City of Westminster Livability Index

An Interactive Qualifying Project Report

For the London Project Site

Submitted to the Faculty
of the

WORCESTER POLYTECHNIC INSTITUTE

By

Adam Carmichael

Denise Gleason

Ryan Lehrmitt

Christopher Luppino

Date: 23 February 2007

Approved:

Professor Joel J. Brattin, Advisor

Professor Joseph D. Petruccelli, Advisor

Abstract

This report outlines the roadmap for constructing a composite livability index for the Westminster City Council to assist with improvement of the council's services. Through our research and interviews concerning the development of livability indices, we created an environmental sub-index and an outline for an overall composite index for the city. We conclude that our project provides a communication tool for the City Council to enhance council services, which will in turn improve the quality of life of its constituents.

Authorship Page

Abstract	**Author: Christopher Luppino** **Primary editor: Ryan Lehrmitt** **Editors: All**
Executive summary	**Author: Christopher Luppino** **Primary editor: Denise Gleason** **Editors: All**
Introduction	**Author: Ryan Lehrmitt** **Primary editor: Denise Gleason** **Editors: All**
Background	**Author: Denise Gleason** **Primary editor: Christopher Luppino** **Editors: All**
Quality of life	**Author: Denise Gleason** **Primary editor: Christopher Luppino** **Editors: All**
Sustainability	**Author: Denise Gleason** **Primary editor: Adam Carmichael** **Editors: All**
Livability in Great Britain and Westminster	**Author: Denise Gleason** **Primary editor: Adam Carmichael** **Editors: All**
Livability index	**Author: Ryan Lehrmitt** **Primary editor: Denise Gleason** **Editors: All**
General construction of a livability index	**Author: Adam Carmichael** **Primary editor: Denise Gleason** **Editors: All**
Indicators	**Author: Adam Carmichael** **Primary editor: Ryan Lehrmitt** **Editors: All**
Subjective vs. objective indicators	**Author: Adam Carmichael** **Primary editor: Ryan Lehrmitt** **Editors: All**
Selection of indicators	**Author: Adam Carmichael** **Primary editor: Christopher Luppino** **Editors: All**
Data collection	**Author: Christopher Luppino** **Primary editor: Adam Carmichael** **Editors: All**
Qualitative data	**Author: Christopher Luppino**

	Primary editor: Adam Carmichael **Editors: All**
Quantitative data	**Author: Christopher Luppino** **Primary editor: Ryan Lehrmitt** **Editors: All**
Data analysis	**Author: Denise Gleason** **Primary editor: Ryan Lehrmitt** **Editors: All**
Construction of an index	**Author: Denise Gleason** **Primary editor: Christopher Luppino** **Editors: All**
Technology	**Author: Christopher Luppino** **Primary editor: Denise Gleason** **Editors: All**
Dashboards	**Author: Christopher Luppino** **Primary editor: Adam Carmichael** **Editors: All**
Geographic Information System	**Author: Christopher Luppino** **Primary editor: Ryan Lehrmitt** **Editors: All**
Applications: Composite use	**Author: Christopher Luppino** **Primary editor: Denise Gleason** **Editors: All**
Applications: Combination	**Author: Christopher Luppino** **Primary editor: Ryan Lehrmitt** **Editors: All**
Popularity of GIS	**Author: Christopher Luppino** **Primary editor: Denise Gleason** **Editors: All**
Cold Fusion	**Author: Christopher Luppino** **Primary editor: Adam Carmichael** **Editors: All**
Microsoft Excel	**Author: Adam Carmichael** **Primary editor: Christopher Luppino** **Editors: All**
Methodology	**Author: Ryan Lehrmitt** **Primary editor: Christopher Luppino** **Editors: All**
Background research	**Author: Christopher Luppino** **Primary editor: Adam Carmichael** **Editors: All**

Interviews	**Author: Denise Gleason** **Primary editor: Ryan Lehrmitt** **Editors: All**
Indicator selection and data sources to support each indicator	**Author: Denise Gleason** **Primary editor: Christopher Luppino** **Editors: All**
Scoring system	**Author: Adam Carmichael** **Primary editor: Denise Gleason** **Editors: All**
Solving geographical boundary issues	**Author: Ryan Lehrimitt** **Primary editor: Adam Carmichael** **Editors: All**
Selection of sub-indices	**Author: Christopher Luppino** **Primary editor: Ryan Lehrmitt** **Editors: All**
Weighting schemes for combining the sub-indices	**Author: Adam Carmichael** **Primary editor: Christopher Luppino** **Editors: All**
Results and Discussion	**Author: Ryan Lehrmitt** **Primary editor: Denise Gleason** **Editors: All**
City Survey	**Author: Ryan Lehrmitt** **Primary editor: Denise Gleason** **Editors: All**
Scoring system for sub-index	**Author: Adam Carmichael** **Primary editor: Ryan Lehrmitt** **Editors: All**
Presentation	**Author: Adam Carmichael** **Primary editor: Ryan Lehrmitt** **Editors: All**
Feedback	**Author: Adam Carmichael** **Primary editor: Christopher Luppino** **Editors: All**
Information Sheet	**Author: Denise Gleason** **Primary editor: Adam Carmichael** **Editors: All**
Conclusion	**Author: Ryan Lehrmitt** **Primary editor: Adam Carmichael** **Editors: All**
Overall composite index	**Author: Adam Carmichael** **Primary editor: Christopher Luppino** **Editors: All**

Environmental sub-index	**Author: Christopher Luppino** **Primary editor: Denise Gleason** **Editor: All**
Current situation of Westminster City Council	**Author: Denise Gleason** **Primary editor: Ryan Lehrmitt** **Editors: All**
Summary	**Author: Denise Gleason** **Primary editor: Christopher Luppino** **Editors: All**
Recommendations	**Author: Denise Gleason** **Primary editor: Ryan Lehrmitt** **Editors: All**
Recommendation one	**Author: Ryan Lehrmitt** **Primary editor: Denise Gleason** **Editors: All**
Recommendation two	**Author: Ryan Lehrmitt** **Primary editor: Adam Carmichael** **Editors: All**
Recommendation three	**Author: Adam Carmichael** **Primary editor: Christopher Luppino** **Editors: All**
Recommendation four	**Author: Adam Carmichael** **Primary editor: Denise Gleason** **Editors: All**
Recommendation five	**Author: Denise Gleason** **Primary editor: Ryan Lehrmitt** **Editors: All**
Recommendation six	**Author: Christopher Luppino** **Primary editor: Adam Carmichael** **Editors: All**
Recommendation seven	**Author: Christopher Luppino** **Primary editor: Ryan Lehrmitt** **Editors: All**
Recommendation eight	**Author: Adam Carmichael** **Primary editor: Christopher Luppino** **Editors: All**
Recommendation nine	**Author: Adam Carmichael** **Primary editor: Christopher Luppino** **Editors: All**
Recommendation ten	**Author: Adam Carmichael** **Primary editor: Denise Gleason** **Editors: All**

Acknowledgments

Professor Joel J. Brattin
Professor Joseph D. Petruccelli

Martin Whittles
Rachel Wood
Leo Kearse
Nicola Essex
Dave Pettitt
Damian Highwood
Jacqueline Clayton
Adam Taylor
Sarah MacMahon
Lisa Lawrenson
Henrietta Curzon
Michael Begley
Dennis Beveridge

Table of Contents

List of Figures

List of Tables

1 Executive Summary

In order to improve the quality of life for the residents and non-residents for the City of Westminster, we developed an environmental sub-index as well as a roadmap for an overall composite index, which will serve as a communication and planning tool to assist with the City Council services.

To understand the history of livability indices, we researched multiple communities that have developed livability indices over time. In addition, we contacted various individuals who have experience in this field, such as Andrew Tice who assisted in creating an index in Birmingham, England and Sarah McMahon who created the index in Bristol, England. From our background research and interviews, we gained a large amount of knowledge on the process of creating a livability index, and applied it to our methodology to create such an index.

To begin creating an environmental sub-index, we sought to verify the availability of data to support the indicators that comprise the index. Through contact with the Westminster City Council, we gained access to numerous databases that housed various types of relevant information. We utilized these databases to compile pertinent information regarding the environment and selected appropriate indicators for this sub-index. Moreover, through our contact with the Westminster Crime and Policy Department, we created a scoring system by modeling the Westminster CivicWatch's method of scoring indicators. We chose this scoring system to keep our index consistent with this existing index in the City Council, and because CivicWatch's index has a number of beneficial qualities that applied to our project, for example, the members of the Crime and Policy Department currently use this index as a communication tool to improve their services. In this system, we formulated the outcome, impact, and effort scores to gauge each indicator. We based the calculations of these scores on public perception, percent change of complaint data over time, and number of work orders. We explain these calculations in detail in subsequent sections.

While examining the various data accessible within the databases, we compiled the available indicators into seven distinct categories that the City Council could potentially use for the overall composite index. These categories are environment, crime,

transport, health and well-being, housing, education, and economy, which are the fundamental elements of a successful livability index.

In creating our sub-index and our composite index, we encountered difficulty in creating common geographical areas over which to compare the data due to differences in department policies. To overcome the geographical boundary issue, we used postcodes as well as population percentages to create uniform geographical areas that both the environmental sub-index as well as the overall composite index could utilize.

After developing a preliminary model of our index, we sought the comments of many of the people throughout the City Council who would be using the index for communication and policy planning. We received feedback from officials in the Transportation Department, Crime and Policy Department, Cleansing Department, and Communication and Policy Department. Their responses assisted us in revising our model to fit the City of Westminster's needs of flexibility and easy update of the index. Their insight also allowed us to recognize the deficiencies in our index of which we were not aware.

To present our index to the City Council, we created visual templates of the overall composite index, as well as the environmental sub-index. We shared these templates with an officer from the Information Technology Department and discussed the potential uses of the index with such tools as a dashboard, as well as Geographic Information Systems (GIS) maps for displaying the information.

Finally, we provided recommendations to the City of Westminster that highlighted our research gaps where additional development of the index could take place. We also recommended that the city account for the locations throughout the city that may skew the results of the index, due to a disproportionate amount of visitors. Most importantly, we recommended that the City of Westminster continue to develop this index in order for the city to provide better services and to increase the quality of life for the City of Westminster's residents.

2 Introduction

People throughout the world expect their local, state, and federal governments to improve the social, economic, and environmental conditions within their jurisdictions. To this end, government officials and academic researchers have sought to develop various indices in order to gauge progress, to make comparisons between and among different cities, regions, and countries, and to measure the impact of government policies. A livability index is a system that monitors quality of life for a given environment using carefully selected social, economic, and environmental indicators. These indicators ultimately help to measure different aspects of society. While there is a consensus that improving quality of life at any geographic scale is a laudable goal, there is no consensus about what constitutes the most appropriate index or set of indices (Felce, D., & Perry, J. 1996). Consequently, there is now a veritable cottage industry for the development of such quality of life or livability indices. The promulgation of policies such as the United Nations Agenda 21 and calls from leaders such as British Prime Minister Tony Blair promote this industry for greater attention to quality of life issues.

In order to increase livability, the City of Westminster initiated its One City plan, which aims to improve the city's services over the coming years. This plan will serve to improve the city for its residents and businesses, as well as its many visitors. The plan stresses the importance of focusing resources on the neighborhood level and challenges the City Council to be more responsive to neighborhood needs. As a supplement to the neighborhood theme in the One City plan, the Westminster City Council has embarked on a livability index project. The City Council would greatly benefit from an index that uses an essential set of indicators to monitor and display the conditions of the twenty smaller geographical sections (wards) within the city. These indicators must accurately represent the social, environmental, and economic needs of the community. Communities who create livability indices frequently will not create new indicators, but use existing data and information and apply them to the subject of livability. If used properly, communities can measure the quality of life in a region and monitor fluctuations over time using a livability index. By monitoring these important indicators, policy makers and officials can make better-informed decisions about how to address problems within their domains.

The goal of this project is to assist with improvements of the city council's services by developing a model for a composite livability index. We created a sub-index for environmental aspects of livability and integrated this sub-index into a single composite index. We then devised an appropriate interface to display our results. We conducted an extensive review of literature concerning livability indices (see Section 3 below) to determine some of the important parameters that we needed to consider in developing such an index. In addition we:

- Conducted a review of existing models used elsewhere in the world to see what lessons there are to learn from previous experience, particularly in the area of combining indicators.
- Studied the uses of GIS and other interfaces to understand their potential uses with a livability index.
- Interviewed City Council officers and other essential people in the council to characterize community needs concerning the environment and its associated indicators. These interviews provided insight as to the expectations of local officials concerning a livability index.
- Interviewed experts in the council to help determine the appropriate indicators for individual sub-indices.
- Used the information we obtained to develop a sub-index representing environmental issues and to create a model for combining a series of sub-indices into one composite index.
- Used comments from the pilot index to make recommendations about how the City of Westminster might develop additional indices.

With all of the above factors considered, we produced an index that serves as a model for the development of a comprehensive index. Our analysis will give the city insight into approaching the topic of livability. This project provides an organizational and planning tool for the City of Westminster. Ultimately, our livability index will serve to monitor the condition of the city and allow councilors to assess the city's services. Furthermore, a livability index will allow city councilors to make policy decisions

according to the patterns and trends that the index identifies. The councilors' actions will lead to an enhanced quality of life within the community.

3 Background

Creating a livability index is a complex and difficult process, involving several steps. In order to generate a livability index, we needed to examine and understand several subjects. These subjects include: the concept of quality of life, the definition of a livability index, the construction of a livability index, the selection of indicators, appropriate interfaces for presenting an index, and the advantages and disadvantages of using a particular livability index in a community. We investigated different methods and criteria for selecting indicators, methods for developing composite and multiple indices, examples of successful and failed indices in the past, and the effectiveness of using different interfaces with an index. We used this information as a foundation for developing a livability index for the City of Westminster.

3.1 Quality of Life

Individuals and communities strive to improve quality of life. Economists and other social scientists have devised a series of measures that allow researchers to compare standards of living and quality of life among different communities and to track changes over time. Unfortunately, there is considerable confusion in the definition of and the creation of livability indices.

In the first half of the nineteenth century, researchers measured quality of life in terms of economic statistics because they believed "the quality of life of any individual or community can in a direct and simple way be related to income" (Cummins, Eckersley, Pallant, Vugt, and Misajon, 2003). This materialistic idea of quality of life led to the creation of the Gross Domestic Product (GDP) as a primary economic indicator in 1930. Researchers used the GDP to equate the quality of life of a region with economic aspects such as the market values of goods and services produced (Cummins, Eckersley, Pallant, Vugt and Misajon, 2003).

In the 1960s, researchers began to realize that the simple measures of economic performance, such as GDP, did not truly measure the quality of life. This is because

officials created the GDP to compute the gross income of nation, and not to measure the well-being of a population. Consequently, researchers began to incorporate other social indicators to measure quality of life such as levels of education, crime rates, and demographics. Cummins, Eckersley, Pallant, Vugt, and Misajon explained that some researchers argued that quality of life was a much more complex, multi-faceted concept and urged the incorporation of even more qualitative indicators, such as levels of happiness and satisfaction.

On 18 November 1992, senior scientists from seventy different countries sent an urgent warning about the environmental crisis to the United Nation Conference, also known as the Earth Summit, in Rio de Janeiro, Brazil. After this meeting, countries began to increase their focus on how the environment influences people's lives. For example, experts began to consider air quality as an important aspect in quality of life. This idea influenced researchers to measure quality of life not only with social and economic measures but also with environmental measures such as air quality, street cleanliness, and waste management.

Hence, there are various opinions of how to assess quality of life because each person has different values on the important aspects of one's life. For example, one person might consider quality of life as good health, clean environment, and happiness while another person might consider it as wealth, good health, and an excellent education. N.B. Wish (1986) describes the complexity of defining quality of life in saying, "there are as many quality of life definitions as there are people." Therefore, it was important to have a firm grasp on what quality of life meant to the City of Westminster before we created the livability index.

3.2 Sustainability

The Earth Summit in 1992 brought focus to the idea of sustainability. There is no precise definition for sustainability due to differences in politics and values. However, researchers generally agree that sustainability "is a process of continually improving the way we live in order to respect the reality of limits, whether those limits are imposed by nature or embraced voluntarily by people living together in cooperation" (Sustainable Seattle, 2004). Therefore, sustainability "is more a direction than a destination"

(Sustainable Seattle, 2004). The recent emphasis on sustainability has increased the attention given to quality of life; “sustainability is related to the quality of life in a community -- whether the economic, social and environmental systems that make up the community are providing a healthy, productive, meaningful life for all community residents, present and future” (Hart, 2006).

3.3 Livability in Great Britain and Westminster

In Great Britain, achieving a livable environment has been a primary focus in local government since the central government of Great Britain adopted Agenda 21 at the 1992 Earth Summit in Rio de Janeiro. Agenda 21 “is aimed at reversing the negative impact of human behavior on the environment and promoting sustainable development in all countries” (Cornwall County Council, 2006). In 1997, Tony Blair, the British Prime Minister, announced that “each local authority has had to draw up its own Local Agenda 21 (LA21) strategy following discussion with its citizens about what they think is important for the area by 2000” (Local agenda 21, 2006). The Local Agenda 21 strategy required the local authorities to build practical plans to promote the social, economic, and environmental well-being of their local community in order to improve the quality of life in their local area. Thereafter, many cities in Britain began to search for methods to measure quality of life in their communities so that they could measure their progress toward achieving the goals of Local Agenda 21.

The City of Westminster adopted the Local Agenda 21 Strategy in 2000, and committed itself to looking for ways to improve the standard of living in the borough (Local Agenda 21, 2006). The City of Westminster occupies a prominent position in the public eye and seeks to fulfill its obligations under Agenda 21.

Different departments within the City Council are currently adopting ways to enhance the livability in the City of Westminster in accordance with Agenda 21. The Crime and Policy Department created CivicWatch, a program that monitors and records various anti-social behaviors throughout the city. The City Council itself created Area Forums in which residents could voice their opinions about the quality of their neighborhood.

Although both these separate entities tried to improve the quality of life in Westminster, their programs did not share common geographical area boundaries. The difficulty this lack of common boundaries creates resulted in problems for City Council employees who wished to monitor livability programs in more than one system.

