# THE IMPLICATIONS OF SUSTAINABLE DEVELOPMENT FOR HAPPY NEIGHBORHOODS

A Dissertation

Presented to the Faculty of the Graduate School

of Cornell University

In Partial Fulfillment of the Requirements for the Degree of

Doctorate of Philosophy

by

Scott A. Cloutier

January 2014

# ABSTRACT

THE IMPLICATIONS OF SUSTAINABLE DEVELOPMENT FOR HAPPY NEIGHBORHOODS

by,

Scott A. Cloutier

Cornell University, January 2014

A potential solution to some of our major societal challenges is to develop sustainably, while setting human happiness as the ultimate objective. This dissertation investigates relationships between community development and self-reported happiness and suggests potential associations between the two. A Sustainable Neighborhoods Index (SNI) is developed in response to calls for a measure of happiness for our cities. The SNI is a tool to assess and compare how well individual cities, towns, neighborhoods and communities embrace sustainable practices. The hope is that these practices, in turn, create opportunities for their residents to pursue happiness. Furthermore, a Sustainable Neighborhoods Distribution (SND) is created; representing a distribution of 50,000 community scenarios based on measurements of

sustainability for assessment and comparison of communities. The SNI was applied to two cities (Ithaca, NY and Athens, GA) and to nineteen coastal cities. Cities such as Portland, San Francisco and Seattle score well, while cities like Virginia Beach and Detroit score poorly on the SNI. Finally, a "Happy-Centric" framework and the acronym "PERSPECTIVE" are outlined with the intention of guiding the planning, retrofit and design of future communities to move toward sustainability and greater opportunity for happiness.

This dissertation puts happiness into the realm of community development and sets happiness as the ultimate outcome, now and into the future. All humans relate to a desire to be happy and those communities that set sustainability and happiness as ultimate objectives could attract and sustain future generations of residents, while improving the life of current residents. Cities are the future of our civilization and they must be developed in a way that contributes to a lasting relationship with the natural and social environment. Developing our communities with the intention of providing residents with the greatest opportunities for happiness may be the key to a sustainable future.

# DEDICATION

This dissertation is dedicated to Konha Bear: the best dog in the world.

# BIOGRAPHICAL SKETCH

Scott began his educational journey as a top-notch student at Rochester Catholic School, in Rochester, New Hampshire. From there, it was on to Spaulding High School, also in Rochester, New Hampshire, and then Dover High School in Dover, New Hampshire, where Scott struggled to pass high school, barely graduated and headed into the United States Navy. It was in the Navy that Scott received electronics and weapons systems training and excelled as a student. The discipline required for the military gave Scott a thorough appreciation and understanding of what was required to be successful in his studies and in life. Scott was then honorably discharged from the military and headed to Mendocino College in Northern California. As a student at Mendocino College, he gained a deep respect for the planet and all things Math and Science. He was very successful in his coursework there and returned back home to New Hampshire to complete both a Bachelors and Masters of Science Degree at the University of New Hampshire in Environmental Engineering. These educational experiences gave Scott the tools to attend Cornell University and complete a PhD in Biological and Environmental Engineering. He is excited about the future and the many more educational experiences yet to come. Next on the list is learning how to build a home from mud, timber and straw and then how to fly a plane.

ACKNOWLEDGEMENTS

I would first like to acknowledge the most important person in my life: my wife, Kari. You have been a constant source of support for me throughout my entire academic career and are always willing to pick up and move wherever needed for the next step in the process. I am extremely fortunate to have you as a part of my life and will be forever grateful for the sacrifices you have made so I can achieve my academic goals. You are my best friend and partner and I couldn't be more thankful for what I have in you. I love you. Thank you, Kari. I want to acknowledge my recently passed grandmother, Phyllis. Nanny, it is because of you that I don't take life too seriously and am grateful for what I have. You always taught me to have a sense of humor, wear my heart on my sleeve, and to try to be the light in the room, as you were for me. I will never forget the many years I spent with you as a kid and the kindness and compassion you showed me while also being the silliest person I have ever met. I will forever cherish the things you have shown me and will never forget you. I love you, miss you and thank you. Next, I want to acknowledge my advisor, Norm. You have always maintained an open door for me to come and see you with questions and have treated me like a human, rather than another graduate student. I appreciate the time you have spent with me outside of academics, including dinner, golf and tennis. Finally, I sincerely appreciate the opportunity to pursue a PhD at Cornell University and the flexibility you have given me to research my interests and passions. I will miss our chats about sports, science and life in general. Thank you, Norm.

I want to thank my committee, including Mark, Nancy and Jenna. Mark, my thoughts of you will never revolve around the PhD process because of the countless hours we have spent playing basketball together. It is safe to say that 90% of the time we have played, we have spent guarding one another and it has always been a great challenge. I will miss it. I also am extremely thankful for the time you have taken to give me career advice and things to be aware of. You will always be welcome to join me anywhere, anytime for some hoops. Thank you, Mark. Nancy, thank you for your patience and support as I learn the social sciences worldview and perspective on research. It has been an immense challenge trying to bridge

the world of engineering and the social sciences but you have been an unwavering source of support and mentorship for me. Thank you, Nancy. Jenna, thank you for being available to me whenever I had a question or concern I needed to discuss. You have always been a great mentor to me and have been an immense help as a member of my committee. I thoroughly appreciate your ability to be a hybrid engineer that appreciates both the rigor of Math and Science and the unexplained and challenging human dimension of sustainability. Thank you.

I want to thank my father for continuously supporting me throughout my academic career and being such a major proponent of pursuing a PhD. It truly helps to have someone there to encourage you to keep going and working hard. You have always been an amazing example of someone with a dedicated and unending work ethic and I am thankful to have learned this from you. I am sure there will be many more conversations about the next goals and achievements in my life and I look forward to them. Thank you, Dad. I wouldn't be who I am today without the support and love of the Gregoire family. You treated me like one of your own from a very young age and showed me that it is okay to wear your heart on your sleeve and to believe in your dreams. I am forever indebted to you all for the things you have given me. I love you all very much. Thank you.

I want to thank my entire family, including Kari, Dad, Mom, Kristine, Jamie, Stacy, Andrew, Nathan, Kody, Marshall, Jordan, Kayla, Lars, Caroline, Abby, Estelle, Charlie, Jan, Donna, Alyson, Nick, Madeline, Luka, Daddy G., Chris, Monica, Lily, Maggie and the entire Gregoire clan. You all have played a major role in my life and have helped shape who I am today. I am eternally grateful for you all. To all of my beautiful nephews and nieces, you all have allowed me to stay connected with my inner kid and be silly. I believe this is so important to do in life. I love my family with all of my heart and thank you. I want to thank all of my friends, especially Chris, Zach and Rob. You all have always been there for me when I have had technical questions or when I just needed to talk. Chris, you are the best friend a guy could have and one of the most generous and thoughtful people I know. Thank you for all of your support and help over the years. I love you. Zach, you also are the best friend a guy could have. You are

compassionate, thoughtful and one of the best people I know. Thank you for being a great friend to both Kari and I. I love you. Rob, you also are the most amazing friend a guy could have – even though you can't guard me on defense. I will always remember the many times we got together at the pond and played music and relaxed. I will also never forget our long ride on the scooters. I love you. Thank you.

I want to thank the Systems Engineering Department at Cornell University for the many semesters of financial support and many assistantships. I have learned a great deal from both Professors Mason Peck and David Schneider. I thank you both. I also want to thank Professor Mark Lewis for a semester of support. It was quite generous of you to support me in exchange for working for you and I will never forget it. In addition, I want to thank the Communication Department at Cornell University and Professor Linda Van Buskirk for a semester of support. Without all of the generous assistantships, I wouldn't have completed my PhD. Thank you all.

I want to acknowledge the many, many friends I have met through playing basketball at Cornell University and in Ithaca. Sports have always served as an outlet for me when it comes to stress and the everyday challenges of life. Furthermore, some of my greatest friends are so because of relationships that started playing sports. I can sincerely say that some days would have been quite a challenge if I weren't able to play basketball with you all. I will never forget the many great days of basketball in Barton Hall, Helen Newman Hall, Newman Arena and downtown Ithaca. I will always think of you all extremely fondly. Thank you.

I want to thank the wonderful people and members at Ultimate Athletics, Mighty Yoga, and Greenstar Cooperative. You have given both Kari and I a wonderful opportunity to grow as yogis, exercise junkies and health food fanatics. I will think of all three establishments, especially the wonderful people who are employed at and frequent them, with a warm heart. I will miss you all. I also want to thank Tri-Delta Sorority at Cornell University for allowing Kari and I to be house parents to 32 wonderful young ladies who we love and will miss. It has been a great experience. Thank you.

Finally, I want to acknowledge my two amazing doggies, Bodhi & Konha. Bodhi, you have always loved and protected us with a fierce heart and soul. I am so lucky to have you to come home to after a long day. I appreciate how happy you are to be around me and love you very much. Konha, it has been extremely hard without you in our life over the past few months and I will never forget you. You were the happiest dog I have ever known. I will forever remember you bounding about through the woods, in fields of snow and blazing your own trail. I love you and miss you with all of my heart. You will always be my pup. I dedicate this dissertation to you.

## TABLE OF CONTENTS

# LIST OF FIGURES

**Chapter 3:**



**Chapter 4:**



**Chapter 5:**

**Appendix B:**



**Appendix C:**

# LIST OF TABLES

**Chapter 2:**



**Chapter 3:**



**Chapter 4:**



**Appendix A:**



**Appendix B:**

**Appendix C:**

# **CHAPTER 1-** INTRODUCTION

## 1.1. Problem Statement

The majority of modern communities are in need of developmental strategies to move toward sustainability. Conventional community development has primarily focused on short-term economic gain and achieving environmental regulations. Globally, population growth, a foreseeable end to fossil fuel use, costly energy production, limited natural resources, and catastrophic natural disasters, leave society struggling for integrated solutions to ensure the survival of current and future generations. More could be done to set human welfare as an objective of how we design and retrofit our future communities.

Sustainable development should include all aspects of the environment, economy and society. However, descriptions and definitions of the term, along with strategies for action, could be enhanced through the inclusion of human happiness. There have been calls for the United States to model other countries, including Bhutan and Thailand, by developing and including a happiness index as a measure of success (Brooks 2010, Duncan 2010, Ura 2013). The potential exists for happiness to be indexed within communities, while considering its associations with sustainable development. To be clear, there is an assumed relationship between sustainable development and happiness, as described below.

*Happiness and Sustainable Development*

The efforts included within this dissertation are built upon the premise that happiness and sustainable development are positively associated. Thus, a potential definition for sustainable development, as adapted from Weston (1992) and the Brundtland Commission (1987), is *a process of change in which the direction of investment, the orientation of technology, the allocation of resources, and the development and functioning of institutions afford the opportunity for the pursuit of happiness while preserving the opportunity for future generations to pursue their own happiness.* Humans are incredibly resourceful and inventive and this dissertation serves as a call to action to refocus our research, efforts, resources and innovation to intentionally design communities for two outcomes: (1) sustainability and (2) residential happiness. Although often misguided, happiness is what humans strive for. Thus, community planners, architects, engineers, and designers should consider happiness as an objective for their designs.

*Engineering for Happiness*

Engineering for Happiness is meant to represent a shift of current engineering and design outcomes. In particular, engineers should alter the objectives of their design processes from efficiency and meeting economic guidelines alone to providing the greatest opportunity for humans to pursue

their own happiness. Engineers are typically problem solvers with innovative and unique approaches to some of the most complex issues. As mentioned by Catalano (2010), "If people need things designed engineers tend to just design them without giving a lot of thought to their applications" (p. 11). Engineering for happiness could take the design process to a new level by considering how each facet of design might be associated with improving the happiness of those using the product. Inherently, engineering for happiness would include meeting economic guidelines and ensuring efficiency. However, it would bring a whole new dynamic of social engineering to the forefront of design.

This dissertation is driven by the overarching hypothesis that communities designed/retrofitted for the promotion of happy residents would naturally include sustainable economic, environmental and social aspects - fundamental principles of sustainable development. Furthermore, these communities could provide opportunities for humans to pursue their happiness with meaning and substance, while living a more sustainable existence. This work addresses four issues, as determined through extensive literature review:

1. Sustainability and sustainable development strategies have yet to include happiness as an objective.

2. Happiness has yet to permeate many professional fields, particularly engineering.
3. A sustainability index for the assessment of the opportunities for residents to pursue happiness within communities has yet to be created.
4. A framework for communities to develop sustainably, while also addressing residential happiness, is nonexistent.

## 1.2. Literature Review Summary of Studies of Relationships Between Aspects of Sustainable Community Development and Happiness

Table 1 – 1 Summary of Studies Relating Happiness and Community Development

| Author(s) | Design/Notes | Study Location(s) | Basic Result |
|---|---|---|---|
| Veenhoven 1992 | Cross sectional / collection and analysis of several various surveys on quality of life and other indicators for happiness; controlled for realized life-quality, income levels | 66 total nations | Livability (community design) is associated with happiness |
| O'Brien 2001 | Cross-sectional / Survey of 6,000 elementary students | Ontario, Canada | Walkability is associated with happiness |
| Zidansek 2007 | Cross-sectional / Survey of at least 1000 residents in many countries to compare three measures of happiness with two sustainability indices | Several nations with the EU and UN | Happiness is associated with sustainable development |
| Leyden et al. 2011 | Cross-sectional / 2008 Quality of Life Survey Data collected for 10 cities; controlled for differences in urban form (e.g. cleanliness, access to transportation) and personal characteristics (income, marital status, employment, feelings of connectedness, health, personal view of government) of residents | New York City, London, Paris, Stockholm, Toronto, Milan, Berlin, Seoul, Beijing, Tokyo | Design and conditions of cities are associated with happiness |
| White et al. 2013 | 18 year longitudinal/ Survey of 5,000 households and 10,000 adults; controlled for income, employment status, marital status, health, housing type and local-area-level variables (e.g. crime rates) | United Kingdom | Individuals are happier when living in green cities. |

Table 1-1 is a summary of the studies that have found associations between happiness and aspects of community development. These studies form the basis for both the work in Chapter 2 and for the development of the Sustainable Neighborhoods Index (Chapter 3), as each study demonstrates correlations between sustainable community development and happiness. While the number of studies relating community development and happiness is limited and evidence of existing relationships are correlational (not causal), they do lay the groundwork for future research considering how sustainable development is associated with the happiness of residents.

The subjects of happiness and sustainable development have both become actively researched topics, particularly within the past decade. Figure 1-1 shows the increase in the number of journal articles published on happiness, as found using the Cornell University Library's database. Likewise, Figure 1-2 shows the increase in the number of journal articles published on sustainable development (with a slight drop in publications in 2011). As indicated in both figures, the number of peer-reviewed happiness and peer-reviewed sustainable development articles are experiencing an upward trend. Furthermore, as previously mentioned, there have been a large number of studies that try to establish associations and connections between the two areas. Therefore, it is the purpose of this dissertation to

contribute to these growing areas of research by analyzing and developing a connection between the two.

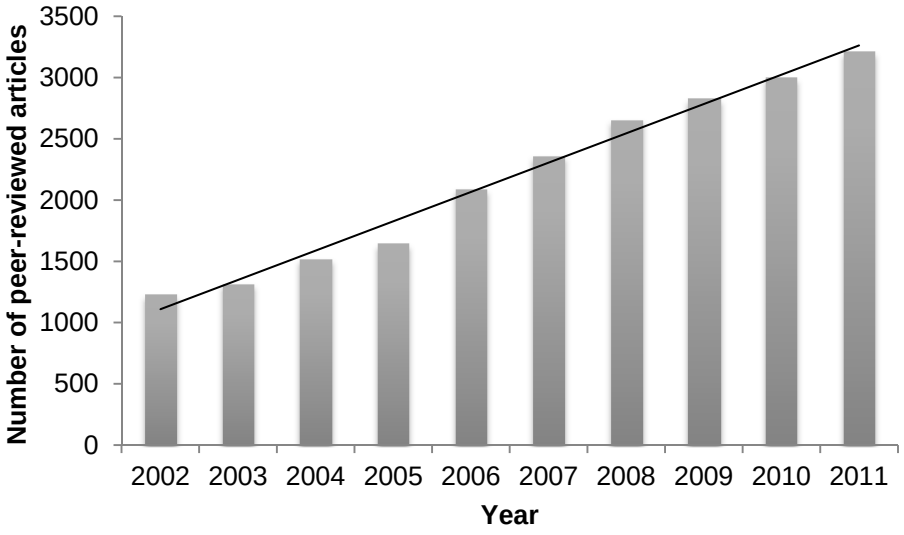



Figure 1 - 1 Number of Peer Reviewed Happiness Articles from 2002-2012 (Cornell University Library 2013)

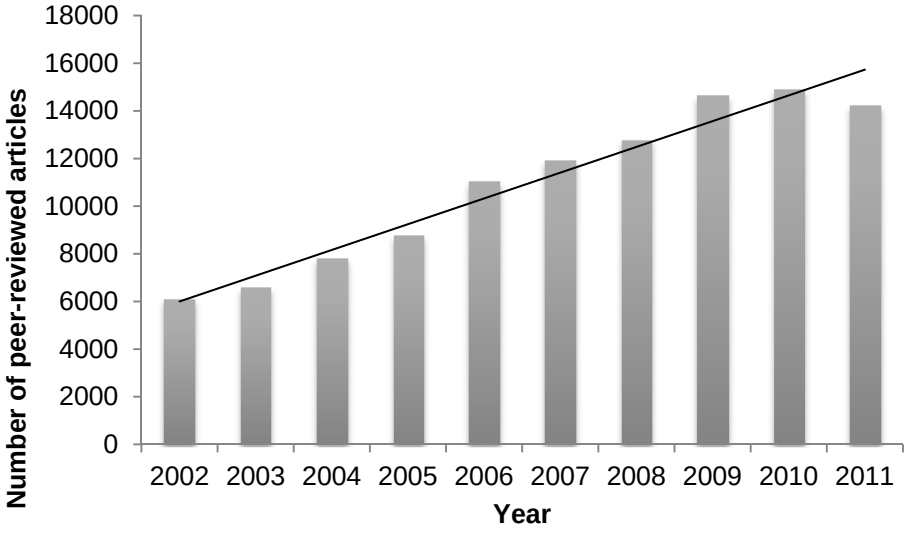



Figure 1 - 2 Number of Peer Reviewed Sustainable Development Articles from 2002-2010 (Cornell University Library 2013)

Studies have yet to consider a full systems relationship between several areas of community development and the happiness of residents. In

fact, the gap in the literature coupled with prior experiences, as described below, motivated the development of the subsystems considered in this research. The effort in the subsequent chapters is driven by three hypotheses:

1. Happiness is associated with community development.
2. Happiness is associated with nine subsystems of community development, each of which can be rated, summed and used for the creation and application of an index.
3. A framework can be developed for communities who want to move toward sustainability and happy residents.

### 1.3. Research Objectives

Setting sustainability and happiness as simultaneous objectives for community development may result in solutions to the aforementioned issues with sustainable development descriptions and approaches. As illustrated in the following chapters, this research considers these relationships through five specific objectives, highlighted below:

1. Examine and evaluate the associations between two existing sustainability indices and self-reported happiness (Chapter 2).

2. Develop a Sustainable Neighborhoods Index (SNI) from already existing sustainability metrics that have been found to be associated with happiness (Chapter 3).
3. Develop an SNI framework for data collection by applying the SNI to two cities within the United States (Chapter 3).
4. Given that the majority of the US population lives on the coasts, apply the SNI to 19 coastal cities within the United States (Chapter 4).
5. Develop a framework for communities desiring a move toward a sustainable future (Chapter 5).

# **CHAPTER 2-** IS SUSTAINABLE COMMUNITY DEVELOPMENT ASSOCIATED WITH HAPPINESS?

## 2.1. Abstract

In this Chapter, we assess the associations between happiness and two US city sustainability indices: the Green City Index (2011) and the SustainLane US Green City Rankings (2007). Based on the examination of associations between self-reported happiness data from the Gallup Healthways Well-Being Index (2012) and the overall Green City Index (N=22 cities) scores and the overall SustainLane US City Rankings (N=50 cities), we find that both sustainability indices are associated with self-reported happiness. We find significant associations between self-reported happiness and four out of nine categories that comprise the Green City Index, including energy, waste, buildings, and environmental governance, and five out of the fifteen categories that comprise the SustainLane US City Rankings, including metro street and freeway congestion, green (LEED) building, air quality, local food and agriculture and housing affordability. The results suggest that those cities that demonstrate characteristics of sustainable development are associated with higher levels of self-reported happiness.

## 2.2. Introduction

In 1987, the Brundtland Commission Report presented the concept of *sustainable development* as "meeting the needs of the present without

compromising the ability of future generations to meet their own needs" (Our Common Future 1987, p. 8). Developing communities sustainably requires resilient and efficient systems integrating economic, environmental and social elements. However, many development efforts continue without sustainability in mind, often focused primarily on short-term economic gain. If the typical development path is followed, meeting the basic needs of a growing and increasingly urbanized population will exponentially increase the demand for energy and natural resources, thereby further exacerbating the pressure on the world's ecosystems. This means that business as usual is not an option (Engel 2011).

Humans face significant economic, environmental and social challenges with respect to an expanding human population, increasing natural resources demand, climate change, food and energy demand, and increased pollution. Thus, there is an urgent need for significant changes in the way we design and retrofit our cities to satisfy a future of growth without compounding our current problems. A potential approach for future community development is one that focuses on offering the greatest opportunity for the happiness of residents. In addition to conserving important ecological and social processes, a community focused on a shift toward sustainable environmental, economic and social systems could potentially improve the overall happiness of its inhabitants (Leyden et al.

2011, O'Brien 2009, Schimmel 2009). However, more evidence is needed to support the notion that sustainable development is associated with residential happiness. This paper is a comparison between two sustainability indices, including the Green City Index (2011) and the SustainLane US City Rankings (2007), and self-reported happiness levels, as obtained from the Gallup Healthways Well Being Index (2012). The two sustainability indices represent the best data available at the time of the study for several categories of community development, while Gallup serves as the best data source for self-reported happiness.

### 2.2.1. Growing Importance of Documenting/Assessing Happiness in Cities Globally

Happiness is commonly referred to as some derivation of John Stuart Mill's (1863) intended pleasure and absence of pain. In more contemporary terms, Diener (2008) defines happiness as life satisfaction and having more positive emotions than negative emotions. As with any term, a number of varying definitions of happiness exist. In this study, we refer to happiness as a lasting feeling of pleasure with more positive emotions than negative emotions. While acknowledging people's happiness is influenced (and differs) on an individual level (the microsocial scale), this work focuses on the community level (macrosocial scale), which has been shown to also be relevant to happiness in terms of ability to cope with life, including subjective

health and financial satisfaction, close social relations, and the economic perspectives for improvement in the future (Haller and Hadler 2006). Happiness is a social and public good, not just a private or individual concern; and people care about it, and policy-makers are beginning to recognize its value in urban planning and development (Thin 2012). Countries like Bhutan, Thailand, France and England are setting the measurement and assessment of happiness as a national standard, while both the state of Vermont and cities like Somerville, Massachusetts and Seattle, Washington are also measuring happiness. Furthermore, justification has been made for an index that considers happiness in our communities (Duncan 2010, Schimmel 2009, Ura 2013). It is essential to consider the many ways our communities may affect the people who reside in them. As Neil Thin (2012) mentions, "no other term [happiness] gives us a more powerful invitation to discuss and assess how society facilitates or inhibits the enjoyment of good lives" (p. 33).

### 2.2.2. Sustainable Community Development Indices

This Chapter investigates the complex community development system by assessing and analyzing the relationships between happiness and two sustainable community development indices, in particular the Green City Index (GCI) (2011) and the SustainLane US City Rankings (2007), as well as their respective categories of assessment. The aforementioned indices

represent a systems-based strategy for developing sustainability rankings for US cities. These indices also allow us to study and analyze several elements of community development and how they are associated with happiness.

### 2.2.3. Sustainable Community Development and Happiness

Several studies have assessed the influence of sustainable community development on happiness (Leyden et al. 2011, O'Brien 2005, O'Brien 2009, Schimmel 2009, Veenhoven 1992, Zidansek 2007) and have called for more research with respect to community development and happiness (Leyden et al. 2011, O'Brien 2009, Schimmel 2009). Studies have been conducted on happiness at the national level (Schimmel 2009, Veenhoven 1992) and the city level (Leyden et al. 2011, O'Brien 2005, Florida 2010) that support the potential association between aspects of sustainable development and happiness. The aforementioned studies demonstrate that there is a great deal of research to be done with respect to community-based happiness studies; i.e., a gap exists in the literature between happiness and an extensive, systems-based analysis of community development on the city level. Our study begins to fills this gap in the literature by assessing the associations between a number of areas of community development and happiness. The aims of this study are to:

1) Examine the relationships between self-reported happiness and the overall Green City Index and SustainLane US City Rankings.

2) Examine the relationship between self-reported happiness and the categories of both the Green City Index and SustainLane US City Rankings.
3) Identify the association between sustainable community development and self-reported happiness.

## 2.3. Data Sources

### 2.3.1. Happiness Data

The Gallup Healthways Well-Being Index (2012) serves as a surrogate for happiness scores for this study. Although an argument can be made for the distinction between the terms "happiness" and "well-being, the terms have been used interchangeably in the literature (Dockery 2005) and this paper treats happiness and well-being as synonyms. As shown in Table 2-1, the Well-Being Index is comprised of six well-being indices: life evaluation, emotional health, physical behavior, healthy behavior, work environment and basic access. Table 2-1 lists the number of items for each index and two types of reliability: Cronbach alpha reflecting internal consistency and test re-test reliability. Further information on the specific items can be found in the Green City Index Report (2011).

Table A-1 (Appendix A) reports the (Gallup Healthways) happiness scores for the twenty-two cities selected for the Green City Index and the fifty cities selected for the SustainLane US City Rankings study. Cities

included in both the GCI and SustainLane Rankings are italicized, while cities (three total) only included in the GCI are bolded. The remaining city names are only included in the SustainLane Rankings.

Table 2 - 1 Gallup Healthways Well-Being Index Summary

| | Life Evaluation | Emotional Health | Physical Behavior | Healthy Behavior | Work Environment | Basic Access | Overall Well-Being Index |
|---|---|---|---|---|---|---|---|
| Number of Items | 2 | 1 | 9 | 4 | 4 | 13 | 33 |
| Cronbach's Alpha | State and District Level: 0.72; Individual Level: 0.60 | | | | | | |
| Test-Retest Reliability | Stale Level: 0.83; District Level: 0.79; Individual Level: 0.72 | | | | | | |

Note: Alpha's not provided for each subscale

### 2.3.2. Sustainability Indices

The sustainability indices for this study include the Green City Index (GCI) (2011) and the SustainLane US City Rankings (2007). Table A-2 summarizes the methods used for the GCI and shows that the Economist Intelligence Unit (EIU), a group for the Economist Magazine (2011), scored all categories included in the GCI. The overall GCI is based on a combined nine scores for twenty-two US cities, including water, energy, land use, waste, transport, buildings, $CO_2$, air and environmental governance. Table A-3 shows the overall GCI scores for all twenty-two cities included in the index.

The overall SustainLane US City Ranking contains fifteen scores for fifty US cities, including an overall SustainLane Ranking and scores for fifteen categories, including city commuting, regional public transportation ridership, metro street and freeway congestion, air quality, tap water quality, solid waste

diversion, planning and land use, city innovation, housing affordability, natural disaster risk, energy and climate change policy, local food and agriculture, green economy, knowledge base and communications and green (LEED) building. Table A-4 summarizes the methods used for the SustainLane US City Rankings and shows that SustainLane staff assigned scores based on their selected indicators for all categories. Table A-5 shows the overall SustainLane US City Ranking scores for all fifty cities assessed.

### 2.4. Methodology

We took happiness data from the Gallup Healthways Well-Being Index (2012) for each city scored by either the Green City Index (GCI) (2011) or the SustainLane US City Rankings (2007). We then took scores for both the GCI and the SustainLane Rankings. All GCI scores were given as 0 to 100 scores and were taken for analysis. The SustainLane Rankings were reverse coded in fourteen of the fifteen categories. For example, SustainLane ranked the city of Boston first out of the fifty cities in food. Thus, we gave Boston a score of 50 to represent the highest number of points possible. Likewise, we scored the city of Dallas as a 3 in food, as SustainLane ranked it at 48 (the third worst ranking). The exception to reverse coding is natural disaster risk, as it is assumed that those cities with the highest natural disaster risk would have a negative impact on happiness.

To assess the relationships between happiness and the sustainability indicators and their respective categories, a Pearson's product moment correlation was run. For example, the air quality category score of the SustainLane US City Rankings (2007) was taken for all 50 cities scored and compared with happiness scores, from the Gallup Healthways Well Being Index (2012), for the same 50 cities. Pearson's correlation coefficients ($\rho$) indicated the strength of linear relationships between two variables. Specifically, a coefficient of either -1 or 1 ($\rho$=±1) demonstrates a perfect linear relationship between two variables while a coefficient value of 0 ($\rho$=0) indicates no linear relationship. In this case, as informed by Berthouex and Brown (2002), the statistical hypothesis, test, and potential conclusions are as follows:

1. $H_0; \rho = 0$

   $H_1; \rho \neq 0$

   where: $\rho$ is the Pearson's population correlation coefficient:

   $$\rho_{X,Y} = \frac{\operatorname{cov}(X,Y)}{\sigma_X \sigma_Y} = \frac{E[(X-\mu_X)(Y-\mu_Y)]}{\sigma_X \sigma_Y}$$

2. Investigate these relationships with $\alpha = .05$ and test statistic t:

   $$t = r\sqrt{\frac{n-2}{1-r^2}}$$

   where: $r$ is the Pearson's sample correlation coefficient:

$$r = \frac{\sum_{i=1}^{n}(X_i - \bar{X})(Y_i - \bar{Y})}{\sqrt{\sum_{i=1}^{n}(X_i - \bar{X})^2}\sqrt{\sum_{i=1}^{n}(Y_i - \bar{Y})^2}}$$

where *n* is the number of cities measured; *n-2* is the degrees of freedom, n=22 for GCI; n=50 for SL

This is a two-sided test, as the alternative hypothesis involves *t* on the positive and negative sides from 0. Thus, the null hypothesis will be rejected if the computed *t* is less than or greater than the value of the lower and upper tail *t* statistics having a probability of $\alpha = .05$.

