CHALLENGES IN MEASURING SUSTAINABILITY AND THE QUALITY OF LIFE – THE CASE OF A SMALL CANADIAN CITY

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Abstract: Many set of indicators are currently available to measure sustainability and the quality of life or well-being of the people. However, choice of the set of indicators can widely affect the ranking of a place in terms of the quality of life of the people. For example, Costa Rica ranks 1st in terms of the 2012 Happy Planet Index, but it ranks 69th in terms of the Human Development Index. The goal of this paper is to design a robust mechanism by combining several methodologies to assess the quality of life in a place. We used a small Canadian city, Kamloops, for our case study. This 311 square km city in Interior British Columbia has a population of about 87,000. MoneySense ranked it 44th and 64th best places to live in Canada in 2012 and 2013 respectively. The index that is too sensitive to annual fluctuations of a few indicators could be good for understanding short-run quality of life changes, but might not necessarily reflect the level of well-being and its sustainability in a place.

In this paper, we have defined a methodology to select an appropriate set of indicators for Kamloops that would measure the average quality of life and its sustainability. With hundreds of global and regional quality of life and sustainability indicator initiatives, and many available methodologies, it is important for any city to choose the appropriate indicators and evaluation methods. Economists often use estimated monetary values of desired indicators to compute Genuine Progress Indicator, or such other quality of life or composite sustainability indices. Natural scientists, on the other hand, use only a few physical indicators for environmental sustainability assessment. We believe that both monetary and physical indicators are important components of any quality of life index, and therefore, have to be part of a comprehensive sustainability plan.

A data aggregation method has been suggested in this paper for computing relatively more composite indices from the large number of quality of life and sustainability indicators. The absence of reliable and adequate data is a serious challenge in measuring the desired indicators. Due to data constraints, a complete assessment of the average quality of life and its sustainability in Kamloops is not possible at this time using our suggested methodology. However, the proposed methodology and the data compiled for this study are steps forward to a complete and systematic accounting of well-being, happiness, income, wealth, and sustainability indices for Kamloops.

We have assessed the current Kamloops Sustainability Plan based on our proposed criteria. It is expected that this study will make different stakeholders in the City of Kamloops re-think about their sustainability plans, and will help contribute to make Kamloops a better place to live. The methodology recommended in this paper is general enough to be used for quality of life and sustainability assessment in any place.

Keywords: Kamloops, quality of life, small city, sustainability, well-being index

INTRODUCTION

Kamloops is a small town of 87,647 people (BCStats, 2012) in Interior British Columbia, Canada. The total area of the city is 311 square km.[1] In some days of July 2012, the sky over the city was hazy. It was not because of smog rather due to smoke from forest fires hundreds of miles away – in Colorado and in Siberia.[2] It's a great example of how trans-boundary pollution can affect people far away. It can affect the quality of life for many at least for short time, if not permanently. Forest fires in surrounding areas also affect the air quality in Kamloops almost every year. There are many such factors that contribute to transient or permanent health and well-being of the people in an area. Therefore, the importance or weights of different indicators in the set of local quality of life (QOL) and sustainability indicators may not necessarily coincide with the weights of the same indicators in a global set of QOL and sustainability indicators.

Take another example. A proposed open-pit gold and copper mine called the Ajax mine within the vicinity of the City of Kamloops poses a different type of sustainability question. Given the high prices of metals, people elsewhere will certainly benefit from it, but the improvement in the quality of life in Kamloops will not be universal. There will be some job creation, but at the same time air quality, water table in Kamloops will likely be affected. Tourism, real estate value, people's decision on relocation, etc. may also be affected. Therefore, the bigger question for Kamloops is whether the improvement in the QOL for people elsewhere and probably for some in Kamloops due to the mine is sustainable or not from the perspective of all present and future Kamloopsians.

All of us know that a mining town may die down in 20/30 years as soon as the extraction of resources from the mine stops leaving signs of permanent damages on the population and the eco-system. Therefore, current prosperity due to the mine may not be sustainable for the local community, though it may be profitable, even sustainable, from the perspective of the region or the country. Hence, the use of appropriate decision criteria for QOL and sustainability assessment is important. A set of global QOL indicators may not always be the best set of QOL indicators for a local community from long-term perspective.