The first map, Figure 1, contains the geographical ward boundaries in the City of Westminster:

Figure 1. City of Westminster Ward Boundaries

Source: City of Westminster Information Technology Department

However, both the Area Forums and CivicWatch programs used different geographical area boundaries as seen in Figure 2 and Figure 3:

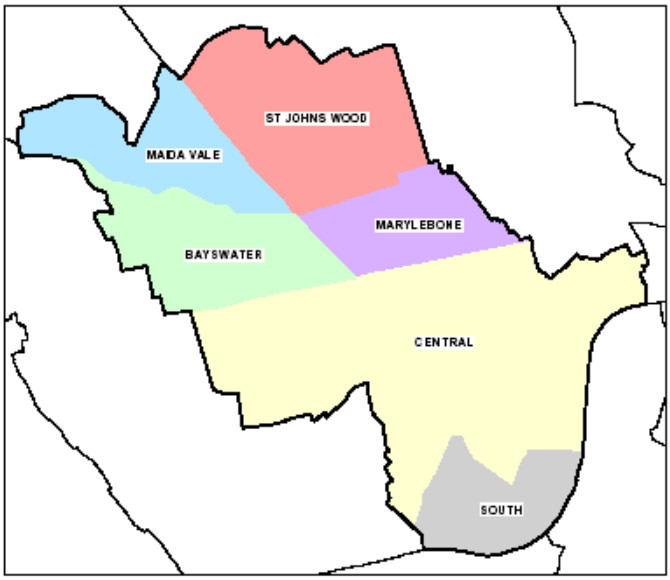


Figure 2. Westminster Forum Areas

Source: Westminster City Survey 2005

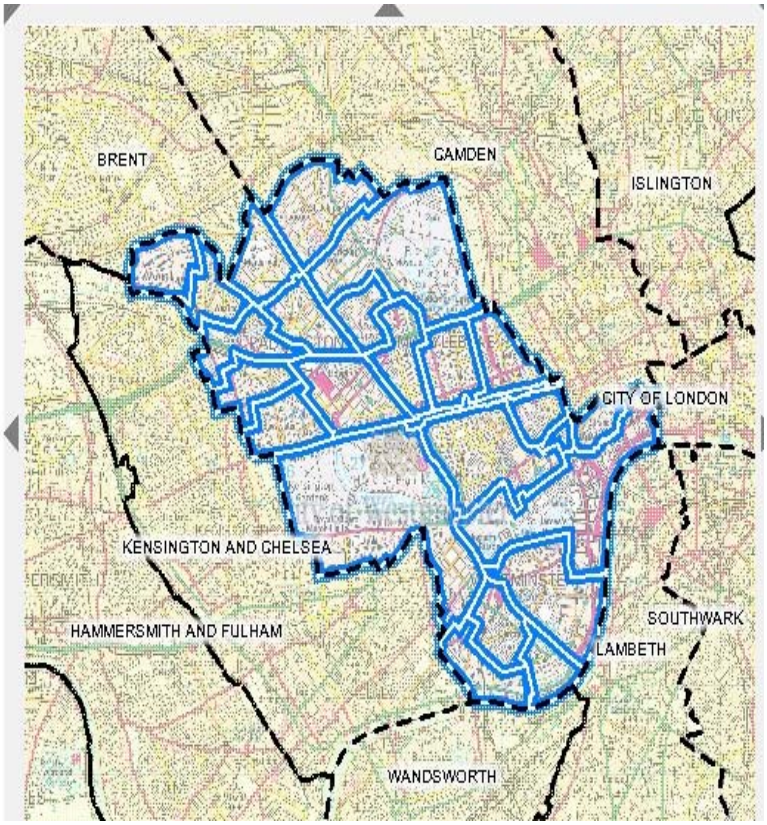


Figure 3. CivicWatch Areas

Source: Westminster Policing and Public Safety Department

A comparison of these three maps clearly shows that different boundaries exist throughout the city for each respective department.

3.4 Livability Indices

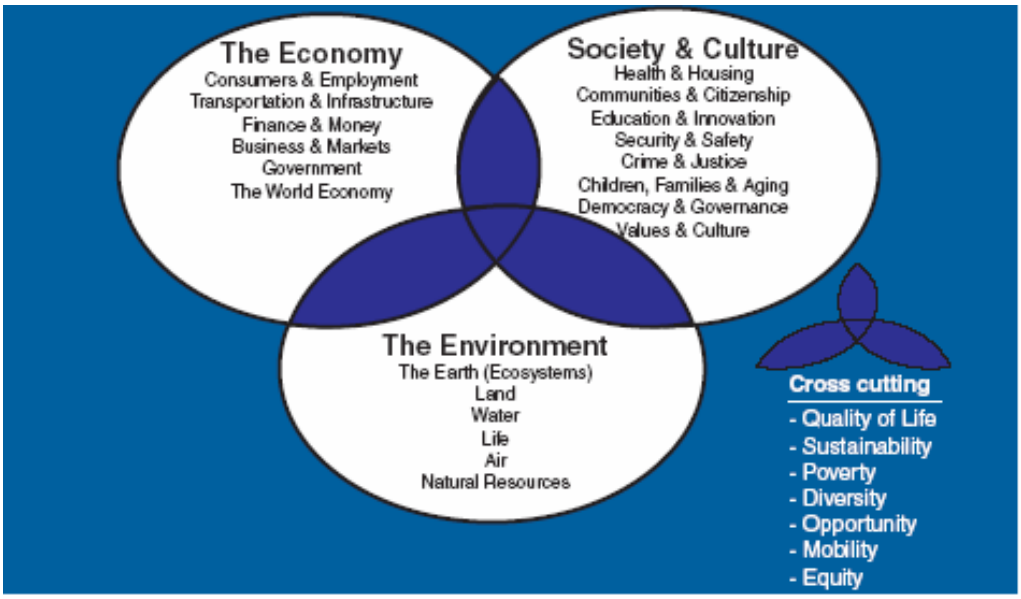
Many communities use livability indices to monitor and communicate their progress in the achievement of particular social, economic, and environmental goals for a particular geographical area. Communities measure this progress using a carefully selected set of indicators that they monitor over a period of time. Administrators can use such data to monitor the fluctuations of socially significant indicators. The fluctuations provide the administrators with vital information about the condition of the selected area; consequently, a livability index is "something other than the gathering of indicators; it aims at providing a direct contribution to policy intervention" (Hortulanus, 1999). Livability indices allow policymakers and officials, as well as ordinary citizens, to gauge progress. They are communication tools that can exhibit the improvement of a given aspect in society as well as distinguish problem areas. The creation of a livability index is an "organized effort to assemble and disseminate a group of indicators that together tell a story about the position and progress of a jurisdiction or jurisdictions" (United States Government Accountability Office, 2004). Livability indices provide information that supply officials with more insight into the dynamics of their constituency and allow officials to create policy accordingly.

3.5 General Construction of a Livability Index

One creates a livability index by combining a list of carefully selected indictors that communicate quality of life and presents them to the intended audience. The purpose of an index is to communicate data in such a way that it encourages the government to implement appropriate legislation. Therefore, the first step of constructing an index is to analyze the demographics of the community. The following step is to select potential indicators. After one selects the indicators, it is necessary to examine methods of integrating them into a format that will communicate the level of quality of life for the particular region. The ability of an index to communicate to its intended audience relates to how accurately the audience perceives the information within the index.

3.5.1 Indicators

An indicator is “a measurement that reflects the status of some social, economic, or environmental system over time. Generally, an indicator focuses on a small, manageable, tangible, and telling piece of a system to give people a sense of the bigger picture’’ (Redefining Progress, April 2002). Meaningful and useful indicators reflect both desirable and measurable outcomes. Indicator creators expect the indicators to simplify complex data sets and provide a clear perspective of the bigger picture. Indicators communicate trends in a community and provide an opportunity for a community to make essential changes. Without indicators, quantitatively measuring the progress of a community and make the necessary changes to improve the council’s services is impossible. Figure 4 illustrates a number of indicator topics under the larger domains of economy, environment, and society and culture. The area linking the larger domains, highlighted in blue, represents common issues the domains share, such as opportunity, diversity, and sustainability.



Source: GAO.

Figure 4. Possible Topics for Indicators

3.5.1.1 Subjective vs. Objective Indicators

Objective indicators represent social data, whereas subjective indicators are an individual’s evaluation of social conditions. In the initial stages, researchers measured quality of life primarily using objective indicators. However, through studies in the

1970s, these indicators proved to encompass a small portion of people's perspectives of well-being (Haas, 1999). Henceforth, the use of indicators related to satisfaction and happiness began to aid in the assessment of quality of life. Table 1 lists examples of frequently used objective and subjective indicators.

Frequently used objective social indicators (represent social data independently of individual evaluations)	**Frequently used subjective social indicators** (individuals' appraisal and evaluation of social conditions)
Life expectancy	Sense of community
Crime rate	Material possessions
Unemployment rate	Sense of safety
Gross Domestic Product	Happiness
Poverty rate	Satisfaction with "life as a whole"
School attendance	Relationships with family
Working hours per week	Job satisfaction
Perinatal mortality rate	Sex life
Suicide rate	Perception of distributional justice
	Class identification
	Hobbies and club membership

Table 1. Objective and Subjective Indicators

Source: Quality of Life and Well-being, 2005

Many composite indices of quality of life use a combination of subjective and objective indicators. There is a growing consensus around the world that such approaches balance the strengths and weaknesses of the different indicators and provide a better measure of quality of life in a region (Quality of Life and Well-being, 2005). Quality of life (QOL) is a multifaceted attribute that researchers cannot adequately represent, as seen in EUROMODULE, "One example is EUROMODULE, a cross-national research initiative in the social indicators tradition involving research teams from nineteen European nations. It uses national social surveys to collect comparative data on living conditions, welfare and QOL, and accords equal weight to objective and subjective indicators" (Quality of Life and Well-being, 2005).

It is important to assess quality of life using a variety of indicators. Although subjective and objective indicators are relatively independent of one another, one should use both types of indicators together to assess the quality of life in order to gain an accurate representation of the well-being of a given area.

3.5.2 Selection of Indicators

Communities select indicators in a variety of ways. Many communities that developed a livability index construct a preliminary list of indicators using focus groups, "A focus group is a form of qualitative research in which a group of people are asked about their attitude towards a product, service, concept, advertisement, idea, or packaging" (Focus Group, 2006). The attitudes and opinions within these focus groups help to identify the necessary indicators. The focus groups produce data lists by expressing what is important to the groups. Focus groups often use a preliminary list as a guide and allow members to focus on important issues in their community. For example, Seattle, Washington, used focus groups to create a potential list of two hundred indicators. A group of citizens in Minnesota developed a list of potential indicators for a livability index roughly the same way. This index consisted of seventy indicators and the researchers from Minnesota categorized them into four different categories: people, environment, community, and economy.

Once a community has compiled a potential list of indicators, it then refines the list. Many of the communities that developed indices used similar sets of guidelines to select the most important indicators. For example, in the United States the following locations: Jacksonville, Florida, Glenn Cove, New York, Baltimore, Maryland, and Seattle, Washington all used similar guidelines to select their indicators. See Appendices B and C for relevant examples. Jacksonville's guidelines include credentials such as: purpose, importance, validity, relevance, responsiveness, anticipation, understandability, availability, stability, outcome orientation, asset orientation, scale, clarity, and representative ability. In order to gain a full understanding of the selection process, one needs to look at the general guidelines that most communities use.

An indicator's purpose is to contribute to the measurement and the comprehension of a given community's well-being. Appendices D, E, F, and G give sample lists of indicators. These lists gave us a basis for the initial selection of indicators for the City of Westminster.

Importance is an essential characteristic of an indicator. The indicator should measure an aspect of quality of life, which the community, as well as experts, agrees is important. Some type of surveying or interviewing process usually measures importance

of an indicator. Appendix H provides an example of possible survey questions that researchers could use to assess the community's opinion. This survey asks the person to pick one of two options to represent importance when picking a place to live. Each option represents a domain within that community. Such domains include the environment, economy, and the transportation system. This survey then gives the researcher an idea as to what domains are most important to the people of that community which then allows the researcher to focus on selecting indicators in those particular domains.

In addition, the leaders of a community may influence the choice of indicators, and in many communities, opinions of leaders may take the primary role in the selection of the indicators. For example, Seattle, Washington selected leaders from environmental, government, educational, religious, and business groups to serve on a Civic Panel that was responsible for the review and selection of indicators (Sustainable Seattle, 2004 and Bristol City Council).

Validity is a valuable trait in an effort to track trends. If the trend line of an indicator were to move up or down, a diverse selection of individuals from the community would have to agree whether quality of life is really improving or declining. The community must come to an agreement in order to produce an effective trend analysis. Oftentimes communities have extensive diversity, which makes it difficult to justify validity of certain indicators. The traffic density on a street would be an example of an indicator that produces a diverse opinion concerning the measurement of quality of life. Most people would perceive lower density as improved quality of life. However, someone such as a shopkeeper on that particular road would perceive it as a decrease in quality of life because an increase in density is beneficial to a shopkeeper. A sample with a high percentage of business owners in turn could skew the results as to what the community felt as a whole regarding traffic density for their area. Therefore, it is always important to keep in mind the history of one's data in order to understand the composition of an indicator's score.

Indicators must be relevant to measure a community's quality of life. The index's ability to communicate trends enables the production of positive changes through public actions and decision-making. The community should be able to alter the underlying

variable or condition that the indicator measures, through such changes as innovative laws, altered distribution of funds, or public action.

A high-quality indicator should monitor city conditions in order to aid city officials in anticipating and accommodating for future trends in the attributes index. With strong indicators, a government has the ability to create positive change (What makes a good indicator, 2002).

Indicators must have the ability to communicate quality of life issues to the majority of citizens. People of the community need to be able to relate indicator trends to their own lives, that allow them to make constructive changes.

When collecting data for indicators, one must consider the availability and consistency of the data. The levels of availability and validity of data can often limit which indicators a community can use. Weak data sources can inhibit indicators from aiding a government in monitoring important trends.

When an indicator meets all the guidelines, one considers the indicator as a valid measure of quality of life for a given community. The conditions of quality of life change from community to community due to diversity. Therefore, it is important for the community to have the ability to readjust and change the indicators periodically.

3.5.3 Data Collection

There are two main types of data to consider when creating a livability index: qualitative and quantitative. Both types of data have advantages and disadvantages. Researchers usually collect qualitative data when they use subjective indicators and quantitative data when they are researching objective indicators. In both instances, the accuracy of the data is essential. Therefore, researchers who use data must ensure data collectors used a random sampling method in gathering the data to ensure the data contains minimal biases.

3.5.3.1 Qualitative Data

Qualitative data is “data that are difficult to measure, count, or express in numerical terms” (U.S. Environmental Protection Agency, 2006). In regards to a livability index, one can associate this type of data with opinions of residents on a

specific issue in a neighborhood or an attitude that a number of residents possess concerning a perceived important issue. Many times, as researchers record this data, it is very difficult to organize and decipher because of all of the variations that can occur. In most cases, researchers make the mistake of trying to break down the qualitative data into data that one can measure through "symbolic numerical representations" (Qualitative Research Methods, 37). Bruce L. Berg believes once researchers convert the data into the numerical representation, the data researchers are working with is no longer qualitative, but quantitative (Qualitative Research Methods, 37).

3.5.3.2 Quantitative Data

Quantitative data is information that "can be expressed in numerical terms, counted, or compared on a scale" (U.S. Environmental Protection Agency, 2006). Typically, one would consider crime statistics, census data, and measures of pollution as quantitative data. Many communities in the United States, including Bryan, Texas and Pittsburgh, Pennsylvania, created livability indices using such quantitative data.

3.5.4 Data Analysis

There are three steps in data analysis: data preparation, descriptive statistics, and inferential statistics (Trochim, 2006). The analysis of the livability indices also follows these steps.

Data preparation involves entering information into a database structure. One checks the data for accuracy and completeness to assure that the data obtained is legible, complete, and relevant to the subject so that researchers can conduct an accurate analysis (Trochim, 2006). The researchers then enter the data into a database system to store the information for subsequent data analyses. Then, researchers check the data again in the database system to assure that errors did not occur during the entering process.

After researchers collect and prepare adequate data, descriptive analysis follows. Descriptive analysis describes the basic features of the data in a study and usually involves construction of graphs or charts and summaries of the measurements in the sample. Researchers create the graphs and charts through trend analysis, which can track a variable over time (BNIA, 2006). Examples of some communities who favor this

representation of the data are Jacksonville and the City of Bristol. These communities favor this representation because the graphical representations of the trends allow the viewers to see results in a glance, as seen in Figure 5.

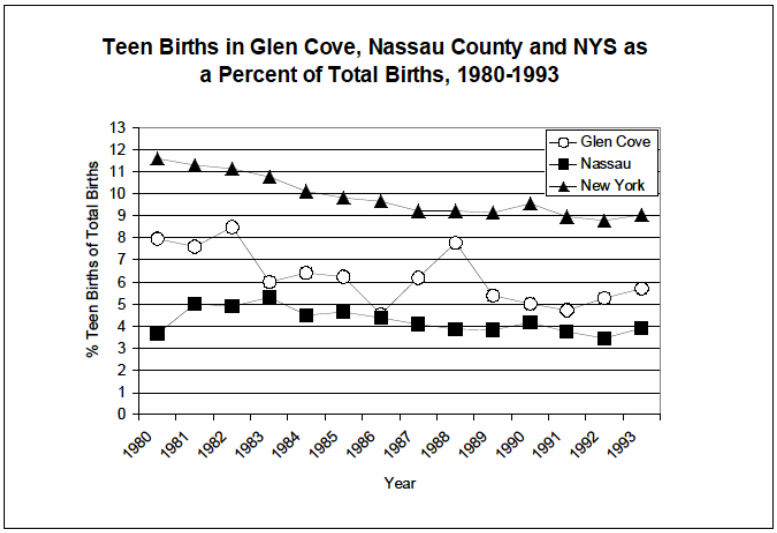


Figure 5. Teen Births in Glen Cove

Source: Quality of Life, 2005

The final process in the data analysis is inferential statistics, which is a statistical technique that many use to make inferences from the data of the subject of study. For example, the indicator project Jacksonville created used inferential statistics to demonstrate the dependency of different types of indicators on each other. Furthermore, by understanding the relationship between indicators, Jacksonville gained a better understanding of the public perception of the city.

After researchers complete all the steps of data analysis, they have sufficient results to generate recommendations for actions and policy developments. For our project, it was important to determine the best method for analyzing the data.

3.5.5 Construction of an index

The construction of an index is a crucial step in monitoring a community because it has an influence on the usability of the index. There are many types of indices, such as multiple sub-indices, single number indices, and technology based indices.

Multiple indices present the results of each indicator separately. Multiple indices work well when one wants comprehensive results of all the indicators that would help

generate a detailed analysis of the city. Furthermore, multiple indices give a better insight on public interests and concerns of the city. Multiple indices often contain graphs, charts, and summaries of the indicators. Jacksonville, Seattle, and Minnesota are some of the communities in the United States that have constructed multiple livability indices.

The City of Bristol also included an additional index that gave an overview of the results of each indicator using a traffic light symbol as seen in Figure 6. The color of the traffic light represents an improvement or decline toward reaching its goal. The traffic lights provide the viewers a quick overview on how certain council services are performing in their community (Bristol City Council).

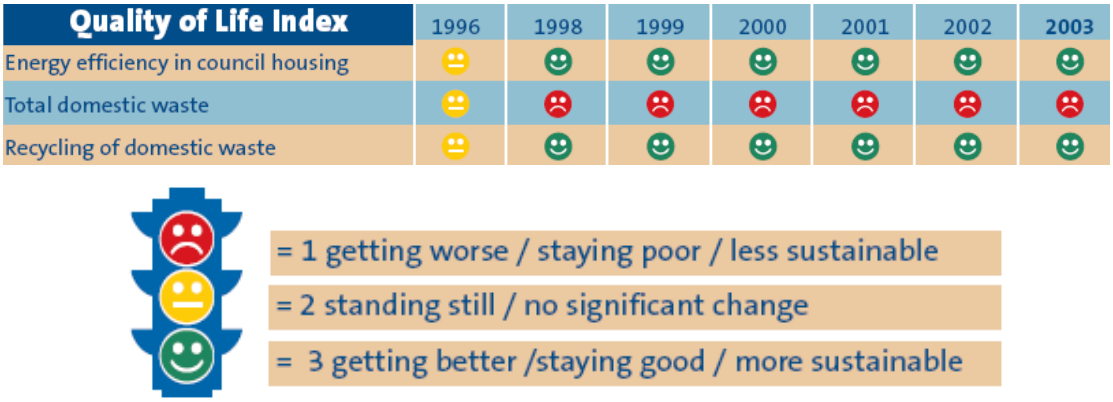


Figure 6. The city of Bristol Quality of Life Index

Source: Summary – Bristol's Quality of Life Index, 2005

The Seattle indicator project also had a similar index, in which they used arrows instead of traffic lights (Sustainable Seattle, 2004). These index presentation methods allow the users to understand quickly the overview of the general trends.