3. If test statistic *t* meets criteria in step 2 and $|r|>0$, reject null hypothesis, accept alternative hypothesis with given criteria (Quinnipiac, 2013):

   $r = \pm 0.20$ to $\pm 0.29$ weak relationship

   $r = \pm 0.30$ to $\pm 0.39$ moderate relationship

   $r = \pm 0.40$ to $\pm 0.69$ strong relationship

   $r = \pm 0.70$ to $\pm 1.0$ very strong relationship

## 2.5. Results

### Happiness and the GCI and SustainLane

Table 2-2 shows the Pearson correlation coefficients between happiness and the respective categories of both the Green City Index and SustainLane. Those coefficients with either a single or double asterisk meet the $\alpha = .05$ requirement and confirm alternative hypothesis demonstrating correlations between happiness and aspects of sustainable development.

Table 2 - 2 Correlation between happiness, SustainLane, the Green City Index and the Respective Categories

| SustainLane Categories | Pearson's r | GCI Categories | Pearson's r |
|---|---|---|---|
| Overall SustainLane | .303* | Overall GCI | .532* |
| City Commuting | .102 | Water | .420 |
| Air Quality | .284* | Energy | .465* |
| Tap Water Quality | -.078 | Land Use | .320 |
| Solid Waste Diversion | .256 | Waste | .485* |
| Planning and Land Use | .092 | Transport | .183 |
| City Innovation | -.003 | Buildings | .453* |
| Housing Affordability | -.305* | $CO_2$ | .335 |
| Natural Disaster Risk | -.138 | Air | .397 |
| Energy Climate Policy | .032 | Environmental Governance | .535* |
| Local Food and Agriculture | .338* | | |
| Green Economy | .312 | | |
| Knowledge Base and Communications | .110 | | |
| Green (LEED) Buildings | .369** | | |
| Regional Public Transportation Ridership | .263 | | |
| Metro Street and Freeway Congestion | -.405** | | |

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

## 2.6. Discussion

### 2.6.1. Happiness and the Overall Sustainability Indices

As illustrated in Table 2-2, the overall Green City Index has a strong association (r(20)=0.532, p=0.011) with self-reported happiness scores, while the overall SustainLane US City Rankings are moderately associated (r(20)=0.303, p=0.033) with self-reported happiness. These results agree with previous findings from literature that demonstrate associations between sustainable community development and happiness (Leyden et al. 2011, O'Brien 2005, O'Brien 2009, Schimmel 2009, Veenhoven 1992, Zidansek

2007). The analysis between the categories for each sustainability index and happiness is discussed below.

### 2.6.2. Happiness and the Nine Categories of the Green City Index

Four of the nine categories of the GCI, including energy ($r(20)=0.465$, $p=0.029$), waste ($r(20)=0.485$, $p=0.022$), buildings ($r(20)=0.453$, $p=0.034$) and environmental governance ($r(20)=0.535$, $p=0.010$), have a statistically significant association with happiness. As indicated by the measures for the energy category in Table A-2 (Appendix A), cities with high levels of clean and efficient energy policies and lower electricity consumption are associated with higher reported levels of happiness. In addition, as indicated by the measures for waste, cities that recycle a large percentage of municipal solid waste, coupled with effective waste reduction policies, report higher levels of residential happiness. The measures for the buildings category also suggest that cities with a greater number of LEED certified buildings, combined with energy efficient building standards and green building incentives, are associated with higher levels of self-reported happiness. Finally, results show that cities with extensive green action plans and green management strategies, coupled with public participation in green policy, self-report higher levels of happiness.

An interesting finding is that water management just misses the mark for an acceptable relationship with happiness ($r(20)=0.420$, $p=0.051$). Thus,

as indicated by the scoring methods in Table A-2, it is possible that residents living in cities with lower water consumption per capita, lower incidences of water system leakages and high water quality and storm water policies tend to be happier. We find no statistically significant associations between happiness and land use, $CO_2$, air, and transport. However, in the author's opinion, these variables should still be included in future work that considers the associations between community development and happiness for the following reasons.

Currently, land use includes percent of green space, population density, and the quality of green land use policies and urban sprawl mitigation policies all of which are a significant part of community development (Godschalk 2004). The current indicators might need to be reconsidered for future work. For example, the category might be expanded to include orientation, access to good and services, walkability, street side dining, and building frontage attractiveness scores. Air quality and $CO_2$ emissions should also be included, as both can influence one's health, which has a significant influence on happiness (Layard 2007).

Access to larger datasets might have yielded different results, as some findings were contrary to prior research. Thus, our results should not suggest that all categories be excluded from future work. For instance, transportation should be included in future work as it was found to be associated with

happiness by both O'Brien (2008) and Leyden (2011). As shown in Table A-6, the indicators for the transport category include aspects of alternative transit, green transit promotion, commute time and congestion reduction policies. It is possible that more could be included, such as systems for carpooling, bike sharing, car sharing, independence as a result of personal transportation, average fuel economy, walkability and number of vehicles per household. Nonetheless, the results of the GCI analysis suggest that several aspects of community development may be connected to happiness and indicate there is significant work needed to understand the elements of community development that may be associated with happiness.

### 2.6.3. Happiness and the Fifteen Categories of the SustainLane US City Rankings

Table 2-2 shows that five out of the fifteen categories of the SustainLane US City Rankings are associated with happiness. Metro street and freeway congestion has a strongly inverse correlation ($r=-0.405$) with happiness, while green (LEED) building shares a moderately positive correlation ($r(48)=0.369$, $p=0.008$) with happiness. Air quality is weakly correlated with ($r(48)=0.284$, $p=0.045$) with happiness, while local food and agriculture is moderately correlated ($r(47)=0.338$, $p=0.017$) with happiness. Finally, housing affordability has a moderate inverse correlation ($r(48)=-0.305$, $p=0.031$) with happiness. With respect to congestion, those cities with

high congestion levels for both streets and freeways had higher reported happiness levels than those with low congestion. One might think that the opposite would be true, as congestion could be associated with frustration with traffic, excess pollution and wasted time. However, the result may indicate that the density of cities with high congestions rates might contribute to greater happiness levels, which has been documented to be associated with happiness (Florida 2010). Specifically, it may be the density of such cities that allows for access to a greater range of goods, services and social ties that is associated with happiness. Further research is needed to assess this relationship.

The strong association between green (LEED) buildings and happiness supports the association between happiness and the buildings category for the GCI. As indicated by the scoring methods in Table A-2, cities with a greater number of LEED certified buildings, as well as more LEED Platinum and Gold buildings versus LEED Silver and LEED certified buildings, had higher self-reported happiness levels. LEED is very much an occupant and environmental efficiency centered program that improves on the health of humans and our planet. Furthermore, as stated in Lehman (2008), building methods focused on lifting the quality of the experience within buildings will not only accommodate a sense of happiness in the occupants, but will also foster a sense of happiness proactively. As supported by both the finding in

the GCI and SustainLane, LEED buildings and green building in general instills a sense of happiness within a city's residents.

The positive correlation between happiness and air quality supports the positive association between the environmental governance category of the GCI and happiness. Our research confirms that the better the air quality is for a city, the higher self-reported happiness levels are. Our research also indicates that local food and agriculture is associated with self-reported happiness levels within a city. Specifically, as indicated by the scoring methods in Table A-2, cities with a greater number of farmers' markets and community gardens have higher self-reported happiness levels. Farmers' markets and community gardens also serve as social hubs for community members to build new friendships and take an active role in supporting their community. In fact, numerous studies (Armstrong 2000, Twiss et al. 2003, Saldivar-Tanaka and Krasny 2004, Shinew et al. 2004, Somerset et al. 2005, Wakefield et al. 2007, Alaimo 2008, Kingsley et al. 2009, Okvat and Zautra 2011) highlight the countless benefits of community gardens and local food systems, including healthy environments, improved human health, greater social interactions, better connections to food and increased community resilience; all of which are factors that contribute to happier people.

The inverse correlation between happiness and housing affordability indicates that the more affordable homes are, the lower self-reported

happiness levels are. It has been documented that high housing prices reflect a combination of productivity and quality of life amenities and that regions with higher home prices may have more housing related attributes that affect happiness (Florida 2010). We found no associations between happiness and city commuting, regional public transportation ridership, tap water quality, solid waste diversion, planning and land use, natural disaster risk, energy and climate change policy, green economy, and knowledge base and communications. First, we suspect that missing data for some cities in five of the ten categories, including tap water quality, solid waste diversion, city innovation, energy and climate change policy, green economy and knowledge base and communications, may have resulted in a lack of correlation. Second, we suggest that some of the categories with no association with happiness may not be inclusive enough and many could be selected as indicators for an overarching category. For example, city commuting includes aspects of inner city modes of transit that people use to get to work and inner city public transportation ridership percentages, while regional public transportation ridership includes regional public transit use and the square miles per metro area. As separate categories, these two may not be inclusive enough and could serve as measures within a comprehensive transportation category. In the same regard, tap water quality is only a measure of the water quality from the tap and could be expanded into a category that includes aspects of grey

water reuse and management, water consumption levels and measures of efficiency. Nonetheless, while there are limitations to the SustainLane Rankings categories, our results suggest that several aspects of community development are associated with self-reported happiness.

### 2.6.4. Limitations & Alternative Explanations

There are some recognized shortcomings in this chapter that require more research and investigation. First, this analysis is conducted at the city level. At this scale, many variables such as socioeconomic status, gender, race, age or education level become aggregated and averaged for a given city. An analysis conducted at a finer scale (e.g., neighborhood level) would allow us to better understand how, for example, residents living in a neighborhood well below the poverty level might self-report their happiness. Second, we have only assessed what could be considered a fraction of the subsystems that comprise any community development system. For instance, one could include other subsystems, which include, but are not limited to, social services, recreation, entertainment, ecosystem services, health care, and communications. However, we have chosen subsystems that have readily available data, via the GCI and SustainLane Rankings, for analysis. Ultimately, the GCI and SustainLane Rankings allowed us to assess the associations between many elements of community development and happiness.

Third, while these data could lead to the conclusion that an emphasis on sustainable urban characteristics and attributes leads to happiness, it may also be the case that happy residents are more invested in their communities and more likely to be involved in activities linked to sustainable development. For instance, residents may be more likely to come together and engage in social causes that promote sustainable development practices such as community gardening. Because our analyses are based on cross-sectional, non-experimental data, we are not able to make causal conclusions. To truly assess causality, longitudinal data with residents randomly assigned to cities would be necessary, the ultimate, yet extremely challenging, goal of this research. Nevertheless, it is evident that, at least in the case of U.S. cities, happiness and sustainability appear to be linked.

Fourth, and also related to causality, there are a variety of variables that are likely to affect both city characteristics and residential happiness and may result in a spurious association between sustainability and happiness. For example, employment rates and socioeconomic status of a community are associated with many city characteristics (e.g., the quality of the roads; the ability to construct new LEED certified buildings; the number of staff at city hall who can address clean energy and clean air issues). These economic variables could also be associated, although perhaps not linearly, with human happiness. A more robust study would statistically control for covariates such

as employment rate or median income, to more clearly isolate the relation between city characteristics and resident happiness. However, given the limited number of data for this study, it was not possible to statistically control for covariates.

Nonetheless, there are certainly alternative explanations that must be included in future research. A common alternative explanation is that the happiest cities have great weather and a "western culture". However, we were able to examine this potential alternative explanation and rule it out. We found that weather conditions (including temperature, precipitation rates, days of sunshine, cloudy days) are not associated with happiness levels within cities. Furthermore, when investigating the associations between geographic location (latitude and longitude) and happiness only latitude is associated. This finding makes sense, as some of the most sustainable cities (San Francisco, Seattle and Portland) are located on the west coast. Still, one needs to determine what underlying factors make these western cities excel in the areas of sustainability and happy residents.

### 2.7. Conclusion

In this Chapter we analyze the relationship of two indices potentially or possibly related to sustainable community development and their respective categories with the happiness of residents within many cities in the United States. We find that both the overall GCI and SustainLane Rankings

are correlated with self-reported happiness. Furthermore, for the GCI, we find that energy, waste, buildings and environmental governance play a role in the reported happiness of residents of twenty-two US cities, while water management is marginally associated with reported happiness. For SustainLane, we find that metro street and freeway congestion and housing affordability are both inversely correlated with happiness, while green (LEED) building, air quality and local food and agriculture are all positively correlated with happiness.

Ultimately, our findings serve as a precursor for future research and consideration of how several aspects of our communities are associated with the happiness of residents. Both the GCI scores and SustainLane US City Rankings are rooted in sustainability, meaning the more a city focuses on moving toward sustainability, the higher score they receive. We find that those communities demonstrating sustainable characteristics are associated with higher self-reported happiness levels. Thus, a community focused on moving toward sustainability may also contribute to a happier life for its residents, which supports previous findings and suggests three key concepts, as supported by our analysis:

1. Sustainable development is associated with self-reported happiness or self-reported happiness is associated with sustainable development.

2. Policy makers, planners, engineers, designers, architects and public officials and developers need to seriously consider how their decisions and design choices for community development affect the happiness of residents.
3. There is extensive research yet to be done to examine the connection between community development and happiness.

# **CHAPTER 3 -** THE SUSTAINABLE NEIGHBORHOODS INDEX: A METRIC FOR ASSESSING A COMMUNITY'S POTENTIAL INFLUENCE ON RESIDENTIAL HAPPINESS

## 3.1. Abstract

This paper describes the development of the Sustainable Neighborhoods Index (SNI). The SNI is a tool to assess and compare how well individual cities, towns, neighborhoods and communities embrace sustainable practices. The hope is that these practices, in turn, create opportunities for their residents to pursue happiness. In particular, nine subsystems of community development are included in the generation of the index: water management, energy management, urban design, food management, business & economic development, waste management, buildings & infrastructure, transportation and community governance. The SNI is grounded in findings from Chapter 2, primary literature, and previous research (Leyden 2011, Florida 2010, O'Brien 2008, Schimmel 2009, Zidansek 2007) that suggest that sustainable development is associated with higher levels of self-reported happiness. Specifically, prior findings were used to assist in the selection and relative weighting of each subsystem for the generation of the SNI equation. Data were then compiled from the Green City Index (2011) and the SustainLane US City Rankings (2007) to develop SNI scores for sixteen US cities. We found that San Francisco has the highest

SNI, while Detroit has the lowest. 50,000 SNI scores were generated to create an approximate SNI distribution, titled the Sustainable Neighborhoods Distribution (SND). Lastly, data were collected for Athens, Georgia and Ithaca, New York to determine SNI scores for each and plot their respective scores on the SND. The SNI serves as a tool for decision makers, community stakeholders, engineers, developers, architects, planners and researchers to assess the current state of any neighborhood or community, with respect to development and residential happiness. Additionally, the SNI can be used as a tool for creating informed strategies for simultaneously improving sustainability and promoting greater opportunity for residential happiness within any neighborhood.

KEYWORDS: Happiness, Index, Sustainability, Sustainable Development, Sustainable Neighborhoods

### 3.2. Introduction

One of the major challenges facing humans is the development and revitalization of our current and future communities. Current generations face significant economic, environmental and social challenges with respect to an expanding human population, increasing natural resources demand, climate change, food and energy demands, and increased pollution. Because of historic resource abundance, a relatively small population, and advancing

technologies, community development efforts have typically focused primarily on short-term economic gain and not long-term sustainability. If development remains "business as usual" (Engel 2011*)*, meeting the basic needs of a growing and increasingly urbanized population will become exceedingly difficult. Significant changes in community retrofit and design are needed to satisfy future growth without compounding current problems, and communities should be developed to integrate resilient and efficient economic, environmental and social systems. A potential approach for community development could focus on human happiness. Happiness, like physical and mental health, denotes the degree to which people flourish in a society (Veenhoven 1992). Prior research has shown that a community rooted in happiness is likely to include sustainable environmental, economic and social systems (Leyden 2011, Florida 2010, O'Brien 2005, O'Brien 2008).

Research not only indicates that sustainable development requires no sacrifices in happiness, but that design strategies can improve happiness and sustainability simultaneously (Zidansek 2007). In addition, positive associations have been found between happiness levels and sustainable development (Leyden 2011, Florida 2010, O'Brien 2008, Schimmel 2009, Zidansek 2007). Other countries should take notice of Bhutan and Thailand, which have created and utilized happiness indices. Bhutan measures nine domains that affect happiness for the assessment of their Gross National

Happiness: 1) psychological well-being or mental health, 2) physical health, 3) time and work-life balance, 4) education, 5) cultural vitality and expression, 6) social connection and relationships, 7) environmental quality and access to nature, 8) quality of government, and 9) material well-being (DeGraaf 2010). Thailand uses the Green and Happiness Index, measuring six components: 1) health, 2) warm and loving family, 3) empowerment of the community, 4) economic strength and equity, 5) surroundings and ecological system and 6) democratic society with good governance (Barameechai 2007). While both Gross National Happiness and the Green and Happiness Index are groundbreaking efforts, no comprehensive approach to indexing the relationship between sustainable community development and happiness exists.

The current study fills a gap in the literature by developing an index, the Sustainable Neighborhoods Index (SNI), to measure nine community development subsystems and their potential association with residential happiness. However, to be clear, the SNI is not a measure of happiness levels of residents. Rather, the SNI is a tool to assess and compare how well individual cities, towns, neighborhoods and communities embrace sustainability, which in turn may create opportunities for their residents to pursue happiness. This study has four objectives:

1. Identify subsystems of community development, and their relative weightings, to be used for the creation of the Sustainable Neighborhoods Index (SNI).
2. Generate SNI scores for sixteen US cities for comparison, analysis and to establish an approximate mean and standard deviation.
3. Generate 50,000 SNI data points to create an approximate distribution of SNI scores, titled the Sustainable Neighborhoods Distribution (SND).
4. Collect data for Athens, Georgia and Ithaca, New York to test the SNI scoring methods and plot the scores on the SND for analysis and comparison.

### 3.3. Materials and Methods

The Sustainable Neighborhoods Index (SNI) combines methods and indicators from two sustainability indexes, including the Green City Index (GCI) (2011) and the SustainLane US City Rankings (SL) (2007). The Economist Intelligence Unit (a group from the Economist Magazine) (EIU, 2013) created the GCI and scores were developed for twenty-two US cities. The GCI is a combined score of nine categories: water, energy, land use, waste, transport, buildings, CO2, air and environmental governance. The SL were created by the SustainLane staff and scores were developed for fifty US cities in fifteen categories: city commuting, regional public transportation ridership, metro street and freeway congestion, air quality, tap water quality,

solid waste diversion, planning and land use, city innovation, housing affordability, natural disaster risk, energy and climate change policy, local food and agriculture, green economy, knowledge base and communications and green (LEED) building. Table A-2 and A-4 indicate the indicators and scoring methods used for both the GCI and the SustainLane US City Rankings, respectively.

### 3.3.1. Nine Subsystems of Community Development

Significant associations between self-reported happiness and four out of nine categories of the Green City Index, including energy, waste, buildings and environmental governance have been previously identified in Chapter 2. Additionally, correlations have been established between self-reported happiness and five of the fifteen categories of the SustainLane US City Rankings, including metro street and freeway congestion, green (LEED) building, air quality, local food and agriculture and housing affordability. Furthermore, relationships have been established through literature review for many areas of community development, as detailed below.

*Urban Design ($U_d$)*

The urban design subsystem includes percentage of green spaces, population density, green land use policies, urban sprawl containment and reuse of brownfields. Several studies (Babey et al 2005, Bedimo-Rung et al. 2005, Cohen et al. 2006, Roemmich et al. 2006, Wilkie et al. 2006, West 2009)

have found green spaces and parks to have positive effects on human health, social interactions, human welfare and physical activity, all of which serve as influences on human happiness (Jung 1960, Diener 2000, Diener 2002, De Graaf 2010). Furthermore, human happiness and sustainable ecosystems (which includes green spaces and green land use policies) are interdependent (Jordan et al. 2010). In addition, exercise in green spaces also promotes human happiness (Barton and Pretty 2010, Coon et al. 2011), as exercising in areas with views of nature, specifically including the color green, enhances mood and well-being (Akers et al. 2012). Thus, designing our communities to include green spaces and access to nature could promote the happiness of residents. Associations between density levels and self-reported happiness levels have also been discovered, potentially indicating that the density of cities allows for access to a greater range of goods, services and social ties that promotes happiness (Florida 2010). As indicated in Chapter 2, communities with green land use policies also have a significant association with self-reported happiness levels.

*Water Management (H2Om)*

The water management subsystem includes water consumption, leakages, water quality policy and the provision of storm water management policies. Naturally, all people require access to clean drinking water (Gleick 1998). Thus, water management systems should include access to clean,

uninterrupted sources of drinking water as well as efficient systems that conserve and effectively manage it. The majority of cities within the United States have access to clean drinking water. However, well-being was found to increase substantially in homes who had just gained access to piped water in Morocco (Devoto et al. 2011).

*Waste Management (Wm)*

The waste management subsystem of community development includes the percent of municipal solid waste recycled and the measure of waste reduction policies taken by a community. Literature on the connection between waste management and happiness levels is currently lacking. However, proper disposal of waste is connected to the health and well-being of humans, thus influencing happiness. In fact, one of the indicators used for a Gross National Happiness measure in Thailand is solid waste (Kittiprapas 2006).

*Transportation (Ts)*

The transportation subsystem includes the percent of workers travelling to work by public transit, bicycle or foot, public transportation availability, average commute time from home to work, the promotion of green transportation and congestion reduction policies. Public transit is an important subsystem of community development, as it serves as a means of mobility to many people. In fact, city residents, particularly the poor, highly

rely on public transportation, as it provides a means of mobility and access to employment (Glaeser et al. 2008). In fact, public transportation access serves as a significant factor in determining average rates of labor participation within Portland, Oregon and Atlanta, Georgia (Sanchez 1999). This is important, as work and a sense of purpose both greatly contribute to happiness, as does income (Larsen and Gilliland 2009). Thus, the transportation subsystem has been included in the SNI.

*Food Management (Fm)*

The food management subsystem includes the number of farmers' markets and community gardens in a community and the number of farmers' markets accepting Women, Infants & Children (WIC) federal program vouchers and food stamps. Farmers' markets and community gardens have a significant association with the happiness of residents (Layard 2005, Story et al. 2007). Numerous studies (Armstrong 2000, Twiss et al. 2003, Saldivar-Tanaka and Krasny 2004, Shinew et al. 2004, Somerset et al. 2005, Wakefield et al. 2007, Alaimo 2008, Kingsley et al. 2009, Okvat and Zautra 2011) highlight the benefits of community gardens, including improved health, greater social interactions, better connections to food and increased community resilience, all of which contribute to the happiness of people.

*Buildings & Infrastructure (Bg)*

The buildings & infrastructure subsystem includes the number of LEED certified buildings in a community, how extensively a community promotes energy efficient building standards and provides incentives for energy efficient buildings to be constructed. Green buildings and neighborhoods have a positive effect on human health and well-being, both of which contribute to human happiness (Wells and Laquatra 2010, Campbell and Wiesen 2010). Furthermore, building methods focused on lifting the quality of the experience within the buildings that occupants spend their time will not only accommodate a sense of happiness in the occupants, but will also foster a sense of happiness proactively (Lehman 2011*)*. Thus, it is suggested LEED buildings and green building in general instills a sense of happiness within a city's residents.

*Energy Management (Em)*

The energy management subsystem includes the electricity consumption per unit of GDP and per person and the measure of a city's commitment to clean and efficient energy policies. As a highly industrialized and developed country, humans are extremely reliant on energy sources to live their daily life. A lack of electricity, particularly for those who regularly have it, could possibly affect happiness. One can draw connections between a need for electricity for employment, income, and a host of other factors that influence happiness. Furthermore, renewable energy supplies and policies are

essential to national security, economic well-being and human health and well-being (Bull 2001, Millennium Ecosystem Assessment 2005).

*Business & Economic Development (Bed)*

The business & economic development subsystem includes the presence of a clean technology incubator in a community, as well as the presence of a green business directory and the number of farmers' markets and LEED buildings per capita. The presence of green and local businesses promotes employment and income, both of which have been found to promote happiness (Larsen and Gilliland 2009, Layard 2005, Bruni and Porta 2006). Furthermore, the shift toward a sustainable and green business subsystem provides a community with economic strength and empowers the community, which are two indicators used in the Green and Happiness Index (Barameechai 2007).

*Community Governance (Cg)*

The community governance subsystem includes the measure of a community's green action plan, the extensiveness of environmental management undertaken by a community and the measure of a community's effort to involve the public in monitoring its environmental performance. Significant correlation between community governance and self-reported happiness has been found, as indicated in Chapter 2. It is proposed that those cities implementing a quality approach to move a city toward sustainability are

associated with higher levels of self-reported happiness. The quality of government has an influence on happiness and the more effective, corruption free and impartial government institutions are, the happier residents will be (Samanni and Holmberg 2010, Bjornskov et al 2008, Helliwell and Huang 2008).

The aforementioned associations, coupled with a review of primary literature, ultimately led to the selection of nine subsystems for the generation of an SNI score: water management, energy management, urban design, food management, business & economic development, waste management, buildings & infrastructure, transportation and community governance. Essentially, a subsystem and its measures were selected based on associations with happiness, as found in literature review and/or through the study in Chapter 2. Indicators and measures for each of the nine subsystems are presented in Table A-6 of the Appendix. The subsystems that correlate with happiness in Chapter 2 and were also supported by literature include energy management, food management, waste management, buildings & infrastructure and community governance. The remaining subsystems, including water management, urban design, transportation and business & economic development, were selected due to their associations with happiness as supported by literature.

The nine subsystems and their measures do not represent the entirety of community development. In addition, as discussed later in the paper, the measures included within each subsystem may not be entirely representative of each subsystem and more might be included. However, the selected subsystems and their measures serve as a good starting point for an organized approach to aspects of future community development that have associations with residential happiness.

### 3.3.2. Happiness Scores

Well-being scores were taken from the Gallup Healthways Well-Being Index (2012) as a surrogate for happiness scores, similar in methods to Chapter 2. The relationships between happiness and the respective subsystems in this study are assumed to be linear. Thus, these scores were used to optimize the potential weighted impacts of community development on happiness through constrained optimization, as described in section 3.3.4 below.

### 3.3.3. Performance Scores

In order for a city to be selected for analysis in this study, it had to have a performance score (score for a subsystem) in all nine subsystems. The data sources for the performance scores include the Green City Index (GCI) (2011) for water management, energy management, urban design, waste management, transportation, buildings & infrastructure and environmental

governance. Scores for food management and business & economic development were obtained from SustainLane (2007). Both food and business & economic development data have been reverse coded for correlational analysis. For example, SustainLane ranked the city of Boston first out of the fifty cities it ranked in food. Thus, Boston was given a score of 50 to represent the highest number of points possible. Likewise, the city of Dallas received a score a 3 in food, as SustainLane ranked it at 48 (the third worst ranking). Data for the other six subsystems were obtained from the Green City Index (2011) as scores on a 0-100 scale. All scores were then adjusted to be on a 0-10 scale (GCI scores were divided by ten, while SL scores were divided by 5).

### 3.3.4. Weighted Influences of the Nine Subsystems of Community Development on Happiness

Once the nine subsystems were selected and performance scores were collected, each was assessed relative to one another to determine their potential weighted association with happiness. The final weightings were determined in three steps: (1) considering associations between each subsystem and self-reported happiness and from both literature review and Chapter 2 (2) establishing initial weightings based on these findings and those from primary literature and (3) performing constrained optimization to achieve final weightings.

*Initial Weightings*

Table 3 - 1 Initial Weightings for Nine Subsystems of Community Development

| Subsystem | Initial Weight | Rationale |
|---|---|---|
| Energy<br>Waste<br>Buildings | 1.00 | Strong association in Chapter 2 and literature. |
| Food | 0.90 | Moderate association in Chapter 2 and literature. |
| Water | 0.80 | Marginal association in Chapter 2 and literature. |
| BED<br>Governance | 0.75 | Marginal association in Chapter 2 and limited associations in literature. |
| Urban Design<br>Transportation | 0.60 | No association in Chapter 2 and limited associations in literature. |

Table 3-1 indicates the initial weightings (prior to optimization) for all nine subsystems and the rationale for each. Specifically, the greater the association between the particular subsystem and happiness was (as supported by literature and Chapter 2), the higher the initial weighting.

*Constrained Optimization*

Table 3 - 2 Weighting Constraints for Optimization

| Subsystem | Constraint Range |
|---|---|
| Energy<br>Waste<br>Buildings | 0.90 to 1.00 |
| Food | 0.80 to 1.00 |
| Water | 0.70 to 0.90 |
| BED<br>Governance | 0.65 to 0.85 |
| UD<br>Transportation | 0.50 to 0.70 |

Once all initial weightings were established, a range of ± .1 (with the exception of those subsystems initially weighted a 1, as they were given a

range of 0.9-1.0) was utilized as a constraint for optimization, as shown in Table 3-2.

The final optimization target was Pearson's r (as each subsystem of community development is treated as an independent variable that is associated with happiness) between self-reported happiness, as shown in Table A-8 of the Appendix, and the SNI scores for sixteen US cities, as shown in Table 3-6. Maximizing the Pearson's r between these indices, by separately adjusting the subsystem weightings (lowering, increasing or leaving the same) of the SNI in combination, ensures that the weightings reflect the best possible association between the combined subsystems and happiness for the given constraints.