The Economic Intelligence Unit reports best places to live on earth every year based on 30 indicators.[3] That's a good list of indicators for assessing the present QOL, but the question is if the attained quality of life in a city based on those indicators is sustainable or not. If not, a high present QOL should just give a temporary satisfaction or happiness. In 2012, 140 big cities were included in the study. Of course, a small city like Kamloops was not included. Also, a global set of indicators cannot capture all QOL and sustainability issues that concern Kamloops stakeholders. Therefore, a custom set of indicators is more appropriate for understanding present and potential future standard of living in the City.

Philosophically speaking, one of our common goals on the planet is to have a better living for all and sustain that forever. In other words, have economic growth and development; maintain the ecological balance and environmental quality; preserve heritage and culture; and encourage social progress. Global cooperation or conflict, technological progress - all play their respective roles in these complex set of equations. Living in a small city today does not make one immune to many of the effects that others in the country or in the world feel. However, local community often has to rely on local resources and environment for their sustained quality of life. Global and national policies and changes are certainly of importance for any community, but the focus in this paper will be to identify all relevant indicators that directly affect the quality of life and sustainability in Kamloops, a typical small city in Canada.

In this paper, we will define a methodology to find the appropriate custom list of QOL indicators for Kamloops and to assess the sustainability of all activities that give them a certain standard of living. The paper will also give some direction for integrating different indicators to come up with appropriate Decision Rules/Criteria for determining sustainability.

The significance of this study is that the methodology used in this paper can be used by any local community to determine relevant QOL indicators for them. It may help them plan for the future and assess the sustainability of their present activities. The diversity of indicators is necessary to make the indicators useful for respective communities;

[1] http://www.tourismkamloops.com/fastfacts. Accessed 9/7/2013.

[2] http://www.cbc.ca/news/canada/british-columbia/story/2012/07/10/bc-haze-russian-forest-fire.html & https://www. facebook.com/BCForestFireInfo/posts/10151051708585673. Accessed 9/7/2013.

[3] http://www.eiu.com/site_info.asp?info_name=The_Global_Liveability_Report. Accessed 9/7/2013.

however, we can still find a common ground to aggregate them to understand and compare successes in different regions. We propose a methodology that is suitable to find a comprehensive index, but at the same time allows having different indicators and weights based on local needs.

The structure of the paper is as follows. The next section lists some typical global, regional, and local QOL and sustainability indicator initiatives to show their similarities and diversities. The following section explains our methodology. This section also defines a set of Decision Criteria for performance measurement and sustainability assessment. Next, we assess the Sustainable Kamloops Plan and other recommended set of indicators for Kamloops. This section also presents the available data for QOL and sustainability assessment, and identifies the data gaps. The final section concludes.

LITERATURE REVIEW

It is not a survey paper. Therefore, we will not attempt to list all indicator initiatives here. The compendium of sustainable development initiatives, hosted and managed by the International Institute for Sustainable Development (IISD), currently has information on 173 sustainability indicator initiatives.[4] Over the years, many attempts were made to define QOL indicators as well. IISD lists 73 global and local QOL indicator initiatives on its site. These two lists are not mutually exclusive. We will present a few popular global indicator initiatives along with several regional and local indicator initiatives as examples to show their similarities, diversities, limitations and relevance for our present study.

Global Indicators

"While Quality of Life (QOL) has long been an explicit or implicit policy goal, adequate definition and measurement have been elusive" (Costanza, et al., 2008). Popular quality of life indicators include the Measure of Economic Welfare (Nordhaus & Tobin, 1973), the Physical Quality of Life Index or PQLI (Morris, 1979), the Human Development Index (UNDP, 1990), the Quality of Life Index (Economist Intelligence Unit, 2005), the Happy Planet Index (New Economics Foundation, 2006), and so on. The Gross National Happiness (Wangchuk, 1972; The Centre for Bhutan Studies, 2010) is a state introduced concept. One of the general criticisms of the quality of life indicators is their inadequate emphasis on environmental sustainability. Therefore, for a comprehensive understanding of present and future QOL, looking at both Quality of Life Indicators (QOLI) and Sustainable Development Indicators (SDI) is important. Together they can give a longer term perspective on the QOL in a place. The Genuine Progress Indicator (Cobb, et al., 1995) and the Genuine Wealth (Anielski, 2004 & 2007) are two recently introduced well-being indices that a number of communities around the world have attempted to measure.