A single number index, on the other hand, uses indicators aggregated in a composite index to generate a single number summary. Moreover, communities can aggregate the indicators by themes to create a sub-index, and then they can aggregate the sub-indices to generate a single number that represents the quality of life of their community. Composite indexing works well when one wants to present an overview of the data. There are several methods to aggregate the indicators due to the different techniques of weighing indicators. The County of Larimer created clusters of indicators that had the same topic to combine and weight the indicators. This community had a cluster called Basic Need and Property; in this cluster, they included indicators such as "Rental Vacancy Rate," affordable housing indicators, among others. In each cluster of

indicators, the community officials weighted individual indicators according to their influence on government policy making. For example, government policy influences objective indicators, such as the number of people who recycle more, rather than subjective indicators, such as the number of people satisfied with the street condition. This policy is generally the case because government funding has not directly affected a community's state of mind and or perception. From here, officials equally weighted each cluster to generate a single number (Larimer County, 2004). The indicator project of the Netherlands used a statistical technique, nonlinear canonical correlation analysis (OVERALS), which is a complicated algorithm that weights each indicator. The Human Development Index, created by economist Mahbub ul Haq, used a process in which he defined goals for each indicator. Researchers then calculated the indicators by measuring the percentage of success rate. Another method communities use to analyze an index is to observe the change in the percentage of several indicators compared the results of the preceding years. After the observations, communities aggregated each indicator into an un-weighted average. Similar to this method, another technique is to not weight the indicators, and just add them together (Boelhouwer, 2002).

Furthermore, the Baltimore, Oregon, and the City of Bristol indicator projects presented their indices through integration of their results with geographic areas through Geographic Informational Systems (BNIA, 2006 and Bristol City Council).

3.5.6 Technology

We discovered a number of technological means that apply to our project. Organizations worldwide use various modes of data communication for portraying their areas of interest. Additionally, the interfaces and programs we are interested in are present within the City Council in Westminster. Within the City Council, Information Technology associates are familiar or specialize in these devices. These specific devices include dashboards, Geographic Information Systems (GIS), and presentation software such as Cold Fusion.

3.5.6.1 Dashboards

A dashboard is an interface that displays data using a variety of charts, maps, and graphs. A number of departments within the Westminster City Council utilize this type of program to provide a means of communicating and interpreting relevant information within their specific departments. A livability index could readily fit into the format of such an interface; only it would contain a much larger variety of data not exclusive to one department. The use of GIS is the prominent means of constructing the maps contained within these dashboards.

3.5.6.2 Geographic Information System (GIS)

Geographic Information System is a tool that allows users to conduct spatial analysis of geographical data (Getting Started with ArcGIS, 2005). Typically, GIS consists of four main components: a function to input and digitize maps and other geographic material, a storage system, an analysis program, and a product system that produces maps, charts, and tables for the user to examine. Robey and Sahay (1996) stated that many communities used GIS to allow governments to make decisions concerning such functions as environmental management, land-use planning, and law enforcement. In many communities throughout the world, local governments used GIS as a tool to analyze their community's strengths and weaknesses.

The local government in Bryan, Texas has incorporated GIS with a livability index project in just this fashion. City agencies in Bryan used GIS to increase the availability of particular information pertaining to quality of life that they can disseminate to the public and the city government. The information that the Quality of Life Group researched included various livability indicators and their respective data such as crime statistics in Bryan, Texas. "Parents sending their children to Texas A&M University can look up crime statistics about a specific area they are thinking of leasing or purchasing property" (Enhancing Quality of Life (QOL) with GIS). Figure 7 shows how GIS can display data, such as crime instances, spatially.

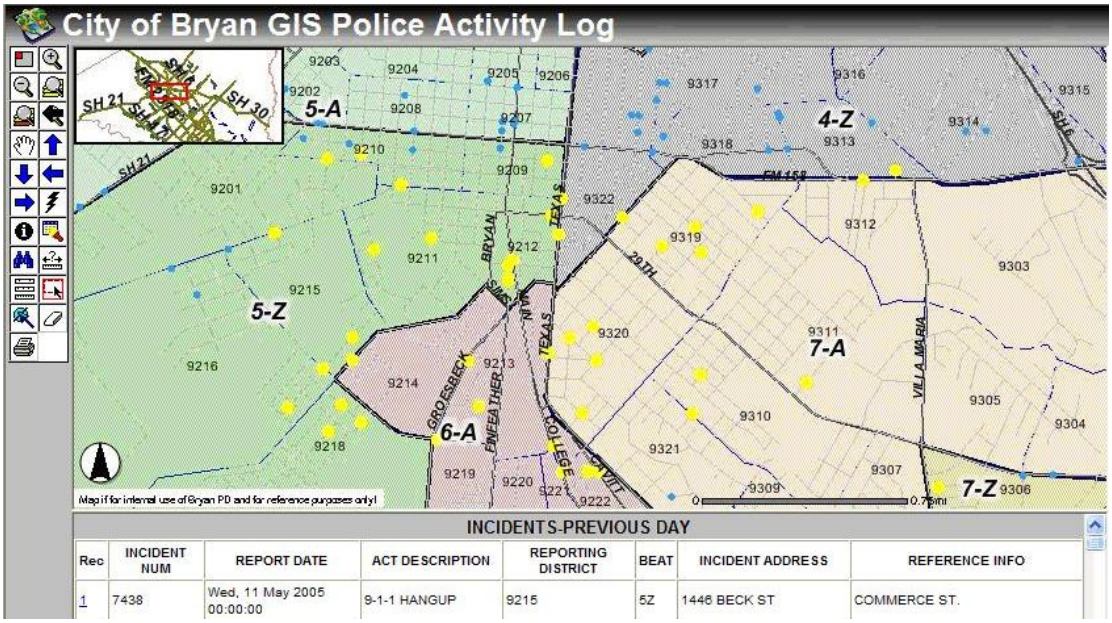


Figure 7. City of Bryan GIS Police Activity Log

Source: Police Map Service 2002

Citizens can also inspect property values, public safety buildings, and other essential information using GIS (Enhancing the Quality of Life (QOL) with GIS). City officials believe that using this system has allowed many different departments to combine their individual sets of data into a homogenous database (Enhancing the Quality of Life (QOL) with GIS).

3.5.6.3 Applications: Composite Use

A second way to display the results of a livability index is with the use of a single diagram to convey the overall "livability" of a particular community. There are few if any statistics displayed on the map. Instead, developers assign appropriate ranges of data from an index to respective colors. Once assigned, the developers shade the areas in which these statistics coincide. Finally, they create a legend allowing the user of the map to identify the areas of concern.

A prominent city that uses this method is Charlotte, North Carolina. There, the city government uses the results of their own Quality of Life Index and integrates it into GIS. For over ten years, the city has collected data on selected quality of life indicators and published the data annually. Using this information, the city planners created their own system of defining quality of life throughout the various communities. They created

broad categories in displaying the results in an easily read map using GIS: “Stable, Transitioning, and Challenging” (Stable, Transitioning, and Challenged Neighborhoods, 2006). Each level of livability has its own unique characteristic, as seen in Table 2.

Stable	These neighborhoods score well on the entire social, physical, crime, and economic dimensions.
Transitioning	These are Neighborhood Statistical Areas (NSAs) that are average on most dimensions, but also display a weakness on one or more of the dimensions. This pattern may be signaling a shift in the overall NSA quality of life. Transitional status can indicate an improving or declining position, relative to other Charlotte NSAs.
Challenged	Challenged NSAs generally have low to moderate scores on some or all quality of life dimensions. A challenged neighborhood has a lower quality of life than other communities in Charlotte and is "at risk" on multiple dimensions

Table 2. Definitions of Stable, Transitioning, and Challenged Neighborhoods

By creating these categories, city officials can easily recognize potential at-risk areas and begin to research what specific issues are of concern.

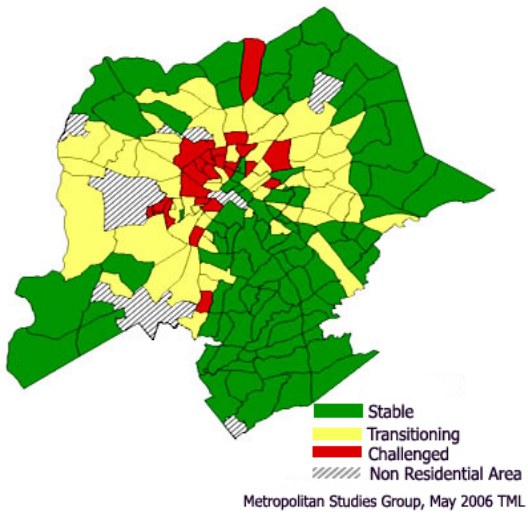


Figure 8. Charlotte Neighborhood Quality of Life Study Map

Source: Metropolitan Studies Group, 2006

The use of the colors green, yellow, and red assigned to stable, transitioning, and challenged categories, respectively, allows a user to gauge the geographical patterns in the quality of life index.

There are a number of advantages to this method of displaying a quality of life index. Most importantly, city officials and members of the public who are not proficient in GIS or statistics can understand the larger picture quickly and easily. This mode of displaying the information allows individuals to identify the topics of concern. The straightforward nature of the map is helpful to people who are not familiar with such studies. There is one disadvantage to using this method, color-coded areas of a community do not quantify trends.

3.5.6.4 Applications: Combination

Most often, communities that created livability indices used a combination of GIS maps that feature color-coded areas as well as the corresponding data on these maps. Here, GIS developers mainly take the statistical data given and create ranges for this data. From here, they assign each range of data with its own individual color.

In Oregon's effort to create a livability index, the planning agency developed color-coded maps to "compare Oregon Benchmark data for all counties" (Oregon Progress Board, 2006). So far, they created over thirty maps, each displaying a particular indicator. In Figure 9, the map displays the color-coded ranges (green to red), and a legend lists the ranges associated with the colors.

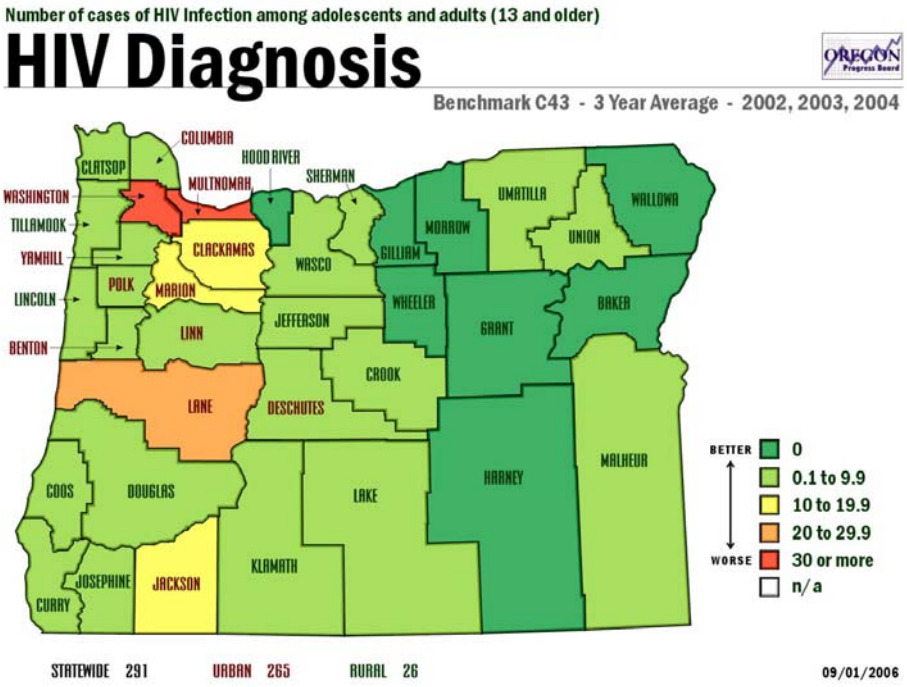


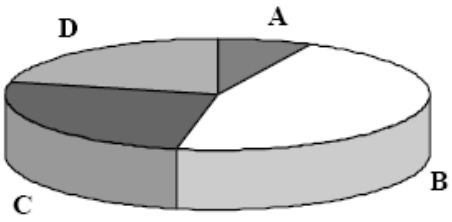
Figure 9. Oregon Benchmarks: HIV Diagnosis

Source: Oregon Progress Report 2006

There are many advantages to using this approach to convey the results of a livability index to both the city government and the city's residents. The use of various shades of color allows people to identify where areas of prosperity occur and where improvements are necessary concerning specific issues. In addition, government employees can view the specific statistics on the map to investigate further. There is a drawback to this method of conveying the results of a quality of life index. Many residents may feel that the use of color is too general a method to assess a community. (Enhancing the Quality of Life (QoL) with GIS, 2006).

3.5.6.5 Popularity of GIS

In Great Britain today, Geographic Information Systems are becoming more popular. In April 2002, Turner and Higgs (2003) found, through a survey of four hundred fifty local authorities, that the use of GIS was an important part of allowing local authorities to view information. Figure 10 displays the number of areas in city government that are using GIS.



A – GIS use restricted to a single department	7%
B – GIS used in more than one department	45%
C – GIS used in most departments	25%
D – GIS used corporately within a strategy framework	21%

GIS use within local government authorities (percentage of respondents).

Figure 10. GIS use within Local Government Authorities
Source: The use and management of geographic information in local E-government in the UK., 2003

This use of GIS is also present within the City of Westminster. There is a GIS team in the City Council that uses GIS to map information. Other departments can then interpret the maps and use the information accordingly.

3.5.6.6 Cold Fusion

Cold Fusion is a type of software that can display data and information using a variety of charts and graphs. This program generates complex and visually pleasing graphic representations of data with relative simplicity for users. Software like Cold Fusion provides a way for one to demonstrate information impressively and comprehensibly.

3.5.6.7 Microsoft Excel

This commonly used software has the ability to organize information into tables, graphs, and charts. Excel is a simple and convenient program that produces quick and impressive results in presenting data. It is always important to display data in an easily understandable fashion and Excel has the ability to do this.

4 Methodology

The main goal of this project was to assist the City of Westminster in the development of a comprehensive livability index. Time constraints forced us to develop a

pilot index that encompasses only a sub-set of the available data, such as data on environment. We chose to focus on the environmental because of the high quality data that was readily available, and due to its importance to the City of Westminster. Using the framework we constructed, Westminster can now solicit internal feedback from users that will help develop a more complete index in the future. We made recommendations to the City of Westminster based on the experience we obtained through the construction of the pilot index. One could use a livability index in Westminster developments such as the Area Information Meetings, City of Westminster statistical database, and the member grid, a type of database the city uses.

To fulfill our goal of developing a pilot sub-index our team completed the following objectives:

- Conducted a needs-assessment to determine why the City of Westminster wants a livability index, what they expect of it, and what they plan to do with it.
- Assessed the work that the City of Westminster had already done in selecting indicators or creating indices within individual departments.
- Reviewed and evaluated indices developed by other local governments to identify the advantages and disadvantages of different methods and data that our team might use in the development of livability indices.
- Determined the most appropriate methods to identify suitable weighting factors and to combine indicators into an aggregate index.

As a team, we completed the following tasks necessary to achieve these objectives:

- Continued to research archival data to understand better the City's initial intentions for creating a livability index as well as what actions Westminster had taken to develop their current set of indicators.
- Contacted other communities that had developed similar indices to determine potential problems and good ideas that we incorporated into our design.

- Conducted interviews with various important individuals within the City of Westminster, such as councilors and officers, to determine policy makers' expectations of the livability index. We used these interviews to determine both important indicators and available data.
- Interviewed experts, scholars, and local government officials to clarify what kinds of data one may use to characterize environment, as well as to provide insight into the importance and weighting factors of individual indicators.
- Analyzed the information compiled to obtain a clearer view on individual geographical areas' priorities as well as the significance of different indicators to the entire city.
- Constructed a pilot model using all of the pertinent information.
- Obtained feedback and suggestions from those who will use the model.
- Implemented these suggestions into the revisions to the model.

The completion of these tasks provided a sufficient amount of information to develop an acceptable and accurate pilot index. The city can use this model as the basis for the development of a more comprehensive quality of life index for the City of Westminster. The following Table 3 illustrates our detailed schedule of our tasks.

TASK	WEEK							
	PQP	1	2	3	4	5	6	7
Background Research								
Interviews								
Data Analysis								
Construction of Pilot Model								
Feedback and Suggestions								
Presentation of Final Report								

Table 3. Timeline of the Project

4.1 Background Research

We conducted an extensive review of the literature to determine how various governmental agencies around the world construct and use livability indices. We continued to conduct background research in England to follow up on leads that interview subjects suggested, and to track down items that were not accessible in the United States. In particular, the three main areas of concern that were necessary to continue our research were public surveys, background information, and the methods for weighting data to derive composite indices.

The City of Westminster conducted a number of public surveys that display the public's perceptions of the communities. One of the most important of these was the City survey. This survey assessed how residents feel about important issues in their respective communities. These issues covered a large range of subjects including noise, pollution, and education. City employees conducted these surveys annually, and the results provided an accurate representation of the community.

Furthermore, the city of Westminster contains a department that has put extensive effort into creating an index concerning anti-social behavior. We examined the methods this department used to create the index and applied these strategies in creating our own model of a livability index.

Finally, we continued to research the different ways that Bristol, England and Larimer County, Colorado weighted the various datasets in compiling their indices. We examined the methods and important documents that relate to their livability indices and how these methods applied to our own project. One applicable method obtained from our research of the Bristol Index involved using a city's budget as a weighting factor. We elaborate on the budget-weighting scheme within the following section.

4.2 Interviews

In order to understand further and to develop a pilot livability index for the City of Westminster, we conducted several interviews. We interviewed scholars, our sponsor, appropriate representatives from other government departments, and representatives from Westminster City Council departments including: Crime and Policy Department, Policy and Communication Department, Information Technology Department, and Environmental Department.

The interview with our liaison, Mr. Martin Whittles of the city's Environmental Planning Department, clarified the direction of the project by providing information about his expectations of the project, and necessary contact information. We received feedback and suggestions concerning our project. Additionally, we proposed to our sponsor that we develop a pilot sub-index that focuses on environment rather than developing a comprehensive livability index. We interviewed our liaison in person, and we continued to have in-person interviews with him as often as necessary regarding our project. See Appendix J for an interview schedule.

We interviewed representatives from other government departments and organizations that successfully developed livability indices. We obtained information on the obstacles in data collection when constructing their indices, their intentions for constructing indices, the use of their indices, and the reasoning behind the methods that they used. We asked people responsible for the index about feedback they received, as well as any suggestions they might offer us. The literature we used for the Background section (See Section 3) continually cited The City of Bristol for having conducted a very successful indicator project in England. We interviewed Ms. Sarah McMahon from Bristol's Environmental Quality Department, who is currently responsible for their

livability project. Consequently, we obtained other contact information on governments who developed successful composite livability indices in England. In addition, we found that City of Bristol livability index uses funding information, such as how much money each department receives and spends, as weighting factor.

Moreover, based on our research, we found that the livability index that Larimer County's Compass Team developed is a single number index. This single number index is comprised of single-number sub-indices, which consist of several aggregated indicators. We contacted Ms. Lisa Summers, who is currently a member of the Larimer County's Compass Team. We asked her several questions regarding the Compass Team's methodology for aggregating indicators and sub-indices. We communicated through e-mails to answer some of the questions that arose after reading the documentation that she sent to us. See Appendix K for an interview schedule.

We interviewed several important members from the Westminster City Council who are involved in our project. We conducted interviews of the appropriate members from the City Council. We interviewed the Projects and Statistics Officer for the Policy and Communication Department to obtain insights on Westminster's different database systems. In this interview, we learned the specific use of the databases in order to understand the function of our index in regards with the database systems. In addition, we learned that different departments' policies led to different geographical units for the data. See Appendix L for an interview schedule.

Our initial meeting with our liaison showed that the Crime and Policy Department has an index on indicators that measure anti-social behaviors called CivicWatch. Consequently, we interviewed the Intelligence Analyst for the Crime and Policy Department to obtain details on the intention and the use of the index, the methodology for their index, the database linked to the index, and the indicator selection process. Furthermore, we obtained information on any concerns or issues that arose when constructing the index. We followed up with additional interviews to obtain facts on CivicWatch Surveys. See Appendix M for an interview schedule.

In order to understand the technological aspect of our index, we interviewed the IT Relationship Manager for the Policy and Communications Department. The information from the IT Relationship Manager helped us understand the operation and

the sustainability of the database systems, which clarified how we would integrate our project with the database systems. See Appendix N for an interview schedule.