The equation below indicates the formula for Pearson's r and the variables of interest. Specifically, $X_i$ (SNI scores for sixteen US cities) is adjusted to maximize r by adjusting $W_{H_i}$ within the given constraints in Table 3-2.

$$\text{Maximize } r = \frac{\Sigma(X_i - \overline{X})(Y_i - \overline{Y})}{\sqrt{\Sigma(X_i - \overline{X})^2 \Sigma(Y_i - \overline{Y})^2}}$$

where $X_i$ = SNI score for respective cities ( $P_{M_i}$) ($W_{H_i}$)

where $Y_i$ = Happiness scores for respective cities

where $W_{H_i}$= weighted subsystem of interest association with happiness; $P_{M_i}$= performance score for subsystem of interest

More specifically, the following SNI equation is adjusted:

$$SNI = \beta_0 + \boldsymbol{H2Om}(H2Om_H) + \boldsymbol{Em}(Em_H) + \boldsymbol{Ud}(Ud_H) + \boldsymbol{Fp}(Fp_H) + \boldsymbol{Bed}(Bed_H) + \boldsymbol{Wm}(Wm_H) + \boldsymbol{Ts}(Ts_H) + \boldsymbol{Bg}(Bg_H) + \boldsymbol{Cg}(Cg_H)$$

where those variables with subscript H ($W_{H_i}$) are adjusted for the given constraints:

$0.70 \leq H_20m_H \leq 0.90$;

$0.90 \leq Em_H \leq 1.00$;

$0.50 \leq Ud_H \leq 0.70$;

$0.80 \leq Fp_H \leq 1.00$;

$0.65 \leq Bed_H \leq 0.85$;

$0.90 \leq Wm_H \leq 1.00$;

$0.50 \leq Ts_H \leq 0.70$;

$0.65 \leq Bg_H \leq 0.85$;

$0.65 \leq Cg_H \leq 0.85$;

*Excel Solver Method*

The optimization was performed utilizing the Microsoft Excel Solver function, which utilizes a generalized reduced gradient algorithm. In this case, Pearson's r is selected as the optimum cell to be maximized and the constraints are entered for the weightings (the adjustable cells). The problem is then taken through the Solver process, using iterative numerical methods that involve plugging in trial values for the weightings and observing the results calculated by the weighting constraints and the maximized Pearson's r.

The process is not a method of trial and error, rather, extensive analyses are performed and the observed outputs and the rates of change are observed to guide the selection of new trial values. The constraints and the optimum cell are functions of (that is, they depend on) the adjustable cells. The first derivative of a function measures its rate of change as the input is varied. In this case, several weighting values ($W_{H_i}$) are entered and the Pearson's r function has several partial derivatives measuring its rate of change with respect to each of the input values; together, the partial derivatives form a vector called the gradient of the function.

Derivatives (and gradients) play a crucial role in iterative methods in Microsoft Excel Solver. They provide clues as to how the adjustable cells should be varied. In this case, the optimum cell (Pearson's r) is being maximized. If, for example, the partial derivative of Pearson's r with respect to one adjustable cell is a large positive number, while another partial derivative is near zero, Microsoft Excel Solver will increase the first adjustable cell's value on the next iteration. A negative partial derivative suggests that the related adjustable cell's value should be varied in the opposite direction. The process allows solver to hone in on the ideal value by approximating the derivatives numerically by moving each adjustable cell value slightly and observing the rate of change of each constraint cell and the optimum cell; a process called finite difference estimate of the derivative. The differencing

uses a single point (that is, set of adjustable cell values) that is slightly different from the current point to compute the derivative.

*Optimality Conditions*

Because the first derivative (or gradient) of the optimum cell measures its rate of change with respect to (each of) the adjustable cells, when all of the partial derivatives of the optimum cell are zero (that is, the gradient is the zero vector), the first-order conditions for optimality have been satisfied (some additional second order conditions must be checked as well) having found the highest (or lowest) possible value for the optimum cell (Microsoft, 2013).

### 3.3.5. The Sustainable Neighborhoods Index Formula

Performance scores ($P_{M_i}$ - scores for the nine subsystems of community development) are shown as variables listed within the circles below each subsystem title within Figure 3-1. The variables listed over the lines ($W_H$) indicate the weighted impacts of the subsystems of community development on the opportunity for residents to pursue their own happiness. Equation 1 is the SNI formula and is combination of the weighted impacts and performance scores. The equation also includes a baseline sustainable neighborhoods score ($\beta_0$) indicating a city has some baseline score for sustainability.

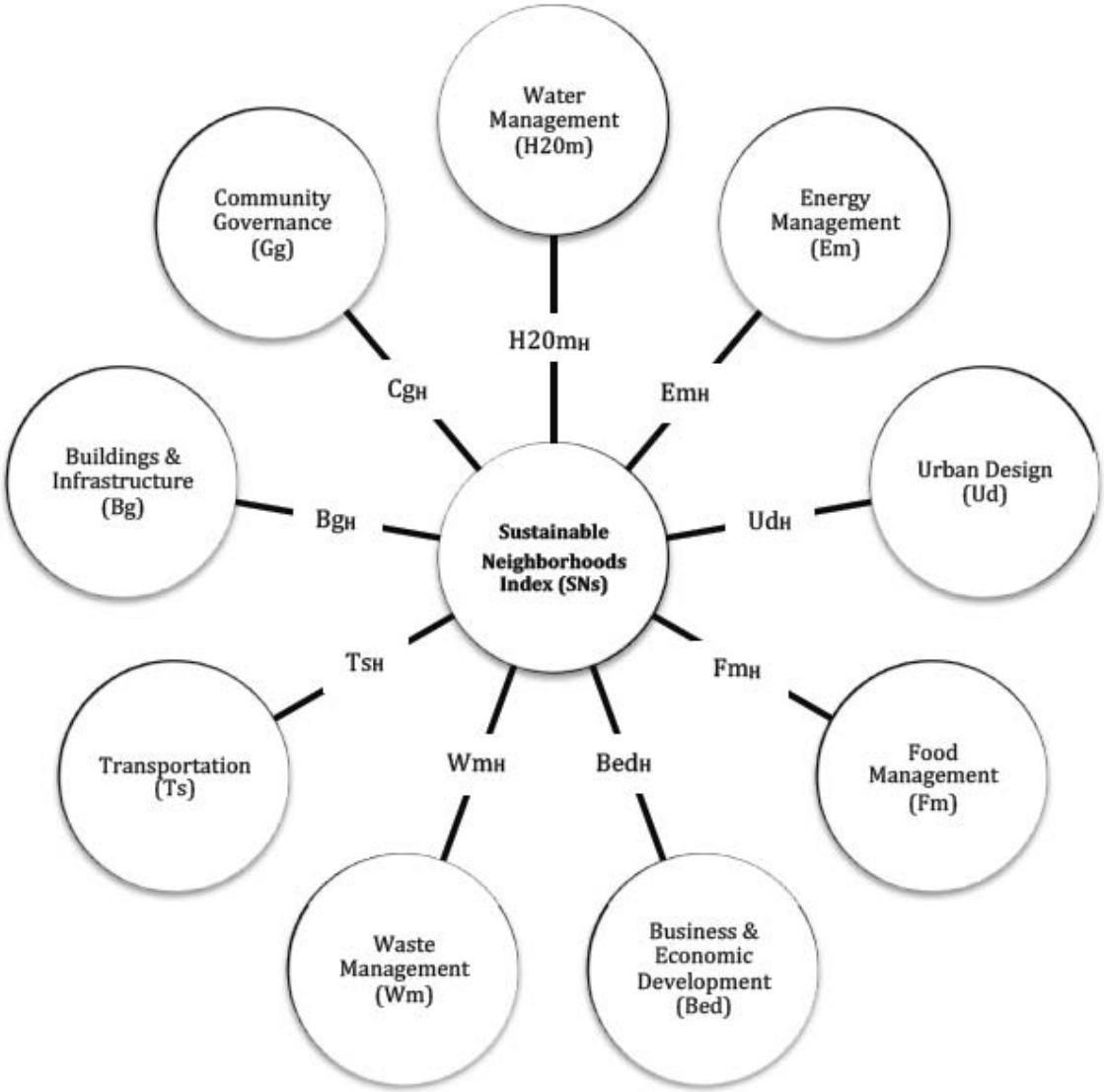



Figure 3 - 1 The Sustainable Neighborhoods Index

***Equation (1):***

$$SNI = \beta_0 + \boldsymbol{H2Om}(H2Om_H) + \boldsymbol{Em}(Em_H) + \boldsymbol{Ud}(Ud_H) + \boldsymbol{Fp}(Fp_H) + \boldsymbol{Bed}(Bed_H)$$

$$+ \boldsymbol{Wm}(Wm_H) + \boldsymbol{Ts}(Ts_H) + \boldsymbol{Bg}(Bg_H) + \boldsymbol{Cg}(Cg_H)$$

***SNI*** *= Sustainable Neighborhoods Index;* $\boldsymbol{\beta_0}$ *= Baseline Sustainability Neighborhood Score;* $\boldsymbol{H20m_H}$ *= Water Management Weighted Impact on Happiness;* $\boldsymbol{Em_H}$ *= Energy Management Weighted Impact on Happiness;* $\boldsymbol{Ud_H}$ *= Urban Design Weighted Impact on Happiness;* $\boldsymbol{Fp_H}$ *= Food Production Weighted Impact on Happiness;* $\boldsymbol{Bed_H}$ *= Business and Economic Development Weighted Impact on Happiness;* $\boldsymbol{Wm_H}$ *= Waste Management Weighted Impact on Happiness;* $\boldsymbol{Ts_H}$ *= Transportation Systems Weighted Impact on Happiness;* $\boldsymbol{Bg_H}$ *= Buildings and Infrastructure Weighted Impact on Happiness;* $\boldsymbol{Cg_H}$ *= Community Governance Weighted Impact on Happiness;* ***H20m*** *= Performance score for Water Management;* ***Em*** *= Performance score for Energy Management;* ***Ud*** *= Performance score for Urban Design;* ***Fp*** *= Performance score for Food Production;* ***Bed*** *= Performance score for Business and Economic Development;* ***Wm*** *= Performance score for Waste Management;* ***Ts*** *= Performance score for Transportation;* ***Bg*** *= Performance score for Buildings and Infrastructure;* ***Cg*** *= Performance score*

The performance scores, along with the relative subsystem weightings, were used to generate SNI scores for sixteen U.S. cities. Scores were then divided by 72.08 (representing a perfect SNI score of ten for each subsystem combined with all weightings) to place cities on a 0-100 scale.

### 3.3.6. The SNI Distribution for the United States

*SNI Characteristics*

The SNI is assumed to be a linear function and also normally distributed, as are each of the nine subsystems. To test the assumption of normality, a goodness-of-fit test was applied. Specifically, Q-Q test plots were used to compare the sample distribution where, given a set of *n* sample data, data is organized in quantiles from smallest to largest. Corresponding to each of the data points, its order position (e.g. *i*th) in that data set is associated with a cumulative percentage (called *p* value) in the occurrence distribution of that data $(i - 0.5)/n$ (Yang et al. 1997). Once the data are

ordered and each *p* is calculated, the data is plotted against an ideal normal distribution (generated by calculating the inverse of a cumulative distribution function) on a standard normal distribution scale. The ideal normal distribution has the pattern of a straight line and the sample data should closely match this line, if normally distributed. As indicated in Appendix B, some subsystems appear to be normally distributed, while others have outliers and patterns that are not linear. However, we will assume a normal distribution for each subsystem until larger data sets can be obtained to either confirm the normality assumption or consider more appropriate transformations that might make the normality assumption valid (Appendix B).

In total, there are *n* (16) data points each obtained as a function of *k* (9) independent variables. In this case:

$$Y_1 = f(X_{11}, X_{12} \dots, X_{1k})$$
$$\vdots \qquad \vdots$$
$$Y_1 = f(X_{n1}, X_{n2} \dots, X_{nk})$$

Where $Y_n$ = SNI for a given city

As mentioned, two assumptions have been made:

(1) *f* is assumed to be linear, thus, equation 1 is shown in linearized form above:

$$Y_1 = \beta_0 + \alpha_1 X_{11} + \alpha_2 X_{12} \dots + \alpha_k X_{1k}$$
$$\vdots \qquad \vdots$$
$$Y_n = \beta_0 + \alpha_1 X_{n1} + \alpha_2 X_{n2} \dots + \alpha_k X_{nk}$$

Where $Y_n$ = SNI for a given city and is assumed that $\beta_0 = 0$ in this study

(2) $\{X_{11}, X_{12} \dots, X_{n1}\}$ are assumed to be independent and identically distributed random variables (i.i.d.) and $N(\mu_1, \sigma_1^2)$. Similarly, for $\{X_{12}, X_{22} \dots, X_{n2}\}$, i.i.d. $N(\mu_2, \sigma_2^2)$, etc.

(a) In this case, unknowns are $\{(\mu_1, \sigma_1^2), (\mu_2, \sigma_2^2), \dots (\mu_k, \sigma_k^2)\}$ and, thus,

(b) $\{Y_1, Y_2, \dots\}$ are i.i.d., normally distributed with

$$\mu_Y = \beta_0 + \alpha_1\mu_1 + \alpha_2\mu_2 \dots \alpha_k\mu_k,$$
$$\sigma_Y^2 = \alpha_1^2\sigma_1^2 + \alpha_2^2\sigma_2^2 \dots \alpha_k^2\sigma_k^2 \text{ (by the independence of the X's)}$$

Thus, the following estimates are used to determine $\mu_Y$ and $\sigma_Y^2$:

$$\widehat{\mu_Y} = \beta_0 + \alpha_1\overline{X_{\cdot 1}} + \cdots + \alpha_k\overline{X_{\cdot k}}$$
$$\widehat{\sigma_Y^2} = \alpha_1^2 s^2(X_{\cdot 1}) + \cdots + \alpha_k^2 s^2(X_{\cdot k})$$

where $s^2$ is the sample variance

*SNI Distribution*

Once estimates of the population mean and standard deviation were determined, an approximate distribution of the SNI was generated. In particular, 50,000 points were generated for each subsystem (representing 50,000 different subsystem score combinations) using the sample mean and standard deviation for each. SNI scores were then calculated for all 50,000 scenarios, using equation 1. The scores were then separated into 18 SNI bins

total, with values from 45-85 in 2.5 point increments, as well as values less than 45 and greater than 85. The bins were used to generate an approximate histogram and distribution of the SNI scores, titled the Sustainable Neighborhoods Distribution (SND).

### 3.3.7. The Sustainable Neighborhoods Index for Athens and Ithaca

The SNI was applied to communities on a smaller scale, using data collected from both Athens, Georgia and Ithaca, New York. These two cities were selected as an author lived in each city and could assist with data collection. The Sustainable Neighborhoods Index data collection method was created, as shown in Table B-1 of Appendix B, as adapted from the Green City Index (2011) and SustainLane US City Rankings (2007). Table B-1 details the categories, selected indicators, potential sources for data acquisition and other information (city/town/neighborhood from which data were collected, the collecting researcher, collected data, actual sources and notes for each indicator). The table also provides the units for all objective data and the appropriate scoring for any subjective data (scores based on the scorer's perception, as informed by a detailed search, of the city).

*Objective Data*

Objective data were collected from public records, websites and community leaders for Athens and Ithaca. The cities were then ranked in each category, as in the GCI (2011) methodology. Briefly, Athens and Ithaca

were compared to the other cities of the GCI that have a low population (<515,505), including Atlanta, Minneapolis and Sacramento. Although Ithaca and Athens are quite small compared to their counterparts, the metrics for the SNI allow data to be normalized for any population size. For example, the number of farmers' markets is a measure per 100,000 people. The objective scores for each category for the cities are then ranked relative to one another, with a 10 for the best scoring city, a 0 for the worst, and a 5 for the mean of all city raw data scores. For instance, the city that has the best score for energy consumption per person receives a 10, while the worst city receives a zero. A 5 is assigned to the mean of all city energy consumption scores. The three points (10, 5 and 0 and their respective raw data) are then plotted and a linear regression formula is used to derive the other ranked scores. Figure 3-2 serves as an example of how this was achieved for the electricity consumption per unit of GDP measure. Figures B-1 through B-13 in Appendix B show all charts from this process. Additionally, section 3.3.8 is an example of this process.

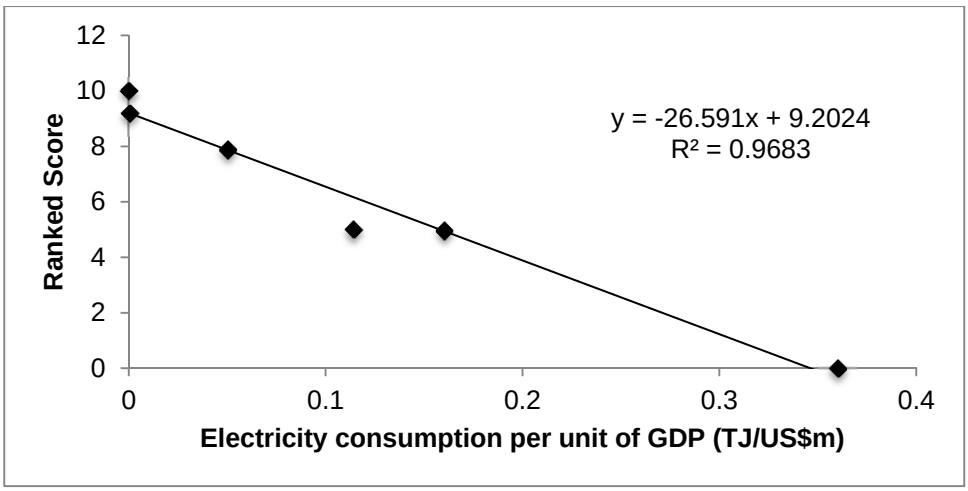



Figure 3 - 2 Linear Regression for Ranked Scoring of Annual Electricity Consumption per unit of GDP

*Subjective Data*

Subjective data were derived by comparing the performance of each city to its peers and also by reviewing strategies and actions that each city have or have not taken. In some cases, a city is given a zero or a one with a one representing the presence of an indicator and a zero representing no presence. In most cases, cities are scored on a 1 to 3 scale with a one representing a city that is below the scorer's expectations, while a three represents a city that exceeds expectations. Table 3-3 shows the criteria for assigned scores of 1-3.

While assigning scores of 1-3 does leave room for bias (as considered in Chapter 4), the decision for these values is informed by a detailed search of city websites, public information and sustainability plans.

Table 3 - 3 Subjective Data Scoring Criteria

| Subjective Score | Scoring Criteria |
|---|---|
| 1 | City has no to limited sustainability goals for the scored measure. |
| 2 | City is invested in sustainable practices with respect to the scored measure, has set sustainability of the measure as a goal and strives to include its residents in the process. |
| 3 | City has an extensive sustainability plan with respect to the scored measure, includes its residents in the process and has assigned a working group (e.g. office of sustainability) to achieve/meet set goals. |

Once all raw data was obtained and the cities were ranked, the ranked scores were multiplied by the weightings shown in Table B-2 (to give equal weight to each subsystem and their measures) and summed. The results of this scoring are shown in Table B-3. Finally, the SNI scores were obtained, using equation 1 for each city, and Athens and Ithaca were plotted on the Sustainable Neighborhoods Distribution. The scoring process is detailed in section 3.3.8 below.

### 3.3.8. Scoring Example

The city of Boston, Massachusetts has been selected to illustrate the scoring process for the SNI. Data were taken from the GCI (2011) and SustainLane (2007) for performance scores in each subsystem, indicated in Table A-7. Next, for a 1-10 scale, the performance scores from the GCI were divided by ten, while the SustainLane scores were divided by 5. All nine subsystem performance scores for the city of Boston were then used to calculate Boston's SNI, using equation 1 ($\beta$ is assumed to be equal to zero).

As shown below, Boston's SNI (on a 0-72.08 scale, as 72.08 represents a perfect score for a city with a ten in every subsystem) is 54.61 and, once put on a 0-100 scale, equates to a 75.76. The same method applies to all cities scored herein.

$$
\begin{aligned}
SNI = \beta_0 + \boldsymbol{H2Om}(H2Om_H) + \boldsymbol{Em}(Em_H) + \boldsymbol{Ud}(Ud_H) + \boldsymbol{Fp}(Fp_H) + \boldsymbol{Bed}(Bed_H) \\
+ \boldsymbol{Wm}(Wm_H) + \boldsymbol{Ts}(Ts_H) + \boldsymbol{Bg}(Bg_H) + \boldsymbol{Cg}(Cg_H) \\
= \mathbf{9.18}(0.9) + \mathbf{8.24}(1.0) + \mathbf{7.49}(0.51) + \mathbf{10}(0.8) + \mathbf{7.60}(0.65) \\
+ \mathbf{5.47}(1.0) + \mathbf{5.02}(0.5) + \mathbf{6.21}(1.0) + \mathbf{8.44}(0.85) \\
= \mathbf{54.61}\ (\mathbf{0}\ \boldsymbol{to}\ \mathbf{72.08}\ \boldsymbol{scale}) \rightarrow\ \mathbf{54.61}\left(\frac{\mathbf{100}}{\mathbf{72.08}}\right) \\
= \mathbf{75.76}\ (\mathbf{0}\ \boldsymbol{to}\ \mathbf{100}\ \boldsymbol{scale})
\end{aligned}
$$

### 3.4. Results

*The Sustainable Neighborhoods Index Data Collection*

The raw data and sources for this process are shown in Table B-2 of Appendix B. Also included are the subjective scores assigned for each category of Ithaca and Athens, as well as the rankings (as obtained from SustainLane or the Green City Index) for comparison and scoring.

*The Sustainable Neighborhoods Relative Subsystem Weightings*

Table 3-4 indicates the initial weightings, constraint ranges and final weightings for each subsystem, as generated through optimization.

Table 3 - 4 Relative Weightings for Nine Subsystems of Community Development

| Subsystem | Initial Weight | Constraint Range | | | Final Weight |
|---|---|---|---|---|---|
| Water | 0.8 | 0.70 | to | 0.90 | 0.90 |
| Energy | 1 | 0.90 | to | 1.00 | 1.00 |
| UD | 0.6 | 0.50 | to | 0.70 | 0.51 |
| Food | 0.9 | 0.80 | to | 1.00 | 0.80 |
| BED | 0.75 | 0.65 | to | 0.85 | 0.65 |
| Waste | 1 | 0.90 | to | 1.00 | 1.00 |
| Transportation | 0.6 | 0.50 | to | 0.70 | 0.50 |
| Buildings | 1 | 0.90 | to | 1.00 | 1.00 |
| Governance | 0.75 | 0.65 | to | 0.85 | 0.85 |

*SNI Scoring Results*

The SNI scores for the sixteen cities are shown in Table 3-5. As indicated, San Francisco has the highest SNI, while the lowest is Detroit.

Table 3 - 5 Sustainable Neighborhoods Index Scores for Sixteen US Cities

| **City** | **SNI** | **City** | **SNI** |
|---|---|---|---|
| Boston | 75.76 | Minneapolis | 75.82 |
| Charlotte | 54.20 | New York City | 72.43 |
| Chicago | 69.26 | Philadelphia | 69.24 |
| Dallas | 54.40 | Phoenix | 52.04 |
| Denver | 76.34 | Sacramento | 65.06 |
| Detroit | 24.01 | San Francisco | 85.21 |
| Houston | 62.83 | Seattle | 83.80 |
| Los Angeles | 66.00 | Washington DC | 73.22 |

mean = 66.23; s.d.= 14.92

*Generation of SNI Distribution*

Figure 3-3 shows the corresponding histogram for 50,000 total points generated and, as indicated, the number of simulations is on the vertical axis, while the SNI scores are on the horizontal axis. Figure 3-4 shows the approximate distribution for the SNI, titled the Sustainable Neighborhoods Distribution. The horizontal axis represents the number of simulations, while the vertical access represents the SNI scores. Table B-2 indicates the scores

collected, via the methodology in Table B-1, for both Athens and Ithaca, which were then used to calculate SNI scores for each category and city, as shown in Table 3-6, and plotted in Figure 3-4. A square represents Athens while a circle represents Ithaca.

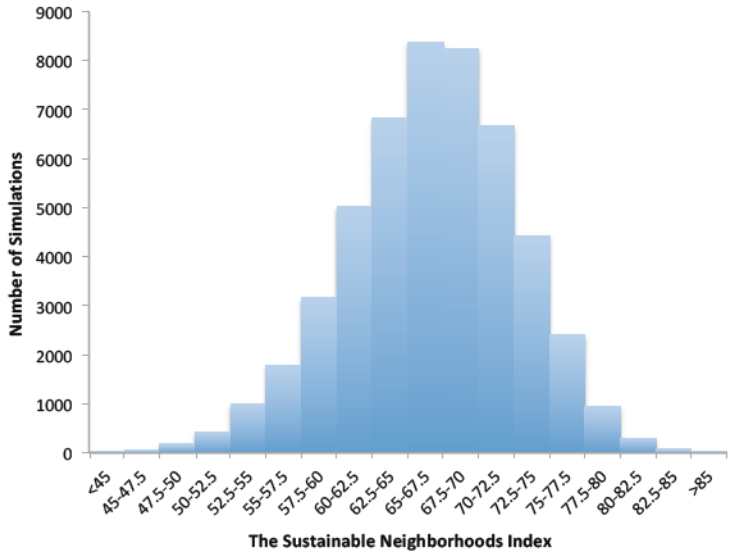



Figure 3 - 3 Approximate SNI Histogram

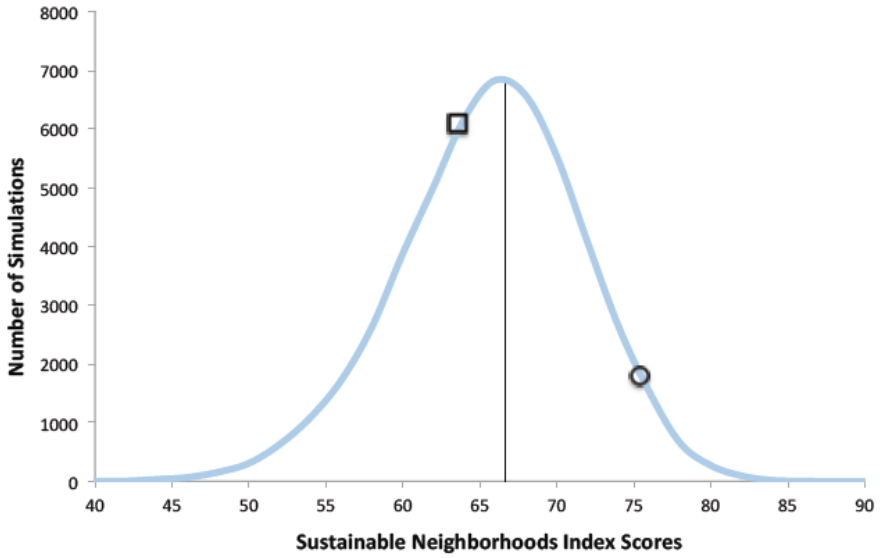



Figure 3 - 4 The Sustainable Neighborhoods Distribution with Athens (□) and Ithaca (O) Plotted

Table 3 - 6 Performance and SNI Scores for Athens and Ithaca

| Community Development Subsystem | Athens | Ithaca |
|---|---|---|
| Energy Management | 7.61 | 8.89 |
| Urban Design | 9.17 | 6.95 |
| Buildings & Infrastructure | 2.71 | 5.52 |
| Transportation | 3.77 | 8.41 |
| Waste Management | 7.74 | 10 |
| Water Management | 9.64 | 7.13 |
| Food Management | 5.56 | 6.67 |
| Business & Economic Development | 3.7 | 5.83 |
| Community Governance | 6.67 | 7.78 |
| SNI | 64.63 | 74.51 |

### 3.5. Discussion

The Sustainable Neighborhoods Index (SNI) is proposed to serve as a means of assessing and comparing how well individual cities, towns, neighborhoods and communities address sustainability issues through community design and development, which is potentially associated with residential happiness. The relative weightings for the SNI indicate the areas where designers, planners, engineers and architects should focus their effort to improve their overall SNI score. For example, the energy, waste and buildings subsystems were all found to have a relative weighting of 1.0. Thus, communities should take notice of these subsystems to do their best to improve their SNI. In addition, the Sustainable Neighborhoods Distribution (SND) can serve as a powerful tool for assessing where neighborhoods and communities stand and where they can potentially go. For this paper, data

were collected for Athens, Georgia and Ithaca, New York and Athens is just short of the mean SNI, while Ithaca is located in the upper 75th percentile.

The results indicate that Athens, Georgia could focus on improving its overall SNI score by focusing on buildings & infrastructure, transportation and business & economic development. In particular, Athens might consider some actions such as policies that promote high levels of energy efficiency in buildings, encourage an increase in the number of LEED certified or green buildings, focus on increasing the maximum public transit vehicles per square mile and annual public transit vehicle revenue miles and begin the process of establishing a clean technology incubator within the city. Ithaca, on the other hand, is well above the mean but should focus on improving in the areas of buildings & infrastructure and business and economic development. Specifically, Ithaca should consider including policies that require high levels of energy efficiency in buildings and establishing a clean technology incubator within the city.

As discussed above, the SNI and the plots on the SND could indicate several areas where communities might improve. However, although Ithaca is higher on the SND than Athens, this does not necessarily mean that the residents of Ithaca are happier than the residents of Athens. Nor, does this infer that there are more happy people in Ithaca than there are in Athens. In short, the higher the SNI score for a community, the more the community

has exhibited a commitment to sustainability, which could provide greater opportunity for residents to pursue their own happiness.