The Measure of Economic Well-being "is a measure of consumption, does not directly address environmental concerns, and is often criticized for distinguishing between economic and non-economic welfare (Brekke, 1997). While PQLI lists different life quality indicators, it does not ensure sustainability of those indicators." (Dewan, 2013) The Human Development Index (HDI) makes no reference to environmental quality either. How the higher HDI was attained and whether the attained HDI is sustainable or not, we cannot tell from the numerical value of the HDI. The latest revision of the computational methodology of HDI was made in 2010.

The Quality of Life Index is a composite index based on 30 indicators from five categories – "stability; healthcare; culture and environment; education; and infrastructure."[5] In 2012, the index was calculated for 140 cities. The Happy Planet Index is calculated as

$$Happy\ Planet\ Index = \frac{Experienced\ wellbeing * Life\ expectancy}{Ecological\ footprint},$$

where experienced well-being is computed from a world-wide survey. The survey include questions about individual income, spending, shelter, diet, travel, energy conservation, recycling, stress, health conditions, etc. In 2012, it was calculated for 151 countries.[6] The Gross National Happiness treats happiness as a socioeconomic development metric. The revised index (2010) is a function of economic, environmental, physical, mental, work-place, social, and political wellness.

The Genuine Progress Indicator (GPI) and its earlier version, the Index for Sustainable Economic Welfare or ISEW (Daly & Cobb, 1989; Cobb & Cobb, 1994), are corrections of the National Income (NI) accounts for environmental and some other non-market activities to reflect Hicksian income.[7] The Genuine Wealth Index, on the other hand, is calculated based

[4] http://www.iisd.org/measure/compendium/searchinitiatives.aspx. Accessed 22/08/2012.

[5] https://www.eiu.com/public/topical_report.aspx?campaignid=Liveability2012. Accessed 8/7/2013.

[6] http://www.happyplanetindex.org/about/. Accessed 9/7/2013.

[7] Hicks (1946). Hicksian income is comparable to maximum sustainable consumption. It is an amount of income that people can "consume without impoverishing themselves."

on core values of the residents together with community economic, social, health, and environmental conditions. The index is calculated based on the scores given to different indicators by the participants of a survey. It tells us about the well-being condition of a city relative to the benchmark, which is usually the average well-being condition in the province.

There have been many efforts to measure QOL and sustainability in different countries based on the above ideas. However, for empirical studies the lists of indicators have to be modified according to needs and data availability as can be seen in the following paragraphs.

European Commission and Eurostat focused on issues such as Agriculture, Air Quality, Atmosphere, Nature and Biodiversity, Climate Change, Economic Performance, Education, Employment, Energy, Fisheries, Forestry, Freshwater, Governance, Human Health, Housing, Land Use, Natural Resources, Oceans and Seas and Coasts, Population, Poverty, Public Safety, Social, Stratospheric Ozone Depletion, Harmful Substances and Chemicals, Transportation, Waste, Ageing population, Production and Consumption patterns, Environmental, Innovation, External dimension, and Social exclusion for a more sustainable Europe.[8]

Economic Commission for Latin America and the Caribbean (ECLAC) as part of sustainable development initiative in South and Central American and the Caribbean supported the use of environmental, social and economic indicators such as Agriculture, Air Quality, Economic Performance, Education, Land Use, Natural Resources, Poverty, and Harmful Substances and Chemicals.[9]

Canadian Index of Wellbeing, proposed by the Institute of Wellbeing, identified the following themes for the index based on, in their words, Canadian needs and values: Standard of Living; Health; Quality of Environment; Education and Skill Levels; Way Canadians Use Their Time; Vitality of Canadian Communities; Participation in the Democratic Process; State of Arts, Culture and Recreation.[10]

It is evident from the above discussions that some like to use physical indicators and some prefer to monetize those indicators to evaluate QOL and sustainability. In absence of objective measures of some indicators, sometimes proxies or subjective measures are used – which can be questioned. Though the list of indicators varies from one initiative to another, the indicators belong to several broad categories. They are similar to what Singh, et al. (2012) observed in their survey article: the broad theme indicators are social, environmental and economic in GRI (2002) framework and IChemE sustainability metric (Labuschagne, et al. 2005); social, environmental, economic and institutional in UNCSD and Wuppertal indicator framework (Labuschagne, et al. 2005) with diverse set of sub-indicators.