Our liaison mentioned that the Cleansing Departments already defined environmental indicators; therefore, we interviewed the Business-Processing Manager for the Cleansing Department to obtain information about specific environmental indicators. This information helped us understand the purpose of the indicators, which we needed to combine appropriate indicators. See Appendix O for interview schedule.

We transcribed all interviews for analysis. We dissected and looked for patterns in the interviews in order to select the appropriate indicators for each community and to find the best method of aggregating indicators. This information combined with background research allowed us to create our livability index.

4.3 Indicator selection and data sources to support each indicator

We selected the indicators for the environmental sub-index, factoring in the priorities set by the City Survey with data availability. The City Surveys provided information on the priorities for each of the area forums. We selected the environmental indicators that corresponded to these priorities, such as the number of work orders, cleanliness of the streets, and so forth. We then verified the data availability for the indicators through UNIFORM, a database primarily used to record environmental data. This method of selecting environmental indicators is equivalent to the indicator selection that the Crime and Policy Department used to construct their crime and anti-social behavior index, also known as the CivicWatch model. We applied the CivicWatch methodology to select the indicators as well as calculate the scores since the City Council already uses the CivicWatch model as a communication tool to improve the City Council's services. Using the same scoring methodology as the CivicWatch model assured compatibility throughout the entire composite index to allow for the easy combination of sub-indices. See Appendix P for the list of environmental indicators.

4.4 Scoring system

Our geographical area-based scoring system parallels the CivicWatch scoring methodology. We calculated outcome, impact, and effort scores for each geographical

area. The outcome score measured public perception whereas the impact score assessed the priorities of the geographical areas. The effort score measured the amount of effort the city used in a particular geographical area concerning a specific environmental subject.

The outcome score used public perception data from the annual City Survey that measures perception both on a citywide and area forum basis. We chose three public perception questions that pertained to the subject of environment. After choosing the three public perception questions, we assigned ranges of percentages to values on a scale of one to ten. We averaged the percentage of positive (satisfied) responses from the three questions and then used the pre-determined set of ranges for a particular geographical area to assign corresponding impact score. See Appendix Q for an example of an outcome, impact, and effort calculation. We could only provide these scores on an area forum level. Therefore, it is important to note that the respective wards in each area forum receive an identical score.

Next, we calculated the impact scores, which assessed priorities of a particular geographical area. The priorities were on an area forum level and we chose the priorities based on the results of the City Survey. We scored these priorities based on their percent change from a particular quarter from one year to the next. We scored each priority using the same pre-determined range system we used to calculate the outcome score. We determined ranges for each priority and gave a corresponding value from one to ten. We then assigned these values for each priority of a particular geographical area based on this scale. Once we calculated all the priority scores for a particular geographical area, we calculated an un-weighted average. The averages of these priority scores represented the impact score for that area.

We calculated the effort scores for each particular geographical area. We used the same range system used for the calculations of the other two scores. We measured effort using work order numbers found on the UNIFORM database. These numbers are available on both a ward and an area forum level. We explored the possibility of using percent change of work orders to compute effort scores. However, due to the desire to keep consistent with the current crime sub-index, we chose the aforementioned method. Once we calculated the effort scores, we determined the sub-index scores for the aspect

of environment. See Appendix R for summary of the calculations of outcome, impact, and effort scores on each geographical level as well as the composite score for the sub-index of environment.

As previously mentioned, we matched up the data from each score to pre-determined scoring scales. We created the scales through the analysis of a series of potential scales. This first step was to organize the data using a variety of spreadsheets and graphs in order to obtain a visual display of the data distribution. On these spreadsheets, we provided tables of the final ranges we selected as well as the distributions for three different methods of determining these ranges. See Appendix Q for sample of the distribution of the three different methods. We show historical data from the past four quarters in these distributions. We used only the past four quarters because we wanted our score ranges to be as modern as possible, and the data is plentiful enough to give us a basic idea of where range boundaries should fall for each method.

The first distribution we show for each of the three scores is the equal distribution method of determining scores. In this method, we assigned the scores to equal percentages of the available data. We have ten different scores (1-10) so ten percent of the data should fall within the range for any given score. This method is beneficial in that it places the median value at the center of the scoring scale, so the half of the data above the median would be above five, and the data less than the median would score five or less. Scoring ranges with such a distribution are easier to interpret for this reason. One could deduce that a sub-index for a specific region with an effort score of seven indicates that the particular region is at or above the seventieth percentile of all other effort scores for that sub-index. However, these ranges provide for ten percent of all data to fall into the range for a score of ten. One can see this as a disadvantage because guarantees that ten percent of the data will receive a “perfect” score every time even though it might not deserve that score. In addition, the inconsistent, non-uniform ranges could be confusing and more difficult to update.

The second distribution we show for the three different scores uses equal step sizes. We calculated these step sizes by taking the range, without the outliers, and dividing by ten, because of the ten scores. We then assigned scores to the data values that fell within the corresponding ranges. The benefit of this method is the easily

understandable and uniform ranges. However, this method has its own flaws. For example, if one uses this method on the impact data, an increase in the number of complaints could still receive a seven, a rather high score. One can observe this undesirable quality in the distribution in the screen shot in Appendix S.

The method that we settled on is, more or less, a combination of the two previous methods. We still needed to keep our method compatible with the CivicWatch methodology, while providing a method that made the most sense for our purpose. Our final scoring method is essentially a modified version of CivicWatch method. This approach is still consistent with the CivicWatch scores, but provides a slightly different look at the data. CivicWatch uses uniform step sizes, but takes into account the median values, and shifts their ranges to reflect what they feel are acceptable scores. To determine our ranges, we first found the median and set it as the upper limit of the range for five. This action, similar to the equal distribution method, places half the data at scores above five, and half at five or below. We then applied uniform step sizes around this median value. We calculated the range, without the outliers, for the values above the median and divided this value by five. We then used this value as our step size for scores above five. We calculated the step size for scores five and below using the data below the median value. We used separate values for the steps above and bellow the median value to provide a more evenly spread distribution. Using a single step size in this approach can cause a significant amount of the data to fall into scoring ranges of ten or one, due to the possibility of a larger range on either side of the median value. This method of using two-step sizes provides an indication of where the data point falls within the entire set, while still utilizing the simplicity of uniform step sizes. We used this method in calculating our ranges and assigning scores to the data.

4.5 Solving geographical boundary issues

Within the Westminster City Council, various departments use different geographical boundaries when segmenting the city into smaller, more manageable sections. This inconsistency introduces the need to adapt data from one geographical division to another that may not have the same boundary. The ability to create uniform geographical boundaries makes this livability index more standardized because one could

compare different aspects of livability over the same geographical area. The ability to manipulate data also increases the flexibility of the index as one can select a number of different geographical breakdowns to review.

In order to combine different geographical areas, such as a group of wards into their respective area forums, we used residential population numbers. Using these numbers, we created percentages, which we used to apply weights to different wards when combining them into their area forum. We used the same method for obtaining information on a citywide scale, using population percentages of the six area forums. Ultimately, we decided to exclude the West End from these types of combinations as it has a large number of visitors on a daily basis that the population figures did not reflect the visitor value. The large number of visitors to the West End skews much of the information; therefore, in order to level the substantial influx of visitors to regions like the West End, one needs to examine some type of visitor factor. Appendix T shows a table that outlines the population percentage calculations.

Some of the data we needed to support our index was only available on a larger geographical basis. Therefore, we had to calculate uniform smaller regions through proportions using census data. This type of transformation is necessary to display the data on a ward level, if data are only available on an area forum level. The only option was to use the area forum scores as the ward scores, as no details were available to assign scores in a more accurate manner. This method is reputable, as each ward is partially responsible for its respective area forum score. When something occurs within one ward, its influence can still travel across boundary lines and affect the surrounding wards. In the end, the data for the area forum is the most specific available.

Unfortunately, many instances occur where the geographical unit that one department uses overlap another geographical unit another department uses. This circumstance is true for the geographical areas of the CivicWatch program and the city wards. This overlapping of geographical areas calls for a slightly more complex manipulation of the scores. CivicWatch uses twenty-five geographical areas whereas there are only twenty wards. We needed to acquire scores for only four of the wards through new means as sixteen of the wards share common boundaries with the CivicWatch units. The ward of Vincent Street is entirely inside the larger Vincent Street

CivicWatch area so we attained values for this through the method explained in the previous paragraph. The remaining three wards, however, are comprised of whole and partial CivicWatch geographical areas. We used the existence of different postcodes within these geographical areas to establish a rational method of combining these inconsistent zones. For example, three entire CivicWatch zones and parts of two others make up St. James' Ward. We determined the common postcodes that exist in CivicWatch zones as well as the ward, and have used these to develop a method of creating a ward-level score from CivicWatch-level scores. One can see the number of postcodes within this ward with their corresponding CivicWatch zone in the Table 4 below.

St. James's Ward		
CivicWatch Zone	**Number of Postcodes**	**Percentage of Total**
Covent Garden (CG)	466	21.89%
Mayfair & St. James's (MSJ)	340	15.97%
Strand & Whitehall (SW)	602	28.28%
Vincent Square (VS)	449	21.09%
West End & Chinatown (WEC)	272	12.77%
	TOTAL 2129	

Table 4: CivicWatch postcodes in St. James's Ward

We used the percentages of postcodes as weights to establish a score for the ward. Multiplying the CivicWatch scores by the weights and summing them yielded our desired ward score. The equation giving the St. James's ward score is

St. James's Ward Score: 0.2189(CG score) + 0.1597(MSJ score) + 0.2828(SW score) + 0.2109(VS score) + 0.1277(WEC score)

This is a somewhat crude approach to create uniform geographical areas, but it is applicable for many of the reasons we discussed above. To increase flexibility within our index, we provided a practical method for displaying information over a common

geographical domain. This method is also more accurate than, say, taking percentages of units of area because large parks within Westminster could skew these results. The postcodes take into account all the residences and businesses, and therefore better reflect population density. The city can use this approach to create uniform boundaries for any geographical domain, granted the postcodes are available. The standardization of geographical areas or the collection of data on very accurate locations (i.e. postcodes) would greatly improve the accuracy of the index, but currently a method such as this is suitable. The tables for all the wards that are comprised of multiple CivicWatch zones is located in Appendix U (WardCWtables).

4.6 Selection of sub-indices

We selected a number of sub-index topics based on the themes of our research as well as our exploration of the databases available within the City Council Intranet. From examining the databases and collecting data that have common themes, we were able to devise a list of seven sub-indices that the city council should construct as a part of their livability index, which are environment, crime, transport, health and well-being, housing, education, and economy.

4.7 Weighting schemes for combining the sub-indices

To create a composite index, it was necessary to develop a method to combine a series of sub-indices. To accomplish this combination, we applied appropriate weights to each sub-index to represent the level of importance each sub-index had within the city. We used the city budget as well as internal perception to weight these indices. In implementing multiple approaches to weighting the sub-indices, it helps to reduce any inaccuracies and produces a more sound weighting scheme. This method of weighting yielded a more reasonable result than a single source within a weighting factor.

We chose the city budget as an important weighting factor because it provided a breakdown as to where the city collected and spent its revenue. These factors were important as the city's finances supported the services they provided which contribute to the overall quality of life of the city. If an aspect of the index were not important to the city, the city would not spend a lot of money on that aspect. To assess the percent of the

budget the city council spent and earned on each sub-index, we used capital and revenue scores for each of the sub-indices. We calculated the percentage of capital and revenue associated with each sub-index compared to the total capital and revenue values. We then averaged the capital and revenue scores together to obtain a weight to apply to each sub-index in order to create the overall composite index. We used both revenue and capital numbers so that we could take both of the main scores in the City Council's budget into consideration for our weighting scheme. Appendix V shows the calculated budget score percentages. Note the capital scores are missing for crime and health and well-being; therefore, we solely used the revenue percentage in the budget factor of the weighting scheme. The notion and method of using the budget as a weighting factor are largely incomplete as data corresponding specifically to the list of sub-indices was not readily available within the council.

We supplemented the budget factor in the weighting scheme with the idea of using internal perception as a means for weighting the sub-index values. We felt it was important for the policy makers and city officials to have a hand in the weighting of the sub-indices as they have a better understanding of how the city runs and what council services need more improvement. To measure internal perception we proposed o conduct a simple survey of the sixty city councilors, as well as members of the IT department, communications department, and policy section of the council. We selected these people due to their likeliness to lack a bias to a specific sub-index due to non-specific departmental affiliations. The survey listed all seven sub-indices and asked the participants to select the three sub-indices that they feel are most important to the City of Westminster. See Appendix W for the preliminary internal perception survey. We would then record the percentage of people that selected each sub-index topic. These percentages for each sub-index could then provide a value to use in our weighting scheme to create the composite index.

Below is the formula that we used to provide a weighting factor for a given sub-index. We averaged the budget factor and internal perception factor to obtain a weight for the given sub-index. There is no need to add a constant to this formula since there is no possibility of a solution of zero, due to the budget part of the equation.

Sub-Index Weight = {[(%capital + %revenue)/2] + %internal perception}/2

The index we developed considers public perception, geographical area priorities, effort scores, budget scores, and internal perception. The use of many factors can balance each other when one might be inaccurate or misleading. Due to the consideration of these several factors, there is a higher level of integrity and stability in the index, which is important when using an index in such tools to assist in both communication and policymaking.

5 Results and Discussion

Through our applied methodology, we produced results to deliver to the City of Westminster, as well as topics to discuss. We discussed the City Survey from which we derived the priorities for the impact scores, as well as the resulting scoring system and methods for presenting our index. We obtained a considerable amount of feedback that we used to refine our model and to prepare recommendations for the City of Westminster. In addition, we assembled a list of potential indicators and contact information for all of the sub-indices to simplify the progression of the livability index**.**

It is important to note, we refrained from analyzing the scores we calculated due to the gaps in our data and incompleteness of the information necessary to obtain an accurate livability index. It is still premature to try to deduce any reasonable conclusions and, because of this, we do not want to make any statements that are not valid and accurate. Some of the results may provide an undesirable score for a particular region where it is not appropriate. We did not want to say anything negative about a particular ward or geographic area that may end up being false due to the missing data. We calculated the given scores for the different geographic areas to demonstrate the method. We explained the gaps that are present in our calculations and how to fill them in our recommendations section. Once the City of Westminster resolves these gaps, one can analyze the data to obtain reasonable results.

5.1 City Survey

It was important to note that we used the priorities that the City of Westminster expressed in the 2005 City Survey. This survey report was the most recent information, as the 2006 report was not available. The city has the ability to evaluate its priorities on a yearly basis using the most recent City Survey. However, one can define the priorities independently of the survey in gatherings such as the Area Information Meetings, which would allow the index to be flexible and dynamic and to change with time due to the demands of the city. The city officers may see an aspect of livability as a priority, although it may not be present in the City Survey. We used the priorities listed in the 2005 City Survey as a starting point that Westminster can later refine.

5.2 Scoring System for Sub-index

The scoring system for our sub-index was fundamentally the same system that the Crime and Policy Department used to construct their index. We kept all the scoring system for sub-indices consistent in an effort to make it easier to combine the sub-indices into a composite index when the council was ready to do so. We chose to use this scoring system to maintain compatibility with the CivicWatch program and their unique method of obtaining the scores that comprise their index. CivicWatch uses three different scores to assess quality of life. These three scores, outcome, impact, and effort scores, represent different aspects of a particular aspect of quality of life, such as environment, of a specific geographical area of the city. We gained some insight into public perception, geographical area performance, and effort towards improving quality of life, which are important elements when attempting to assess the livability of a particular geographical area.

5.3 Combining Sub-indices

As mentioned in the Interview section of Methodology, we discovered through our interview with Sarah McMahon that the City of Bristol weights the priorities on their livability index based on the amount of budget they invest into a particular subject such as environment, health, and crime. Through our investigation, we also learned that the budget for the City of Westminster parallels many of the themes of our sub-indices.

Therefore, one can use the budget as a weighting factor because the amount of money spent on each aspect generally reflects the importance of each aspect to the community.

5.4 Presentation

Presentation is an important part in the delivery of the final product. In our case, we produced a sub-index and a roadmap to create a composite index. For our sub-index, we performed a series of calculations in order to obtain outcome, impact, and effort scores for each geographical area over the last four quarters. See Appendix R for a summary of the scores. We then created graphs to summarize these results as shown in figure 11. Figure 11 graphically displays the outcome, impact, and effort scores for the City of Westminster. The graph tracks the results of the scores over the four quarters (3-month period) of 2006. The quarters follow the calendar year and start in January.

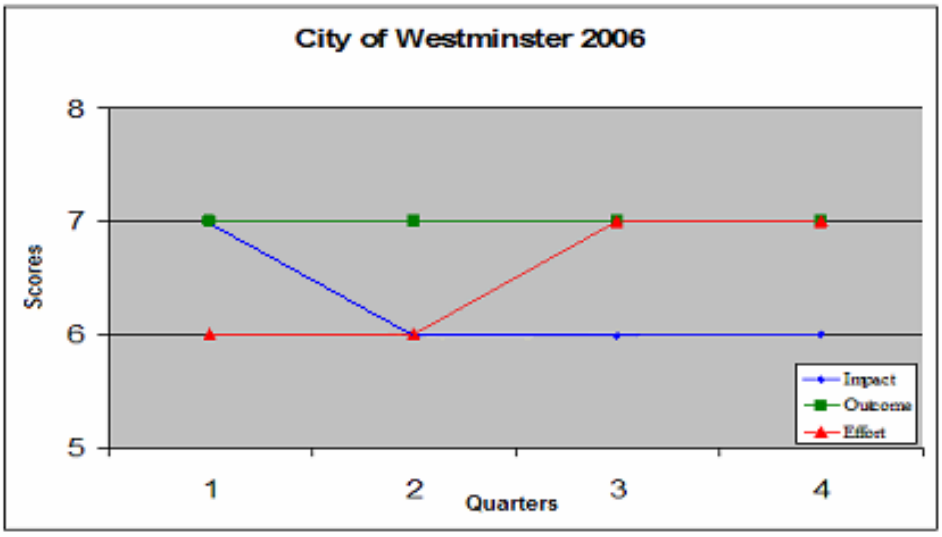


Figure 11. Outcome, impact, and effort scores for City of Westminster in 2006

For our roadmap to create a composite index, we created templates for the Information Technology Department. We received feedback regarding our templates from an IT Relationships Manager, David Pettitt. The IT Relationships Manager gave us positive feedback regarding the way we mapped out our composite index and suggested using Power Point to display and explain our templates. He suggested each slide to represent a different part of the composite index with a key to show the location of each slide on the overall index flowchart. He also recommended having descriptive details to go along with each of the different screen shots. Considering these suggestions, we

modified our templates to display our livability index in an understandable fashion. Figure 12 is an example of what a screen shot might look like. This particular screen shot displays, outcome, impact, and effort scores both graphically and spatially for all six of the area forums.

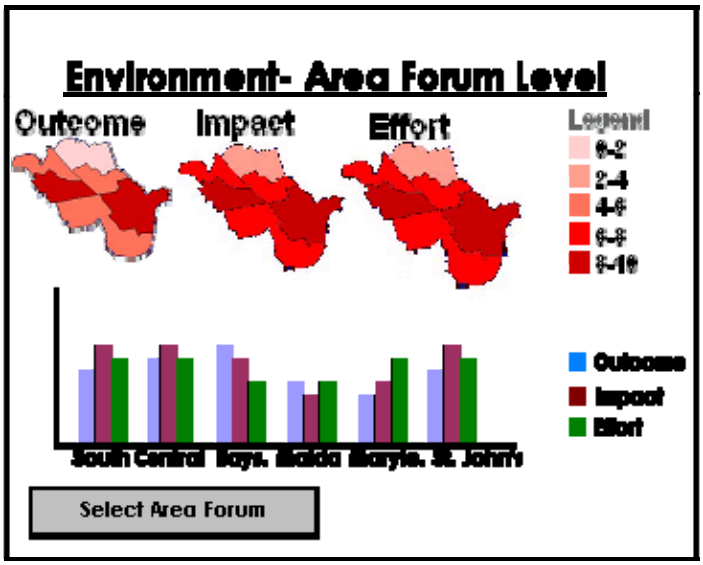


Figure 12. Example IT template screen shot

See Appendix X for more template screen shots. We have made these templates simple so that non-experts can understand how to operate the livability index and what information they can obtain from the index.