*Future Measures*

In total, nine subsystems were selected for inclusion in the SNI: water management, energy management, urban design, food management, business & economic development, waste management, buildings & infrastructure, transportation and community governance. However, there could be several more subsystems and measures included in the SNI than the nine selected. These subsystems were selected based on previous findings in Chapter 2, a demonstrated connection to happiness through primary literature and the availability of data, providing a good starting point for the analysis of community sustainability, and ultimately the linkages with community happiness. Furthermore, data were readily available for these subsystems making it possible to calculate the SNI scores for sixteen cities. Nonetheless, as shown in Table 3-7, future work may include the addition of other measures.

Currently, the most effective way to establish appropriate indicators and an index is to closely model what has been done by the GCI and SustainLane to this point, followed by working closely with communities and other researchers to implement new measures in the future, such as those suggested in Table 3-7 below.

Table 3 - 7 Current and Potential Future Measures for the SNI

| Subsystem | Current Measures | Potential Future Measures |
|---|---|---|
| **Water Management** | Water consumption per capita; water system leakages; water quality policy; stormwater management policy | Grey water systems; rainwater collection; water supply withdrawal rates; Total percent impervious; low impact development (LID) use; surface water discharge; type of water treatment system(s) |
| **Energy Management** | Electricity consumption per unit of GDP; electricity consumption per person; clean and efficient energy policies | Percent of total renewable energy in place – public and private; renewable energy projects in planning phases |
| **Urban Design** | Green spaces; population density; green land use policies; urban sprawl | Walkability; orientation; Use of native vegetation; green space connectivity/biodiversity; access to nature; measures of social capital |
| **Food Management** | Farmers' markets; community gardens; farmers' markets vouchers | Composting; Ordinances allowing urban homesteading; food co-ops; affordability; access; proximity |
| **Business & Economic Development** | Clean technology incubator; green business directory; farmers' markets; LEED buildings | Number of new business start-ups; jobs created; alternative forms of exchange such as bartering and work-for-trade |
| **Waste Management** | Percent of municipal solid waste recycled; waste reduction policies | Landfill gas-to-energy projects; reuse programs; swap shops; local bans on disposable items, e.g., plastic bags or water bottles |
| **Buildings and Infrastructure** | Number of LEED certified buildings; energy efficient building standards; energy efficient building incentives | Number of other green certified buildings; percent of green government buildings; number of green building business in community |
| **Transportation Systems** | Share of workers travelling by public transit, bicycle or foot; public transportation supply; average commute time from residence to work; green transport promotion; congestion reduction policies | Car share programs; bike share programs; carpooling programs; percent of low emission vehicles in fleet; electric vehicle charging stations |
| **Community Governance** | Green action plan; green management; public participation in green policy | Communications; Quality of governmental websites and information promoting sustainability, high speed broadband capability |

*Shortcomings*

There are many recognized shortcomings in this study that require more research and investigation. First, the SNI assumes a linear relationship between community development and happiness. While this may not be the case and an oversimplification of the system, it is a good start to understanding the relationships that exist between happiness and communities. Furthermore, it follows the methods of many well-known sustainability and happiness indices, including the Green City Index, the Gross National Happiness measures used in Bhutan and the Green and Happiness Index (Barameechai 2007). There may also be some questions to the validity of the relative subsystem weightings for this study. However, the weightings for the SNI are based on previous findings, a review of primary literature review, and an optimization process. The flexibility in the SNI is that the weightings can be adjusted or removed. In fact, the Green and Happiness Index (Barameechai 2007) is based on the assumption that all weightings are equal, as it is developed as a holistic measure of happiness. The Green City Index (2011) also makes the same assumption, with regards to indicators of sustainability. It is suggested, however, that some subsystems have more of an impact on happiness than others. These relative weightings will continually be refined through research and by reviewing primary studies from others.

The approximate SND is based on data from only sixteen cities, which is a small sample. However, the beauty of this study is that the SND can be continuously refined as more data are collected from communities in the future. In fact, the ultimate goal is to have enough data collected to generate a distribution that no longer requires generation of additional points and is a more accurate estimate of the SNI distribution. Finally, the premise of the SNI is that sustainable development influences happiness in a positive way. There have been studies that demonstrate associations between happiness and sustainable development, including Chapter 2. However, more research is needed in this area to establish causality and directionality (i.e. do happy people make a community more sustainable or vice versa?).

### 3.6. Conclusion

Traditionally, sustainability has been related to economic performance and efficiency as well as the environment and equity. The SNI presents an increased focus on something all humans can relate to in happiness. No matter the creed, culture, background, educational level or socioeconomic status, all humans deserve to be happy and the SNI allows for communities to potentially consider how to improve the overall happiness of their residents through a shift toward sustainability.

The SNI and its methodology potentially serve as a tool for planners, designers, engineers, architects, developers and community stakeholders in

general. The methodology requires communities to look critically at the current state of their neighborhoods and perform systems-thinking and analysis for how to best improve. Overall, there are three key notions as a result of this study:

1. The SNI and its methodology provide communities with a tool to critically analyze the state of their current sustainability goals and develop strategies to improve for the future.
2. The SNI promotes a systems based approach to community development that improves upon the many facets of the built and natural environment that may be associated with happiness.
3. The approach within this paper proposes an increased focus on sustainability goals to be more aligned with human happiness.

# **CHAPTER 4 -** APPLICATION OF THE SUSTAINABLE NEIGHBORHOODS INDEX TO COASTAL CITIES IN THE UNITED STATES

## 4.1. Abstract

The Sustainable Neighborhoods Index (SNI) was created to assess and compare the potential opportunities, offered through sustainable development, for residential happiness within any neighborhood, town or city in the world. Recent studies have shown that the overwhelming majority of humanity is concentrated along or near the coasts on just 10% of the earth's land surface (Hinrichsen 2012). Thus, it is crucial to consider how to develop/retrofit these areas in the coming years, as these populations continue to grow, sea levels rise and natural resources become more stressed. We applied the SNI to nineteen coastal cities, all members of the fifty most populous cities in the United States, to assess the current state of sustainability and potential opportunities for residential happiness. The nineteen SNI scores were then plotted on The Sustainable Neighborhoods Distribution (Chapter 3), representing 50,000 simulated SNI scenarios, for comparison and assessment. Finally, we assessed the influence of bias on subjective scores for the SNI through sensitivity analysis and all cities were comparatively ranked. Our results show that San Francisco has the greatest SNI score of 82.73, while Detroit has the lowest SNI score at 35.28.

Furthermore, even when accounting for bias with respect to subjective indicators, the rank of the cities remains relatively stable with the top and bottom performers intact.

## 4.2. Introduction

Cities are a potential solution to many of our current environmental, economic and social issues. In fact, if properly designed, a city can offer a number of services and a wholesome lifestyle for its residents. However, if designed poorly, cities can present themselves as unsafe places to live, energy gluttons and centers of pollution. The challenge is to develop strategies and policies that allow for sustainable growth and the retrofit of our cities in a modern age of climate change, pollution, limited natural resources and an expanding human population. The majority of the human population lives in large coastal cities, many of which will be affected by all of the aforementioned issues (Hinrichsen 2012). Thus, it is imperative that these cities seriously consider their path of development for the future. The Sustainable Neighborhoods Index (SNI) offers a method for such development, setting both sustainability and happy residents as the top priority.

### 4.2.1 The Sustainable Neighborhoods Index (SNI)

The Sustainable Neighborhoods Index (SNI) was created in response to calls for an index that considers happiness (Brooks 2010, Duncan 2010,

Schimmel 2009, Ura 2013) and to encourage and assist developers, engineers, architects, planners and community stakeholders to reconsider sustainable development goals and outcomes. Researchers and communities should use the SNI to assess their current community development system (including the built and natural environment, strategies and policy) and the potential opportunities it offers for happiness. In particular, the SNI accounts for nine subsystems of the community development system including urban design, water management, waste management, transportation, food management, buildings & infrastructure, energy management, business & economic development and community governance. Figure 4-1 indicates the relationships and variables for the SNI.

Performance scores (scores for the nine subsystems of community development) are shown as variables listed within the circles below each subsystem title. The variables listed above the arrows ($X_H$) indicate the weighted impacts of the subsystems of community development on neighborhood happiness. These weighted impacts were obtained through primary literature review, prior associations (Chapter 2) and optimization, as discussed in Chapter 3. The combination of these variables is utilized to calculate the Sustainable Neighborhoods Index (SNI) for any community of interest, as shown in equation 1.

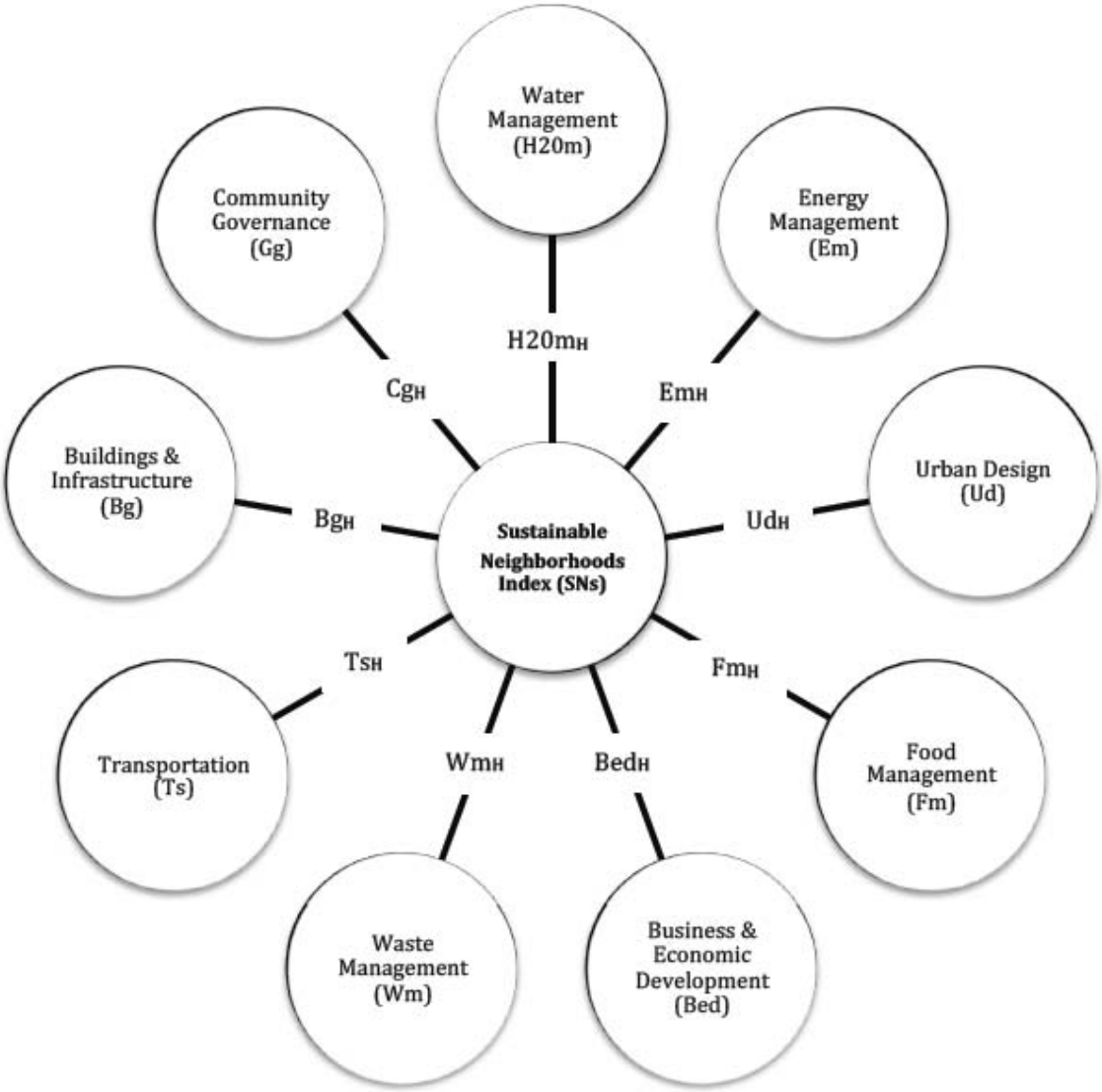



Figure 4 - 1 The Sustainable Neighborhoods Index

***Equation (1):***

$$SNI = \left[\left(\boldsymbol{H2Om}(H2Om_H)\right) + \boldsymbol{Em}(Em_H) + \boldsymbol{Ud}(Ud_H) + \boldsymbol{Fp}(Fp_H) + \boldsymbol{Bed}(Bed_h) + \boldsymbol{Wm}(Wm_H) + \boldsymbol{Ts}(Ts_H) + \boldsymbol{Bg}(Bg_H) + \boldsymbol{Cg}(Cg_H)\right]$$

***SNI*** *= Sustainable Neighborhoods Index;* ***H20mH*** *= Water Management Weighted Impact on Happiness;* $\boldsymbol{Em_H}$ *= Energy Management Weighted Impact on Happiness;* $\boldsymbol{Ud_H}$ *= Urban Design Weighted Impact on Happiness;* $\boldsymbol{Fp_H}$ *= Food Production Weighted Impact on Happiness;* $\boldsymbol{Bed_H}$ *= Business and Economic Development Weighted Impact on Happiness;* $\boldsymbol{Wm_H}$ *= Waste Management Weighted Impact on Happiness;* $\boldsymbol{Ts_H}$ *= Transportation Systems Weighted Impact on Happiness;* $\boldsymbol{Bg_H}$ *= Buildings and Infrastructure Weighted Impact on Happiness;* $\boldsymbol{Cg_H}$ *= Community Governance Weighted Impact on Happiness;* ***H20m*** *= Performance score for Water Management;* ***Em*** *= Performance score for Energy Management;* ***Ud*** *= Performance score for Urban Design;* ***Fp*** *= Performance score for Food Production;* ***Bed*** *= Performance score for Business and Economic Development;* ***Wm*** *= Performance score for Waste Management;* ***Ts*** *= Performance score for Transportation;* ***Bg*** *= Performance score for Buildings and Infrastructure;* ***Cg*** *= Performance score for Community Governance*

### 4.2.2 Coastal Cities

As previously mentioned, the majority of humans reside in coastal cities, which is any city close to a large body of water (Great Lakes, Atlantic Ocean, Pacific Ocean, Gulf of Mexico). Thus, we apply the SNI to some of the largest coastal cities within the United States. In total, nineteen US cities were selected, as described below, including Baltimore, Boston, Chicago, Cleveland, Detroit, Jacksonville, Houston, Long Beach, Los Angeles, Miami, Milwaukee, New York City, Oakland, Portland, San Diego, San Francisco, Seattle, Virginia Beach and Washington DC. The SNI score for each city was determined within this paper for comparison and discussion of each city's current state of sustainability and the potential opportunity for residents to pursue their own happiness.

## 4.3. Methods

### 4.3.1 Selection of US Coastal Cities

The selection of coastal cities, within the United States, was achieved by obtaining a list of the fifty largest cities within the US, according to the US Census (2010). Cities were then deemed as coastal given their proximity to large bodies of water, including oceans and the Great Lakes. In total, nineteen of the fifty largest US cities were selected as coastal cities.

### 4.3.2 The Sustainable Neighborhoods Index Generation

An SNI score was generated for each of nineteen coastal cities utilizing the methods from Chapter 3, including the data collection methods (Table B-1 in Appendix B) and the SNI formula for each city (equation 1). Briefly, indicators and their respective objective or subjective measures were assessed and scores were derived for each city. Objective scores were developed from the available data and cities received a 0-10 score when compared to their peers (as determined by population size). All cities with a population below 500,000 people (low population) were compared to one another, while those with a population ranging from 500,000 to 2.25 million people (medium population) were compared. All cities with a population greater than 2.25 million people (high population) were compared to one another. A score of 10 was given to the city with the best objective indicator score, while a 0 represents the worst and a 5 represents the mean. All other city scores were determined using a linear regression plot and corresponding formula (see Chapter 3).

Subjective scores for some indicators were generated based on a 1-3 score ranging from below expectations to exceeding expectations (see Chapter 3). Next, scaling factors, as shown in Table B-2, were utilized to sum indicators for each category, resulting in a 0-10 score for the overall category and summed to obtain a total score for city.

As an example, the energy management subsystem consists of two objective measures (0-10 scale) and one subjective measure (1-3 scale). In total, there were three measures for the energy management subsystem, the sum of which should be on a 0 to 10 scale (with a 10 representing a perfect score for a subsystem). Thus, the scaling factor for the objective measures (0-10 scale) is 0.33, while the scaling factor of the subjective measure (1-3 scale) is 1.11. Multiplying the scaled scores by these scaling factors allow the indicators to be summed, resulting in an overall 0-10 score for the energy management category. This method was utilized for each subsystem, resulting in 9 subsystem scores on a 0-10 scale. Finally, these scores were utilized, along with the relative subsystem weightings from Chapter 3 to create an overall SNI score for each city, using equation 1.

### 4.3.3 The Sustainable Neighborhoods Distribution Comparison

The Sustainable Neighborhoods Distribution was created (Chapter 3) by generating 50,000 SNI scores, serving as an approximate distribution of SNI scores. Additionally, the SND can be used to plot the SNI of

communities in the future. In this paper, SNI scores were generated for nineteen coastal cities and were plotted on the Sustainable Neighborhoods Distribution for comparison and discussion.

#### 4.3.4 The Sustainable Neighborhoods Subjective Indicators Bias

Of the 33 total indicators for the SNI, 13 (39.39%) are subjective and given scores ranging from 1-3. While these scores are not entirely subjective, as they are informed by objective information as shown in Table C-1, there is always concern with the bias of any subjective indicator. Essentially, one might be concerned with the bias of the person giving subjective scores to a city. Therefore, sensitivity analysis was performed to determine the effects of changes in subjective scores. Specifically, all cities shown in Figure 5-22 on the Sustainable Neighborhoods Distribution (Chapter 3) were rescored in three ways:

1. Adding one point to each subjective indicator score (henceforth the plus one method) unless they received a maximum score of three in the original SNI scoring.
2. Subtracting one point from each subjective indicator score (henceforth the minus one method) unless they received a minimum score of one.
3. Removal of the subjective indicators from the SNI methodology (henceforth the removal method).

The rationale is that adding points to cities accounts for a bias that is conservative with points, while subtracting points accounts for a bias that is too generous with points. The removal of the subjective indicators completely eliminates bias, as all indicators are then based on objective data. The scores for all three scenarios were then plotted again on the Sustainable Neighborhoods Distribution for comparison and assessment. Two tables were also generated to show the shift of cities on the Sustainable Neighborhoods Distribution and the respective 1 to 19 rankings of the cities based upon their SNI scores for the original scoring method, the plus one method (adding one point to all subjective indicators not equal to three), the minus one method (removing one point from all subjective indicators that are not equal to 1) and the removal method (removal of all subjective indicators from the SNI scoring method).

## 4.4. Results

In total, nineteen cities were selected and scored, utilizing the SNI methodology, the results of which are shown below.

### 4.4.1 Collected/Generated Data

The collected objective and generated subjective data for each city is shown in Appendix C, Tables C-1 through C-19. As indicated, the obtained information includes the collected objective data, derived subjective data (as informed by internet and city information searches), the source of the

information and notes, including dates, times and specifics on the information obtained.

### 4.4.2 Scaled Scoring for Objective Indicators

The linear regressions for the scaled scoring for each objective indicator of each subsystem and the respective low, medium or high populations, are also shown in Appendix C, Figures C-1 through C-45.

### 4.4.3 The Sustainable Neighborhoods Index Scoring Profiles

The scoring profiles for each of the nineteen cities, as grouped by population size, are shown in Figures 4-2 through 4-4 below. The large profile at the top of each figure represents the best and average score for all nineteen cities, while the solid black line represents the average score for each group of cities for a given population range. Each city profile indicates the best, average and city score for each subsystem of the SNI. These scores are shown before the final calculation of the SNI where subsystems are weighted according to their relative association with happiness (Table 4-1 in Chapter 3) as in equation 1.

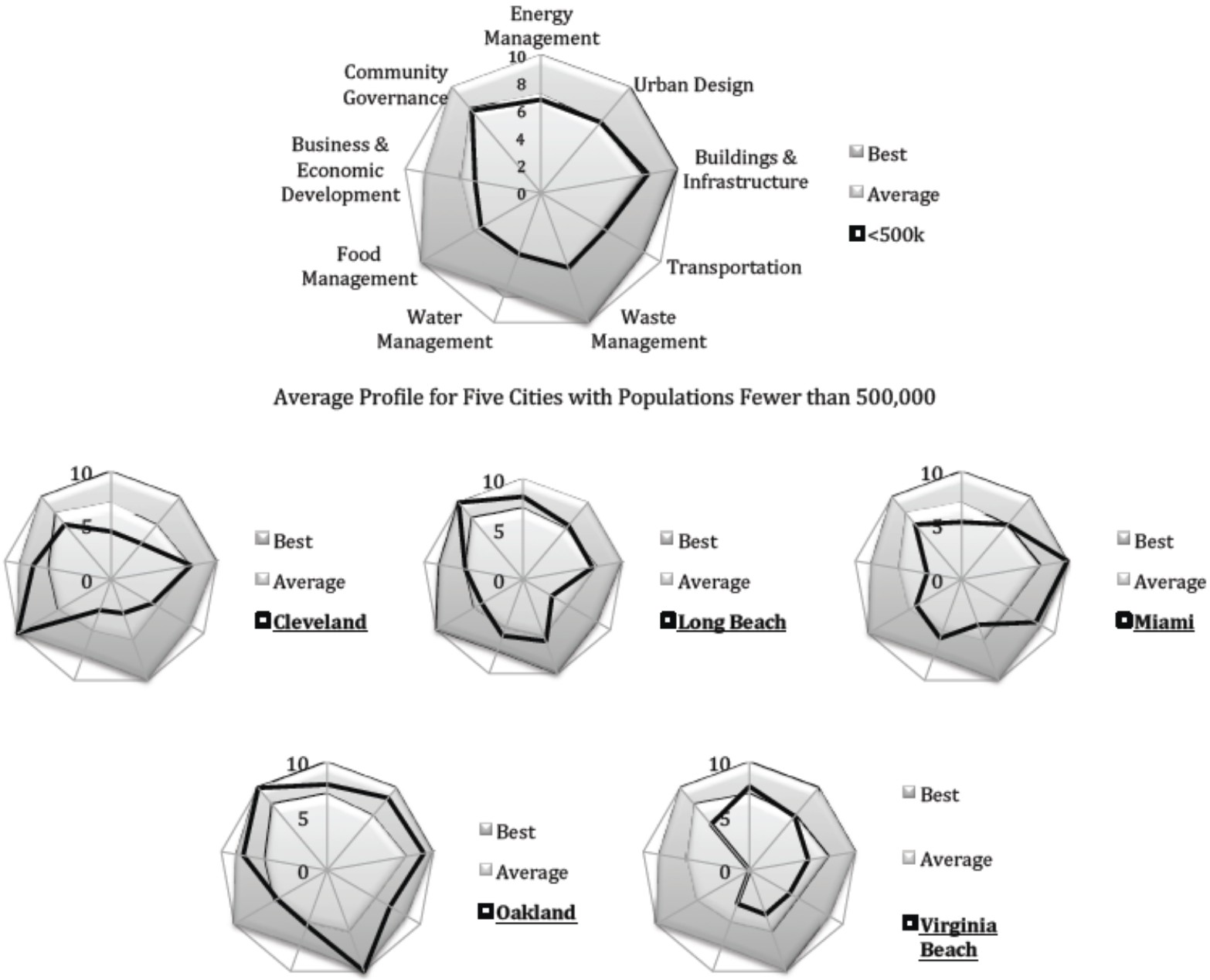



Figure 4 - 2 The Sustainable Neighborhoods Index Scoring Profile for Cities with Populations Fewer than 500,000

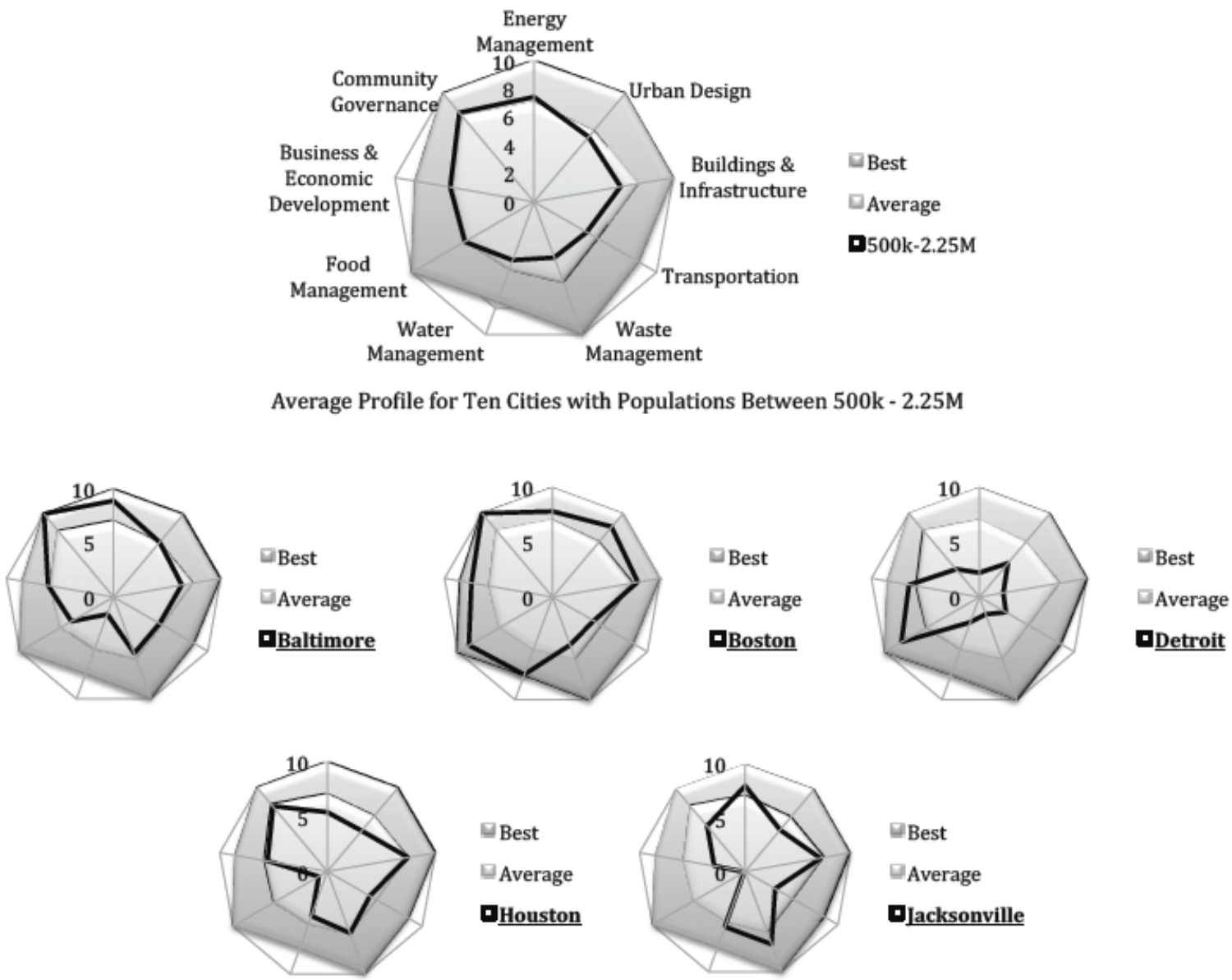
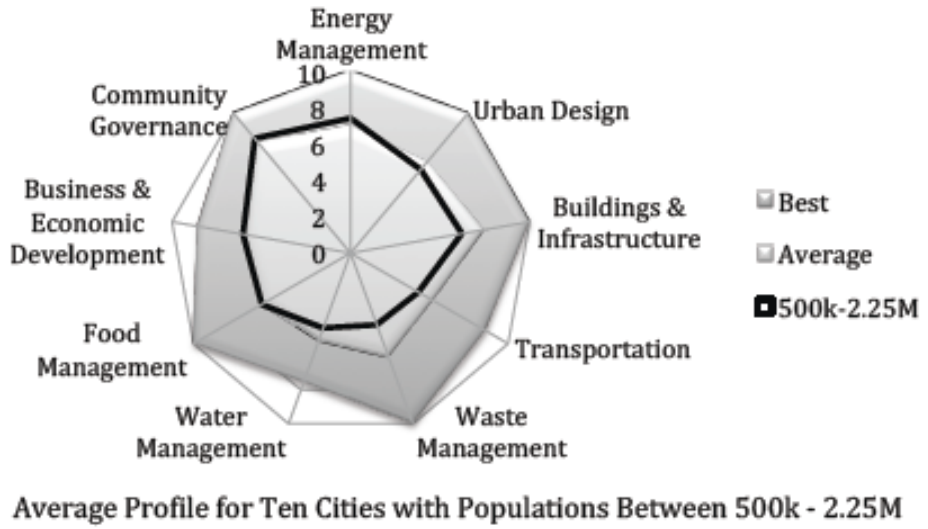



Figure 4 - 3 The Sustainable Neighborhoods Index Scoring Profile for Cities with Populations Between 500,000 and 2,250,000