Regional Indicators

At the provincial or state level, we see more diversity at the disaggregated level of the indicators. However, the broad themes are still the same. There are differences in data collection methodology and in availability of data, and also in the use of proxies.

The Central Texas Sustainability Indicators Project (2006) expected to achieve sustainability through public awareness, collaboration and engagement. They grouped over 40 indicators into 8 broad categories: Public Safety, Education and Children, Social Equity, Engagement, Economy, Health, Environment, and Land Use and Mobility. After evaluating the data and the trend, they marked the status of each indicator as 'doing well', 'keep watch' and 'need action'. In absence of any universally accepted sustainability rule, this can be a very good way to keep an eye on important indicators. They relied on physical indicators and did not attempt to aggregate the indicators to define a composite sustainability index.

The Australia Institute and New Castle City Council identified Air Quality, Nature and Biodiversity, Economic Performance, Education, Employment, Housing, Natural Resources, Oceans and Seas and Coasts, Social, and Transportation as the important indicators for the quality of life in New Castle based on working group of experts and citizens opinions.[11]

Genuine Progress Indicator (GPI) was calculated for many regions including Alberta and Victoria in Canada and Australia respectively. GPI is a monetary-based index. It is computed more-or-less uniform way everywhere depending on data availability. The variations in indicators and methodology used are mainly due to differences in data collection methodology in different countries and availability of data to compute the GPI. The set of indicators include Personal Consumption; Gini Coefficient; Values of Household Labor, Higher

[8] http://www.iisd.org/measure/compendium/DisplayInitiative.aspx?id=1561. Accessed 22/8/2012.
[9] http://www.iisd.org/measure/compendium/DisplayInitiative.aspx?id=1935. Accessed 22/8/2012.
[10] http://www.iisd.org/measure/compendium/DisplayInitiative.aspx?id=2068. Accessed 22/8/2012.
[11] http://www.iisd.org/measure/compendium/DisplayInitiative.aspx?id=1516. Accessed 15/9/2012.

Education, Leisure Time, and Volunteer Hours; Costs of Crime, Commuting, and Pollution; Net Capital Investment and Foreign Borrowing; and many other indicators. Some of these have positive and some have negative contributions in determining the value of the index.

GPI Atlantic in Canada has produced over 60 detailed reports on different components of GPI since 1997. They grouped all of the components of GPI into six main categories: Time Use, Living Standards, Natural Capital, Human Impact on the Environment, Social Capital, and Population Health. One of their recent reports included GPI components such as Agriculture, Air Quality, Climate Change, Education, Employment, Energy, Fisheries, Forestry, Freshwater, Human Health, Natural Resources, Oceans and Seas and Coasts, Poverty, Public Safety, Social, Transportation, Waste, Work Hours, The Value of Unpaid Work, Ecological Footprint, and Gambling.[12]

It can be noticed that these regional indicators are somewhat different from global set of indicators, but they are certainly more appropriate for the regions according to the proponents of those indices.

Local Indicators

Local indicator initiatives show even more diversities and asymmetries. Their emphasis is on specific local needs and they try to meet the demands of local stakeholders, which make sense. For example, an island community may have to focus among other things on sustainable fishing, whereas a community dependent on forest products will have a different priority. Nonetheless, the indicators can all be grouped into several broad categories as discussed above. The following are some examples of local indicator initiatives.

The City of Leduc in Alberta, Canada prepared its 2005 Genuine Well-being (Wealth) Report (Anielski & Wilson, 2006) which included 117 indicators under 22 themes such as Agriculture, Air Quality, Economic Performance, Education, Employment, Energy, Governance, Human Health, Housing, Land Use, Population, Public Safety, Recreation, Harmful Substances and Chemicals, Waste, Noise, Greenhouse Gases, Happiness, Time Use, Water Use, and so on. Using Anielski model, they gave scores to each of those themes relative to the benchmarks.

Fraser Basin Sustainability Report (2011) of British Columbia, Canada included such indicators as Health Care Expenditures, Life Expectancy, Low Birth Weight, Leading Causes of Death, Index of Economic Hardship, Energy Consumption, Ground Level Ozone Concentrations, Forest Area Affected by Pine Beetles, etc.

An indicator program to monitor sustainability in several islands in British Columbia included environmental, economic, social, and governance indicators such as Groundwater Level, Vegetation, Shell Fish Harvesting, Income Levels, Unemployment Rate, Housing, Farm Acreage, Population, Age Groups, Education, Crime Rates, Participation in Local Elections, Partnerships with NGOs, etc. (Islands Trust Council, 2003).