5.5 Feedback

In presenting our sub-index for the environment and roadmap for the creation of a composite index, we received feedback from Nicola Hyde who is the Business Process Manager from the Environmental Department. Ms. Hyde looked over our calculations for the environmental sub-index and explained a series of problems with some of the data we used. The first issue she raised was with the waste complaint data we used in calculating the impact scores. We used residential waste complaints as an indicator to measure the aspect of impact. However, the City of Westminster records commercial waste complaints within that indicator which contradicts what we were trying to measure. Next, Ms. Hyde pointed out issues surrounding the recycling complaint data involved in the calculation of our impact score. Through our preliminary analysis, we noticed a trend of

increased number of recycling complaints for a majority of the geographical areas over time. We discovered through our interview with Ms. Hyde that this rise in complaints was a result of an increasing number of streets beginning to participate in the recycling program, due to recent focus on environmental issues within the city. Moreover, Ms. Hyde provided us feedback pertaining to our effort score. Within the work orders data that we used to calculate our effort scores, there were unsuitable services to what the Cleansing Department defined as effort. We defined the effort scores as all work orders found in the UNIFORM database; however, the Cleansing Department excludes services including special collections and bag orders from the work orders. This exclusion is because these services have no impact on improving the environment. These two instances would both require work orders, but Ms. Hyde advised we should exclude them when calculating our effort score. Lastly, Ms. Hyde made us aware of an issue with the way employees recorded work orders within the UNIFORM database. Employees recorded work orders within UNIFORM, but they are not all submitted. For example, if one created a work order for an abandoned waste complaint, but if the daily maintenance of the road responded to the complaint within a reasonable period, then the employee would not submit the work order through UNIFORM.

The feedback we obtained from several departments, allowed us to improve our model as well as to expand our recommendations section in an effort to leave this project with all research gaps addressed.

5.6 Information sheet for each sub-index

To provide assistance in the future expansion of the City of Westminster Livability Index, we have created a spreadsheet containing a list of potential indicators, the data sources, and any other relevant information for each individual prospective sub-index. The potential database system, known as CoWStat, already contained a list of main indicators and database sources used by four of the seven sub-indices: education, health and well-being, housing, and economy. In order to assure compatibility with the CoWStat information for the City Council required the database having the potential to support the overall composite livability index. We selected the possible indicators for the Environment and Transportation sub-indices, factoring in research patterns from current

existing livability indices and data availability. Data availability was an essential aspect when selecting the indicators in order to comprise sufficient data to calculate the impact scores. Furthermore, the spreadsheet does not present indicator information on the crime sub-index because the Crime and Policy Department already has constructed a crime sub-index. This information sheet contains all such necessary information as the names of indicators, the frequency of the data collection, and data sources to develop other components of the livability index. Consequently, this complete list of prospective indicators provides the necessary groundwork to select the indicators for the calculation of the impact scores, which will assist in developing other sub-indices of the composite index. The contact information and databases on this spreadsheet will not frequently change; however, the priorities for the City Survey might vary more often due to public demands. Therefore, this spreadsheet will provide a solid list of potential indicators for each sub-index. Furthermore, the information sheet provided contact information on the person who is accountable for the data for each sub-index. Our roadmap for the construction of the livability index combined with this spreadsheet will assist the city council to continue further development of a successful composite livability index. See Appendix Y for a sample from the spreadsheet.

6 Conclusions

We provided the City of Westminster with a solid base from which to finish building their livability index. In the construction and refinement of this project, we encountered many barriers, which we overcame to achieve the goal of a composite livability index. Our findings were practical and provided the city with a powerful tool that, when completed, could lead to improved quality of life within Westminster. In addition, we mentioned any gaps or aspects of our project that we have not completely addressed refined. Overall, our project has provided Westminster with a device to improve both the communication and services of the council.

6.1 Overall composite index

An overall composite index is a useful tool for the Westminster City Council that provides services to its constituents more effectively. Another direct application of this

index is to improve communication within the council, particularly at the quarterly Area Information Meetings. To aid the council in continuing to build this composite index, we compiled lists of potential indicators, contact information, and data sources for each of the sub-indices. With the roadmap we have created along with the research we conducted, the vision for a composite index can soon become a reality for the City of Westminster.

6.2 Environmental sub-index

Our creation of a sub-index relating to environmental indicators provided a roadmap for the City of Westminster to create further sub-indices, and ultimately an overall composite index. We interviewed employees in the Cleansing Department, researched the appropriate data relating to environmental quality, and selected the appropriate sets of data from multiple databases. From these interviews, we created outcome, impact, and effort scores to monitor the quality of the environment within the City of Westminster over a period. Finally, we graphed these scores over a period and displayed their trends.

6.3 Current Situation of Westminster City Council

Through our research of the databases within different City Council departments, we discovered that many of these databases are inconsistent and difficult to relate. The inconsistency and the complexity are due to the various departments use different types of databases and have various purposes for them. The assorted departments often collect their data over different time intervals and geographical areas. The data may also be difficult to obtain, acquirable only by request, and incomplete. Furthermore, some of the databases are difficult to function and filter, leaving only experts to operate the systems. This lack of a central information system affected the development of our composite index, for it created difficulty in abiding by the low-maintenance constraint of our project. This difficulty is because each sub-index is comprised of different databases. However, through our interviews, we found that the City Council is currently working to build a central information system. Therefore, it is necessary for the Westminster City

Council to finish developing this central information system in order for our roadmap of the composite index to be more feasible as well as more sustainable.

6.4 Summary

Our project has provided the City of Westminster with a foundation for creating a composite livability index. The construction of the composite index modeling our environmental sub-index will not only enhance communication in the council but also improve the council's services. Moreover, the flexibility of our model has provided a means for the City Council to change aspects of the index in order to meet the changing demands and concerns of the public. Therefore, we believe that it is crucial for the City Council to continue to create the other elements of the composite livability index in order to attain the utmost capabilities of this index. Further development and improvement of the composite index, could lead the index for other purpose. One such use is to raise public awareness in certain fields of quality of life that needs improvements. Therefore, the index has many potential of becoming an influential communication tool for the Westminster City Council.

7 Recommendations

Although we completed many steps in creating an overall composite livability index, there is still a considerable amount of work to complete in order to achieve a fully functional system. We outline recommendations regarding emphasis on further development of the composite index and improvements in the weighting schemes, calculation system, and structure of the City Surveys. By considering our recommendations, the Westminster City Council will be able to fill in the gaps of our project as well as construct a communication tool that will accurately reflect the progress of the council services.

7.1 Recommendation One- Further Development of Roadmap

We recommend that the City of Westminster use our roadmap to create a composite index while filling in the gaps within the proposed composite index. The city can easily expand upon the roadmap we have designed. Accordingly, the purpose of this

roadmap is to guide whoever continues the development of the livability index. The roadmap we developed centralizes all the information necessary to expand and refine the index.

7.2 Recommendation Two- Refine Budget Element of Weighting Scheme

We recommend that the city further develop and refine the budget element of the weighting scheme, which aims to combine the seven sub-indices. We have discovered through our interview with Sarah McMahon that the City of Bristol weights the priorities of their livability index based on the amount of budget they invest into a particular subject such as environment, health, and crime. As it stands currently, the budget information for the City of Westminster is missing capital data for the aspects of crime and health and well-being. This weighting factor is important and must be sound and consistent across all sub-indices. If the city can integrate the budget information with the variety of other features in the scoring formula, Westminster will have a powerful and accurate way of conveying livability.

7.3 Recommendation Three- Obtain Internal Perception

We recommend obtaining internal perception in order to use it as a weighting factor to combine the sub-indices; therefore, the council should further develop and conduct an internal survey within the City Council. The premises of the internal perception methodology came from interviews with our sponsor and an interview with Ms. Nicola Hyde, a business project manager for the Cleansing Department. The city should distribute the survey via email. All participants in the survey must be as unbiased as possible. We recommend sending the survey to any councilors, members of the IT Department, members of the Communications Department, as well as members of the Policy sector. Each participant will select their three top priorities from a list of seven. The council will need to compile these results in order to obtain the percentage of people who felt each sub-index aspect was a priority. The council could then apply these percentages to determine the internal perception factor of the weighting scheme. We recommend conducting this survey annually in order to achieve a level of accuracy and consistency with the weighting scheme.

Moreover, our proposed weighting scheme contains two equally weighted factors, the city budget and internal perception. Currently, we have left the weighting factors themselves not weighted with the assumption that the city's finances are equally as important as the council's perception. However, we recognize the possibility of one weighting factor having greater importance than the next. Though, we cannot foresee a proper way to weight the weighting factors due to lack of available data, we recommend the council consider developing the weighting factors further.

7.4 Recommendation Four- Adjust City Survey

We recommend the City of Westminster adjust its annual City Survey to accommodate the livability index. A slightly revised survey could provide public perception data regarding all the sub-indices on multiple geographic levels. Currently, the survey only provides a limited number of questions regarding public satisfaction with different services. With the current content of the survey, it is impossible to obtain outcome scores for all the sub-indices. In addition, the information is often unavailable on all geographic levels. Usually the information comes on an Area Forum level and sometimes only citywide. This inconsistency and lack of precision is an issue when trying to create a composite index. We recommend the city include at least three questions covering each of the sub-indices. In addition, we suggest collecting the data on a ward level for all the data to be consistent throughout the index, which will allow one to compare any of the indicators in a given sub-index on the same geographical level.

7.5 Recommendation Five- Collect Complaint Data for Parks and Open Spaces

We recommend the Westminster City Council to collect data related to residential complaints regarding the quality of parks and open spaces. The City Survey lists parks and open spaces as priorities for some of the Area Forums. This data is necessary as we used the priorities to compute the impact scores. The collection of this data will increase the accuracy of the impact score for certain geographical areas and thus improve the accuracy of the index as a whole.

7.6 Recommendation Six- Develop Visitor Factors for all Geographical Areas

To increase the accuracy of the index, we recommend the City Council find an alternative solution for considering visitors in areas such as the West End. We recommend that the City Council consider such information as public transport figures, number of attractions, hotels, and so forth. Presently, many of the statistics relating to the West End, when combined with the other area forums, produce a distorted reflection of the city because of the vast number of visitors. Therefore, we recommend that the city use accurate numbers to judge the population, including visitors, in this geographical area if they wish to incorporate the West End into each sub-index and the overall composite index values.

7.7 Recommendation Seven- Develop Remaining Sub-Indices

We recommend the City of Westminster to continue developing the sub-indices for the other aspects of livability outlined in our roadmap in an effort to create an overall index for the city. As previously mentioned, we suggested using seven different aspects in creating sub-indices. If the City of Westminster were to create these separate sub-indices, we believe the combination would produce an overall composite index that would accurately portray the quality of life of the city, which will in turn assist in council services.

7.8 Recommendation Eight- Filter Data

Through our feedback, we discovered a series of problems with the data we are using for our sub-index. Therefore, we are recommending filtering out commercial waste complaints from the residential waste complaint data. We also recommend filtering out such special services as special collections and bag orders from the work order data. These special services do not put effort towards improving the overall quality of life of the city. There is also the issue of how employees document work orders on UNIFORM. UNIFORM records any work order one created regardless if one submitted upon completion. Therefore, we recommend using the Onyx database, which filters out work orders that the city employee does not submit.

7.9 Recommendation Nine- Use Area Relation Team's Database to Asses Priorities

We recommend using the Area Relation Team's database (ARTs), a database that has information to assess priorities on a ward level. This database contains information that will fill in gaps within not only our sub-index but also any of our proposed sub-indices.

7.10 Recommendation Ten- Account for Growing Recycling Program

From the feedback we obtained from Ms. Nicola Hyde, who is the business project manager for the Cleansing Department, we became aware of an issue regarding the increasing number of recycling complaints. The number of recycling complaints is increasing due to an increasing number of streets participating in the recycling program each quarter over the last few years. The best way to account for the increasing number of recycling complaints would be to break down each street's population and factor in the number of new people involved in the recycling plan. However, this would be time-consuming; therefore, we recommend using street lengths and combining the lengths of new streets each quarter to give recycling complaints per total length of streets involved in the recycling program figure. Currently, this data is available but not organized. Ms. Hyde explained that it would require a fair amount of effort to extract the data required to make these calculations. Henceforth, we recommend the recycling team to start monitoring the streets added to each quarter beginning with the first quarter of 2007 (January-March).

Appendix A- Sponsor Description

The city of Westminster is located at the heart of London and is home to the most prominent landmarks and districts in London, including Big Ben, Houses of Parliament, Marble Arch, and Oxford Street. The city of Westminster, which is one of the 33 London Boroughs, as shown in Figure 1 covers "Pimlico and Victoria in the south through the West End, Marylebone and Bayswater to Paddington and Queen's Park in the north-west" (Westminster City Council, 2005).

Figure 1. City of Westminster, New London Architecture.

There are 222,000 residents in the City; however, with its rich environment in business and tourism; about one million people enter the city of Westminster each day (Westminster City Council 2005).

King Henry VIII established the City of Westminster in 1540, when he converted Westminster Abbey into a cathedral. There was no city government at this time; therefore, the Dean of Westminster Abbey presided over the town. However, in 1586 Queen Elizabeth I allowed a council to run the city. A High Steward who was usually a high-ranking official in the British government originally oversaw the council until 1900, when an Act of Parliament allowed the city to elect a mayor, also known as a "Lord Mayor." Today, the Westminster City Council is the governing body that oversees the day-to-day finances and operations of local authority (Westminster City Council, 2005).

The council consists of sixty councilors who represent the twenty Wards of the City of Westminster, with three councilors elected from each Ward. A Ward is simply a section of the city. Currently, the Council comprises forty-eight Conservative members and twelve members of the Labour Party. Among the sixty members is the Lord Mayor who acts as the ceremonial head of the city. These annually elected officials democratically make decisions on behalf of the people of Westminster. The City Council

includes a Cabinet and various other specific committees, such as the Built Environment Overview and Scrutiny Committee, Health and Community Services Overview and Scrutiny Committee, and Council & Staff Joint Consultation Committee. The City Council employs about 4,900 people divided into nine departments to serve the many needs of the City of Westminster. Figure 2 shows the structure of the Westminster City Council (Westminster City Council 2005).

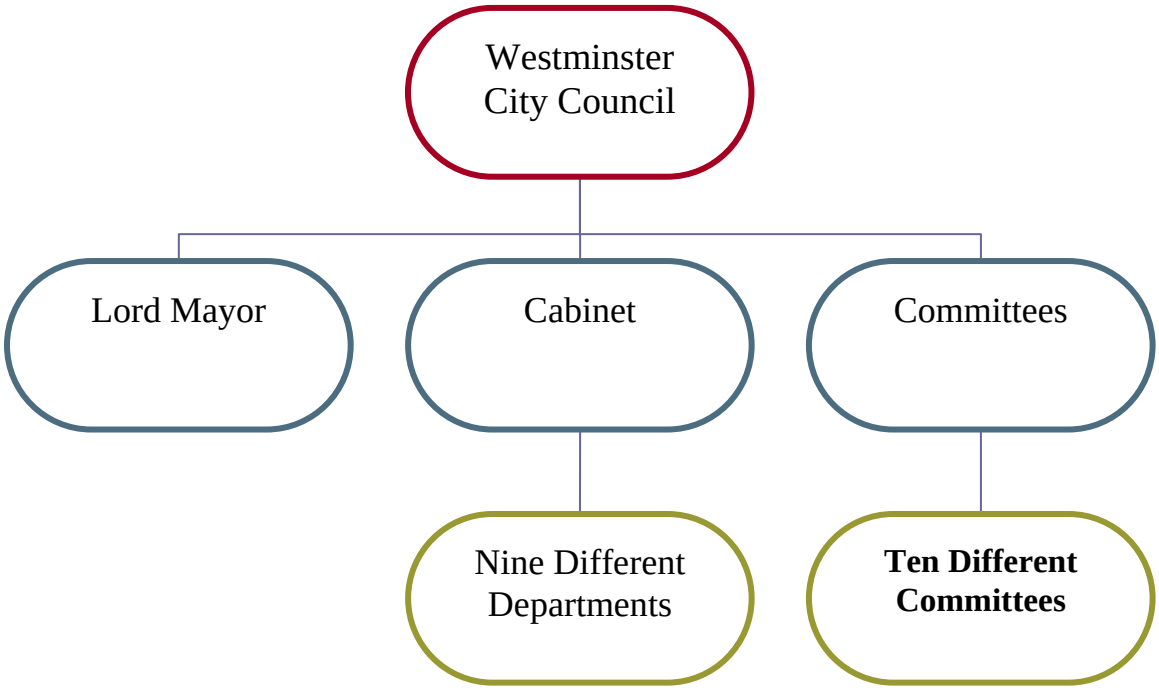


Figure 2. Westminster City Council 2005.

The operating budget for the City Council is £687.81 million (2005-2006) which pays for the salary of the Mayor of London, the Councilors, Council Staff, and all the other expenses associated with the provision of all local authority services. The taxation of the residents of the City of Westminster, specific grants, charges and other income funded the budget of the City Council. This year's Council Tax level for City of Westminster is £659 per household (Westminster City Council 2005).

The city council's mission in running the city is to build city neighborhoods, characterized by tolerant and active citizens, where the council maintains order, offers opportunity, and supports enterprising business (Westminster City Council, 2005). The Westminster's five-year vision, *One City* clearly outlined this mission (Westminster City

Council, 2005). The Westminster City Council developed *One City* and made it emphasize an ongoing need to cater to increasing numbers of people with higher expectations and backgrounds that are more diverse. The overall vision of the One City program is to ensure that Westminster has the highest quality of life of any city in the UK and in doing so take a step towards making London the 'best' city in the world (Westminster City Council 2005).

Over the past five years, the different departments in Westminster have been working toward this goal by collecting data through methods such as surveys to study social and environmental aspects including street cleanliness, crime rates, housing, and education of the neighborhoods. With vast amounts of data coming from the various city departments, the city council has asked Worcester Polytechnic Institute to help aggregate and analyze the information from each local area to create a single livability index. We weighted the indicators that we selected accordingly based on pertinent data. With the growing and developing population of the City of Westminster, the Westminster City Council may utilized the index to monitor fluctuations over time on the community level, which will allow the City Council to act more effectively if problems emerge in certain areas. The City Council will not only be able to operate their services efficiently but also be able to inform the communities with structured summary reports about their area. The City Council hopes that the livability index will contribute to improvements in the quality of life for both residents and the non-residents of Westminster, which will eventually help achieve the mission statement of Westminster.

Appendix B- Indicator Credentials

What Makes a Good Indicator:

Criteria for Assessing Usefulness to the Community

Measure progress towards a goal

- Does the indicator measure a condition that people have decided is important to the community?

Compel, interest, and excite

- Does the indicator resonate with the intended community audience?
- Is it attractive to the media?

Focus on resources and assets

- Is the indicator framed in a positive way?
- Does it focus on problems or assets?

Focus on causes, not symptoms

- Does the indicator help to forewarn of future problems and focus on causes, rather than symptoms of problems?

Make linkages and relationships

- How does the indicator link to other issues (e.g. social, environmental, economic)?
- What other indicators would be affected by changes in this one?
- Does this help to round out the set of indicators in each topic?

Relate to the whole community

- Does the indicator affect the community as a whole or only one narrow group?
- Do the indicators help communicate to an outsider what is most important to the community?
- Do the indicators address assets and problem areas?

Understandable

- Is the indicator simple and clear enough to be understandable to the community as a whole?

Criteria for Assessing Data Quality

Accessible and affordable

- How easily can the data for each indicator be obtained and how much does it cost?
- Are partnerships within the community possible to access the data cost-effectively and efficiently?