Average Profile for Ten Cities with Populations Between 500k - 2.25M

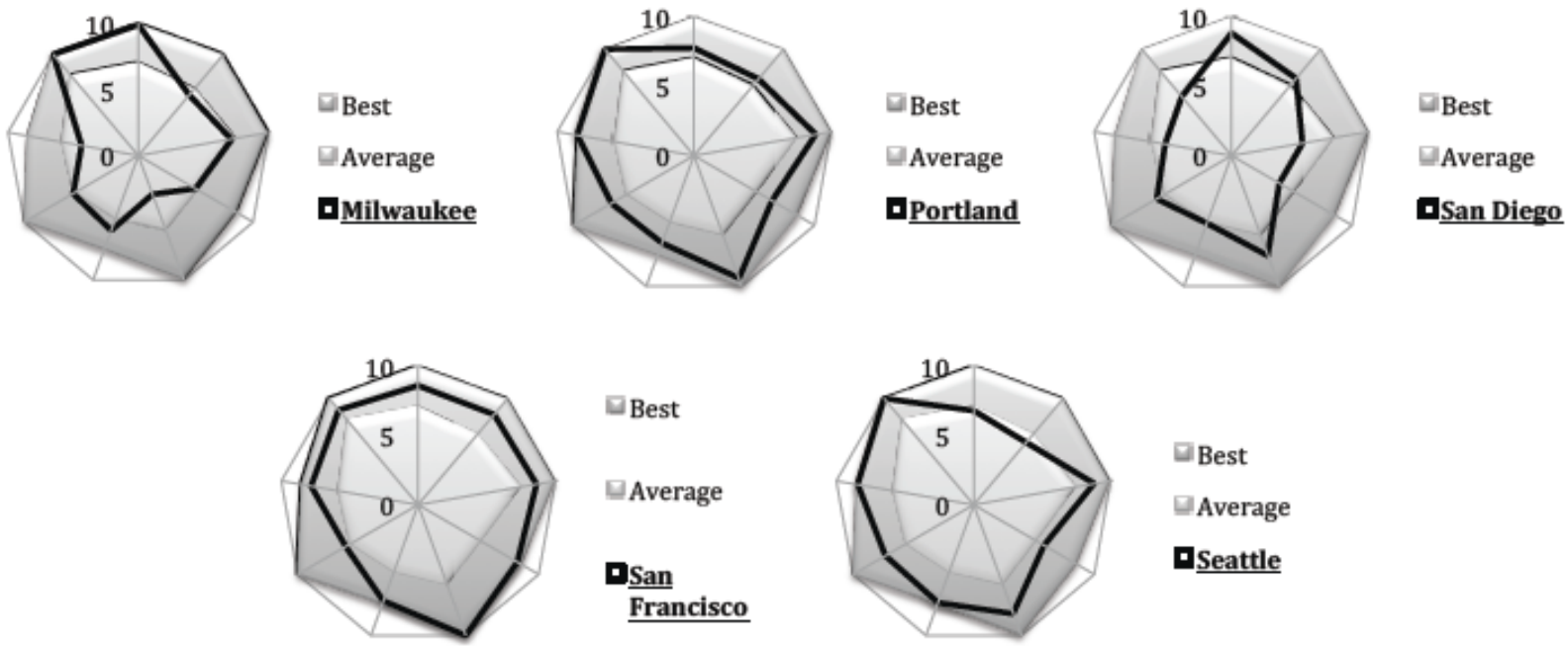



Figure 4 – 3 (cont'd) The Sustainable Neighborhoods Index Scoring Profile for Cities with Populations Between 500,000 and 2,250,000

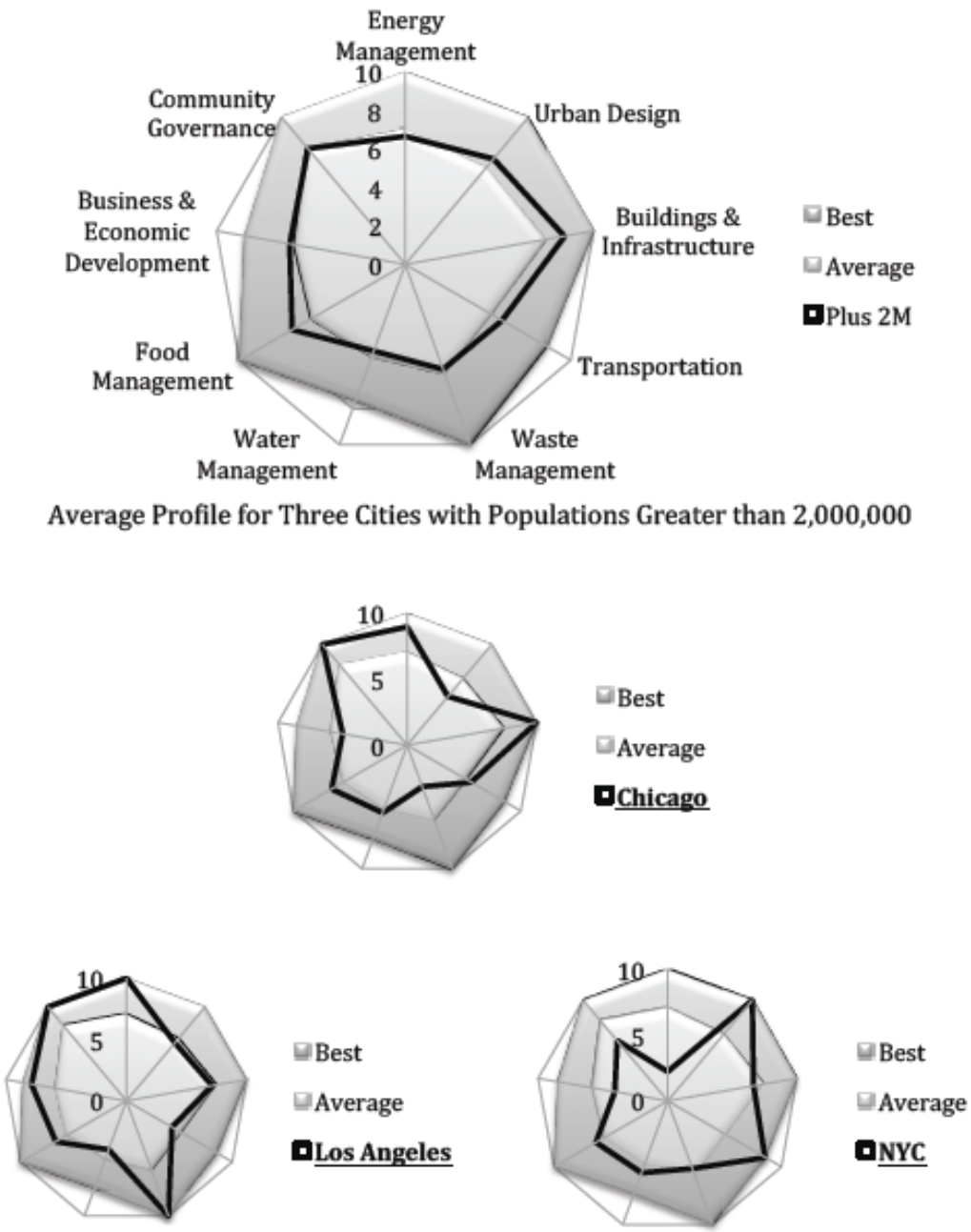



Figure 4 - 4 The Sustainable Neighborhoods Index Scoring Profile for Cities with Populations Greater than 2,250,000

### 4.4.4 The Sustainable Neighborhoods Index Scores

The SNI scores for all nineteen US coastal cities are shown below in Figure 4-5. The results show that the mean SNI for all nineteen coastal cities is approximately 64 (64.24 to be exact). As shown, some cities (Oakland, Portland, San Francisco and Seattle) are greater than one standard deviation (s.d = 12.98) above the mean while other cities (Detroit and Virginia Beach) are greater than one standard deviation below the mean

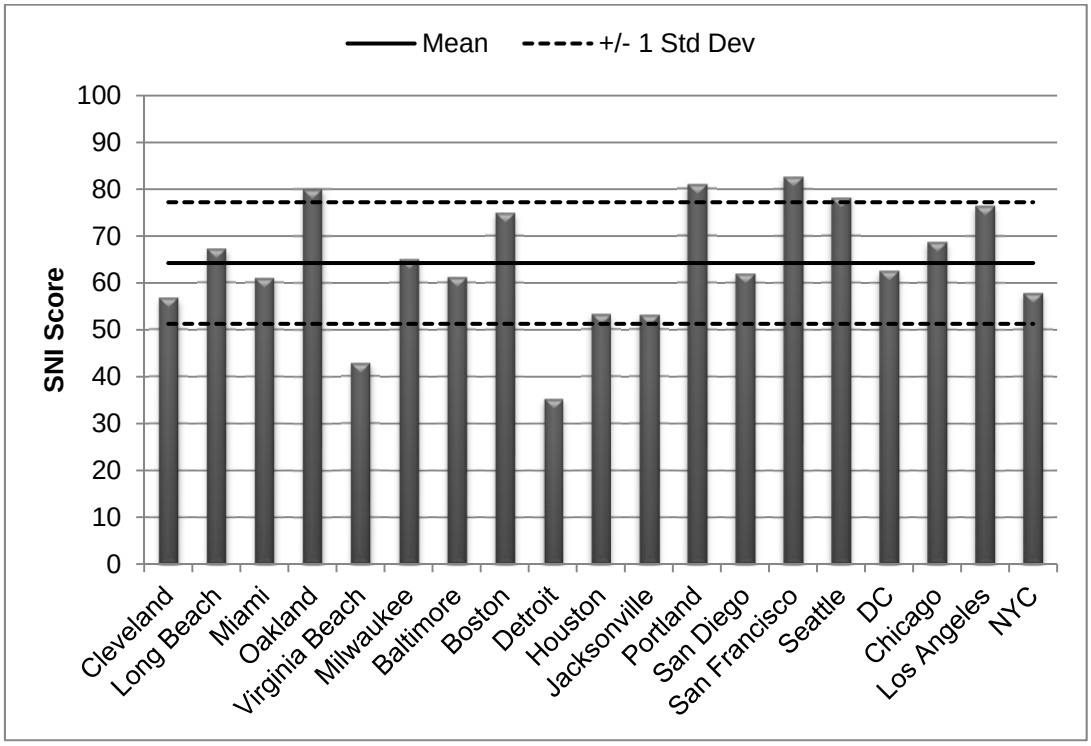



Figure 4 - 5 The Sustainable Neighborhoods Index Comparative Scores for Nineteen US Coastal Cities

### 4.4.5 Top and Bottom Performers

The SNI scores for all nineteen US coastal cities are shown in Figure 4-5. Table 4-1 and Table 4-2 indicate the subsystem scores for each of the cities lying one or more standard deviation outside the mean.

Table 4 - 1 SNI Scoring Profiles for Cities Greater than +1 Standard Deviation from Mean

| Category | Los Angeles | Oakland | Portland | San Francisco | Seattle |
|---|---|---|---|---|---|
| Energy Management | 10.00 | 7.98 | 7.74 | 8.57 | 6.78 |
| Urban Design | 6.20 | 8.78 | 7.20 | 8.47 | 5.86 |
| Buildings & Infrastructure | 7.15 | 9.12 | 8.87 | 8.62 | 8.79 |
| Transportation | 4.29 | 6.73 | 6.45 | 8.22 | 5.85 |
| Waste Management | 10.00 | 10.00 | 9.39 | 10.00 | 8.35 |
| Water Management | 4.26 | 5.48 | 6.72 | 7.37 | 7.48 |
| Food Management | 6.67 | 5.38 | 6.85 | 6.02 | 7.31 |
| Business & Economic Development | 7.86 | 7.91 | 8.52 | 7.84 | 8.45 |
| Community Governance | 10.00 | 10.00 | 10.00 | 8.89 | 10.00 |
| **SNI** | 76.54 | 80.10 | 81.10 | 82.73 | 78.18 |

Table 4 - 2 SNI Scoring Profiles for Cities Greater than -1 Standard Deviation from Mean

| Category | Los Angeles | Oakland | Portland | San Francisco | Seattle |
|---|---|---|---|---|---|
| Energy Management | 10.00 | 7.98 | 7.74 | 8.57 | 6.78 |
| Urban Design | 6.20 | 8.78 | 7.20 | 8.47 | 5.86 |
| Buildings & Infrastructure | 7.15 | 9.12 | 8.87 | 8.62 | 8.79 |
| Transportation | 4.29 | 6.73 | 6.45 | 8.22 | 5.85 |
| Waste Management | 10.00 | 10.00 | 9.39 | 10.00 | 8.35 |
| Water Management | 4.26 | 5.48 | 6.72 | 7.37 | 7.48 |
| Food Management | 6.67 | 5.38 | 6.85 | 6.02 | 7.31 |
| Business & Economic Development | 7.86 | 7.91 | 8.52 | 7.84 | 8.45 |
| Community Governance | 10.00 | 10.00 | 10.00 | 8.89 | 10.00 |
| **SNI** | 76.54 | 80.10 | 81.10 | 82.73 | 78.18 |

### 4.4.6 The Sustainable Neighborhoods Distribution Comparison

Figure 4-6 shows the Sustainable Neighborhoods Distribution (SND) (generated in Chapter 3) with the SNI scores for all nineteen coastal cities plotted on it. As shown, many cities lie well outside one standard deviation below and above the mean of the SND.

### 4.4.7 Adjusting the Sustainable Neighborhoods Subjective Indicators

Figure 4-7 shows the SND (generated in Chapter 3) with the adjusted subjective indicators plus one method for all nineteen coastal cities, while Figure 4-8 shows the SND with the minus one method. Figure 4-9 indicates the original SNI scores with error bars indicating both the plus and minus one methods and is accompanied by Figure 4-10 which indicates the percent change for both adding one point and taking away one point from the subjective indicators for all cities. Table 4-3 shows the shifts for each respective city as a result of the addition and subtraction of 1 point from each subjective category. As indicated, cities either remained within the same number of standard deviations from the mean for the SND or shifted to ±1, ±1-2 or >±2 standard deviations from the mean.

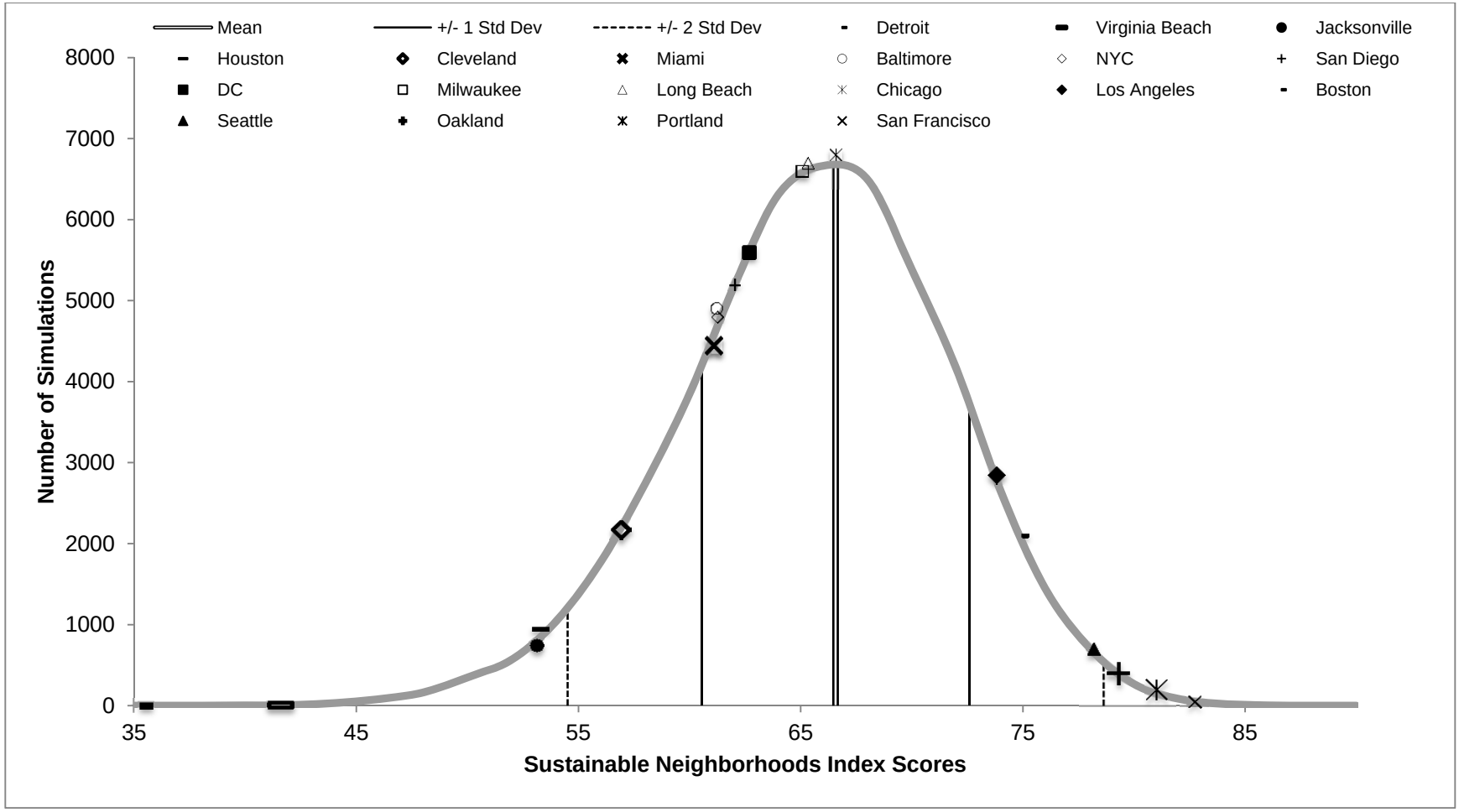



Figure 4 - 6 The Sustainable Neighborhoods Distribution with Study Cities Plotted (Cities listed as plotted left to right in legend)

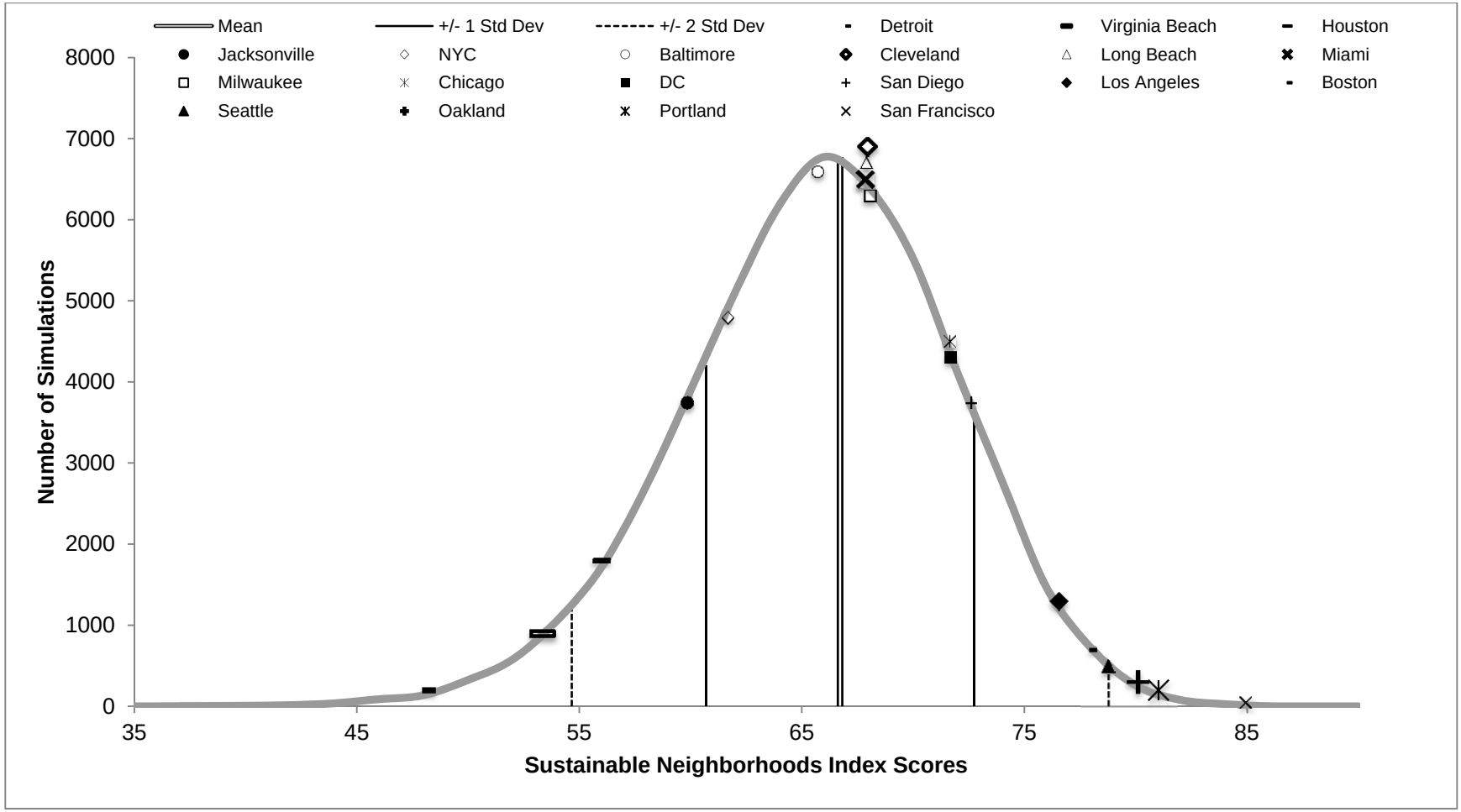



Figure 4 - 7 The Sustainable Neighborhoods Distribution for the Plus One Method (+1 Point per Indicator)

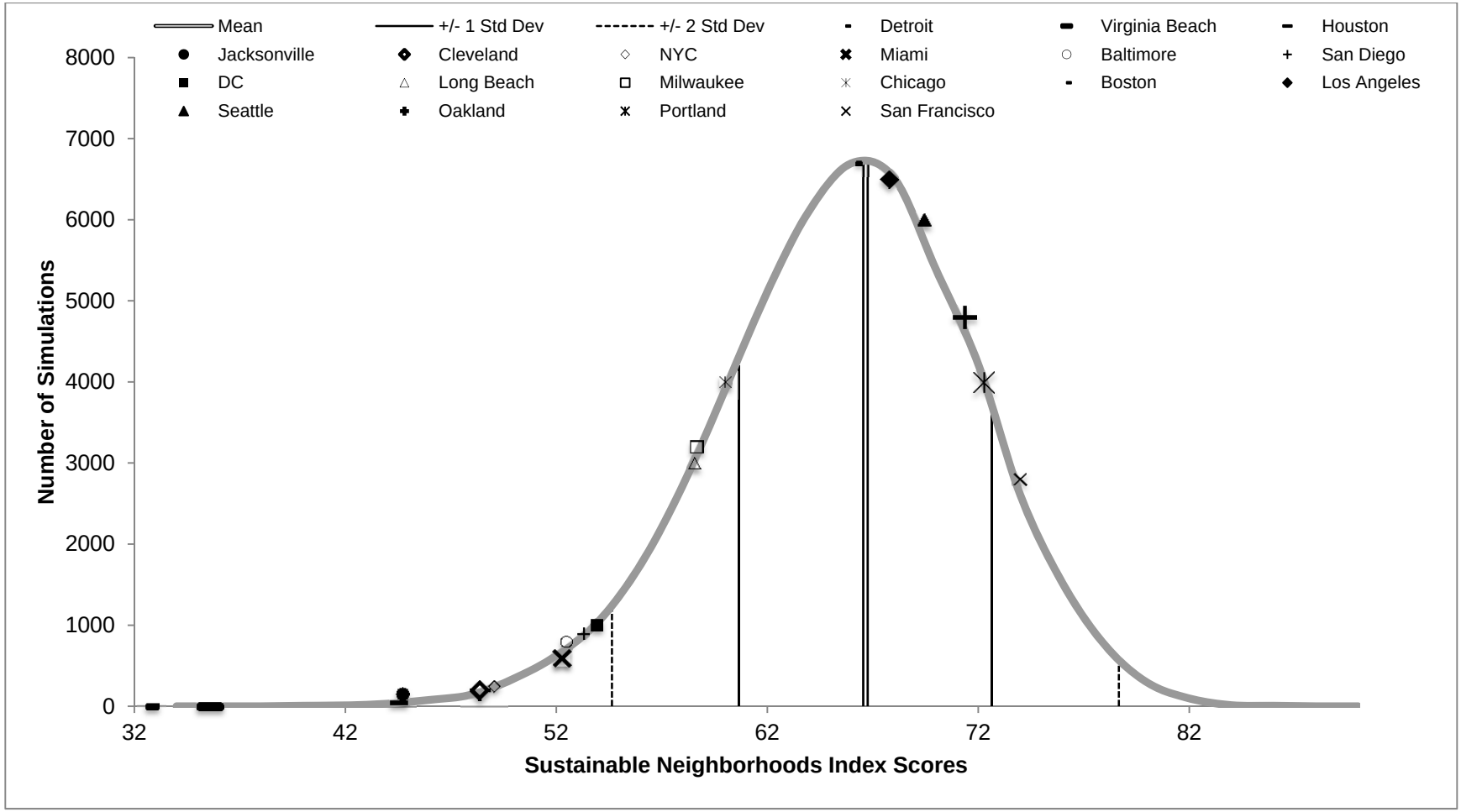



Figure 4 - 8 The Sustainable Neighborhoods Distribution for the Minus One Method (-1 Point per Indicator)

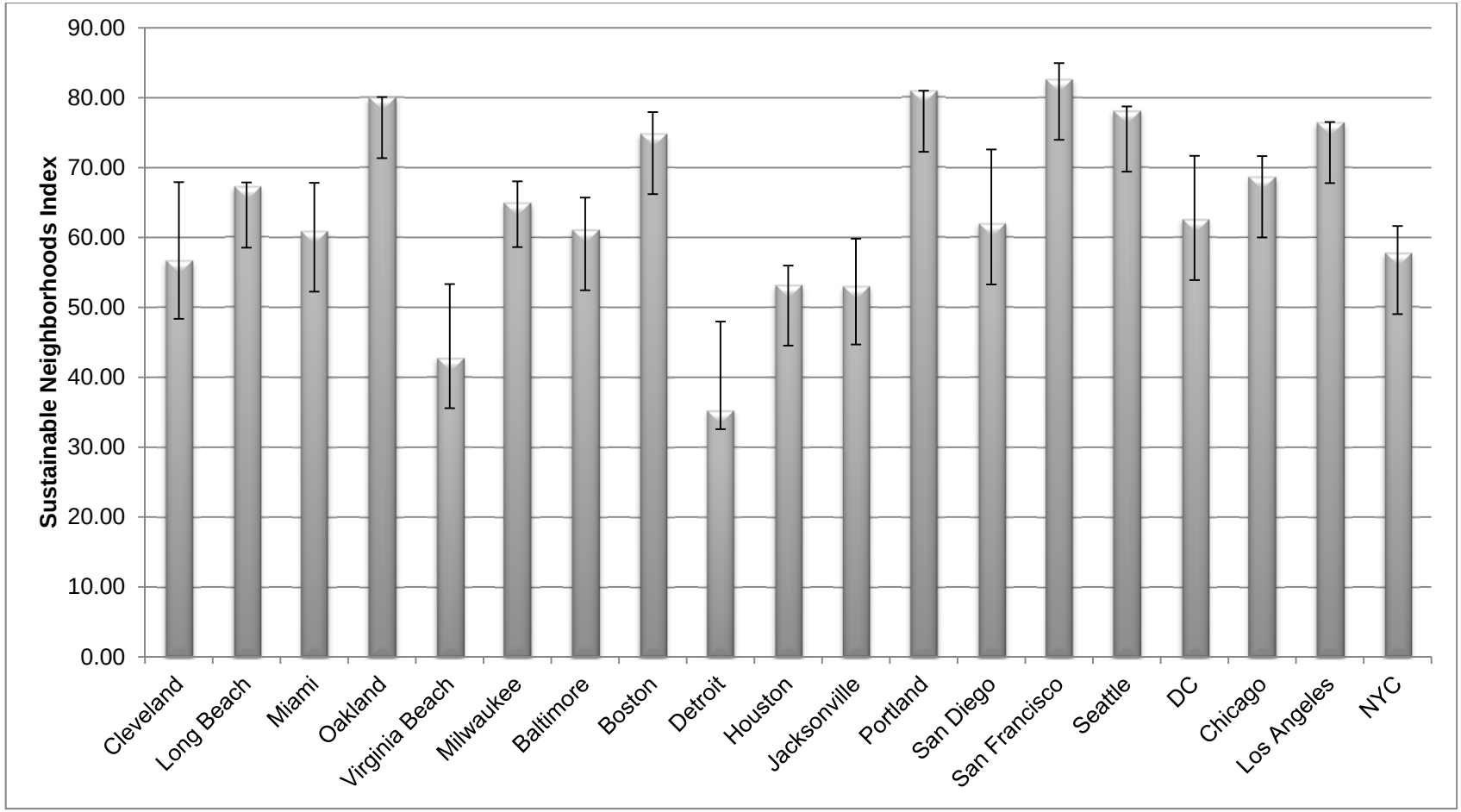



Figure 4 - 9 The Sustainable Neighborhoods Scores for Nineteen Coastal Cities with Subjective Score Adjustment

