooperatively deliver monitoring and reporting that:
  - is effective and efficient
  - meets scientific standards for accuracy and consistency
  - facilitates comparisons and analysis across regions and jurisdictions, and
  - communicates information to partners, stakeholders and the public in a timely manner.

SCOPE

The *Statement of Principles* applies to environmental monitoring and reporting activities where federal/provincial/territorial governments agree that these would best be delivered through cooperative arrangements, such as protocols or agreements.

Cooperative arrangements could be developed for activities such as:

- monitoring, such as ambient environmental monitoring, discharge based monitoring, transboundary pollution monitoring, and broad environmental effects monitoring;
- data management, which means quality assurance mechanisms, data modeling, meta-data, data base applications, and archiving of data; and
- reporting, which means the dissemination of the results of monitoring, including data analysis, interpretation, and prediction.

PRINCIPLES

The following principles will guide cooperative arrangements for monitoring and reporting negotiated by governments and by governments with other parties:

1. **Communication of information:** There will be open, transparent and timely reporting of information from monitoring programs, sufficient to meet the needs of jurisdictions and their obligation to communicate to the public.
2. **Mandates respected:** Cooperative arrangements will respect the mandates of jurisdictions and other parties.
3. **Shared responsibility:** Resourcing and implementing monitoring and reporting activities is a shared responsibility among federal, provincial, territorial and local governments, and between governments, industry, academic institutions and other partners. Identifying these responsibilities is an integral component of cooperative arrangements.
4. **Effectiveness and efficiency:** Parties will plan and deliver monitoring and reporting activities in a way that makes the best use of public and private resources.
5. **Timely sharing of data between parties:** Parties will share their data with each other in a timely fashion to support their activities and to meet their legal, program and/or international obligations.
6. **Third party access to data:** Third parties may have access to data for research and/or analysis other than that for which it was originally collected, subject to the applicable government legislation, policies and contractual obligations.
7. **Proprietary information:** Parties will protect proprietary information included in data in accordance with applicable policies and legislation.
8. **Cost recovery:** Where appropriate, parties may make data, analysis and reports available on a cost-recovery basis, consistent with applicable government policies.
9. **Scientific standards:** Parties will respect commitments to national and international monitoring and reporting protocols, and will work cooperatively to develop new protocols as appropriate, to allow for the meaningful analysis and comparison of data and results.
10. **Standardized data and data management:** Parties agree that data should be standardized and to respect data management protocols and develop new protocols as appropriate, to ensure compatibility and facilitate the effective sharing of data, support data integrity, permit comprehensive data analysis, and protect historical records.
11. **Accountability and transparency:** Parties will make information about cooperative arrangements available to stakeholders and the public, and will consult, as appropriate, in developing these arrangements.
12. **Reciprocal notice:** Parties will provide appropriate prior notice in the event of terminating or changing cooperative arrangements.

source: (CCME, 2000)

Appendix P – Indicators that have been used or proposed by municipalities, by sustainability issue

source: (NIRO, 2003) and others

Natural areas and corridors
Greenspace as percentage of total land area (greenspace may include protected and unprotected natural areas, parks, vacant Crown land with greenspace value, agricultural land, forest land)
Total area of environmentally sensitive habitat and percentage of area protected from development (i.e., protected area or covenanted land)
Number of species at risk
Population trends of species at risk
Population trends of keystone species
Amount of significant natural areas protected
Stream health measured by B-IB Index
Percentage of native plant species that are healthy
Percentage of wild salmon and steelhead population in key sub-basins that are at target levels
Measure of wild bird populations
Improving land quality
Percentage of cropland eroding above tolerance levels
Improving water quality
Total loading of nitrogen and phosphorous into the harbour
Number of "All beaches open for swimming days"
Stream water quality index
Percentage of ground water meeting drinking water quality
Percentage of monitored lakes and rivers fit for swimming and aquatic life
Percentage of ground water supply affected by nitrate
Fecal coliform count
Water quality and consumption
Municipal water consumption per capita (total, residential, commercial, other)
Phosphorus levels in lakes compared with water quality guidelines or objectives
Percent of households with water meters
Beach closures (annual number of days specified beaches closed due to unacceptably high coliform counts)
Percentage of households serviced by sewage treatment (e.g., by level: none, primary, secondary, tertiary)
Average annual faecal coliform level in stormwater
Average annual concentrations of substances of environmental concern in sediments at selected stormwater discharges
Exceedances of sewage effluent guidelines (number of occurrences)
Contaminated sites
Remediated contaminated sites as percentage of total known sites
Improving air quality
Carbon monoxide and coarse particle matter measurement
Sulfur dioxide concentration in the air
Annual number of respiratory illness hospital visits per year
Carbon dioxide emissions as percentage of 1990 emissions
Vehicle miles traveled per person