Comparable (standardized)

- How easily does this compare with indicators used for other local projects?
- Does it require a special survey that other communities would not be likely to replicate?

Consistent and reliable

- Is the information source likely to produce high quality data over a number of years?

Credible

- Is the indicator believable to the participants who selected it? To the community as a whole?
- Does the data source help reinforce credibility or detract from it?

Measurable

- Is the indicator framed in a way that can be answered by a number, percentage, or proportion?
- Does the data exist to address the indicator, or is there a practical way to obtain the data needed?

Relevant

- Does the indicator address one of the community goals?
- Does it address the issue the community wants to know about?
- Does it help to communicate what is important?

Valid

- Is the indicator truly measuring what it is intended to measure, and not a by-product?
- Is the indicator well grounded and founded in fact?
- Can you support, defend, and justify it in logical or scientific terms?

http://www.ubalt.edu/bnia/pdf/0._Section_VS_IV_Cover_Section_I.pdf

Appendix C- Indicator Selection Guidelines

INDICATOR SELECTION GUIDELINES

The Quality of Life indicators have been selected and are maintained based on the following criteria:

Purpose: The indicator is both meaningful (it provides information valuable for community members to understand important aspects of their quality of life) and useful (it offers a sense of direction for additional research, planning, and action toward positive community changes and a means of assessing progress toward these desired changes).

Importance: The indicator measures an aspect of the quality of life which a diverse group of people in the community would agree is important in relation to the priorities in the community's shared vision or goals.

Validity and accuracy: If the indicator trend line moves upward or downward, a diverse group of people in the community would agree on whether the quality of life is improving or declining.

Relevance: The indicator measures an aspect of the community's quality of life concerning which the community can achieve positive change through public decision making and action at the community level.

Responsiveness: The indicator trend line responds relatively quickly and noticeably to real changes in the quality of life.

Anticipation: The indicator anticipates future trends rather than reacting to past trends. A "leading" indicator is generally more useful than a "lagging" indicator because it allows a proactive response.

Understandability: The indicator measures an aspect of the community's quality of life in a way that most citizens can easily understand and interpret in relation to their own lives.

Availability and timeliness: Data for the indicator are readily available and affordably accessible on an annual basis from a credible public or private source.

Stability and reliability: Data for the indicator are collected, compiled, and calculated in the same way each year.

Outcome orientation: Where possible, the indicator measures the actual condition of the community's quality of life. Alternatively, it measures an outcome of the response to the issue rather than the input of the response itself.

Asset orientation: Where possible, the indicator measures a positive aspect of the community's quality of life (to focus on community assets) and a trend line increase clearly denotes an improvement in the quality of life.

Scale: The indicator is reported for a geographic area that is most meaningful for community understanding and most helpful for improvement. For many indicators, both regional and single-county trendlines are reported; others have sub-county measures.

Clarity: The indicator uses measures that filter out extraneous factors. Per-person rates filter out the effect of population growth, and constant dollars eliminate the effect of inflation. Raw numbers are used where magnitudes are important.

Representativeness: Taken together, the indicators measure the major dimensions of the community's quality of life.

http://www.jcci.org/statistics/qualityoflife.aspx

Appendix D- Examples of Environmental, Economic, and Social Indicators

Environmental Indicators

Environmental indicators look at the effects of human activities on the environment as well as the implications of those actions on human health, quality of life and the integrity of ecosystems. Environmental indicators are usually scientifically-based information that describes environmental conditions and trends. Reliable information about the current state of the environment and the factors that stress it, is essential for making appropriate future commitments of time, energy, and resources to meet environmental challenges.

Indicator	Purpose	Linkages
Vehicle Miles Traveled	To encourage efficient development patterns	• Commuting time affects our quality of life • Air and water quality • Natural nonrenewable resource consumption • Social stress, declining sense of community • Transportation cost for road construction and maintenance • Loss of open space and wildlife habitat.
Percentage of land preserved as open space	To encourage and monitor efficient development patterns	• Air quality • Mental health • Drainage control and improved water quality
Soil Erosion • bed load • suspended solids • turbidity	To track impact of our development patterns on the natural environment	• Degradation of water quality and aquatic habitat • Aesthetic quality and recreational capacity of our waters. • Fertility and productivity of the land • Altered drainage patterns
Impervious Surface	To monitor stormwater impact on natural environment	• Biodiversity in wetlands • Economic loss due to flooding and fisheries decline. • Vehicle miles traveled • Energy use due to "urban heat island" effect • Air quality
Farm Acreage	To preserve productive agriculture land use	• Diminished economic and cultural diversity of the region • Impervious surface • Energy use • Vehicle miles traveled
Residential Water Consumption	Efficient use of freshwater supplies	• Economic capacity to grow food, produce power, support industry. • Increased demand for water has negative impacts on aquatic systems. • Financial burden (infostructure) to supply new water supplies and/or additional treatments.
Tons of solid waste generated and solid waste recycled per capita	To minimize the amount of solid waste that goes to landfills or is incinerated.	• Population growth • Soil and groundwater contamination • Nonrenewable resource consumption

Days in the past year with Air Quality Index (AQI) in the good range	Good air quality is fundamental to public health	• Degradation of natural environment, forest health • Water and soil quality • Negative impact on aquatic ecosystems • Limited economic expansion, restriction of certain industrial activities. • Denied federal government funding • Reduced agriculture productivity • Impact on marine and freshwater fisheries • Impact on tourism
Electricity consumption generated from nonrenewable & renewable sources	To promote the conservation of our natural resources	• Air quality • Water Quality • Soil Quality • Global Warming
Percentage of area of assessed rivers and streams that do not meet state and federal water quality standards	To restore degraded waterways	• Degradation of aquatic habitat • Aesthetic quality and recreational capacity of our waters. • Biodiversity in wetlands • Economic loss due to flooding and fisheries decline.
Number of Bald Eagle Nests and Young	To measure conservation efforts to restore habitat and decrease pesticides.	

Economic Indicators

How can a Green Community create a sustainable economy? Look at your current economic conditions and learn how they are linked to social and environmental issues. We have been programed to perceive development and growth as necessary for a prosperous community. We are learning that the outcome of improper development -- sprawl -- has caused a huge economic burden for our communities. We need to learn how to properly channel our resources so that we create a prosperous community without creating further problems in the future. Use economic indicators to provide information on current conditions, trends and movements towards targets.

Indicator	Purpose	Linkages
Ratio of Affordable Housing Cost	To evaluate affordable housing in the community. Adequate affordable housing is necessary to foster economic sustainability.	Linkages to social well-being, economic stability, health and welfare issues, poverty.
Percentage with economic access to Health Care	How much of our financial resources go towards caring for or preventing illness.	• Health and self sufficiency • Increased costs to community • Decline in education spending • Decline in environmental spending
Percentage of Families Living Below Poverty Line	Equal distribution of wealth	• Child poverty • Poor health • Juvenile crime • Low civic participation
Percentage of Total Employment by Industry	Resilience of the job market. Diversified job market is less susceptible to changing market demands	• Environmental protection • Poverty • Homelessness • Consumer spending • Crime rate

Social Indicators

We need to be responsible for our own destiny. The demographics measured in our community starts to tell us how the population is distributed. But social indicators also measure our social well-being and quality-of-life. Does your community respect the rights and feeling of others, enjoy diversity in cultures, values, wants and opinions? The social structure of a community is linked to the ability of its residents to take a stewardship approach. Whether our concerns are racial tensions, the safety of our neighborhoods, reliable child care resource, good schools, social and recreational resources -- we need to empower strong public participation and control over decisions. Green communities offer equal opportunity, social harmony, and mutual respect for a diverse community.

Indicator	Purpose	Linkages
Voters Participating in Primary Elections	Participate fully in decsions about the way their community is governed.	• Poverty Levels • Crime • Political Awareness • Improved government • Environmental health • Enhance Economic health
Low Birth Weight Babies per 1000 Live Births	Adequate nurturing of future generations	• Literacy • Low income • Poor health • Inequity of ethnic groups • Economic imbalance
Suicide Rates per 1000 population	To address the mental health of community and underlying social issues: age-, race-, and ethnic-inequity.	• Economic imbalance
Demographics (population, race, age)	Future sustainability must take in account the projected population. Ensure population does not grow beyond environmental resources.	• Land use patterns • Biodiversity • Water and air quality • Housing affordability
Child Abuse	Monitor quality-of-life in families.	• Drug and alcohol abuse • Teen pregnancy • Crime • Unemployment

http://www.epa.gov/greenkit/indicator.htm

Appendix E- Examples of Indicators

Goals and indicators at a glance

PEOPLE

Our children will not live in poverty.

1. Child poverty
2. Low-income schoolchildren

Families will provide a stable, supportive environment for their children.

3. Satisfaction with child care
4. School transfers
5. Child abuse and neglect
6. Teen pregnancy
7. Runaways

All children will be healthy and start school ready to learn.

8. Low birth weight
9. On-time immunization
10. Preschool child development

Minnesotans will excel in basic and challenging academic skills and knowledge.

11. Elementary school skills
12. Eighth-grade basic skills
13. College entrance scores
14. High school graduation

Minnesotans will be healthy.

15. Health insurance
16. Infant mortality
17. Life expectancy
18. Premature death
19. Smoking and tobacco use
20. Suicide

COMMUNITY AND DEMOCRACY

Our communities will be safe, friendly and caring.

21. Sense of safety
22. Violent and property crime
23. Juvenile apprehensions
24. Volunteer work

People in need will receive support that helps them live as independently as they can.

25. Nearby support
26. In-home help for older people
27. Welfare to work
28. Food shelf use
29. Homelessness

All people will be welcomed, respected and able to participate fully in Minnesota's communities and economy.

30. Bias crimes
31. Minority teachers
32. Employment of people with disabilities
33. Transportation for people with disabilities

People will participate in government and politics.

34. Voter turnout
35. Checkoff campaign contributions

Government in Minnesota will be cost-efficient, and services will be designed to meet the needs of the people who use them.

36. Satisfaction with government services
37. Price of government

ECONOMY

Minnesota will have sustainable, strong economic growth.

38. Growth of gross state product
39. Employment of working-age population
40. Energy efficiency of the economy

Minnesota's workforce will have the education and training to make the state a leader in the global economy.

41. Post-high school education and training
42. Job placement after two-year college
43. Adults with college education

All Minnesotans will have the economic means to maintain a reasonable standard of living.

44. Median family income compared to U.S. median
45. Poverty rate
46. Availability of full-time work

All Minnesotans will have decent, safe and affordable housing.

47. Housing costs
48. Home ownership

Rural areas, small cities and urban neighborhoods throughout the state will be economically viable places for people to live and work.

49. Counties losing population
50. Net gain in businesses
51. Regional disparity in unemployment
52. Unrestricted highways
53. Urban home values
54. Freeway congestion

ENVIRONMENT

Minnesotans will conserve natural resources to give future generations a healthy environment and a strong economy.

55. Energy use per person
56. Renewable energy sources
57. Vehicle miles
58. Air pollutants
59. Water use
60. Timber harvest
61. Solid waste and recycling
62. Toxic chemicals

Minnesotans will improve the quality of the air, water and earth.

63. Urban air pollution
64. Water quality in lakes and rivers
65. Nitrate in groundwater
66. Erosion of cropland

Minnesota will restore and maintain healthy ecosystems that support diverse plants and wildlife.

67. Wildlife habitat
68. Changes in land use

Minnesotans will have opportunities to enjoy the state's natural resources.

69. Parkland and open space
70. Recreational trails

http://www.gda.state.mn.us/pdf/2002/MilestonesMeasuresthatMatter.pdf

Appendix F- List of Indicators Organized into Categories

List of the Vital Signs

Topic areas, results, indicators and measures

Vision For Baltimore:

Baltimore - a strong, stable city of safe and thriving neighborhoods – distinctive places where residents work together to improve the quality of life for our children, families, and neighbors.

TOPIC AREAS:

- Housing and Community Development
- Children and Family Health, Safety, and Well-being
- Workforce and Economic Development
- Sanitation
- Urban Environment and Transit
- Education and Youth
- Neighborhood Action and Sense of Community

Housing and Community Development

Vision: Neighborhoods that are both racially and economically diverse. This city preserves its rich physical heritage and provides affordable housing to all residents

Result: Well-maintained homes

Residential Investment Activity

INDICATORS:

- Percent of residential properties that undergo rehab investment above $5,000

Housing Conditions

INDICATORS:

- Percent of residential properties that are vacant and abandoned at year's end (City definition)
- Percent of residential properties with other types of housing violations (excludes vacants) at year's end

Housing Values

INDICATORS:

- Median sale price
- Total housing units sold
- Median number of days a house stays on the market

Result: Racially and economically diverse and inclusive neighborhood

Racial and Economic Diversity

INDICATORS:

- Racial Diversity Index - Percent chance that two people picked at random will be of different race/ethnicity
- Economic Diversity Index - Percent chance that two households picked at random will be in a different income range group

Owner-Occupied Housing

INDICATORS:

- Percent of housing units owner-occupied (single family homes and condos)

Housing Affordability

INDICATORS:

- Affordability Index -
  - Percent of households that rent who pay more than 30 percent of their household income for rent and related costs
  - Percent of households that own who pay more than 30 percent of their household income for mortgage and related costs.
- Number of rental evictions per 1,000 people
- Number of residential properties under mortgage foreclosure

Children and Family Health, Safety and Well-being

Vision: Neighborhoods that are home to stable families with the resources needed to nurture children, including access to high-quality health care, and jobs that pay family-supporting wages

Result: Safe children in their homes, families, and neighborhoods

Safe Homes and Families

INDICATORS:

- Domestic violence rate - Number of 911 calls regarding domestic violence incidents per 1,000 people
- Number of reported and substantiated cases of abuse and neglect per 1,000 children ages 0-17
- Percent of children ages 0-6 years old with elevated blood lead levels out of all children tested

Safe Neighborhoods

INDICATORS:

- Juvenile arrest rate - Number of juvenile arrests per 1,000 youth ages 10-17
- Juvenile arrest rate for violent offenses - Number of juvenile arrests for violent offenses per 1,000 youth ages 10-17
- Juvenile arrest rate for drug-related offenses - Number of juvenile arrests for drug related offenses per 1,000 youth ages 10-17
- Percent of all juvenile arrests where juvenile has at least one prior offense
- Crime rate - Number of reported Part I criminal offenses per 1,000 people
- Violent crime rate - Number of reported Part I criminal offenses classified as violent per 1,000 people

Result: Stable and economically independent families

Income and Poverty

INDICATORS:

- Median household income
- Teen birth rate - Number of teens ages 15-19 who gave birth per 1,000 female teens

Family Self-Sufficiency Standard

INDICATORS:

- Percent of married couple family households earning below Family Self-Sufficiency Standard
- Percent of "other" family households earning below the Family Self-Sufficiency Standard

Result: Babies born healthy

Maternal and Child Health

INDICATORS:

- Maternal and Child Health Index
- Percent of births delivered at term (37-42 weeks gestation)
- Percent of babies born with satisfactory birth-weight

Result: Healthy families, children, and individuals with health insurance, and access to preventive care

Access to Health Insurance and Preventive Health Care

INDICATORS:

- Percent of births where mother received early prenatal care (first trimester)
- Number of people with vaccine-preventable diseases per 10,000 people
- Percent of emergency room visits that are not emergency-related
- Number of children ages 0-17 years old hospitalized for asthma or asthma-related illnesses

Drug Addiction

INDICATORS:

- Number of drug treatment clients

Workforce and Economic Development

Vision: A city where residents are working, and commercial districts thrive

Result: Job-ready, working adults who continue to gain skills

Labor Force Participation and Employment

INDICATORS:

- Percent of population ages 16-64 that is employed
- Percent of population ages 16-64 that is unemployed and looking for work
- Percent of population ages 16-64 that is not in the labor force
- Unemployment Rate

Educational Attainment

INDICATORS:

- Percent of population ages 25-64 that have high school diploma or equivalent only
- Percent of population ages 25-64 that have some college and above

Result: Thriving neighborhood commercial districts

Commercial Investment Activity

INDICATORS:

- Percent of commercial properties that undergo rehab investment over $5,000
- Percent of commercial properties that are vacant and abandoned at year's end

Successful Businesses and Successful Small Businesses

INDICATORS:

- Total retail sales in $ millions
- Percent of all businesses over 4 years old as of the 4th quarter of year
- Percent of all businesses with 50 employees or less that are over 4 years old

Sanitation

Vision: A city that is safe and clean

Result: Neighborhoods that have clean streets, alleys, and yards

INDICATORS:

- Rate of illegal dumping -Number of reported incidents of illegal dumping per 1,000 people
- Rate of dirty streets and alleys - Number of reported incidents of dirty streets and alleys per 1,000 people
- Rate of clogged storm drains - Number of reported incidents of clogged storm drains per 1,000 people
- Rate of abandoned vehicles - Number of reported incidents of abandoned vehicles per 1,000 people
- Rate of rat incidents - Number of reported incidents of rats per 1,000 people

Urban Environment and Transit

Vision: Places of physical beauty, where residents breathe clean air and drink clean water. In this city, mass transit is utilized, and all residents can find a green space nearby

Result: Improved and well-maintained parks and open spaces

Quality of Parks and Open Spaces

INDICATORS: (redesigning)

Result: Clean air, clean water, high quality soil and vegetation

Air Quality, Water Quality, Hazardous Waste

INDICATORS:

- Tree Canopy - Percent of area covered by trees
- "Code Red Days" - Number of days ozone levels exceed EPA standards for ozone exposure for one hour
- Percent of residents served with safe drinking water systems
- Number of "potential" hazardous waste sites

Result: People choose alternative modes of transportation

Alternative Transportation Mode Use

INDICATORS:

- Percent of population ages 16 and over who are employed using a mode of transportation other than a car (such as bikes, public transit, walking, etc.) to get to work
- Percent of population ages 16 and over who are employed using public transit (bus, lightrail, etc) to get to work
- Percent of population ages 16 and over who are employed using other modes of transit other than a car or public transit (i.e bike, walk, etc) to get to work

Education and Youth

Vision: A city in which people are well educated and prepared to meet the challenges of today and the future

Result: Students graduate as productive citizens ready for work, higher education, entrepreneurship and leadership

High School Completion rate and Dropout rate

INDICATORS:

- Percent of 12th graders who received Maryland High School diploma or equivalency certificate at the end of the year.
- Percent of students in grades 9-12 who withdrew from school before completion

High School Performance

INDICATORS:

- Maryland School Assessment Test Scores in Reading and Math – Grade 10

High School Graduates prepared for Higher Education and/or Labor Force Participation

INDICATORS:

- Percent of graduates who successfully completed courses qualifying them for University of Maryland
- Percent of graduates who successfully completed courses in approved Career/Technology Ed. program
- Percent of graduates who successfully completed both: Qualifications for UMD and an approved Career/Technology Education program

Youth Entrepreneurship and Leadership

INDICATORS:

- Percent of population ages 18-25 registered to vote
- Percent of population ages 18-25 that voted in general elections
- Percent of population ages 16-19 in school and/or employed

Result: Children achieve at high levels

Absentee Rate

INDICATORS:

- Percent of students absent 20 days or more out of school year

Elementary and Middle School Student Achievement

INDICATORS:

- Maryland School AssessmentTest scores in reading and math – Grades 3, 5 ,and 8

Neighborhood Action and Sense of Community

Neighborhoods that thrive and grow, bound together by a strong sense of community and anchored by neighborhood groups that are committed to the work of progress

Result: All neighborhoods are active, organized, and empowered

Neighborhood Groups

ASSETS:

- Neighborhood associations and block clubs
- Community development corporations
- "Umbrella" organizations
- Parks and environmental stewardship groups

Neighborhood Initiatives

ASSETS:

- Community gardens
- Areas with Healthy Neighborhood Initiative programs
- Areas with Mainstreet Initiative programs
- Areas participating in Strategic Neighborhood Action Planning programs (SNAP)
- Designated local historic buildings (CHAP)

Voter Participation

INDICATORS:

- Percent of population ages 18 and over registered to vote
- Percent of population ages 18 and over who voted in the general election

October 21, 2004

http://www.ubalt.edu/bnia/pdf/0.VITALSIGNS3_ALL_FINAL.pdf

Appendix G- Indicators for Environment, Economy, Society, and Health

List of Indicators Used in the Report

Environment

Production and Recycling of Municipal Solid Waste (MSW)
- Annual Per Capita Rate at which Municipal Solid Waste is Produced and Recycled

Toxic Chemical Releases
- Amount of Toxic Chemical Releases into the Air and Water

Glen Cove Creek Water Quality
- Average Dissolved Oxygen (DO) Concentration During the Summer Months in Glen Cove Creek

Annual Water Use
- Annual Water Pumpage in Millions of Gallons

Energy Consumption
- LILCO/LIPA Residential Sales per Customer

Economy

Employment Status
- Percent of the Adult Population that is Unemployed

Household Income
- Percent of Households in Different Income Brackets

Affordable Housing
- Number of Housing Units Affordable for Low to Moderate Income Households per 1,000 Residents

Child Poverty
- Percent of Persons Under Age 18 in Families Below the Poverty Line

Means of Transportation to Work
- Percentage of Commuters Using Each Mode of Transportation

Society

High School Graduation Profiles
- Percent of High School Graduates Applying to Four Year Colleges

Basic Education Skills
- Test Scores in Reading and Mathematics for Sixth-graders

Public Safety
- Tracking the Number of Reported Crimes

Voter Participation
- Percentage of Voting Age Population Actually Voting in Elections

Public Library Support
- Annual per Capita Spending Rates

Public Access to the Waterfront
- Public Access to the Waterfront as a Percentage of Total Coastline

Health

Infant Mortality
- Death Rate of Children Under One Year Old per 1,000 Live Births

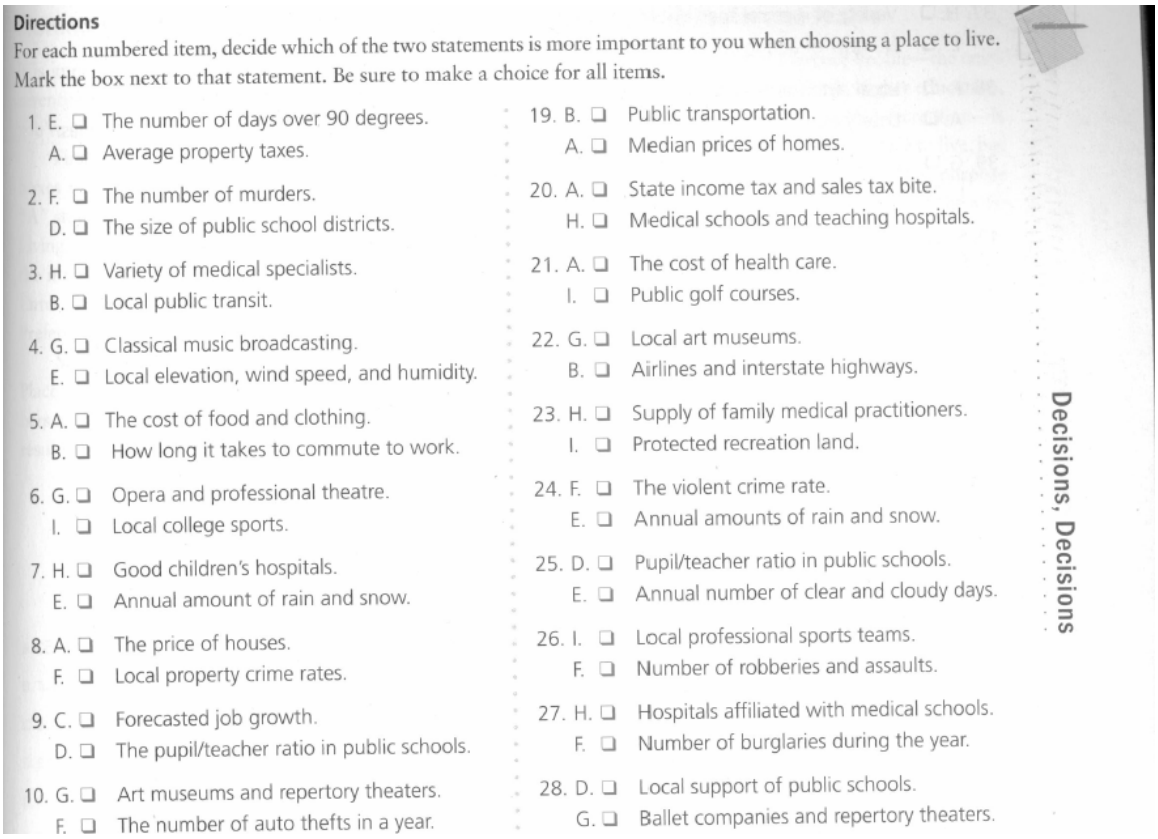
Teen Births
- Number of Teen Births as a Percentage of Total Annual Births

Breast Cancer
- Breast Cancer Rates as a Percentage of Total Annual Cancer Rates

Child Asthma
- Annual Number of Children with Asthma Discharged from Glen Cove Hospital as a Percentage of all Children Discharged

http://www.liu.edu/sustain/quality2000.pdf#search='quality%20of%20life%20indicators%20for%20communities

Appendix H- Sample Survey



Directions

For each numbered item, decide which of the two statements is more important to you when choosing a place to live. Mark the box next to that statement. Be sure to make a choice for all items.

1. E. ❑ The number of days over 90 degrees.
   A. ❑ Average property taxes.
2. F. ❑ The number of murders.
   D. ❑ The size of public school districts.
3. H. ❑ Variety of medical specialists.
   B. ❑ Local public transit.
4. G. ❑ Classical music broadcasting.
   E. ❑ Local elevation, wind speed, and humidity.
5. A. ❑ The cost of food and clothing.
   B. ❑ How long it takes to commute to work.
6. G. ❑ Opera and professional theatre.
   I. ❑ Local college sports.
7. H. ❑ Good children's hospitals.
   E. ❑ Annual amount of rain and snow.
8. A. ❑ The price of houses.
   F. ❑ Local property crime rates.
9. C. ❑ Forecasted job growth.
   D. ❑ The pupil/teacher ratio in public schools.
10. G. ❑ Art museums and repertory theaters.
    F. ❑ The number of auto thefts in a year.
19. B. ❑ Public transportation.
    A. ❑ Median prices of homes.
20. A. ❑ State income tax and sales tax bite.
    H. ❑ Medical schools and teaching hospitals.
21. A. ❑ The cost of health care.
    I. ❑ Public golf courses.
22. G. ❑ Local art museums.
    B. ❑ Airlines and interstate highways.
23. H. ❑ Supply of family medical practitioners.
    I. ❑ Protected recreation land.
24. F. ❑ The violent crime rate.
    E. ❑ Annual amounts of rain and snow.
25. D. ❑ Pupil/teacher ratio in public schools.
    E. ❑ Annual number of clear and cloudy days.
26. I. ❑ Local professional sports teams.
    F. ❑ Number of robberies and assaults.
27. H. ❑ Hospitals affiliated with medical schools.
    F. ❑ Number of burglaries during the year.
28. D. ❑ Local support of public schools.
    G. ❑ Ballet companies and repertory theaters.

Decisions, Decisions

Appendix I- Interview Schedule for Academics

Interview schedule for academics

1. **Introduction**
    - Introduce ourselves (name, school, and our sponsor)
    - Briefly explain the project
        Objective and use of the project
    - Interviewee is allowed to ask questions any time during the interview

2. **Consent**
    - We will not mention name or personal information
    - We will ask for permission beforehand if it needs to be quoted
    - Interviewee has the opportunity to look over parts in the paper

3. **Topics**
    - What methods have you used to develop a single index?
    - Do you know any methods that would help us in combining the indicators into an index?
    - Are there any computer programs that would aid us in any related issues? (Combining indicators, organizing data, analyzing trends, etc.)
    - Do you know of anyone who may have experience in this field?

4. **Closing Remarks**
    Any questions or concerns

Appendix J- Interview Schedule for our Sponsor

Interview schedule for our sponsor, Martin Whittles

1. Introduction

Introduce ourselves

2. Consent

- We will not mention name or personal information
- We will ask for permission beforehand if it needs to be quoted
- Interviewee has the opportunity to look over parts in the paper

3. Interview Style

Interviewee is allowed to ask questions any time during the interview

4. Question Topics

- Comments and feedback on our proposal
- Clarification on the project
  - ♦ Intentions and expectations of the project
  - ♦ Who is going to use the index?
- Suggestion to our sponsor

  To create a pilot sub-index that focuses on environment and transportation
- Any necessary data and contact information regarding the project

5. Closing Remarks

Any questions or concerns

Appendix K- Interview Schedule for Other Governments

Interview schedule for representative from government departments who have constructed a livability index

1. **Introduction**
   - Introduce ourselves (name, school, and our sponsor)
   - Briefly explain the project
     Objective and use of the project
   - Interviewee is allowed to ask questions any time during the interview

2. **Consent**
   - We will not mention name or personal information
   - We will ask for permission beforehand if it needs to be quoted
   - Interviewee has the opportunity to look over parts in the paper

3. **Question Topics**
   - Intention and use of the livability index
   - Any issues or concerns that arose when constructing the index
     - ♦ Difficulties faced when selecting and weighting indicator
     - ♦ Criteria for selection of indicators
     - ♦ Single index vs. multiple indices
   - Feedback and suggestions concerning the livability index
   - Any suggestions that you can give us
   - Contact information about people in the same field elsewhere in England

4. **Closing Remarks**
   Any questions or concerns

Appendix L- Interview Schedule for Comm. and Policy Dept.

Interview schedule for Communication and Policy Department

1. Introduction

- Introduce ourselves (names, school, and our sponsor)
- Briefly explain the project
  Objective and use of the project
- Interviewee is allowed to ask questions any time during the interview

2. Consent

- Name or personal information will not be mentioned
- Permission will be asked beforehand if it needs to be quoted
- Opportunity to look over parts in the paper

3. Question Topic

- Would you explain and/or show us the different database (UNIFORM, Member's Grid, CoWStat)
  - Where is the data coming from? How does one process the data?
  - What is the use of such database?
- Use of such index. Effectiveness?
  Do you think it will fit in with these databases or any others?
- Obtain AIMs papers or any other documents
- Who attends the AIMs? Purpose?
- What methods of communicating statuses for different wards to the councilors?
- Are you aware of the index that focuses on the indicators of anti-social behaviours, the Crime and Policy Department created?

4. Closing Remarks

Any questions or concerns

Appendix M- Interview Schedule for Crime and Policy Dept.

Interview schedule for Westminster Crime and Policy Department

1. **Introduction**
    - Introduce ourselves (names, school, and our sponsor)
    - Briefly explain the project
      Objective and use of the project
    - Interviewee is allowed to ask questions any time during the interview

2. **Consent**
    - We will not mention name or personal information
    - We will ask for permission beforehand if it needs to be quoted
    - Interviewee has the opportunity to look over parts in the paper

3. **Background**
    - How long have you been working for this department?
    - What is your current position in the department?
    - What is your responsibility?
    - What positions have you held in the past?

4. **Question Topics**
    - Obtain the methodology, any necessary data and their index
    - What was your role in the development of methodology?
    - Where is the data coming from? How does one process it?
    - What is the use of your index? Effectiveness?
    - What are some of the difficulties you faced when you created this index or selected indicators?

5. **Closing Remarks**
   Any questions or concerns

Appendix N- Interview Schedule for IT Relationship Manager

Interview schedule for IT Relationship Manager

1. **Introduction**
   - Introduce ourselves (names, school, and our sponsor)
   - Briefly explain the project
     Objective and use of the project
   - Interviewee is allowed to ask questions any time during the interview

2. **Consent**
   - We will not mention name or personal information
   - We will ask for permission beforehand if it needs to be quoted
   - Interviewee has the opportunity to look over parts in the paper

3. **Question Topic**
   - Would you explain and/or show us the different database (UNIFORM, Member's Grid, COWStat)
     - Where is the data coming from? How does one process it?
     - What are the uses of such databases?
     - How are the databases sustainable?
       Automatic data feeding
   - Would you explain and/or show us the dashboards?
   - Use of such index. Effectiveness?
     Do you think it will fit in with these databases or any others?

4. **Closing Remarks**
   Any questions or concerns

Appendix O- Interview Schedule for Environmental Department

Interview schedule for Environment Department

1. **Introduction**
    - Introduce ourselves (names, school, and our sponsor)
    - Briefly explain the project
        Objective and use of the project
    - Interviewee is allowed to ask questions any time during the interview

2. **Consent**
    - We will not mention name or personal information
    - We will ask for permission beforehand if it needs to be quoted
    - Interviewee has the opportunity to look over parts in the paper

3. **Question Topics**
    - Obtain the data on indicators
    - Any issues or concerns that arose when selecting the indicators
        - ♦ Criteria for selecting indicators
        - ♦ Difficulties faced when selecting indicator
        - ♦ Any issues/concerns with the current indicators
    - What database do you use? How often do people collect the data?
        What is the geographic breakdown?
    - Your thoughts on how an index will be used
    - Any suggestions that you can give us

4. **Closing Remarks**
    Any questions or concerns

Appendix P-Table of Environmental Indicators

	Themes	Grouping	Indicators
A.	Environment	street cleansing	Cleansing complaints
B.	Environment	waste-management	All waste complaints
C.	Environment	waste-management	Residential waste complaints
D.	Environment	waste-management	General waste complaints
E.	Environment	Recycle	Recycling complaints
	Geographical units	**Update Frequency**	**Source**
A.	wards, area forum, and streets	every four month	UNIFORM, ENCAMS
B.	wards, area forum, and streets	every four month	UNIFORM, ENCAMS
C.	wards, area forum, and streets	every four month	UNIFORM, ENCAMS
D	wards, area forum, and streets	every four month	UNIFORM, ENCAMS
E.	wards, area forum, and streets	every four month	UNIFORM, ENCAMS

Appendix Q- Calculation Sheet

This is a sample calculation sheet for the environmental sub-index. This calculation sheet provides examples of livability scores (impact, effort, and outcome scores) for the Bayswater Area Forum and the wards that are part of the Bayswater Area Forum (Bayswater, Hyde Park, Lancaster Gate, and Westbourne).

Outcome Score:

From the City Survey:

Question	Percentage (2005)
How satisfied are you with refuse collection?	87
How satisfied are you with street cleaning?	74
How satisfied are you with recycling?	87

These values are percentages of people who answered positively (above neutral – satisfied or very satisfied) to the corresponding questions.
To calculate outcome score, we found the average satisfaction percentage as follows.

(87% + 74% + 87%) / 3 = 83%

Outcome	
Ranges	**Score**
<72	**1**
72-73	**2**
74-75	**3**
76-77	**4**
78-80	**5**
81-82	**6**
83-84	**7**
85-86	**8**
87-88	**9**
>88	**10**

83% scores a 7 according to the score scale above. Therefore, Bayswater Area Forum and the wards that are part of the Bayswater Area Forum score a 7.

Impact Scores:

To calculate impact scores for each ward:

Given information from UNIFROM:

Geographical Areas	Refuse collection Q4, 05	Refuse collection Q4, 06
Bayswater	39	37
Hyde Park	46	42
Lancaster Gate	21	32
Westbourne	20	23
Bayswater Area Forum	126	134

As stated in the methodology sections, these values are numbers of complaints regarding the specific topic; in this case, the topic is refuse collection. Since the Bayswater Area Forum is comprised of four wards, (Bayswater, Hyde Park, Lancaster Gate, and Westbourne) the method to obtain the refuse collection Q4, 05 for the Bayswater Area Forum is:

39+46+21+20 = 126

Summing the values for the wards yields the total for the area forum. A similar procedure followed for Refuse collection Q4, 06.
To calculate percent change for the Bayswater Area Forum, one first needs to calculate the percent change for each ward.

e.g.
Hyde Park
(Q4, 06 – Q4, 05) / (Q4, 05) *100 = percent change

((42-46) / 46) * 100 = -8.695652174

We followed the same procedure as above to calculate the percent change for Lancaster Gate, Westbourne, and Bayswater. The chart below presents the results for the rest of the wards.

Ward	Percentage change
Bayswater	-5.128205128
Hyde Park	-8.695652174
Lancaster Gate	52.38095238
Westbourne	15

We then assigned each percent change a score according to the scale below:

Impact	
Ranges	**Score**
>121	**1**
89.1-121	**2**
57.1-89	**3**
25.1-57	**4**
-6.9-25	**5**
-21.6--7	**6**
-36.2--21.7	**7**
-50.8--36.3	**8**
-65.4--50.9	**9**
<-65.4	**10**

The corresponding score for each ward is:

Ward	Score
Bayswater	5
Hyde Park	6
Lancaster Gate	4
Westbourne	5

To calculate the Bayswater (Area Forum) score:
The population for each ward is given:

Geographical Area	Population
Bayswater	9233
Hyde Park	11842
Lancaster Gate	13299
Westbourne	11677

To calculate the total population for the Bayswater Area Forum, we added the population for every ward in the Bayswater Area Forum.

Bayswater Area Forum population calculation:

9233 + 11842 + 13299 + 11677 = 46051

To calculate the appropriate weighting factors to obtain the Bayswater Area Forum score, we found the population percentages for each ward with respect to the total area forum population.

e.g.
Hyde Park
9233 / 46051 = 0.257149682

We followed the same procedure as above to calculate the weights for Lancaster Gate, Westbourne, and Bayswater. The chart below presents the results for the all of the wards.

Wards	Weights
Bayswater	0.200495103
Hyde Park	0.257149682
Lancaster Gate	0.288788517
Westbourne	0.253566698

To calculate the score for the Bayswater Area Forum:

Wards	**Weights**	**Percent Change**
Bayswater	0.200495103	-5.128205128
Hyde Park	0.257149682	-8.695652174
Lancaster Gate	0.288788517	52.38095238
Westbourne	0.253566698	15

We multiplied the weights by the corresponding percent changes for each ward and then summed these values to obtain a percent change for the Bayswater Area Forum. We then assigned a score based in accordance with the predetermined scoring scale in order to minimize errors

(0.200495103 *-5.128205128) + (0.257149682 * -8.695652174) + (0.288788517 * 52.38095238) + (0.253566698 * 15) = 15.66625382

This would suggest a score of 5 based on the scoring scale.

It is important to note that when determining citywide scores, we use the un-rounded area forum scores along with the population percentages of the area forums with respect to the entire city population. We used un-rounded values to eliminate any significant errors due to rounding. Although, when we display scores on an area forum level, we do round to the nearest whole number for simplicity.

Effort Scores:

To calculate scores for each ward:

Given information from UNIFROM:

Geographical Areas	Work orders
Bayswater	2723
Bayswater	776
Hyde Park	690
Lancaster Gate	773
Westbourne	484

We scored each ward on a scale of one to ten based on the following chart:

Effort	
Ranges	**Score**
<256	**1**
256-333	**2**
334-411	**3**
412-489	**4**
490-568	**5**
569-646	**6**
647-723	**7**
724-800	**8**
801-877	**9**
>877	**10**

Therefore, Bayswater receives an 8, Hyde Park a 7, Lancaster Gate an 8, and Westbourne receives a 4.

To calculate the Bayswater (Area Forum) score:
We used the same population percentages that we derived above for calculating the Bayswater Area Forum score.

To calculate the score for the Bayswater Area Forum:

Wards	Weights	Work orders
Bayswater	0.200495103	673
Hyde Park	0.257149682	673
Lancaster Gate	0.288788517	689
Westbourne	0.253566698	498

We then multiplied the weights and the number of work orders for each ward and then added them to create a Bayswater Area Forum work order value.

(0.200495103 * 673) + (0.257149682 * 673) + (0.288788517 * 689) + (0.253566698 *498) = 633.2464442

This would suggest a score of 6 based on the scoring scale.