We can see that the island cities have very different indicator needs than those in other communities. Even with all the diversities, we can find some common indicators that the stakeholders in all communities are concerned about. The broad categories are more or less the same everywhere.

The weighting of different indicators in the set of indicators is not the same in all locations. We argue that we must allow diversities and asymmetries when it comes to selecting indicators, yet we can group them into three or four broad categories, and even can come up with a composite index.

The composite indices from different places may not be directly comparable in the sense that they constitute different elements with different weights; but they are comparable in the sense that they measure the same thing - QOL and sustainability - as appropriate in a locality. The ultimate goal of all of these exercises is to make the world a better place to live for present and all future generations. As the QOL and sustainability issues are not the same in all locations, we must consider local needs. Sometimes, local sustainability and people's better QOL may be in conflict with regional, national or global sustainability and better QOL. Therefore, the use of appropriate decision rules/criteria is important for QOL and sustainability assessment. The Pareto optimality can be a guiding principle.

To summarize, we say that the set of indicators for community QOL and sustainability assessment may not be the same everywhere, but still they can be grouped into some common categories.

The next section presents our methodology for this study.

METHODOLOGY

One question that needs to be answered is: how do we choose an appropriate set of QOL indicators for Kamloops? A more challenging question is: how can we determine the sustainability of the attained QOL of the City population? A constraint for measuring the indicators is the non-availability of appropriate

[12] http://www.iisd.org/measure/compendium/DisplayInitiative.aspx?id=1371. Accessed 8/7/2013.

data. Therefore, finding proxies or substitutes for some of the indicators could be another challenge.

First, we will look at the demographics and other general characteristics of Kamloops such as population, age structure, industry, resource base, etc. Next, we will review the City of Kamloops Sustainability Plan and their targeted indicators for measuring success. In order to find an appropriate set of QOL indicators and a composite index for Kamloops, and the sustainability of those indices, we follow three steps as stated below.

Conceptual Framework, List of Indicators, Data Presentation, and Report Cards

Dewan's (2009) Conceptual Framework shows that human activities that are influenced by markets, governments, NGOs, and international organizations directly affect present well-being, future development potentials, and existing natural and social environments. Changes in natural and social environments affect both present and future well-being. This framework identifies some composite indicators such as the Human Development Index (HDI); Equity (E); Capital-Debts Index (CDI); Productivity (P); and Natural and Social Environments (NSE) which include Environmental Conditions (ENV), Natural Recourses (NAT), Natural Amenities (AMN), and Socio-Cultural and Institutional Conditions (SOC) for QOL and sustainability assessment. These composite indicators consist of some common and some locality-specific sub-indicators. They all fall into four broad categories of indicators – economic, environmental, socio-cultural, and institutional – as identified in the literature review section. We will use Dewan's framework for this study. A list of sub-indicators for Kamloops will be defined based on our conceptual framework, top public issues in Kamloops, and various regional and global indicator initiatives.

A radar chart or the Genuine Well-being Index flower proposed by Anielski (2007) are our preferred data presentation tools as they can show relative strengths and weaknesses of different indicators in a community. Using of grading scheme for performance measure is another tool for understanding strengths and weaknesses of community efforts. The scheme used by the City of Santa Monica, USA (2012) for assessing sustainable businesses gives grades for their current conditions and also for their efforts every year. A similar scheme is recommended for Kamloops.

Composite Index

Defining a single composite index based on the sub-indicators is possible as shown in Dewan (2009). The advantage of a single composite index is that it makes the comparison and decision making easier. To aggregate the indicators it is necessary to assign weights to different indicators based on some reasonable criteria. A sensitivity analysis for different weights also needs to be conducted. We must recognize that the use of same weights may not be efficient for all jurisdictions. We will compute a composite index for Kamloops based on Dewan's (2009) methodology.

We will also attempt to compute a composite monetary index, GPI, which is calculated based on real or scarcity values of all indicators, and is a preferred index to many economists. To compute the GPI for a small city like Kamloops, it will be necessary to find appropriate proxies for some indicators with missing data and estimate their values. It should be noted that the GPI possibly cannot be the sole measure of average quality of life in a community. Monetization of physical indicators to compute the GPI is often considered very subjective. Another criticism is that socio-cultural and institutional variables are not considered while computing the GPI. Any measure of QOL needs to include both economic and non-economic well-being. Therefore, we prefer to supplement the Kamloops GPI with other indices for a better understanding of sustained QOL.