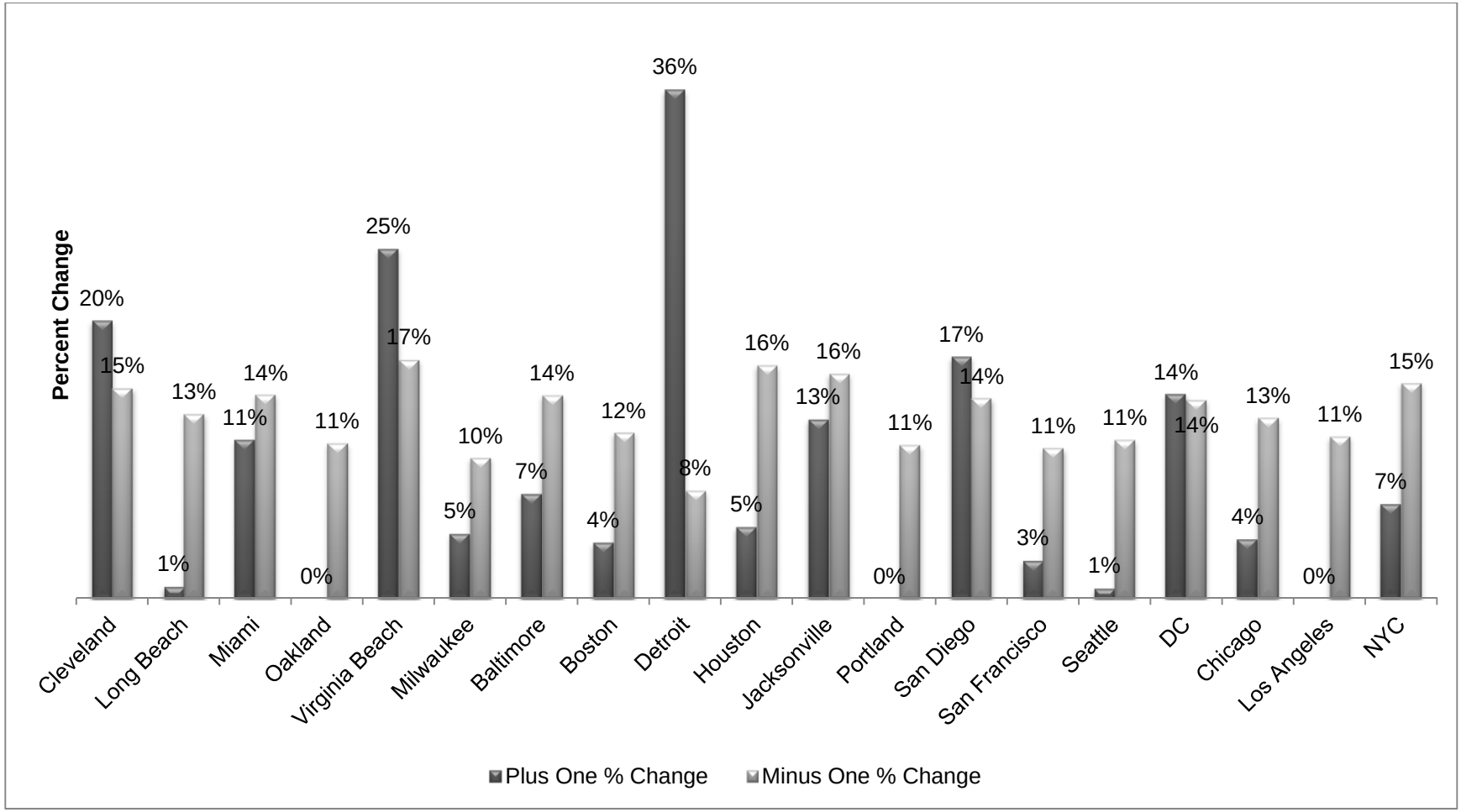



Figure 4 - 10 The Sustainable Neighborhoods Index Percent Change for Nineteen Coastal Cities with Plus and Minus One Methods

Table 4 - 3 Nineteen Coastal Cities Location on the Sustainable Neighborhoods Distribution for Original SNI and Pre- and Post- Subjective Scoring Shifts

| City | Scenario | > Minus 2 Sigma | Minus 1 to 2 sigma | Zero to minus 1 sigma | Zero to plus 1 Sigma | Plus 1 to 2 Sigma | > Plus 2 Sigma |
|---|---|---|---|---|---|---|---|
| **Baltimore** | Original | | | ✓ | | | |
| | Plus One | | | ✓ | | | |
| | Minus One | ✓ | | | | | |
| **Boston** | Original | | | | | ✓ | |
| | Plus One | | | | | ✓ | |
| | Minus One | | | ✓ | | | |
| **Chicago** | Original | | | ✓ | | | |
| | Plus One | | | | ✓ | | |
| | Minus One | | ✓ | | | | |
| **Cleveland** | Original | | ✓ | | | | |
| | Plus One | | | | ✓ | | |
| | Minus One | ✓ | | | | | |
| **DC** | Original | | | ✓ | | | |
| | Plus One | | | | ✓ | | |
| | Minus One | ✓ | | | | | |
| **Detroit** | Original | ✓ | | | | | |
| | Plus One | ✓ | | | | | |
| | Minus One | ✓ | | | | | |
| **Houston** | Original | ✓ | | | | | |
| | Plus One | | ✓ | | | | |
| | Minus One | ✓ | | | | | |
| **Jacksonville** | Original | ✓ | | | | | |
| | Plus One | | ✓ | | | | |
| | Minus One | ✓ | | | | | |

Table 4 - 3 (Continued)

| City | Scenario | > Minus 2 Sigma | Minus 1 to 2 sigma | Zero to minus 1 sigma | Zero to plus 1 Sigma | Plus 1 to 2 Sigma | > Plus 2 Sigma |
|---|---|---|---|---|---|---|---|
| **Long Beach** | Original | | | ✓ | | | |
| | Plus One | | | | ✓ | | |
| | Minus One | | ✓ | | | | |
| **Los Angeles** | Original | | | | | ✓ | |
| | Plus One | | | | | ✓ | |
| | Minus One | | | | ✓ | | |
| **Miami** | Original | | | ✓ | | | |
| | Plus One | | | | ✓ | | |
| | Minus One | ✓ | | | | | |
| **Milwaukee** | Original | | | ✓ | | | |
| | Plus One | | | | ✓ | | |
| | Minus One | | ✓ | | | | |
| **NYC** | Original | | | ✓ | | | |
| | Plus One | | | ✓ | | | |
| | Minus One | ✓ | | | | | |
| **Oakland** | Original | | | | | ✓ | |
| | Plus One | | | | | | ✓ |
| | Minus One | | | | ✓ | | |
| **Portland** | Original | | | | | ✓ | |
| | Plus One | | | | | | ✓ |
| | Minus One | | | | ✓ | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **San Diego** | Original | | | ✓ | | | |
| | Plus One | | | | ✓ | | |
| | Minus One | ✓ | | | | | |

Table 4-3 (Continued)

| City | Scenario | > Minus 2 Sigma | Minus 1 to 2 sigma | Zero to minus 1 sigma | Zero to plus 1 Sigma | Plus 1 to 2 Sigma | > Plus 2 Sigma |
|---|---|---|---|---|---|---|---|
| **San Francisco** | Original | | | | | | ✓ |
| | Plus One | | | | | | ✓ |
| | Minus One | | | | | ✓ | |
| **Seattle** | Original | | | | | ✓ | |
| | Plus One | | | | | ✓ | |
| | Minus One | | | | ✓ | | |
| **Virginia Beach** | Original | ✓ | | | | | |
| | Plus One | ✓ | | | | | |
| | Minus One | ✓ | | | | | |

### 4.4.8 Removal of the Subjective Indicators

Figure 4-11 shows the SNI scores for all nineteen coastal cities once the subjective indicators were removed from the scoring method. As indicated, the new mean is approximately 52 (51.72 to be exact).

### 4.4.9 Rankings for All Subjective Indicator Scenarios

Table 4-4 summarizes the rankings for all nineteen coastal cities for each of the subjective indicator scenarios, including the original SNI calculations, the plus one method, the minus one method and the removal method. As indicated, those cities that are italicized remained the same in ranking from the original SNI calculation.

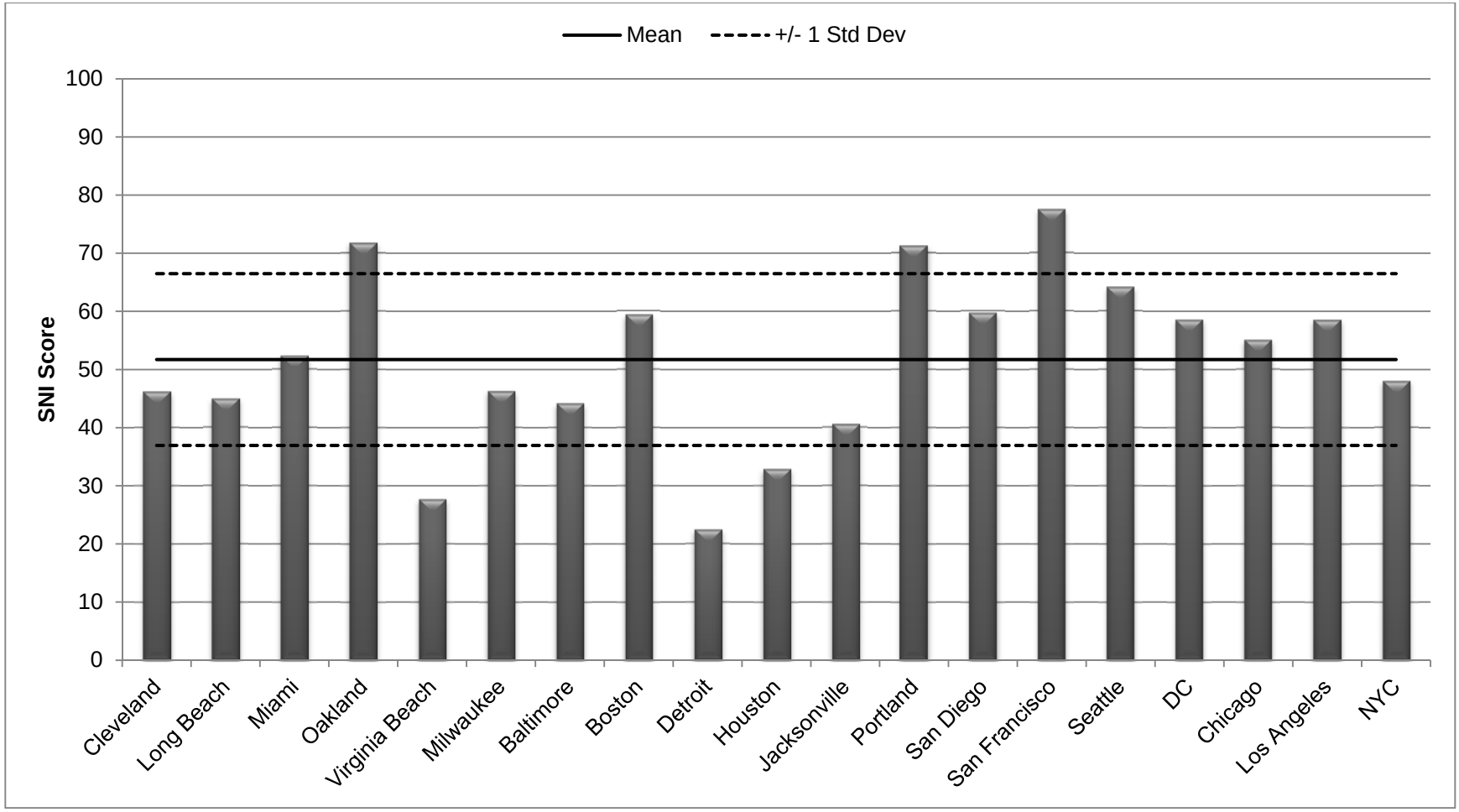



Figure 4 - 11 The Sustainable Neighborhoods Index Scores for Nineteen Coastal Cities with Removal of Subjective Indicators

Table 4 - 4 SNI Rankings for all Subjective Indicator Scenarios

| Rank | Original | Plus One | Minus One | Removal |
|---|---|---|---|---|
| **1** | *San Francisco* | *San Francisco* | *San Francisco* | *San Francisco* |
| **2** | *Portland* | *Portland* | *Portland* | Oakland |
| **3** | *Oakland* | *Oakland* | *Oakland* | Portland |
| **4** | *Seattle* | *Seattle* | *Seattle* | *Seattle* |
| **5** | *Los Angeles* | Boston | *Los Angeles* | San Diego |
| **6** | *Boston* | Los Angeles | *Boston* | *Boston* |
| **7** | *Chicago* | San Diego | *Chicago* | DC |
| **8** | Long Beach | DC | Milwaukee | Los Angeles |
| **9** | Milwaukee | Chicago | Long Beach | Chicago |
| **10** | *DC* | Milwaukee | *DC* | Miami |
| **11** | *San Diego* | Cleveland | *San Diego* | NYC |
| **12** | *Baltimore* | Long Beach | *Baltimore* | Milwaukee |
| **13** | *Miami* | *Miami* | *Miami* | Cleveland |
| **14** | *NYC* | Baltimore | *NYC* | Long Beach |
| **15** | *Cleveland* | NYC | *Cleveland* | Baltimore |
| **16** | Houston | Jacksonville | Jacksonville | Jacksonville |
| **17** | Jacksonville | Houston | Houston | Houston |
| **18** | *Virginia Beach* | *Virginia Beach* | *Virginia Beach* | *Virginia Beach* |
| **19** | *Detroit* | *Detroit* | *Detroit* | *Detroit* |

Note: Cities that did not change position shown in italics

### 4.5. Discussion

The Sustainable Neighborhoods Index and its methodology serve as a potential means for cities to simultaneously focus on sustainability and the happiness of its residents. The results indicate that many cities, including Oakland, Portland, San Francisco and Seattle score well in the SNI while cities like Virginia Beach and Detroit score poorly. When considering the scoring profiles for the cities that score well, it is clear that they excel in several subsystems. All of the cities have high scores in the community governance and waste management subsystems and relatively high scores in the energy management, water management, buildings & infrastructure and

business & economic development subsystems. However, most cities could use improvement in the transportation and food management subsystems. With respect to the cities that score poorly (Detroit and Virginia Beach), they struggle in nearly every subsystem and could use new strategies and protocol for developing the subsystems in the future. However, Detroit is effective in the area of food management and business & economic development. Virginia Beach is doing well in the area of energy management and is respectable in the areas of urban design and community governance. These cities can shift their attention to the scoring profiles for their cities to determine which subsystems need their focus and effort. Furthermore, these cities can utilize the SND to see where they stand compared to their peers. The SND serves as a potentially useful visual tool indicating where cities rank amongst several other city scores when placed on a distribution of 50,000 SNI scenarios. As indicated in the results, cities like Oakland, Portland and San Francisco are well above the mean on the SND (> +2 standard deviations), while cities like Houston, Jacksonville, Virginia Beach and Detroit are well below the mean (> -2 standard deviations).

The SNI is composed of both objective indicators and subjective indicators and, as previously mentioned, of the 33 total indicators, there are 20 objective indicators and 13 subjective indicators (39.39% subjective). Thus, the influence of the subjective indicators on the overall SNI scores is

not trivial. In fact, at a maximum, if a city received a 1 in all subjective categories and should have received a 3 in each (due to a negative bias with the assessor), it could have been shorted a total of approximately 29 points (28.89 specifically) or 29% of the total SNI score. The results indicate cities shifted from the original SNI scoring when adjusting for bias, through the +1, -1, and removal method. Some cities experience large shifts in scores (NYC, San Diego, DC, Chicago), while other cities experience small shifts (Cleveland, Virginia Beach, Detroit, Houston, Jacksonville and San Diego) and many cities remained fairly constant (San Francisco, Virginia Beach, Seattle, Los Angeles, Detroit, Houston, Jacksonville). Nonetheless, as indicated in Table 4-4, a number of cities (particularly the top and bottom performers) remained the same (indicated by italicized text) or within the same tier. In fact, when looking at the position of most cities in the original scoring method it is clear that only a few of them shift more than two or three positions as a result of bias adjustment scenario.

Still, these results indicate that bias can certainly affect the way these cities are distributed and this must be remembered when scoring cities in the future. An easy way to account for bias is to obtain information from cities and take good notes within the data collection sheets. Many cities have extensive sustainability strategies and plans for the future that address a number of the indicators in detail. Looking for information like this makes

scoring the subjective indicators much easier. Additionally, a committee of several people could subjectively score cities and the scores could be averaged.

Two visual tools emerged from the SNI development process including the comparative SNI score chart and the scoring profile for the cities of interest. The comparative score chart allows cities to see how they compare to their peers, while the scoring profiles show the best score, average score and SNI subsystem score for each city. These profiles serve as a tool for planners, designers, developers, engineers, politicians, residents and any other stakeholder of a city. The profiles also provide information that is not available from the comparative SNI scores. For example, a planner from the city of Detroit, who looks at the comparative SNI scores, will see that their city scores low when compared to its peers. However, no information is provided on how the city might improve its scores and its overall SNI. Shifting his/her focus to the scoring profile for Detroit allows the planner to see what areas the city excels in and what areas could use work. Furthermore, the planner could then look at the indicators for each subsystem and determine ways to improve in each area.

*Limitations*

This study has some shortcomings that need to be mentioned. The SNI is grounded in weighted associations from literature (and our own work)

that requires improvement. Specifically, the associations between the subsystems need to be clearly identified with robust studies consisting of large datasets from hundreds of US cities. Furthermore, a multilevel model that accounts for the potential interdependence of the subsystems will aid in determining future weightings for the SNI. The process will also help to determine which additional indicators and subsystems might be included for future versions of the SNI.

### 4.6. Conclusion

The purpose of this paper was to apply the SNI to nineteen coastal US cities. The exercise resulted not only in the generation of nineteen SNI scores but hundreds of simulated data points for many cities, a refined methodology for data collection and scoring and an understanding of the effort necessary to determine the SNI score of any community. In summary, high scoring cities serve as models for current cities that may want to offer their residents the opportunity to pursue happiness. While there is much high scoring cities can do to improve, they are on a path toward both sustainability and potentially happy residents for the future.

The true benefit of the SNI process and its methods is that cities will comparatively be assessed to other cities striving for sustainability. Ultimately, the resultant effort required to improve the SNI score for any city will result

in greater sustainability and, potentially, happier residents. Three key concepts are evident as a result of this work:

1. The SNI scoring process results in three tools, including the comparative scoring table, the scoring profile for each city, and the Sustainable Neighborhoods Distribution plot for comparison with several other cities.
2. The SNI scoring process requires a systems approach to sustainability, instilling an awareness of the connectivity of many aspects of community development.
3. The SNI could drive competition between cities that are striving for sustainability while offering potentially greater opportunity for residents to pursue their own happiness.

# **CHAPTER 5 -** IN PURSUIT OF HAPPINESS: MOVING OUR COMMUNITIES TOWARD A SUSTAINABLE & HAPPY FUTURE

## 5.1 Abstract

A significant challenge humans may face is the development of future communities that addresses a rapidly expanding population, finite natural resources, the potential end of affordable fossil fuels, environmental pollution and climate change. While the issues are many, the opportunity has presented itself to design our communities in a way that comprehensively accounts for social, economic and environmental sustainability. Communities designed with the intention of promoting the opportunity for all residents to pursue their own happiness may serve as a solution to many of these challenges. This paper is a call to action for engineers, scientists, architects, designers, developers, and planners to consider the promotion of happiness within our communities. A "Happy-Centric" framework and the acronym "PERSPECTIVE" are outlined with the intention of guiding the planning, retrofit and design of future communities to move toward sustainability and greater opportunity for happiness.

KEYWORDS: Community development, sustainable development, happiness, sustainability

*"The significant problems we face cannot be solved at the same level of thinking we were at when we created them." – Albert Einstein*

## 5.2 Introduction

Humans will face significant challenges in the near future, with respect to the design and retrofit of our communities, including expanding populations, dwindling natural resources, environmental pollution and climate change. Community development is historically and currently focused on short-term economic gain (building for the lowest cost) followed by compliance with environmental standards and regulations. A new approach and level of thinking is needed in lieu of the economically focused, environmental-regulation-driven strategies that led us to the challenges we immediately and predictably face. Humans are incredibly resourceful and inventive and this paper serves as a call to action to refocus our research, efforts, resources and innovation to intentionally design communities for two outcomes: (1) sustainability and (2) residential happiness. Currently, with respect to sustainable development, the human dimension of community development is often forgotten. However, a focus on happiness could potentially address many human factors, comprehensively including the three pillars of sustainability: economics, environment and social equity. In fact, sustainable attributes within these three areas are associated with higher levels

of self-reported happiness (Veenhoven 1992, O'Brien 2001, Zidansek 2007, Leyden et al. 2011, White et al. 2013).

This paper details the basis and rationale for an approach to community development dedicated to simultaneously improving sustainability and the happiness of residents. Furthermore, it provides a "Happy-Centric" framework for focusing on the associations between community development and happiness and outlines the acronym, "PERSPECTIVE", which could be used to guide the design and retrofit of future communities to achieve both sustainability and happier residents. However, before the framework and acronym are detailed, it is first necessary to describe sustainable development and happiness as well as the challenges facing us in the future.

### 5.3 The State of Current Sustainable Development Definitions

Sustainability typically is described to include three pillars: economic, environmental and social. The economic pillar includes factors such as income, employment and investments, while the environmental pillar includes factors such as air and water quality, greenhouse gas emissions and preservation of green space. The social pillar includes components such as health, security and well-being. Thus, sustainable development should be composed of sustainable economic, environmental and social pillars. To date, the most commonly cited definition or description of sustainable

development is the Brundtland Commission's, "sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland Commission 1987, p.8). While this definition addresses the preservation and conservation of resources for the future, the term "needs" leaves more to be desired, given its subjectivity. For instance, how would a human living in a state of chaos rate his or her needs when compared to one in a tranquil environment? Naturally, the most basic of needs include food, water and shelter. However, humans strive for some of the most complex factors, not easily addressed by having these three basic necessities. For instance, most humans desire social relationships and interactions, a loving partner and family, a safe place to live, the free will to practice their own beliefs, a healthy mind and body, a source of income and a sense of purpose (Jung 1960, Holden 1998, Seligman 2002, Diener and Seligman 2004, Brooks 2008, Diener and Ryan 2009, De Graaf 2010, Demir and Ozdemir 2010, Blanchflower and Oswald 2011, Lappé 2012). In essence, humans desire a host of factors that ultimately lead to happiness. Why, then, do definitions and descriptions of sustainability have yet to consider the human dimension and, ultimately, happiness?

The United States of America Declaration of Independence states, "We hold these truths as self-evident, that all men are created equal, that they

are endowed by their Creator within certain unalienable Rights, that among these are Life, Liberty and the ***pursuit of happiness***." The declaration was written in a time of idealistic Puritan beliefs intended to provide a man with a home, some land, a loving wife and children, an unending work ethic and a strong belief in a Creator. Nearly two and a half centuries later, times have changed, yet, at the fundamental root, many of these same values hold true. People desire to have their own space, a loving partner and family, meaningful and lasting relationships, employment, something to believe in, a sense of purpose, health and sustenance (Jung 1960, Holden 1998, Seligman 2002, Diener and Seligman 2004, Brooks 2008, Diener and Ryan 2009, De Graaf 2010, Demir and Ozdemir 2010, Blanchflower and Oswald 2011, Lappé 2012). Communities that are intentionally designed for residential happiness could meet not only the objectives set forth by our founding fathers but the needs for all humans to live wholesome and meaningful lives.

Sustainability is a loosely used term, however, in nearly every situation, it is anthropocentric in nature. Thus, descriptions and definitions of sustainability and development should specifically include and address happiness: the human dimension commonly shared by all. Sustainable development should be considered as *a process of change in which the direction of investment, the orientation of technology, the allocation of resources, and the development and functioning of institutions afford the opportunity for the pursuit of happiness while*

*preserving the opportunity for future generations to pursue their own happiness.* The word opportunity is emphasized because it is recognized that not all people will be happy. However, communities should be designed in a way that gives the greatest chance for all people to achieve happiness. While some studies (O'Brien 2005, Florida 2010, Leyden et al. 2011) do consider how the design of our communities is associated with happiness, more can be done to translate research to action. Community planners, engineers, designers, developers, architects and stakeholders need to reconsider the approach to current development patterns and strategies, with a stronger regard to the human dimension of sustainability (O'Brien 2008, Thin 2012). In fact, as demonstrated by this new definition, it is suggested that happiness be set as the ultimate outcome and indicator for human sustainability and community development.

### 5.4 Three Major Challenges for Community Development

The development of resilient, efficient and sustainable communities is a significant challenge facing our generation. In particular, we face three major challenges that need to be addressed by the design and retrofit of our future communities: a growing population, the end of a fossil fuel era, and environmental issues.

### 5.4.1 Growing Population

On October 31, 2011, the United Nations announced that the human population hit seven billion people total. This was only thirteen years after the population hit 6 billion and it is estimated that we will hit 9 billion before the middle of this century. Thus, serious consideration needs to be given to how we will house that many humans, the communities of which they will be a part, and all of the resources necessary for the sustenance of such large numbers. We must seize this opportunity now to allow humans to pursue their happiness so that future people are empowered to do the same. Our future world of nine billion people could consist of thriving sustainable cities, healthy environments, productive economies and social equity; all potentially contributing to happy residents.

### 5.4.2 The Potential End of Affordable Fossil Fuels

Suggestions have been made that we have already hit peak oil production (Hubbert 1962, Cleveland and Kaufmann 1991), resulting in a sustained period of decline. Eventually, a point will be reached where it is no longer profitable to extract this natural resource. The news is concerning as our populations continue to grow and we rely more heavily on fossil fuels to support our way of life. Even more concerning is the fact that major countries like India and China are expanding rapidly while developing countries, such as Africa, are pursuing the same lifestyle that developed

countries have. There is an urgent need to reduce our reliance on fossil fuels, and associated greenhouse gas emissions, through community development efforts that are grounded in conservation, efficiency and the implementation of renewable energy sources. Furthermore, the design and revitalization of our communities should include alternative modes of transportation, healthy homes and buildings, local production of food and, as detailed below, be designed with the idea that residents live, work, play and smile within them.

### 5.4.3 Environmental Issues

Humans heavily rely on clean water and air, healthy soils and arable land for food production, forests, mining and other natural resources. The extraction and use of these natural resources has allowed our populations to expand and thrive. However, we face immediate concerns with a potential end to what was once considered an endless supply of natural resources. Furthermore, we face a changing climate, possibly associated with our past and current greenhouse gas emissions, that has resulted in violent weather, droughts, rapid melting at the poles and rising sea levels. We must develop our communities in a way that conserves and protects our valuable natural resources and mitigates the emission of greenhouse gases.

## 5.5 What is Happiness?

Happiness is a collection of many factors; each of which a human is capable of understanding. However, happiness may mean different things to

different people. People differ in a multitude of ways—but it appears we all experience happiness and unhappiness in much the same way (Brooks 2008). Anthropologists have found that natives of Papa New Guinea, who were so isolated they had never seen people from another tribe, let alone another country, produced a Duchenne smile when they were happy exactly like modern American urbanites do (Klein 2008). The Duchenne smile is a smile that has been declared the one out of nineteen smiles, that humans are capable of producing, that is a display of happiness. It is clear that happiness is, as an expression, a genuine smile. However, as with most words related to the human condition, researchers have been wrestling with a description or definition that captures the complexities of happiness. In 1789, Jeremy Bentham wrote that happiness is "the sum of pleasures and pains" (Bentham 1789). Veenhoven (2003) refers to happiness as "the overall appreciation for one's life-as-a-whole", while sharing that psychologists commonly refer to it as a subjective sense of well-being. Ultimately, happiness is the state of feeling good and more time should be spent on determining what factors influence happiness (including the effects of the built and natural environment) than defining it. Thus, the next section highlights several studies that consider the numerous factors that influence happiness.

### 5.6 What Affects Our Happiness?

People experience happiness when they are satisfied with their lives, feel many pleasant and few unpleasant emotions and are engaged in interesting activities (Diener 2000). Positive psychology is affirming (Holden 1998, Seligman 2002, Diener and Seligman 2004) that once we meet our basic needs, the experience of authentic happiness has a great deal more to do with intrinsic factors such as self-acceptance, meaning, and love (O'Brien 2005). Happiness is also associated with a strong family and commitment to spending time with them, meaningful friendships, economic success, high levels of education, freedom of choice, stable governmental systems and demographic variables, such as religiosity or spirituality, social relationships, employment, culture and income (Diener and Seligman 2004, Diener and Ryan 2009, Diener 2002, Roszkowski and Grable 2007, Demir and Ozdemir 2010).

A common misconception is that great wealth and money are primarily important to happiness. However, while happiness is associated with individual and economic freedom and greater wealth (Demir and Ozdemir 2010), income and wealth are only moderately important to happiness (Roszkowski and Grable 2007) and their influence plateaus after a certain point (Demir and Ozdemir 2010, Simon and Bennett 2009). Equally important, if not of more importance, are factors including religion (something to believe in), family, volunteering, donating, freedom, a job and

the promotion of success and opportunity, rather than economic growth or economic equality (Brooks 2008).

While the aforementioned studies have considered the numerous factors that influence happiness, Griffin (2007) summarized it best: "there is a list of several non-reducible features that contribute to the quality of a characteristic human life, and that anything that contributes to the quality of any human life will be one or other of these features" (p. 139). However, for those keen on a categorization of the factors influencing happiness, Layard (2005) has created the *Big Seven*.

### 5.6.1. Layard's Big Seven

The *Big Seven* consists of family relationships, financial situation, work, community and friends, health, personal freedom and personal values (Layard 2005). The combined seven factors account for many of the aforementioned factors influencing happiness and also capture many factors not mentioned. While there could be more than seven categories influencing happiness, the combination of the *Big Seven* nicely summarizes the several factors of happiness.

## 5.7 Who Cares About Happiness?

Happiness has been studied, particularly by social scienctists, for a number of years. Psychologists, scientists and researchers are invested in happiness and understanding it. However, researchers are typically driven by

a thirst for knowledge and insight. One might wonder if others care about happiness. Research has led to findings that show promise, as shared below.

### 5.7.1. Countries Care

The understanding gained from recent studies on happiness have led to calls for governments to shift priorities away from economic growth and towards other social values (Duncan 2010). Countries, including France, Bhutan, Thailand, England and even parts of the United States are answering the call. In particular, Bhutan is leading the way in understanding the happiness of its residents and doing what it can to improve. The country measures Gross National Happiness, as opposed to Gross Domestic Product, obtaining scores for nine domains: psychological well-being or mental health, physical health, time or work-life balance, education, cultural vitality and expression, social connection and relationships, environmental quality and access to nature, quality of government, and material well-being. Thailand has followed suit with its Green and Happiness Index, measuring six components: health, warm and loving family, empowerment of the community, economic strength and equity, surroundings and ecological system and democratic society with good governance. Both of these examples are outstanding attempts of countries trying to measure and understand the happiness levels of residents and develop methods to improve for the future.