Appendix R- Scoring Summary

Annual impact, outcome, and effort score for 2006

Geographical Areas	Outcome Score	Impact score	Effort Scores
Bayswater	**7**	**6**	**7**
Bayswater	7	7	9
Hyde Park	7	7	8
Lancaster Gate	7	5	8
Westbourne	7	6	5
Central	**7**	**7**	**10**
St James's	7	8	10
West End	7	7	10
Maida Vale	**6**	**6**	**6**
Little Venice	6	6	4
Maida Vale	6	6	7
Harrow Road	6	8	7
Queen's Park	6	8	6
Marylebone	**2**	**7**	**6**
Marylebone High Street	2	7	8
Bryanston and Dorset Square	2	7	8
Church Street	2	6	2
South	**5**	**6**	**4**
Knightsbridge and Belgravia	5	6	4
Warwick	5	5	5
Churchill	5	5	1
Tachbrook	5	8	3
Vincent Square	5	6	4
St. John's Wood	**5**	**6**	**4**
Abbey Road	5	7	5
Regent's Park	5	6	4
Borough	**7**	**6**	**7**

Appendix S- Impact Distribution using Equal Step Size Method

										Ranges
>133.2	133.2-109.4	109.3-85.6	85.5-61.8	61.7-38	37.9-14.2	14.1--9.6	-9.7--33.4	-33.5--57.2	<-57.2	
										Equal Step
							-15.942			
							-15.3846			
							-15			
						9.677419	-15			
						11.11111	-12.5			
						11.11111	-10.9489			
						11.76471	-10			
						12	-10	-50		
						12.5	-27.7778	-50		
						12.5	-27.7778	-47.619048		
						-5.12821	-27.2727	-46.428571		
						-4.54545	-27.2059	-46.428571		
						-3.84615	-24.1379	-44		
						-3.44828	-24.0506	-43.835616		
						0	-21.0084	-42.857143		
					20	0	-20	-42.857143		
					20	0	-18.5185	-42.857143		
					23.52941	0	-18.5185	-40		
					25	2.097902	-16.6667	-39.285714		
					25	2.439024	-16.6667	-39.285714		
					25.80645	2.739726	-16.6667	-38.88889	-100	
				52.38095	29.03226	7.692308	-33.33333	-38.46154	-80.9524	
				54.54546	30.18868	8.333333	-33.33333	-37.93103	-72.7273	
		88.888889	63.414634	57.89474	30.76923	8.333333	-33.33333	-37.5	-70.1299	
		100	75	57.89474	14.28571	-8.69565	-33.33333	-35.55556	-68.9655	
133.3333		100	75	38.88889	15	-7.54717	-31.57895	-34.78261	-68.9655	
158.3333		100	76.470588	40	16.41791	-7.31707	-30.76923	-52.9412	-62.069	
160		100	76.470588	45	17.64706	-6.66667	-30.55556	-52.2124	-61.0619	
180	120.8333	105.5556	76.923077	50	18.51852	-6.12245	-30.43478	-50.9934	-59.0909	

Appendix T- Population Table

Geographical Areas	Residential Population	Appropriate percentages
Bayswater	46051	0.214794119
Bayswater	9233	0.200495103
Hyde Park	11842	0.257149682
Lancaster Gate	13299	0.288788517
Westbourne	11677	0.253566698
Central	21982	
St James's	11395	0.518378673
West End	10587	0.481621327
Maida Vale	40128	0.187167671
Little Venice	9044	0.225378788
Maida Vale	10851	0.270409689
Harrow Road	9813	0.244542464
Queen's Park	10420	0.259669059
Marylebone	33775	0.157535588
Marylebone High Street	10116	0.299511473
Bryanston and Dorset Square	12385	0.36669134
Church Street	11274	0.333797187
South	49232	0.22963115
Knightsbridge and Belgravia	11459	0.232755119
Warwick	9250	0.187885928
Churchill	9445	0.191846766
Tachbrook	9350	0.189917127
Vincent Square	9728	0.19759506
St. John's Wood	23228	0.108341574
Abbey Road	10459	0.45027553
Regent's Park	12769	0.54972447
Borough	214396	

Appendix U- Postcode Data

St. James's Ward		
CivicWatch Zone	**Number of Postcodes**	**Percentage of Total**
Covent Garden (CG)	466	21.89%
Mayfair & St. James's (MSJ)	340	15.97%
Strand & Whitehall (SW)	602	28.28%
Vincent Square (VS)	449	21.09%
West End & Chinatown (WEC)	272	12.77%
	TOTAL 2129	

West End Ward		
CivicWatch Zone	**Number of Postcodes**	**Percentage of Total**
Cavendish Square & Oxford Market	2628	35.83%
Knightsbridge & Belgravia	1	0.01%
Mayfair & St. James's	2845	38.79%
Oxford Street	246	3.35%
Soho	1612	21.98%
Strand & Whitehall	2	0.03%
	TOTAL 7334	

Marylebone High Street Ward		
CivicWatch Zone	**Number of Postcodes**	**Percentage of Total**
Cavendish Square & Oxford Market	379	15.94%
Marylebone High Street	1926	80.99%
Oxford Street	57	2.40%
Regent's Park	16	0.67%
	TOTAL 7334	

Bryanston & Dorset Square Ward		
CivicWatch Zone	**Number of Postcodes**	**Percentage of Total**
Bryanston & Dorset Square	1147	98.79%
Hyde Park	13	1.12%
Oxford Street	1	0.09%
	TOTAL 1161	

Appendix V- Westminster Budget Table

Sub-Index	Transport	Environment	Housing	Heath and Well-being	Crime	Economy	Education	Total
Revenue (million £)	43.15	73.2	301.3	144.2	24.8	43.15	131.6	761.4
Revenue Percentage	5.67	9.61	39.57	18.94	3.26	5.67	17.28	
Capital (million £)	4.05	7.6	80.7			4.05	9.7	106.1
Capital Percentage	3.82	7.16	76.06			3.82	9.14	

Appendix W- Internal Perception Survey

Thank you for your interest in this survey. We are interested in your opinions regarding the priorities of Westminster. As a person who works within the City Council, you have a better understanding of the true needs of the city than an ordinary citizen does. We value your input for the development of a livability index for the City of Westminster. This index can be a powerful communication and planning tool that can greatly benefit the city and the council. Your thoughts on which aspects of livability are most important to the city will help us determine the prominence each aspect should have within the index.
From the following list, please select the three aspects that you feel are the biggest priorities in Westminster.
(Check 3)

_____Transportation

_____Economy

_____Housing

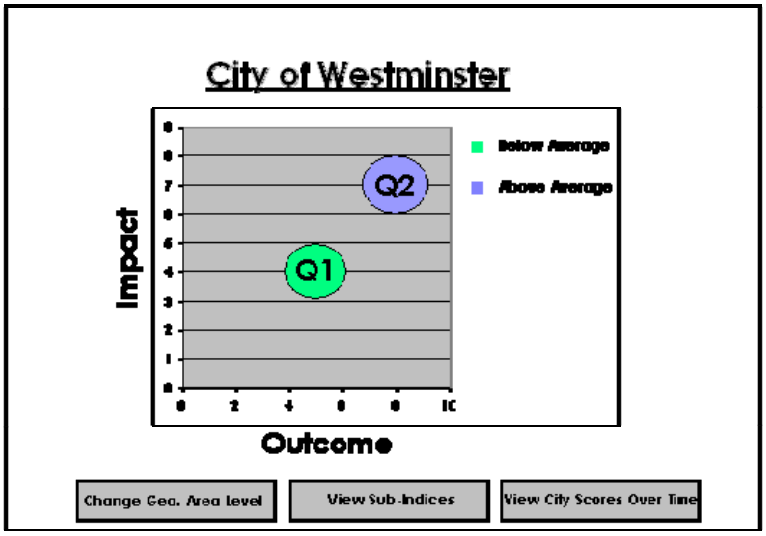
_____Environment

_____Crime

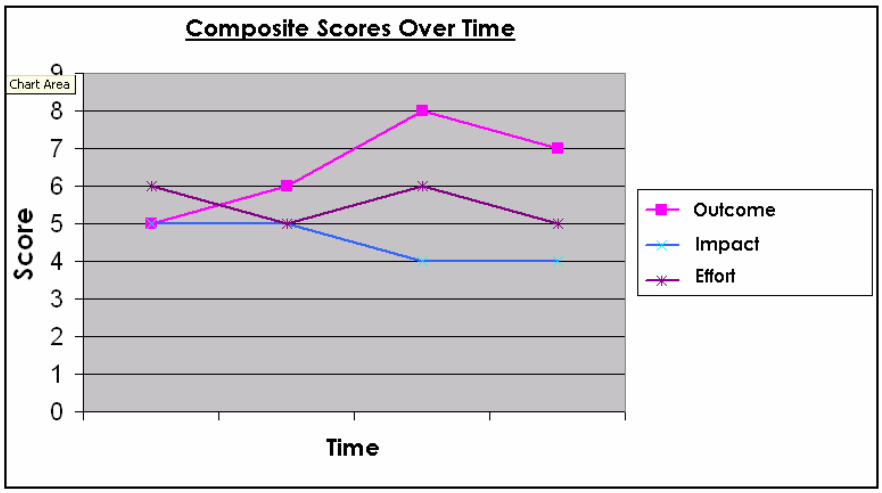
_____Education

_____Health and Well-being

Appendix X- Sample IT Templates



Screen Shot: Outcome, impact, and effort scores for City of Westminster



Screen Shot: Composite values for outcome, impact, and effort scores over time on citywide level

Appendix Y- Sample Information Sheet

Themes	Grouping	Indicators	Geographic Units	Update Frequency	Source
Economy	Benefits	Benefit claimants - working age families	WCC /Unitary Authority (UA),	Annually	DWP
Economy	Unemployment	Claimant Count (JSA claimants)	Lower Layer Super Output Area (SOA) (2004 only), Middle Layer SOA (2004 only), 2003 ward, WCC	Monthly	NOMIS
Education	Children	ID 2004 Education	Lower Layer Super Output Area (SOA)		DCLG: ID 2004
Education	Qualifications	ID 2004 Skills	Lower Layer Super Output Area (SOA)		DCLG: ID 2004
Health and Well-being	Benefits	Attendance Allowance	Lower Layer Super Output Area (SOA) (2004 only), Middle Layer SOA (2004 only), 2003 ward, WCC	Annually	DWP
Health and Well-being	Mortality	Cancer Mortality	WCC /Unitary Authority (UA),	Annually	DoH
Housing		Dwelling Type	Output Area (OA), Lower Layer Super Output Area (SOA), Middle Layer SOA, 2003 ward, WCC	Every 10 years	Census 2001
Housing	Homelessness	Homelessness	WCC	Annually	Office of the Deputy Prime Minister (DCLG)
Transportation	community	Pedestrian flow	time-base and ward	Quarterly	CONFIRM
Transportation	community	Cycle flow	time-base and ward	Quarterly	CONFIRM
Environment	Law enforcement	All Street litter tickets complaints	wards, area forum, and streets	Every four month	UNIFORM, ENCAMS
Environment	Law enforcement	Commercial street litter tickets	wards, area forum, and streets	Every four month	UNIFORM, ENCAMS

References

The Baltimore Neighborhood Indicators Alliance. Retrieved Nov. 2, 2006, from http://www.ubalt.edu/bnia/index.html

Aalfs, M., Arnold, J., Bollinger, D., & et al. (1998). *Sustainable Seattle: Indicators of Sustainable Community* (Status Report No. 1). Seattle, Washington: Sustainable Seattle. Retrieved November 11, 2006, from http://www.sustainableseattle.org/Programs/RegionalIndicators/1998IndicatorsRpt.pdf

Berg, B. L. (2004). Designing Qualitative Research. In J. Lasser (Ed.), *Qualitative Research Methods* (Fifth ed., pp. 37-38). Boston: Pearson Education, Inc.

Boelhouwer, J. (2002). *Quality of Life and Living Conditions in the Netherlands* (Status Report No. 1). Netherlands: Kluwer Academic Publishers.

Burr, E. E. (2005). *Quality of Life Progress Report* (Progress Report No. 21) The City of Jacksonville, Florida. Retrieved November 6, 2006, from http://www.jcci.org/statistics/documents/quality%20of%20life%20progress%20report.pdf

Collins, C. (2006). *Charlotte Neighborhood Quality of Life Study.* Retrieved November 14, 2006, from http://www.charmeck.org/Departments/Neighborhood+Dev/Quality+of+Life/home.htm

Conrad, R. (2005). *Achieving the Oregon Shines Vision: The 2005 Benchmark Performance Report* (Progress Report.)

Cummins, R. A. (2000). Objective and Subjective Quality of Life: An Interactive Model . *Social Indicators Research, 52*(1), 58.

Cummins, R. A., Eckersley, R., Pallant, J., van Vugt, J., & Misajon, R. (2003). Developing a national index of subjective well-being: The Australian unity well-being index. [Electronic version]. *Social Indicators Research, 64*(2), 159-190. Retrieved November 14, 2006, from SpringerLink database.

Custance, J., & Hillier, H. (1998). Statistical issues in developing indicators of sustainable development. *Journal of the Royal Statistical Society. Series A (Statistics in Society), 161*(3), 281-290.

Dluhy, Milan & Swartz, Nicholas (2006). Connecting knowledge and policy: The promise of community indicators in the United States. *Social Indicators Research, 79*, 1-23. Retrieved November 14, 2006, from SpringerLink database.

Erickson, J. (2003). Descriptions of inequality: The Swedish approach to welfare research. *The Quality of Life, ,* 67-87.

ESRI. (2005). *Getting started with ArcGIS*. United States of America.

Felce, D., & Perry, J. (1996). Assessment of quality of life. *Quality of Life, 1*, 65.

Focus group. (2006). Retrieved November 17, 2006, from http://en.wikipedia.org/wiki/Focus_group

Galloway, S., Bell, D., Hamilton, C., & Scullion, A. (2006). *Well-being and quality of life: Measuring the benefits of culture and sport* (Literature Review and Think piece. Edinburgh, Scotland: Scottish Executive Education Department.

Global crisis and sustainable development: The inspiration for the EOLOSS. (2006). Retrieved November 15, 2006, 2006, from http://www.eolss.net/eolss_inspiration.aspx

Greenwood, D. (2001). *Local indicators of quality of life: A preliminary look at the Pikes Peak region introduction* Center for Colorado Policy Studies.

Haas, B. K. (1999). A multidisciplinary concept analysis of quality of life. *Western Journal of Nursing Research, 21*(6729)

Hart, M. (2006). *An introduction to sustainability*. Retrieved December 6, 2006, from http://www.sustainablemeasures.com/Sustainability/index.html

Hemsley, S. (2006). Balancing fact. *Precision Marketing, 18*(37), 21.

Hortulanus, E. P. (2000). The development of urban neighbourhoods and the benefit of indication systems. [Electronic version]. *Social Indicators Research, 50*(2), 209-224. Retrieved November 13, 2006, from SpringerLink database.

Hsieh, C. (2004). To weight or not to weight: The role of domain importance in quality of life measurement. *Social Indicators Research, 68*(2), 163-174.

Indicators of sustainability community(1998). (Progress Report Sustainable Seattle. Retrieved November 13, 2006, from http://www.sustainableseattle.org/Programs/RegionalIndicators/1998IndicatorsRpt.pdf

Indicators of the quality of life in Bristol 2003(2003). (Status Report Bristol City Council. (Quality of Life).

Local agenda 21. (2006). Retrieved December 7, 2006, from http://www.ace.mmu.ac.uk/eae/Sustainability/Older/Local_Agenda21.html

Local agenda 21. (2001). Retrieved December 6, 2006, from http://www.cornwall.gov.uk/index.cfm?articleid=11503

Measuring quality of life in the city of Glen Cove (2000). (Status Report The Institute for Sustainable Development at Long Island University. (Quality of Life).

Minnesota milestones: Measures that matter(2002). (Progress Report Minnesota Planning).

Mokkonen, K. *Feedback system to support interactive planning* (Status No. 1). Finland: Soil and Water Ltd.

Mokkonen, K., & Alppi, S. *Web-based GIS to support citizen interaction in land use planning* (1st ed.). Finland: Soil and Water Ltd.

New London Architecture. *Westminster*. Retrieved October 31, 2006, 2006, from http://www.newlondonarchitecture.org/media/map/boroughs/borough_33.gif

Redefining progress: 2004, 'Community indicators project'. (2004). Retrieved Nov. 4, 2006, from http://redefiningprogress.org/projects/indicators/

Robey, D., & Sahay, S. (1996). Transforming work through information technology: A comparative case study of geographic information systems in county government. [Electronic version]. *Information Systems Research, 7*(1), 93. from Business Source Premier Database.

Roman, G. *Enhancing quality of life (QOL) with GIS* (Status Report No. 1). Bryan, Texas: City of College Station. Retrieved November 13, 2006.

Springer, M. (1970). Social indicators, reports, and accounts: Toward the management of society. *Annals of the American Academy of Political and Social Science, 388*, 1-13.

Stable, transitioning and challenged neighborhoods. (2006). Retrieved November 14, 2006, from http://www.charmeck.org/Departments/Neighborhood+Dev/Quality+of+Life/stable.htm

State of the neighborhoods. (2003). Retrieved Oct. 30, 2006, from http://www.bristolforward.net/evaluation/neighbourhoods.asp

Stutz, J. (2006). *The role of well-being in a great transition* No. 10). Boston: Tellus Institute. Retrieved November 11, 2006, from Great Transition Initiative database. from http://www.gtinitiative.org/documents/PDF%20FINALS/10Well-being.pdf

Trochim, W. M. (2006). *Analysis.* Retrieved November 10, 2006, from http://www.socialresearchmethods.net/kb/analysis.htm

Trochim, W. M. (2006). *Types of data.* Retrieved November 15, 2006, from http://www.socialresearchmethods.net/kb/datatype.htm

Turner, P., & Higgs, G. (2003). The use and management of geographic information in local E-government in the UK. *Information Polity: The International Journal of Government & Democracy in the Information Age, 8*(3/4), 151.

U.S. Census 2000 Data (2000). (Data) University of Baltimore.

United States Environmental Protection Agency. (2006). *Indicators.* Retrieved November 12, 2006, from http://www.epa.gov/greenkit/indicator.htm

United States Government Accountability Office. (2004). *Improving how to understand and assess the USA's position and progress* (Report No. GAO-05-1). Washington, DC: United States Government Accountability Office.

Veenhoven, R. (1996). Happy life expectancy. *Social Indicators Research, 39,* 1-58.

Vital signs: Measuring Baltimore's progress towards strong neighborhoods and a thriving city (2006). (Progress Report No. 4) Baltimore Neighborhood Indicators Alliance.

What makes a good indicator: Criteria for assessing usefulness to the community (2002). (Handbook Baltimore Neighborhood Indicators Alliance. (Indicator)

Westminster City Council (2005). *Annual Accounts.* Retrieved October 31, 2006, 2006, from http://www3.westminster.gov.uk/docstores/publications_store/accounts0506.pdf

Westminster City Council (2005). *Council tax and finance.* Retrieved October 31, 2006, 2006, from http://www.westminster.gov.uk/councilgovernmentanddemocracy/councils/counciltaxandfinance/

Westminster City Council (2005). *Facts and Figures.* Retrieved October 31, 2006, 2006, from http://www.westminster.gov.uk/communityandliving/factsandfigures/upload/Facts%20and%20Figures%202004_05%20Final2.pdf

Westminster City Council (2005). *History of the Lord Mayoralty.* Retrieved October 31, 2006, 2006, from http://www.westminster.gov.uk/councilgovernmentanddemocracy/democraticprocessesandevents/mayor/history.cfm

Westminster City Council (2005). *One City: An introduction.* Retrieved October 31, 2006, 2006, from http://www.westminster.gov.uk/onecity/

Wish, N. B. (1986). Are we really measuring the quality of life? well-being has subjective dimensions, as well as objective ones. *American Journal of Economies and Sociology, 45*(1), 93-99.