Conventional GDP is still the most popular composite index, but like other composite indices this too has limitations in measuring economic well-being.

With data from Germany and the USA, Dewan (1998) showed that the growth rate and the trend of a Green GDP measure, ISEW (a similar concept as the GPI), were different from the growth rates and the trends of conventional GDP and a physical sustainability measure. A recently published article by Kubiszewski, et al. (2013) shows that "(w)hile global Gross Domestic Product (GDP) has increased more than three-fold since 1950, economic welfare, as estimated by the Genuine Progress Indicator (GPI), has actually decreased since 1978." We would like to compare the growth rates of different composite indices as the relevance of each index is different for a society.

Decision Criteria

For sustainability assessment, we must compare achievements vs. losses (or benefits vs. costs). A diagram, proposed by Dewan (1998), shows progress of a society relative to damages to the natural and social environments; and therefore, it can be used for sustainability assessment. We will also use the Decision Criteria/Sustainability Conditions proposed by Dewan (2009) to determine the sustainability of present QOL in Kamloops. Various degrees of sustainability such as perfectly, strongly or weakly

sustainable; unsustainable; and no development can be defined based on these sustainability conditions.

DATA AND INDICATORS FOR KAMLOOPS

Kamloops Profile

"Kamloops has a well-diversified economy based on government services, education, forestry, tourism, and other industries…. Major employers in the community include Royal Inland Hospital, School District # 73, Thompson Rivers University, Highland Valley Copper Mine, Domtar, and the City of Kamloops." (City of Kamloops, 2010a)

Following are some important statistics for the City based on Census, 2006 (Statistics Canada): (a) Median age: 40.6 years (b) 15 years and older: 83.4 % (c) Average family size: 2.8 (d) Unemployment rate (April, 2013): 5.8% (Venture Kamloops, 2013) (e) Median family income: C$65,717 (f) Agriculture and resource-based industry: 2,010 people (g) Manufacturing: 3,160 people (h) Immigrants: 8,495 (i) Aboriginal population: 5,165 (j) Drive to work: 31,345 people (k) University degree or diploma: 8,255 (l) High school equivalent degree: 20,590

The average income of the households is descent, and the City has a good prospect for the future.

Top Public Issues

Recent surveys (n=400) by Ipsos Reid (2009, 2012), commissioned by the City of Kamloops, identified the following as top public issues that concern the Kamloops population: Social, Education, Crime, Transportation, Economy, Healthcare, Tax/Municipal Gov't Spending, Environment, Growth, Parks, Rec & Cultural Facilities/Programs, Municipal Gov't Services, Revitalization, etc.[13]

However, more recently the proposed Ajax Mine in the vicinity of Kamloops has become the most debated issue. It has created a great divide among the city population. Some see it as an opportunity for further economic growth and job creation in Kamloops, while others are concerned about serious long-term health effects on the population. Concerns about increased air pollution, contamination of ground water, noise pollution, and so on could soon be real, if the mine is approved. A representative from the local doctor coalition stated that Ajax would make "low-grade smokers out of children."[14]

The Sustainable Kamloops Plan defines the indicator metric and the priority list based on inputs from the City's own surveys and consultation sessions. Between 2008 and 2010, the city planners got feedback from 639 respondents by using various means.[15]

The Sustainable Kamloops Plan

The City of Kamloops' sustainability initiative that formally started in 2008 is called the Sustainable Kamloops Plan. Kamloops' vision of sustainability is: "In 2050, Kamloops, Canada's Tournament Capital, is an innovative, vibrant and diverse community … It is known for its bold ecological and healthy living initiatives that shape one of the most inviting and liveable cities in Canada … It continues to minimize its corporate and community footprint … Kamloops is a place where blue skies, clean air, and fresh water complement the strong sense of belonging, where residents feel safe and secure, where community input is valued and encouraged, and where all citizens have abundant opportunities to live, learn, work, and play." (City of Kamloops, 2010b)

The City collects and measures progress in indicators that fall into three categories: Economic/Financial, Social, and Environmental. The key components or sub-indices identified through many consultation sessions are (City of Kamloops, 2010b): Transportation, Solid Waste, Energy, Recreation, Greenhouse Gas Emissions, Natural Environment, Climate Change Adaptation, Food Security, Land, Arts, Culture and Heritage, Air, Health and Wellness, Water Use Efficiency, Community Safety, Drinking Water Quality, Economic Development, Storm water, Education, and Wastewater.