### 5.7.2. Cities Care

Cities within the United States, including Seattle, and Somerville, Massachusetts have taken notice of the pursuit of happiness and are conducting research, coupled with action, to improve the happiness of their residents. Seattle has formed the Seattle Area Happiness Initiative, based on the Gross National Happiness Index used by Bhutan, serving as a project offering tools and resources to communities and individuals focused on improving and enhancing their happiness. Somerville, Massachusetts has conducted surveys of its residents to assess their happiness levels and is currently designing strategies for improvement. Both cities serve as striking examples of municipalities that care about happiness and are focused on a future providing opportunity for the pursuit of happiness for their residents. Both programs are in the early stages of development, application and results but it is evident that happiness matters to some communities.

### 5.7.3. Organizations Care

Since 2008, the Gallup organization has been collecting data on the well-being of adults in the United States and the United Kingdom. The organization collects data from at least 500 adults every day in the US and 1,000 adults a month in the UK. The effort has resulted in extensive well-being (often used as a surrogate for happiness) data for a significant number of cities. The collection of an enormous number of self-reported well-being

data shows the commitment of organizations to measuring and understanding happiness. Google has recently focused on improving the happiness of its employees to reduce its loss of high quality work staff. The organization has created new strategies and incentives to keep employees happy and engaged. These examples indicate that happiness research is prevalent within the organizational structures of our world and is becoming more relevant each day.

### 5.7.4. People Care

Happiness is a social and public good, not just a private or individual concern and people care about it (Thin 2012). In fact, a recent survey carried out by the Office of National Statistics found that happiness is the most important thing in the lives of British people. Humans strive for happiness and, although attempts are often misguided, people genuinely desire to be happy. It is up to the leaders and designers of communities to give humans the opportunity to capture their happiness. In order to do this, communities will need to assess the happiness of their residents, as described below.

## 5.8 Can Happiness Be Measured?

Happiness is a potential indicator of sustainability (perhaps on both the individual and community level), however, it has been suggested that it can be challenging to measure. The most common way of measuring happiness is through the use of questionnaires and surveys, however, some

debate the validity of such methods. The idea of using index-based measures from a target audience, rather than observation of some external qualities or characteristics is a difficult concept for some to grasp. "Measurement was long understood to be an objective, external assessment, analogous to the measurement of blood pressure by a doctor" (Veenhoven 2010, p. 9). There has yet to be developed a means of externally observable traits indicating happiness and it is clear that happiness cannot be measured this way. Rather, researchers and communities should utilize self-report questionnaires and surveys, with high levels of reliability and validity (Brooks 2008, Veenhoven 2010).

Psychologists, statisticians and neuroscientists have dedicated a great deal of research to the question of whether or not self-reports are useful for measuring happiness and find that people can generally with accuracy estimate their own degree of happiness and report it on surveys (Brooks 2008). In fact, people are able to score their own happiness levels nearly the same as their own friends would rate them. Happiness can be measured in a useful way through questionnaires and surveys and these tools should be used to assess residential happiness levels in the future.

### 5.9 Can Sustainable Development Impact Happiness?

Many of the aforementioned factors affecting happiness can be viewed as outcomes of the design of a community. Thus, a connection needs to be

made between the design of our communities and happiness of the residents living within them. Studies, including Chapter 2, have considered factors of the built and natural environment and the association with happiness (O'Brien 2005, O'Brien 2009, Schimmel 2009, Zidansek 2007, Florida 2010). In particular, relationships have been assessed between happiness and aspects of sustainable development, showing that sustainable development requires no sacrifices and design strategies can improve both simultaneously (Zidansek 2007). Associations have also been discovered between self-reported happiness and sustainable attributes within subsystems of community development, including energy, waste, buildings and environmental governance, metro street and freeway congestion, green (LEED) building, air quality, local food and agriculture and housing affordability, as indicated in Chapter 2. The self-reported happiness of residents has also been associated with other sustainable aspects of the built environment, including cultural amenities, convenient transportation, local economic conditions, and a sense of place (O'Brien 2005, O'Brien 2008, Florida 2011). It has been demonstrated that happiness and sustainable development share common ground and improving one might contribute to improvements in the other (Zidansek 2007). Thus, a framework has been developed for the community development system to consider the

relationships between subsystems of community development, sustainability and residential happiness.

### 5.10 A Happy-Centric Framework for the Community Design Process

Figure 5-1 shows the Happy-centric Framework recommended for community development. It serves as a visual tool for the relationships between several subsystems of community development (ten at this point) and their influences on the social, environmental and economic pillars of sustainability. As indicated, residential happiness is suggested as the ultimate intersection of these interacting sustainability pillars, as influenced by the ten subsystems of community development. It is suggested that community leaders, designers, engineers, architects and stakeholders consider this framework as they design for the suggested way forward below.

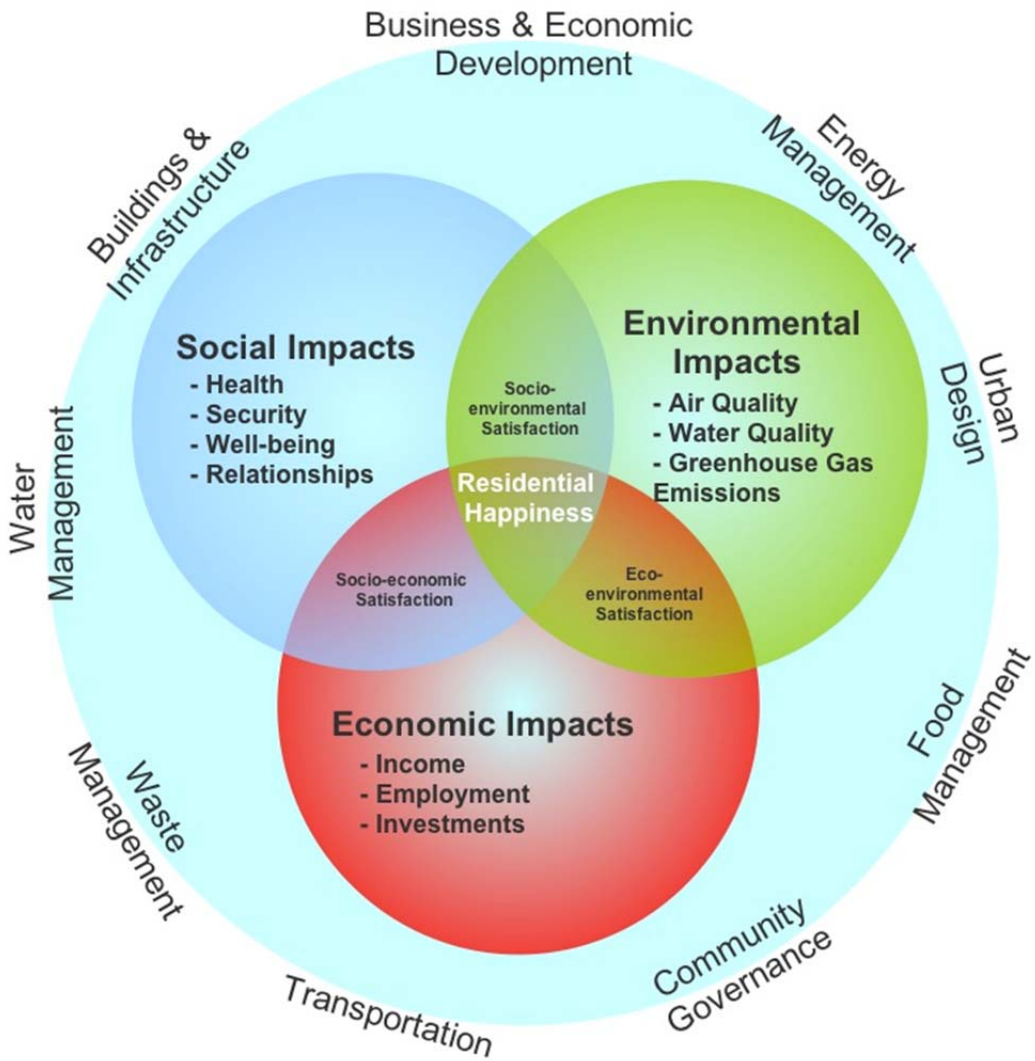



Figure 5 - 1 A Framework for Community Development with an Ultimate Outcome of Residential Happiness

## 5.11 A Way Forward

A way forward for community development is suggested, as guided by the acronym *PERSPECTIVE:* policies for success, education, resilience, systems thinking, placemaking, enlightenment, conservation & efficiency, technology, investment, viable goals and emulation. Communities can utilize the acronym as a guide to developing sustainability action plans and making decisions for designing or revitalizing one community subsystem or the entire system, to simultaneously move toward sustainability and happier residents.

### 5.11.1. Policies for success

A successful sustainability/happiness program is going to require extensive collaboration and support from local government officials and lawmakers. Communities must enact policies that support both sustainable development and the happiness of residents. It has been demonstrated that those communities with policies supporting and promoting sustainability share associations with higher levels of self-reported happiness (Veenhoven 1992, Zidansek 2007, White et al. 2011, Goldberg et al. 2012, Chapter 2). Therefore, there should be significant focus on controlling sprawl and growth (Goldberg et al. 2012), increasing energy efficiency standards and regulations (Zidansek 2007), enhancing building codes to require sustainable materials and methods of building (Zidansek 2007, Chapter 2), maximizing solid municipal waste recycling percentages (Kittiprapas 2006, Chapter 2) and

reducing local greenhouse gas emissions (Cohen and Vandenbergh 2012, Chapter 2). Furthermore, communities should provide incentives for green infrastructure and homes and encourage local businesses and employment through the use of tax breaks, "buy local" campaigns and assistance for the procurement of local contracts of employment.

### 5.11.2. Education

Education is the most crucial component of all the aspects of a process focused on improving happiness (Argyle 2003, Ling-yun 2003, Noddings 2003, Michalos 2008, Cunando 2012). Educational programs need to be developed that empower people to make informed decisions to enhance sustainability and happiness within their own lives and communities (Zidansek 2007, O'Brien 2008). In particular, a focus is needed that can reach both adults and children. While the children are our future, the adults are our present and both are equally important. Educational approaches can start with increasing local awareness of challenges with respect to sustainability, while incorporating educational tools into everyday life. For example, communities can provide short educational videos and announcements that can be distributed via smartphone technology. These can range from the very basic methods of how to recycle, compost or start a home garden to proposed activities and improvements to enhance a community's sustainability and residential happiness levels. However, we need to get away

from the "you should feel guilty" mentality and give people reason to believe that positive change is possible. This can be accomplished with examples of meaningful change, rather than conventional "gloom & doom" tactics.

### 5.11.3. Resilience

Communities need to focus their design and revitalization on the small scale to avoid large-scale collapse. Humans are incredibly reliant on centralized means of energy production and distribution, production of goods and large corporate farms for food. If a disaster were to strike in any of these areas, the effects would be crippling to our way of life. Alternative means of decentralized energy, local farms and food production and local businesses could provide resilience within our communities should a disaster occur (Borron 2006, Monroe 2013, Tipper, 2013). For instance, if a food transportation network were damaged by a storm, local sources of food production could provide food until the network could be repaired. Efforts in this area might include assisting residents to install their own gardens or sources of renewable energy.

### 5.11.4. Systems Thinking

Systems thinking is an art-form that requires the ability to visualize all aspects of a given system and plays a significant role in sustainability (Espejo and Stewart 1998, Robert et al. 2002, Midgley and Arias 2004, Martien et al. 2005, Fiksel 2006, Porter 2008, Watson 2010). Thus, all community

stakeholders should be educated in this area to become aware of feedback, interactions between systems and archetypical models. As we design and revitalize our communities, we must consider and embrace all the possible environmental, economic and social implications, even in the most technical of work. We must be able to design within systems that address both rural and urban issues, account for differences in culture and status and give opportunity to those without. Of most importance is considering what the unintended consequences of designs or changes within a given system or subsystem might be. For example, one might consider how the implementation of a policy requiring each neighborhood to have a garden influences the local demand for water and nutrients. Ultimately, the process involves detailed thought and consideration of the interactions of surrounding systems and subsystems to develop strategies that are mutually beneficial.

#### 5.11.5. Placemaking

Placemaking was introduced in the 1970s to describe the process of creating pleasurable and interesting locations within a community for residents (Burgess 1979, PPS 2013a). The ultimate goal of placemaking is connecting people to place. The benefit of placemaking is that it allows communities to express their individuality, while creating spaces that have meaning to their residents (PPS, 2013b). Furthermore, placemaking can

create shared space for a diverse population, enhance economic and community development, give the community identity and give diverse groups a common goal (PPS 2013b). Placemaking efforts should focus on creating a live, work, play, and smile environment; providing the opportunity to be a resident, employee, recreant and happy member of the community.

#### 5.11.6. Enlightenment

Humans have an amazing ability to tune out the repetitive, seemingly monotonous parts of their days. For instance, how often does one consider the way it feels for their feet to touch the floor, the air that they breathe or how the bus ride they just took reduced greenhouse gas emissions? Enlightenment is simply giving people intellectual information to increase their awareness to the world around then. Enlightenment is best obtained through education and experience. We must connect people with their community in a way that helps them to become mindful and enlightened. Very simple methods can be used such as signs, notices and interactive technology (current examples include stairs that make sounds like a piano or trash can video games) (thefuntheory.com 2013). Implementing fun into tasks that seem menial can help increase human enlightenment and promote a sustainable future. If we strive to increase enlightenment, humans can consider the effects of the choices they make in the moment, while taking time to appreciate the communities of which they are a part.

### 5.11.7. Conservation & Efficiency

Sustainability discussions and written pieces often mention the urgent need for the implementation of renewable energy sources (Brown 1998, Boyle 2004, Bugaje 2006, Del Rio 2008, Forsberg 2009). However, the most crucial aspect of moving toward sustainability is putting an end to wasteful energy use. Communities need to aggressively promote, perhaps enforce, conservation of energy and efficiency within buildings, homes and businesses. Conservation can be achieved through the implementation of technologies, such as smart grid, motion sensors, policies that enforce the reduction of energy use and the education of end users. Efficiency is simply energy out divided by energy in. Communities must work to increase this number with respect to all subsystems of community development. For example, a community might consider the energy used to import food as compared to its caloric content. An immediate solution would be either producing more food locally or obtaining it from local sources.

### 5.11.8. Technology

Communities must take advantage of an emergent source of sustainable technologies to enhance their sustainability and the happiness of residents. Specifically, attention should be given to the integration of promising technology (Clark 2003, Ho 2005, Murphy 2007). Examples include, but are not limited to, smart grid, solar panels, ground-source and

deep well geothermal energy, hydropower, rainwater harvesting, grey water reuse, composting, cogeneration, biomass to energy and anaerobic digestion. Communities must utilize these technologies to meet future and current demands in the most intelligent way possible.

#### 5.11.9. Investment & Affordability

Communities must invest in providing equal access, across age, race, SES, and gender, to sustainable goods and services. Investment includes spending resources on improvements that could enhance sustainability and the happiness of residents. Examples include the implementation of walking and biking paths, bike and car sharing programs, recreational areas and parks, incentives for alternative transportation, green spaces and efficient and sustainable buildings (Leyden et al. 2011, O'Brien 2005, O'Brien 2009, Schimmel 2009, Zidansek 2007, Green City Index 2011). Affordability of these implemented facets of community design should be ensured to provide access to all members of the community, regardless of income levels or socioeconomic status. Thus, communities must make significant attempts at offering reduced or free access to all sustainable goods and services offered. This includes promoting the design and construction of sustainable homes at an affordable cost, a well as making green infrastructure more affordable.

### 5.11.10. Viable Goals

Setting overarching goals, such as becoming carbon neutral within fifty years, is important for a community striving for sustainability. However, goals like this make it challenging to measure positive change in over small periods of time. Thus, communities should set viable goals that can be measured in short time increments. For example, a community could set a goal of meeting 50% of the energy demand for two government buildings with renewable energy sources such as solar or wind. Another example might include the installation of solar panels on 50% of a community's streetlights. Setting goals like these allow both community leaders and residents to measure and realize progress toward an overarching goal of carbon neutrality, evoking a sense of pride and commitment to large-scale change.

### 5.11.11. Emulation

Emulation is best described by two quotes:

*"If we could change ourselves, the tendencies in the world would also change. As a man changes his own nature, so does the attitude of the world change towards him... We need not wait to see what others do." - Gandhi*

*"It is difficult to bring people to goodness with lessons, but it is easy to do so by example." - Seneca*

In 2009, President Obama set forth an Executive Order that pushes federal sustainability (DiBenedetto 2009). His full intention was for the United States to be a leader in sustainability by example. In a recent speech at the Sustainable Operations Summit in New York City, President Bill Clinton echoed those sentiments stating that the United States needs to lead by example to reach sustainability (Navarro 2012). If communities truly wish to move towards sustainability, then they need to take onus for getting there. Simply put, emulation is the act of leading by example. For instance, if a community sets the objective for its residents to move toward sustainability, then it should move toward sustainability itself. Local and federal government should be the leaders in this area, striving to make every government building a striking example of green. Furthermore, all government vehicles should be of the highest efficiency and employees should be given incentives to use alternative modes of transportation. As supported Chief Seneca's quote, it is considerably easy to talk about becoming sustainable but it will provide little action from residents. On the other hand, leading by example could provide residents with direction and strategies to move toward sustainability and their own happiness.

### 5.12 Happiness as the Overall Outcome of the Community Design Process

The Happy-Centric Framework and the acronym PERSPECTIVE are meant to guide community planners, developers, engineers, architects and designers who are focused on providing a sustainable future that could promote greater opportunities for happiness for residents. Each component of the acronym can be utilized to guide policy, development and design for our future communities. The suggested approach to designing our communities to achieve residential happiness is entirely grounded in the greatest good for the greatest number. While happiness is not guaranteed for all residents, it is universal in nature, something we all strive for and, although in different ways, continually try to achieve. As Neil Thin mentions, "no other term [happiness] gives us a more powerful invitation to discuss and assess how society facilitates or inhibits the enjoyment of good lives" (Thin 2012, p.).

# **CHAPTER 6 -** CONCLUSIONS AND FUTURE WORK

This dissertation began with five main objectives, each of which has been accomplished.

1. Associations have been established between self-reported happiness and sustainability metrics, including the SustainLane US City Rankings (2007) and the Green City Index (2011). The efforts support findings that sustainable development and happiness are associated and lay the groundwork for more research and consideration of these relationships. The associations coupled with findings in primary literature also led to the development of the Sustainable Neighborhoods Index and its methods.
2. The Sustainable Neighborhoods Index (SNI) was created for assessment of the opportunities for residents to pursue happiness within communities.
3. The SNI has been applied to Ithaca, New York and Athens, Georgia (Chapter 3).
4. The SNI was applied to the nineteen coastal US cities (Chapter 4), which laid the groundwork for a data collection method and a number of useful tools, including the Sustainable Neighborhoods Distribution,

the scoring profiles for cities being assessed and a comparative chart for all cities.

5. The entire process allowed for the development of a framework for cities that want to pursue sustainability but are unsure of where to begin (Chapter 5).

The Sustainable Neighborhoods Index serves as an excellent tool that allows cities to determine the level of opportunity they afford their residents to pursue their happiness. Thus, it is important to note that the SNI does not predict happiness levels within a city, nor does it indicate that a city with a higher SNI has a larger number of happy residents or is, on the average, happier than a city with a lower SNI score. Rather, the SNI is a score (on a 0-100 scale) that reflects the level of sustainability to which a city offers potential opportunities for residents to pursue their happiness.

Cities, including San Francisco, Seattle and Portland are excelling in the areas of sustainability and potential opportunities for happy residents and can serve as models for those cities that are not. Ultimately, happiness should be the priority of cities but the associations between happiness and sustainable development potentially make it possible for cities to pursue both areas simultaneously. The summative effort raises many required efforts for the future with respect to happiness and sustainable development and the Sustainable Neighborhoods Index. The relationship between happiness and

sustainable development requires more research. It is imperative to establish the influences of sustainable development on happiness and determine if causation exists.

Given that a large number of cities have been assessed with the SNI, a critical consideration of the indicators within the respective subsystems included in the SNI is necessary. It is possible that the indicators are not inclusive enough and others may be added. However, it is cautioned that the indicators added be carefully considered with respect to the ease of data collection. Some of the current indicators presented issues for collection. Future work must include experts from each of the nine subsystems (and any other subsystems that may be added) to consider the indicators being used as well as any possible additions.

This dissertation has put happiness into the realm of community development and sets happiness as the ultimate outcome for the future. All humans relate to a desire to be happy and those communities that set sustainability and happiness as ultimate objectives could attract and sustain a wholesome group of residents, while improving the life of current residents. Cities are the future of our civilization and they must be developed in a way that contributes to a lasting and eternal relationship with the natural environment. Sustaining the human race can ultimately sustain our planet and the happiness of humans worldwide.

REFERENCES


1. Akers et al. (2012). Visual Color Perception in Green Exercise: Positive Effects on Mood and Perceived Exertion *Environmental Science & Technology*. 46(16), 8861-8666.
2. Alaimo et al. (2008). Fruit and Vegetable Intake among Urban Community Gardeners. *Journal of Education and Behavior*. 40(2), 94-101.
3. Argyle, M. (2006). Well-being: The foundations of hedonic philosophy. Chapter 18 – 18 Causes and Correlates of Happiness. Russell Sage Foundation.
4. Armstrong, D. (2000). A survey of community gardens in upstate New York: Implications for health promotion and community development. *Health & Place*. 6(4), 319-327.
5. Babey et al. (2005). Access to Safe Parks Helps Increase Physical Activity Among Teenagers. UCLA Health Policy Research Brief.
6. Baillie, Caroline & Catalano, George. (2010). Engineering and Society: Working Towards Social Justice. Morgan & Claypool Publishers. 324 pages.
7. Barameechai, J. (2007). The Green and Happiness Index. *International Conference on Happiness and Public Policy*. UN Conference Center, Bangkok, Thailand.
8. Barclay, E. (2012, July 31). Bhutan Bets Organic Agriculture Is The Road To Happiness. [Web]. NPR- The Salt. http://www.npr.org/blogs/thesalt/2012/07/31/157645902/bhutan-bets-organic-agriculture-is-the-road-to-happiness
9. Barton, J. and Pretty J. (2010). What is the Best Does of Nature and Green Exercise for Improving Mental Health? *Environmental Science & Technology*. 44, 3497-3955.
10. Bedimo-Rung et al. (2005). The significance of parks to physical activity and public health: A conceptual model. *Active Living Research*. 28(2), 159-168.
11. Bentham, J. (1789). *Introduction to the Principles of Morals and Legislation*. (Clarendon Press, Oxford), pg 24.
12. Berthouex, P.M., & Brown, L. C. (2002). *Statistics for environmental engineers*. CRC press.
13. Bjornskov, C., Dreher, A. and J. A. V. Fischer. (2008). Formal Institutions and Subjective Well-Being: Revisiting the Cross-Country Evidence. *KOF Working Papers: No. 192*. http://ssrn.com/abstract=1121283
14. Blanchflower, D.G. and Oswald, A.J. (2011). International Happiness: A New View on the Measure of Performance. *Academy of Management Perspectives,* 7-22.

15. Borron, S. (2006). Building Resilience for an unpredictable future: How organic agriculture can help farmers adapt to climate change. *Food and Agriculture Organization of the United Nations*.
16. Boyle, G. (2004). *Renewable energy*. OXFORD university press.
17. Brooks, A.C. Gross National Happiness: Why Happiness Matters for America—and How We Can Get More of It (2008). New York: Basic Books.
18. Brooks, C. (2008). Introductory Econometrics for Finance. *Cambridge University Press.*
19. Brown, L. R. (1981). *Building a Sustainable Society*. WW Norton & Company, Inc., 500 Fifth Avenue, New York, NY 10110.
20. Brundtland, G. H. ed. (1987). Our Common Future. Report of the World Commission on Environment and Development. Oxford, Oxford University Press.
21. Bruni, L. and Porta P. (2006). Economics and Happiness: Framing the Analysis. *Oxford University Press.*
22. Bugaje, I. M. (2006). Renewable energy for sustainable development in Africa: a review. *Renewable and Sustainable Energy Reviews*, *10*(6), 603-612.
23. Bull, S. R. (2001). Renewable Energy Today and Tomorrow. *Proceedings of the IEEE*. 89(8), 1216-1226.
24. Burgess, J. A. (1979). Place-making: the contribution of environmental perception studies in planning. *Geography*, 317-326.
25. Campbell, L. and Wiesen, A. (2010) *Restorative Commons: Creating Health and Well-being through Urban Landscapes.* United States Department of Agriculture, Forest Service, Northern Research Station. 278 p.
26. Clark, W. C., & Dickson, N. M. (2003). Sustainability science: the emerging research program. *Proceedings of the National Academy of Sciences*, *100*(14), 8059-8061.
27. Cleveland, C.J. and Kaufmann, R.K. (1991) Forecasting Ultimate Recovery and Its Rate of Production: Incorporating Economic Forces into the Models of M. King Hubbert. *The Energy Journal*, 12(2).
28. Cloutier, S.A., Jambeck, J., Scott, N.R. (In Review). Is Sustainable Development Associated with Happiness? Understanding the Relationship Between Two Indexes of Sustainable Community Development and Happiness. *Journal of Happiness Studies.*
29. Cohen, Mark A. and Vandenbergh, Michael P. , Consumption, Happiness, and Climate Change. RFF Discussion Paper No. 08-39; Environmental Law Reporter, Vol. 38, December 2008; Vanderbilt Law and Economics Research Paper No. 08-29; Vanderbilt Public Law Research Paper No. 08 Available at SSRN: http://ssrn.com/abstract=1288638

30. Cohen et al. (2006). Public Parks and Physical Activity Among Adolescent Girls. *Pediatrics.* 118(5), 1381-1389.
31. Coon et al. (2011). Does Participating in Physical Activity in Outdoor Natural Environments Have a Greater Effect on Physical and Mental Wellbeing than Physical Activity Indoors? A Systematic Review. *Environmental Science & Technology.* 45 (5), 1761-1772.
32. Cornell University. (2013a). Sustainability. Online. http://www.cornell.edu/sustainability/
33. Cornell University. (2013b). Environmental Science and Sustainability Major. Online. http://cals.cornell.edu/admissions/academics/majors/environmental-science-and-sustainability/
34. Cornell University. (2013c). Campus Sustainability Office. Online. http://www.sustainablecampus.cornell.edu/pages/campus-sustainability-office
35. Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 16(3)*, 297–334.
36. Cuñado, J., & de Gracia, F. P. (2012). Does education affect happiness? Evidence for Spain. *Social indicators research*, *108*(1), 185-196.
37. DeGraaf, John et al. (2005). *Affluenza: The All-Consuming Epidemic* (2nd ed.). San Francisco: Berrett-Koehler.
38. Del Rio, P., & Burguillo, M. (2008). Assessing the impact of renewable energy deployment on local sustainability: Towards a theoretical framework. *Renewable and sustainable energy reviews*, *12*(5), 1325-1344.
39. Demir, M. and Ozdemir, M. (2010). Friendship, Need Satisfaction and Hapiness. *Journal of Happiness Studies.* 11, 243-259.
40. Devoto et al. (2011). Happiness on Tap: Piped Water Adoption in Urban Morocco. *National Bureau of Economics Research.* NBER Working Paper 16933.
41. DiBenedetto, B. (2009). *Lead by example: Obama Executive Order Pushes Federal Sustainability.* http://www.triplepundit.com/2009/10/lead-by-example-obama-executive-order-pushes-federal-sustainability/
42. Diener, E. (2000). Subjective well-being: The science of happiness and a proposal for a national index. *American Psychologist.* 55(1), 34-43.
43. Diener, E. (2002). Very Happy People. *Psychological Science.* 13(1): 81-84.
44. Diener, E., & Seligman, M. E. P. (2004). Beyond money: Toward an economy of well-being. *Psychological Science in the Public Interest*, 5, 1-31.
45. Diener, E. and Ryan, K. (2009). Subjective well-being: a general overview. *South African Journal of Psychology.* 39(4), 391-406.
46. Diener, E., & Biswas-Diener, R. (2011). *Happiness: Unlocking the mysteries of psychological wealth.* Wiley-Blackwell.