Emission measurements of sulfur dioxide, nitrogen oxides and carbon monoxide
Emission measurement of greenhouse gases
Number of days that air pollution exceeds moderate levels
Percentage of days with air quality rated as good
Persistent Organic Pollutants (pops)42 -
Ambient levels and exceedances for ground-level ozone, PM10, CO, NO, SO2, and benzene
Energy
Energy consumption per household
Energy consumption by sector.
Conservation
Percentage of energy supplied from renewable sources
Gallons of water used per person each day
Average litres of water consumed per capita per day
Annual consumption of gasoline, electricity and natural gas
Vehicle miles traveled and fuel consumption
Per capita residential electricity consumption
Average annual energy use per person
Barrels of oil per capita per year
Waste water reuse
Reducing and managing waste
Pounds of solid waste per capita generated, recycled, disposed
Total residential waste generated annually
Percentage of municipal solid waste land filled or incinerated per capita
Tons of solid waste per person
Kilos of domestic waste per person
Waste generation and disposal (total and per capita)
Recycling and composting participation rates
Percent of households covered by blue box recycling program
Waste diversion percentages
Transportation
Modal split (percentage of trips by bikes, cars, passengers, transit, and walking)
Motor vehicle ownership per capita (or per household)
Annual amount of fossil fuel consumed for transportation per household
Annual costs of roads and road maintenance per household
Transit ridership (total, and per capita per year)
Amount of land used for automobile-related uses (roads, parking lots, service stations, etc.)
Length of bikeways as a percentage of total length of major vehicle lanes
Average number of people per car per trip
Land use
Suburban Sprawl – change in km2 dedicated to housing vs. Change in population

[42] Such as: PCBs (polychlorinated biphenyls), dioxins (polychlorinated-dibenzo-p-dioxins - PCDD) and furans (polychlorinated-dibenzofurans - PCDF).

Total area of rural land converted to urban uses, and rate of change per 1 000 population growth
New housing starts by type (percentage of detached, attached ground, attached non-ground of total new starts)
Percent of households within 400 m of schools hospitals, transit stops, natural parks
Urban and non-urban residential densities
Percent mixed-use zoning (e.g., commercial-residential)
Average residential lot sizes (new lots and total inventory)
Renovation permits as percent of building permits
Percent of new or renovated development within the built-up area, compared with all development in the urban region or CMA
Average length of journey to work
Percent of labour force working within 400 m of home
Local food production
Acres with agricultural zoning
Change in number of certified organic farms
Housing
Average waiting time for those in need of subsidized housing
Number and percentage of households in core housing need, by tenure
Affordability (percent of households spending 30% or more of income on housing [principal, interest, taxes, and utilities], by tenure)
Adequacy (percent of housing stock below adequacy standard)
Suitability (percent of households below national occupancy standard for number of people per bedroom)
Annual total number of people using homeless shelters (annual total number of overnight stays)
Average price of serviced residential lots (total and as a percent of average price of house)
% of total housing stock made up of social housing units
Vacancy rates, by price and housing type
Supply of serviced residential land coming on stream to meet future demand
Estimates of homeless population
Changes in occupancy rates of shelter beds, using a moving 12 month average
Home ownership as a percentage of housing units
Percent market price is above affordable housing cost
Percentage of renters who can afford a typical starter home
Homes judged unfit to live in
Percentage of people with sewage disposal that does not meet government standards
Traffic and mobility
Percentage of people who commute to and from work during peak hours by means other
Than a single occupancy vehicle
Percentage of workers who report commuting time of 25 minutes or less
Public satisfaction with roads and highways
Public transportation Percentage of trips taken to work using public transit
Annual transit ridership per capita
Society
Educational Attainment
Personal Safety (crime)