As part of the plan, the City aims at achieving a number of goals, some of which are (City of Kamloops, 2010b): (a) Reduce community-wide greenhouse gas (GHG) emissions by 40% below 2007 levels by 2020; (b) Increase alternative transportation to 30% of all trips; (c) Achieve municipal corporate carbon neutrality by 2012; (d) Use carbon neutral energy at all City facilities by 2035; (e) Produce the equivalent of 10% of City (corporate) energy needs through alternative energy systems (i.e. solar, wind, geothermal, methane gas from landfill/sewer, waste heat) by 2020; (f) Decrease community energy use by 20% below 2010 levels by 2020, and 50% by 2050; (g) Manage overall growth of the urban area to achieve a rate of growth which is 50% of the rate of population growth; (h) Reduce peak summer demand for water by 20% by

[13] http://www.kamloops.ca/publications/pdfs/CitizenSurveys/12-CitizenSurveyReport.pdf. Accessed 10/7/2013.

[14] http://infotel.ca/newsitem/Ajax-would-make-low-grade-smokers-out-of-children/IT2909. Accessed 4/7/2013.

[15] Author's calculation based on the information in City of Kamloops (2010b).

2015, and 50% by 2050; (i) Reduce solid waste landfilled to 0.3 tonnes per capita by 2020 (50% reduction); (j) Ensure that the environment is in place for a diverse range of arts and cultural opportunities in the community; (k) Reduce the crime rate from 2009 levels; (l) Make the employment rate in Kamloops higher than the national average; (m) Attain an economic diversity index in Kamloops higher than the provincial and national averages; (n) Ensure that all Kamloops businesses and industries are in compliance with permits issued by the BC Ministry of Environment and other relevant agencies; (o) Achieve a life expectancy in Kamloops similar to or higher than the provincial average; (p) Attain lower rates of obesity, diabetes, cardiovascular and respiratory diseases among Kamloops residents than the provincial average; and (q) Ensure that Kamloops residents will continue to have access to a rich, varied and high-quality level of educational opportunities both within the formal school environment as well as through other programs.

It is evident that the City has an ambitious plan, and arbitrary targets to achieve for each of its chosen indicators within a certain time-frame. It is definitely a step in the right direction. However, the trade-offs or the costs to achieve these goals are not quite clear from its policy document. The city planners use 'complete' or 'incomplete' to evaluate the status of their various initiatives. Graphical presentation of time series data and publication of annual report cards could be useful for self-assessment of progress towards meeting the stated sustainability goals. Currently, there is no way of knowing whether the present state of the local economy and the QOL of the people are sustainable or not, except for the opportunity to observe the effects of local activities on some QOL/sustainability indicators.

Data Needs and the Availability of Data

For a comprehensive assessment of the QOL and to compute the GPI for Kamloops, we will need large amount of data. For example, the computation of GPI requires data on personal consumption; Gini coefficient; values of household labor, higher education, leisure time, and volunteer hours; costs of crime, commuting, and pollution; and many other indicators. Most of the data is currently unavailable. Similarly, data on all physical indicators for calculating a composite sustainability index is also not readily available at this time. Hence, our challenge is to find ways to gather that data. We will need to estimate some values from available data and information, and conduct sample surveys to fill the data gaps. The City of Leduc, Alberta (2005) used Anielski's survey method to compute the Genuine Wealth, which is a relatively more subjective measure of well-being than the GPI. It was calculated based on the scores given by 297 respondents to different indicators. The recent Ipsos-Reid (2012) survey regarding top public issues in Kamloops cost $19,500 (The Kamloops Daily News, 3/11/2012). Their sample included 400 Kamloops residents. As the published data is not adequate for a comprehensive assessment of QOL and sustainability in Kamloops based on our methodology, we will have to secure funding to complete this study.