Homelessness
Affordability (housing, wages)
Voter Participation
Charitable donations
Well-Being
Traffic Congestion
Air Quality
Access to health care (beds/person, insurance)
Infant mortality and birth weight
Substance abuse
Mental Health
Percentage of youths aged 15–18 attending school
Public safety
Accident rates (by type)
Crimes against persons (offences per 1000 population)
Crimes against property (offences per 1000 population)
Number of charges laid (by victim and by police) in domestic violence incidents reported to police (also as percentage of all incidents)
Governance
Percent of population voting in municipal elections
Percent of population participating in voluntary community service organizations.
Economic activity
Bankruptcies and incorporations (per 1000 population)
Annual number of new business licences issued
Number and value of building permits annually
Percent of labour force employed by sector (manufacturing, industry, agriculture, etc.)
Income equity
Percent of households with incomes below Low Income Cut-off
Annual average (or median) household (or individual) income by group (i.e., women, men, native, immigrants)
Middle income earners as a percentage of total population
Real average weekly earnings
Percentage of children, elderly, and disabled with low incomes [e.g., household income below LICO (low income cut off)]
Ratio of income earned by richest 20% of population to poorest 20% of population
Total annual number of meals provided (or annual number of people served) by food banks

Appendix Q – FCM QOLRS Municipal Survey Coordinators

QoLRS Community	Survey Coordinator	Email	Telephone
Calgary	John TeLinde	jtelinde@gov.calgary.ab.ca	403.268.5160
Edmonton	Steve Friedenthal	Steve.friedenthal@gov.edmonton.ab.ca	780.496.5831
Vancouver	Rick Gates	rick_gates@city.vancouver.bc.ca	604.871.6036
Winnipeg	Georges Chartier	gchartier@winnipeg.ca	204.986.4549
RM Halifax	Barb Nehiley	nehileb@region.halifax.ns.ca	902.490.4612
RM Halton	Wendy Kowalski	kowalskw@region.halton.on.ca	905.825.6000.7460
Hamilton	Carmen Bian	cbian@city.hamilton.on.ca	905.546.2187
Kingston	Jeremy DaCosta	jdacosta@city.kingston.on.ca	613.546.4291.1310
London	Rabi Bhandari	rbhandar@city.london.on.ca	519.661.5954
Region of Niagara	Kirk Weaver	kirk.weaver@regional.niagara.on.ca	905.685.4225.3727
Ottawa	Bonny Bryant-Besharah	Bonny.Bryant-besharah@ottawa.ca	613.580.2424.21765
RM Peel	Neil Malcolm	malcolmn@region.peel.on.ca	905.791.7800.4037
City of Greater Sudbury	Tin-Chee Wu	tinchee.wu@city.greatersudbury.on.ca	705.671.2489.4298
Toronto	Harvey Low	hlow@city.toronto.on.ca	416.392.8660
RM Waterloo	Lorie Fioze	florie@region.waterloo.on.ca	519.883.2376
Windsor	Marie Ellen Bernard	mbernard@city.windsor.on.ca	519.255.5354
RM York	Bethan Kemmers	Bethan.kemmers@region.york.on.ca	1.877.464.9675.2128
Regina	Bruce Rice	brice@cityregina.com	306.777.7981
Saskatoon	Bill Holden	bill.holden@city.saskatoon.sk.ca	306.975.2687