A partial environmental assessment in Kamloops can be done based on the following statistics (Lam, 2010): (a) Kamloops has no significant use of wood, heating oil or propane. (b) Solid waste in 2007: 91,319 tonnes (6.3 lbs./person/day vs. 4.4 lbs. of municipal solid waste/person/day in the US)[16] (c) CO_2 from solid waste in 2007: 65, 277 tonnes (4.5 lbs./person/day) (d) Ground-level ozone (O_3): 37.5 ppb (EPA standard is 75 ppb)[17] (e) Fine particulate matter ($PM_{2.5}$): 4.0 $\mu g/m^3$ (EPA standard is 12.0 $\mu g/m^3$)[18]

In 2012, Kamloops had the fifth highest level of fine-particulate pollutants in British Columbia, partly because of Siberian wildfires. Kamloops downtown fine-particulates level reached or exceeded provincial objective of 8 $\mu g/m^3$ (The Kamloops Daily News, 6/6/2013). Except high level of fine-particulate pollutants due to forest fires during certain times of the year, the quality of environment in Kamloops is reasonably good based on other environmental indicators. In 2006, average air quality health index was 2.3 on a 10-point scale, which indicates 'low' health risk (Environment Canada). It may change if the proposed Ajax Mine is approved.

Following are a few other indicators that can shed light on the QOL in Kamloops (Venture Kamloops, 2013): (a) Projected economic growth rate (2009-2013): 1.0-1.9% (b) Population growth rate (2006-2011): 6.6% (c) Median residential price (April, 2013): C$354,000 (d) Average single income: C$26,077 (e) Water quality: C$48.5 million state-of-the-art water treatment plant provides high-quality water (f) Recreation facilities: Art gallery, museums, live theatres, Wildlife Park, WHL hockey team, 82 parks, etc. (g) Canada's Tournament Capital:

[16] http://www.epa.gov/osw/nonhaz/municipal/pubs/MSWcharacterization_508_053113_fs.pdf. Accessed 7/7/2013. The amount of solid waste in Kamloops has now dropped to about 3.6 lbs./person/day according to City of Kamloops sources (City of Kamloops, 2010b).

[17] http://www.epa.gov/region1/airquality/. Accessed 7/7/2013.

[18] http://www.epa.gov/pm/actions.html. Accessed 7/7/2013.

Economic impact – C$11.2 million (h) Institute of higher education: Thompson Rivers University (i) Crime rate per 1,000 people in 2011: 108 (Kamloops This Week, 27/1/2012)

The above data portrays the picture of a descent QOL in this small town. However, it is only a partial picture. Our challenge in this project is to find data for a complete QOL assessment.

One local initiative is worth-mentioning here. An 11-year long project, funded by the Community-University Research Alliance (CURA) program, aimed at mapping quality of life and the culture of small cities, ended in 2012. It involved research on arts, culture, and a few QOL indicators in several small cities including Kamloops. Clearly, the focus of this initiative was on partial QOL assessment rather than a comprehensive QOL and sustainability assessment in a small city.

In this paper, we have identified the challenges in measuring QOL and sustainability in a small city. In the follow-up paper, we will list all indicators for a comprehensive QOL assessment in Kamloops based on the methodology described above; gather data from all available sources and present them; identify the exact data gaps; and provided that funding is obtained we will conduct surveys to fill the data gaps for a complete analysis of QOL and sustainability in Kamloops.

CONCLUSIONS AND FURTHER EXTENSIONS

This paper shows the diversities and variations of indicators by presenting a sample of QOL and sustainability indicator initiatives. In the follow-up paper, we will try to make a comprehensive list of indicators for Kamloops based on popular global, national, regional and local indicator initiatives using our methodology, which is quite robust. In our methodology, several techniques are recommended to compile and present the data. In absence of any hard data, indicator values are often estimates; and therefore, use of multiple methods is justified. One method will serve as a correcting measure for another method. Unlike other indicator initiatives, we will not only compute the values of the QOL indicators, we will also determine the sustainability of the QOL. A cost-benefit type decision rule will be used for sustainability assessment. Several composite indices will be computed and compared.

The biggest challenge for QOL measurement and assessment in a small city is the non-availability of required data. The data limitation has to be overcome for a complete QOL and sustainability assessment. It will require the collection of data from sample surveys and the estimation of some indicators based on available secondary data. The significance of this methodology paper is nonetheless important. It gives a framework for selecting indicators, and assessing the QOL and sustainability in Kamloops. Once completed, it is expected that the findings of this project will help the city planners make Kamloops a better place to live.

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