47. Dockery, A. M. (2005). Happiness, life satisfaction and the role of work: Evidence from two Australian surveys. *Economic Record, 81(255)*, 322-335.
48. Duncan G (2010). Should Happiness-Maximization be the Goal of Government? *Journal of Happiness Studies.* 11: 163-178.
49. Economist Intelligence Unit. (2013). The Economist Magazine Intelligence Unit. http://www.eiu.com/default.aspx
50. Engel, M. (2011). Business as usual is not an option in developing countries. Sustainable Business Blog. http://www.guardian.co.uk/sustainable-business/blog/population-growth-developing-world-business-solutions.
51. Espejo, R., & Stewart, N. D. (1998). Systemic reflections on environmental sustainability. *Systems research and behavioral science*, *15*(6), 483-496.
52. Fiksel, J. (2006). Sustainability and resilience: toward a systems approach. *Sustainability: Science Practice and Policy*, *2*(2), 14-21.
53. Florida, R. (2010). The Happiness of Cities. Martin Proseperity Institute. http://research.martinprosperity.org/papers/Florida%20Mellander%20Rentfrow%20(2010)%20The%20Happiness%20of%20Cities.pdf
54. Forbes Online Magazine. The World's Happiest Countries. January 2011. http://www.forbes.com/2011/01/19/norway-denmark-finland-business-washington-world-happiest-countries_2.html Accessed August 2011.
55. Forsberg, C. W. (2009). Sustainability by combining nuclear, fossil, and renewable energy sources. *Progress in Nuclear energy*, *51*(1), 192-200.
56. Gallup. (2012). Gallup Healthways Well-Being Index.
57. http://www.gallup.com/poll/145913/City-Wellbeing-Tracking.aspx
58. Gallup (2009). Gallup-Healthways Well-Being Index: Methodology Report for Indexes. Resource Document.http://well-beingindex.com/files/Gallup-Healthways%20Index%20Methodology%20Report%20FINAL%203-25-08.pdf
59. Ghent, Alice. 2011. The happiness effect. Bulletin of World Health Organization. 89:246-247.
60. Glaeser et al. (2008). Why do the poor live in cities? The role of public transportation. *Journal of Urban Economics.* 63(1), 1-24.
61. Gleick, P. (1998). The human right to water. *Water Policy.* 1, 487-503.
62. Godschalk, D. R. (2004). Land use planning challenges: Coping with conflicts in visions of sustainable development and livable communities. *Journal of the American Planning Association*, *70*(1), 5-13.
63. Goldberg et al. (2012). Untangling what makes cities liveable: happiness in five cities. *Proceedings of the ICE-Urban Design and Planning,* 165(3), 127-136.

64. Green City Index. Economist Intelligence Unit. (2011). US and Canada Green City Index. http://www.siemens.com/entry/cc/en/greencityindex.htm
65. Griffin, J. (2007). What Do Happiness Studies Study? *Journal of Happiness Studies.* 8, 139-148.
66. Happiness Initiative (2011). The Happiness Initiative. http://www.happycounts.org/ Accessed March 2013.
67. Helliwell, J. F. and H. Huang. (2008). How's Your Government? International Evidence Linking Good Government and Well-Being. *British Journal of Political Science.* 38: 595-619.
68. Ho, G. (2005). Technology for sustainability: the role of onsite, small and community scale technology. *Water science and technology: a journal of the International Association on Water Pollution Research*, *51*(10), 15.
69. Holden, R. (1998). Happiness Now! London: Coronet Books.
70. Hubbert, M.K. (1956). *Nuclear Energy and the Fossil Fuel.* Conference Paper for American Petroleum Institute.
71. Hutchinson, G. E. (1953). The Concept of Pattern in Ecology. *Proceedings of the Academy of Natural Sciences of Philadelphia.* 105, p. 1-12.
72. Jordan et al. Accounting for Natural Resources and Environmental Sustainability: Linking Ecosystem Services to Human Well-Being. *Environmental Science & Technology.* **2010**, 44, 1530-1536.
73. Jung, C.G. (1987). *C.G Jung Speaking.* Princeton University Press.
74. Karlenzig, W. (2009). Online. Obama Speech Lays out One Part of Green Economy Framework. http://www.commoncurrent.com/notes/2009/01/obama-speech-lays-out-one-part.html
75. Karr, J. R. and Chu, E. W. (1995). Ecological Integrity: Reclaiming Lost Connections. *Perspectives on Ecological Integrity Environmental Science and Technology Library.* 5, 34-48.
76. Keefe, B. (2012). Meet Google's Chief Sustainability Officer (What a Cool Job!) Online. http://www.divinecaroline.com/life-etc/career-money/meet-google's-chief-sustainability-officer-what-cool-job
77. Kingsley et al. (2009). Cultivating Health and Wellbeing: Members' Perceptions of the Health Benefits of a Port Melbourne Community Garden. *Leisure Studies.* 28(2), 207-219.
78. Kittiprapas, S. (2006). Gross National Happiness: The Development of Indicators. Public Policy Office, Bangkok, Thailand.
79. Klein, Stefan. (2006) The Science of Happiness: How Our Brains Make Us Happy-and What We Can Do to Get Happier. DeCapo Press.
80. Lappé, F.M. (2012, Spring). Free Your (Eco)Mind. *Yes!*, 61.

81. Larsen, K. and Gilliland, J. (2009). A farmers' market in a food desert. Evaluating impacts on the price and availability of healthy food. *Health & Place.* 15(4), 1158-1162.
82. Layard, R. (2005). *Happiness: Lessons From a New Science.* New York: Penguin Books.
83. Lehman, M. L. (2011). How sensory design brings value to buildings and their occupants. *Intelligent Buildings International.*
84. Leyden, M., Goldberg, A., Michelback, P. (2011). Understanding the Pursuit of Happiness in Ten Major Cities. *Urban Affairs Review,* 47, 861-888.
85. Ling-yun, Y. (2003). On Education Involving Happiness. *Theory and Practice of Education*, 5.
86. Martin, S., Brannigan, J., & Hall, A. (2005). Sustainability, systems thinking and professional practice. *Journal of Geography in Higher Education*, *29*(1), 79-89.
87. Michalos, A. C. (2008). Education, happiness and wellbeing. *Social Indicators Research*, *87*(3), 347-366.
88. Microsoft. (2013). *Solver Uses Generalized Reduced Gradient Algorithm. http://support.microsoft.com/kb/82890*
89. Midgley, G., & Ochoa-Arias, A. (2004). *Community operational research: OR and systems thinking for community development*. Springer.
90. Mill, S. J. (2007). *Utilitarianism* (4th ed.). Mineola, NY: Dover Publications.
91. Millennium Ecosystem Assessment. (2005). *Ecosystem and Human Well-Being: Synthesis.* Island Press, Washington, DC.
92. Mitra, A. (2003). A Tool for Measuring Progress: The Growing Popularity of Sustainability Indicators in the United States. *National Civic Review.* 92(3), 30-45.
93. Monroe, City of. (2013). Resilient Monroe: what makes a community resilient? http://www.resilientmonroe.org/buildresilience.asp Accessed May 2013.
94. Morse, S. and McNamara, N. (2013). Sustainability and Sustainable Livelihood. In Morse, S. and McNamara, N. Sustainable Livelihood Approach. pp. 1-13. Springer.
95. Murphy, J. (2007). *Governing technology for sustainability*. Earthscan.
96. National Oceanic and Atmospheric Administration. (2012). http://www.noaa.gov/
97. National Academies. (2012). Sustainability at the National Academies: Schedule of Sustainability Linkages in the Federal Government Meetings. Online. http://sites.nationalacademies.org/PGA/sustainability/linkages/index.htm

98. National Science Foundation. (2012a). Environmental Engineering and Sustainability. http://nsf.gov/funding/pgm_summ.jsp?pims_id=501033 Accessed March 2013.
99. National Science Foundation. (2012b). Science, Engineering and Education for Sustainability. http://www.nsf.gov/funding/pgm_summ.jsp?pims_id =504707 Accessed March 2013.
100. Navarro, M. (2012). *Lead by Example, Clinton Tells Sustainability Forum.* http://green.blogs.nytimes.com/2012/04/19/lead-by-example-clinton-tells-sustainability-forum/
101. Nicks, D. (2013). Online. Obama Gives "Sustainable Energy" Top Billing in Inaugural Address. Renewable Energy World.Com http://www.renewableenergyworld.com/rea/news/article/2013/01/obama-gives-sustainable-energy-top-billing-in-inaugural-address
102. Noddings, N. (2003). Happiness and Education. Cambridge University Press.
103. O'Brien, C. (2001). *Ontario Walkability Study, Trip to School: Children's Experiences and Aspirations*, report. York University.
104. O'Brien, C. (2005). Sustainable Happiness: Harmonizing Our Internal and External Landscapes. *2nd International Conference on Gross National Happiness,* Antigonish, Nova Scotia.
105. O'Brien, C. (2009). Sustainable Happiness: How Happiness Studies Can contribute to a More Sustainable Future. *Canadian Psycholog, 49*, 289-295.
106. Okvat, H. and Zautra, A. (2011). Community Gardening: A parsimonious Path to Individual, Community, and Environmental Resilience. *American Journal of Community Psychology.* 47(3-4), 374-387.
107. PPS – Project for Public Spaces. (2013a). http://www.pps.org/
108. PPS – Project for Public Spaces. (2013b). Impacts and Benefits. http://www.placemakingchicago.com/about/impacts.asp
109. Porter, T. B. (2008). Managerial applications of corporate social responsibility and systems thinking for achieving sustainability outcomes. *Systems Research and Behavioral Science*, *25*(3), 397-411.
110. Quinnipiac Faculty Statistics. (2013). http://faculty.quinnipiac.edu/libarts/polsci/statistics.html
111. Robèrt, K. H., Schmidt-Bleek, B., Aloisi de Larderel, J., Basile, G., Jansen, J. L., Kuehr, R., ... & Wackernagel, M. (2002). Strategic sustainable development—selection, design and synergies of applied tools. *Journal of Cleaner production*, *10*(3), 197-214.
112. Roemmich et al. (2006).Association of access to parks and recreational facilities with the physical activity of young children. *Preventive Medicine.* 42, 437-441.

113.Roseland, M. (2000). Sustainable community development; integrating environmental, economic and social objectives *Progress in Planning*, 54, 73-132.
114.Roszkowski MJ, Grable J (2007) How are Income and Net Worth Related to Happiness? *Journal of Financial Service Professionals.* 61(1): 64-80.
115.Saldivar-Tanaka, L. and Krasny, M.E. (2004). Culturing Community Development, Neighborhood Open Space, and Civic Agriculture: The case of Latino Community Gardens in New York City. *Agriculture and Human Values.* 21(4), 399-412.
*116*.Samanni, M. and Holmberg, S. (2010). Quality of Government Makes People Happy. *QoG Working Paper Series 2010:1. The Quality of Government Institute.*
117.Sanchez, T. (1999). The Connection Between Public Transit and Employment: The Cases of Portland and Atlanta. *Journal of the American Planning Association.* 65(3), 284-29.
118.Schimmel, J. (2009). Development as Happiness: The Subjective Perception of Happiness and UNDP's Analysis of Poverty, Wealth and Development. *Journal of Happiness Studies,* 10, 93-111.
119.Seligman, M. E. P. (2002). *Authentic Happiness: Using the New Positive Psychology to Realize Your Potential for Lasting Fulfillment*. New York: Free Press (321 pp., ISBN-13: 978-0-7432-2298-3)
120.Shinew et al. (2004). *Journal of Leisure Research.* 36(3), 336-355.
121.Simon RJ, Bennett A (2009) Happiness the World Over. *Gender Issues.* 26: 183-204.
122.Somerset et al. (2005). School-based community gardens: Re-establishing health relationships with food. *Paper presented at National Conference of the Home Economics Institute of Australia.* 12-15 January 2005, Hobart, Tasmania.
123.Somerville, Massachusetts. (2011). A Report on Wellbeing. http://www.somervillema.gov/departments/somerstat/report-on-well--being Accessed March 2013.
124.Story et al. (2007). Creating Healthy Food and Eating Environments: Policy and Environmental Approaches. *Annual Review of Public Health.* 29, 253-272.
125.Sustainable Cities Institute. (2012). Job Descritopn for A Sustainability Officer. Online. http://www.sustainablecitiesinstitute.org/view/page.basic/report/feature.report/report_job_descpt_sust_office
126.SustainLane City Rankings. Karelnzig, W. (2007). *How green is your city?*
127.Thin N (2012) Social Happiness: Theory into policy and practice. (The Policy Press, Chicago).
128.Tipper, H.A. (2013). Carbon Trust. Decentralized energy. Powering a

Sustainable Future. http://www.carbontrust.com/news/2013/01/decentralised-energy-powering-a-sustainable-future Accessed May 2013.
129. TopNews. Happiness Comest First for Britons. July 2011. http://top news.us/content/242076-happiness-comes-first-britons Accessed August 2011.
130. Twiss et al. (2003). Community Gardens: Lessons Learned from California Healthy Cities and Communities. *American Journal of Public Health.* 93(9), 1435-1438.
131. United Nations Conference on Sustainable Development. (2011). Rio +20. http://www.uncsd2012.org/ Accessed March 2013.
132. United States Green Building Council. (2012). Leadership in Energy and Environmental Design. http://new.usgbc.org/leed Accessed March 2013.
133. University of Georgia. (2013a). Sustainable UGA. Online. http://sustainability.uga.edu/
134. University of Georgia. (2013b). Sustainability Course. Online. http://sustainability.uga.edu/get-involved/courses/
135. University of Georgia. (2013c). Office of Sustainability. Online. http://sustainability.uga.edu/about/
136. Ura, K. (2013). Measure Gross National Happiness. Print. NY Times.
137. Veenhoven, R. (1984). Conditions on Happiness. D. Reidel Publishing.
138. Veenhoven R. (1992). Happiness in Nations. *RISBO series: studies in socio-cultural transformation nr. 2*, Rotterdam: Erasmus University.
139. Veenhoven R (2003) Happiness. *The Psychologist* 16(3): 128-129.
140. Veenhoven, R. (2008). Healthy happiness: Effects of happiness on physical health and the consequences for preventive health care. *Journal of Happiness Studies, 9,* 449–469.
141. Veenhoven R (2010). Questioning on Happiness. *World Database of Happiness.* Introductory Text.
142. Wakefield et al. (2007). Growing urban health: Community gardening in South-East Toronto. *Health Promotion International.* 22(2), 92-101.
143. Watson, R. T., Boudreau, M. C., & Chen, A. J. (2010). Information systems and environmentally sustainable development: energy informatics and new directions for the IS community. *MIS quarterly*, *34*(1), 23.
144. Wells, N. M. and Laquatra, J. (2010). Why Green Housing and Green Neighborhoods Are Important to the Health and Well-Being of Older Adults. *Generations: The Journal of the Western Gerontological Society.* 33(4), 50-57.
145. West, P. (2009). Urban region parks and black minorities: Subculture, marginality, and interracial relations in park use in the Detroit metropolitan area. *Leisure Sciences.* 11(1).

146.Weston, R. F. (1993). *Sustainable Development: Definition Implementation Strategies*. West Chester, PA: Roy Weston Inc.
147.White et al. (2013). Would You Be Happier Living in a Greener Urban Area? A Fixed-Effects Analysis of Panel Data. *Psychological Science*. 24(7).
148.Wilkie et al. (2006). Parks and People: Assessing the Human Welfare Effects of Establishing Protected Areas for Biodiversity Conservation. *Conservation Biology*. 20(1), 247-249.
149.World Database of Happiness: Continuous register of scientific research on subjective appreciation of life. http://worlddatabaseofhappiness.eur.nl/ Accessed August 2011.
150.World Database of Happiness: Continuous register of scientific research on subjective appreciation of life. Intro Text 3: Questioning on Happiness.
151.Yang et al. (1997). Skin-Color Modeling and Adaptation. *Report for the Department of the Navy*.
152.Zidansek, A. (2007). Sustainable Development and Happiness in Nations *Energy*, 32, 891-897.

# APPENDIX A

Table A - 1 Gallup Healthways Well-Being Index[1] Scores for US Cities

| City | Score | City | Score | City | Score | City | Score |
|---|---|---|---|---|---|---|---|
| Albuquerque | 67.4 | El Paso | 64.4 | *Miami* | 65.3 | *Sacramento* | 67 |
| Arlington | 69.9 | Fort Worth | 67.9 | Milwaukee | 66.6 | San Antonio | 68 |
| *Atlanta* | 68.1 | Fresno | 66 | *Minneapolis* | 69.6 | San Diego | 68.7 |
| Austin | 68.7 | Honolulu | 70.7 | Nashville | 68.2 | *San Francisco* | 69.6 |
| Baltimore | 67.6 | *Houston* | 67.8 | New Orleans | 65.3 | San Jose | 70.6 |
| *Boston* | 68.6 | Indianapolis | 66.4 | *New York City* | 66.2 | *Seattle* | 68.3 |
| *Charlotte* | 69.4 | Jacksonville | 64.9 | Oakland | 67.9 | **St. Louis** | 66 |
| *Chicago* | 66.5 | Kansas City | 67.9 | **Orlando** | 65.5 | Tucson | 66.7 |
| *Cleveland* | 66.7 | Las Vegas | 64.8 | Oklahoma City | 66.5 | Tulsa | 66.5 |
| Colorado Springs | 68.6 | Long Beach | 67.9 | Omaha | 68.3 | Virginia Beach | 66.6 |
| Columbus | 66.1 | *Los Angeles* | 67.9 | *Philadelphia* | 66 | *Washington DC* | 69.9 |
| *Dallas* | 67.9 | Louisville | 64.9 | *Phoenix* | 67.7 | | |
| *Denver* | 68.4 | Memphis | 66.9 | **Pittsburgh** | 66.5 | | |
| *Detroit* | 65.3 | Mesa | 67.7 | Portland | 67.6 | | |

Note: GCI n = 22; $\bar{x}$ = 67.46; σ = 1.45; SustainLane n = 50; $\bar{x}$ = 67.45; σ = 1.53; [1] Obtained from Gallup (2012).

Table A - 2 The Green City Index Category Scoring Methods

| Category | Indicator | Description | Scoring Method |
|---|---|---|---|
| **Water** | Water consumption per capita | Total water consumption, in gallons per person per day | Scored on a scale of 0 to 10 based on a min/max of data for all cities |
| | Water system leakages | Share of non-revenue public water leakages | |
| | Water quality policy | Assessment of the level and quality of a city's main water sources | Scored by EIU analysts on a scale of 0 to 10 |
| | Stormwater management policy | Indication of whether or not a city has a stormwater management plan | |
| **Energy** | Electricity consumption per unit of GDP | Total electricity consumption, in GJ per US$m of GDP | Scored on a scale of 0 to 10 based on a min/max of data for all cities |
| | Electricity consumption per person | Total electricity consumption, in GJ per person | |
| | Clean and efficient energy policies | Measure of a city's commitment to promoting green energies, developing green energy projects and increasing the amount of locally produced energy | Scored by EIU analysts on a scale of 0 to 10 |
| **Land Use** | Green spaces | Sum of all public parks, recreation areas, greenways, waterways and other protected areas accessible to the public, as a percent of the total city area | Scored on a scale of 0 to 10 based on a min/max of data for all cities |
| | Population density | Number of inhabitants per square mile | |
| | Green land use policies | Assessment of a city's efforts to sustain and improve the quantity and quality (for example, proximity and usability) of green spaces, and its tree planting policy | Scored by EIU analysts on a scale of 0 to 10 |
| | Urban sprawl | Assessment of how rigorously a city promotes containment of urban sprawl and reuse of brownfield areas. | |
| **Waste** | Percent of municipal solid waste recycled | Percentage of municipal solid waste recycled | Scored on a scale of 0 to 10 based on a min/max of data for all cities |
| | Waste reduction policies | Assessment of measures to reduce waste and make waste disposal more sustainable | Scored by EIU analysts on a scale of 0 to 10 |

Table A - 2 (Continued)

| Category | Indicator | Description | Scoring Method |
|---|---|---|---|
| **Buildings** | Number of LEED certified buildings | Number of LEED certified buildings (silver, gold or platinum) per 1,000 persons | Scored on a scale of 0 to 10 based on a min/max of data for all cities |
| | Energy efficient building standards | Assessment of whether a city requires energy audits and whether energy regulations require that new buildings satisfy energy efficiency standards | Scored by EIU analysts on a scale of 0 to 10 |
| | Energy efficient building incentives | Assessment of a city's incentives for retrofitting buildings to improve energy efficiency and how widely it promotes energy efficiency in homes and offices | |
| **Transport** | Share of workers travelling by public transit, bicycle or foot | Percent of workers travelling to work by public transportation, bicycle or foot | Scored on a scale of 0 to 10 based on a min/max of data for all cities |
| | Public transportation supply | Evaluation of availability of public transportation, including length of public transportation network | |
| | Average commute time from residence to work | Average commute time from residence to work, in minutes | |
| | Green transport promotion | Assessment of how extensively the city promotes public transportation and offers incentives for less carbon-intensive travel | Scored by EIU analysts on a scale of 0 to 10 |
| | Congestion reduction policies | Assessment of a city's efforts to reduce congestion | |
| **$CO_2$** | $CO_2$ emissions per unit of GDP | Total $CO_2$ emissions, in metric tons per US$m of GDP | Scored on a scale of 0 to 10 based on a min/max of data for all cities |
| | $CO_2$ emissions per person | Total $CO_2$ emissions, in metrics tons per person | |
| | $CO_2$ reduction strategy | Assessment of the ambitiousness of greenhouse gas emissions reduction strategy as well as the rigor of the city's $CO_2$ reduction target and emissions measurements. | Scored by EIU analysts on a scale of 0 to 10 |

Table A - 2 (Continued)

| | | | |
|---|---|---|---|
| **Air** | Nitrogen oxides emissions | $NO_X$ emissions per annum, in lb per person | Scored on a scale of 0 to 10 based on a min/max of data for all cities |
| | Sulfur dioxide emissions | $SO_2$ emissions per annum, in lb per person | |
| | $PM_{10}$ emissions | $PM_{10}$ emissions per annum, in lb per person | |
| | Clean air policy | Measure of a city's efforts to reduce air pollution | Scored by EIU analysts on a scale of 0 to 10 |
| **Environmental Governance** | Green action plan | Measure of the rigor of a city's green action plan | Scored by EIU analysts on a scale of 0 to 10 |
| | Green management | Measure of the extensiveness of environmental management undertaken by the city | |
| | Public participation in green policy | Measure of the city's efforts to involve the public in monitoring its environmental performance | |

Table A - 3 Overall Green City Index Scores

| City | Score | City | Score | City | Score |
|---|---|---|---|---|---|
| Atlanta | 57.8 | Houston | 62.6 | Phoenix | 55.4 |
| Boston | 72.6 | Los Angeles | 72.5 | Pittsburgh | 56.6 |
| Charlotte | 59.0 | Miami | 57.3 | Sacramento | 63.7 |
| Chicago | 66.9 | Minneapolis | 67.7 | San Francisco | 83.8 |
| Cleveland | 39.7 | New York City | 79.2 | Seattle | 79.1 |
| Dallas | 62.3 | Orlando | 61.1 | St Louis | 35.1 |
| Denver | 73.5 | Philadelphia | 66.7 | Washington DC | 71.4 |
| Detroit | 28.4 | | | | |

Note: $n = 22$; $\bar{x} = 62.38$; $\sigma = 13.90$

Table A - 4 The SustainLane Category Scoring Methods

| Category | Indicator | Description | Scoring Method |
|---|---|---|---|
| **City Commuting** | Public transportation ridership<br>Bike to work<br>Walk to work<br>Carpool to work<br>Drive alone to work | City resident public transportation ridership percentage<br>City resident bike to work percentage<br>City resident walk to work percentage<br>City resident carpool to work percentage<br>City resident drive alone to work percentage | Combined score of indicators assessed by SustainLane staff and city is ranked relative to its peers |
| **Regional Public Transportation Ridership** | Public transit ridership<br>Metro area | Regional general public transit ridership<br>Square miles per metro area | Combined score of indicators assessed by SustainLane staff and city is ranked relative to its peers |
| **Metro Street and Freeway Congestion** | Street congestion<br>Freeway congestion | Regional surface road congestion by metro region<br>Regional freeway congestion by metro region | Combined score of indicators assessed by SustainLane staff and city is ranked relative to its peers |
| **Air Quality** | Median air quality<br>Non-attainment information | Median air quality index for each city<br>Clean Air Act Non-Attainment information | Combined score of indicators assessed by SustainLane staff and city is ranked relative to its peers |
| **Tap Water Quality** | Drinking water quality | Drinking water quality for each city | Combined score of indicators assessed by SustainLane staff and city is ranked relative to its peers |
| **Solid Waste Diversion** | Waste diverted from landfill | Percentage of a city's waste stream diverted from landfill | Combined score of indicators assessed by SustainLane staff and city is ranked relative to its peers |
| **Planning and Land Use** | Urban sprawl<br>Park land area | Urban sprawl measure for each city<br>Percent of land area devoted to parks | Combined score of indicators assessed by SustainLane staff and city is ranked relative to its peers |
| **City Innovation** | Preferred purchasing programs<br>Commercial and residential green building incentives<br>Carpooling<br>Car sharing<br>Other | Environmentally Preferable Purchasing programs presence within each city<br>Presence of commercial and residential building incentives<br>Carpooling coordination level for each city<br>Number of public and private car sharing programs<br>Other city innovation (general credit) | Combined score of indicators, as obtained from by SustainLane staff, and city is ranked relative to its peers |

Table A - 4 (Continued)

| Category | Indicator | Description | Scoring Method |
|---|---|---|---|
| **Housing Affordability** | Housing cost<br>Income | Median housing cost for each city<br>Median income for each city | Compared score of indicators, as obtained by SustainLane staff and city is ranked relative to its peers |
| **Natural Disaster Risk** | Hurricane risk<br>Major flood risk<br>Tornado risk<br>Earthquake risk<br>Hale risk | Measure of hurricane risk for each city<br>Measure of major flood risk for each city<br>Measure of tornado risk for each city<br>Measure of earthquake risk for each city<br>Measure of hale risk for each city | Combined score of indicators assessed by SustainLane staff and city is ranked relative to its peers |
| **Energy and Climate Change Policy** | Greenhouse gas reduction<br>Renewable energy use<br>Alternative fuel fleet | Measure of a city's greenhouse gas reduction tracking, goals and inventories<br>Overall renewable energy use percentage of each city<br>Alternative fuel fleet percent of entire city's fleet, credit given for 12 percent or grater | Combined score of indicators assessed by SustainLane staff and city is ranked relative to its peers |
| **Local Food and Agriculture** | Farmers' markets<br>Community gardens | Number of farmers' markets per capita<br>Number of community gardens per city | Combined score of indicators assessed by SustainLane staff and city is ranked relative to its peers. |
| **Green Economy** | Farmers' markets vouchers<br>Clean technology incubator<br>Green business directory<br>Farmers' markets | Number of farmers' markets accepting Women, Infants & Children (WIC) federal program vouchers and Food Stamp vouchers<br>Presence of a clean technology incubator in each city<br>Presence of a city or private green business directory<br>Average number of farmers' markets per capita | Combined score of indicators assessed by SustainLane staff and city is ranked relative to its peers |
| **Knowledge Base and Communication** | Sustainability plan<br>Environmental functions<br>Research partnerships | Presence of a sustainability plan in each city<br>Presence of a department to manage environmental/sustainability functions<br>Presence of research partnerships with federal laboratories and/or non-governmental organizations | Combined score of indicators assessed by SustainLane staff and city is ranked relative to its peers |
| **Green (LEED) Buildings** | LEED certified buildings | Number of LEED certified buildings in each city, with greater credit given to LEED certified buildings over LEED Registered buildings and for Platinum or Gold Certified LEED buildings over LEED Silver or LEED Certified | Combined score of indicators assessed by SustainLane staff and city is ranked relative to its peers |

Table A - 5 Overall SustainLane US City Rankings

| City | Score | City | Score | City | Score | City | Score |
|---|---|---|---|---|---|---|---|
| Albuquerque | 56.1 | Detroit | 40.3 | Memphis | 40.3 | Phoenix | 54.5 |
| Arlington | 41.8 | El Paso | 49.1 | Mesa | 36.7 | Portland | 85.08 |
| Atlanta | 45.2 | Fort Worth | 37.5 | Miami | 50 | Sacramento | 62.64 |
| Austin | 62 | Fresno | 48.96 | Milwaukee | 60.42 | San Antonio | 54.6 |
| Baltimore | 64.78 | Honolulu | 61.42 | Minneapolis | 66.6 | San Diego | 57.18 |
| Boston | 68.18 | Houston | 44.68 | Nashville | 40.7 | San Francisco | 81.82 |
| Charlotte | 47.58 | Indianapolis | 38.4 | New Orleans | 49.04 | San Jose | 54.28 |
| Chicago | 70.64 | Jacksonville | 46.8 | New York City | 68.2 | Seattle | 79.64 |
| Cleveland | 50.1 | Kansas City | 56.64 | Oakland | 69.18 | Tucson | 55.86 |
| CO Springs | 51.36 | Las Vegas | 50.24 | Oklahoma City | 32.92 | Tulsa | 43.74 |
| Columbus | 32.5 | Long Beach | 49.46 | Omaha | 46.56 | Virginia Beach | 34 |
| Dallas | 54.58 | Los Angeles | 52.28 | Philadelphia | 67.28 | Washington DC | 63.14 |
| Denver | 66.72 | Louisville | 47.14 | | | | |

Note: $n = 50$; $\bar{x} = 53.78$; $\sigma = 12.54$

Table A - 6 Nine Subsystems of Community Development Data Source Measurement Methods

| Subsystem | Indicator | Description | Scoring Method |
|---|---|---|---|
| **Water Management** | Water consumption per capita | Total water consumption, in gallons per person per day | Scored on a scale of 0 to 10 based on a min/max of data for all cities |
| | Water system leakages | Share of non-revenue public water leakages | |
| | Water quality policy | Assessment of the level and quality of a city's main water sources | Scored on a scale of 0 to 10 |
| | Stormwater management policy | Indication of whether or not a city has a stormwater management plan | |
| **Energy Management** | Electricity consumption per unit of GDP | Total electricity consumption, in GJ per US$m of GDP | Scored on a scale of 0 to 10 based on a min/max of data for all cities |
| | Electricity consumption per person | Total electricity consumption, in GJ per person | |
| | Clean and efficient energy policies | Measure of a city's commitment to promoting green energies, developing green energy projects and increasing the amount of locally produced energy | Scored on a scale of 0 to 10 |
| **Urban Design** | Green spaces | Sum of all public parks, recreation areas, greenways, waterways and other protected areas accessible to the public, as a percent of the total city area | Scored on a scale of 0 to 10 based on a min/max of data for all cities |
| | Population density | Number of inhabitants per square mile | |
| | Green land use policies | Assessment of a city's efforts to sustain and improve the quantity and quality (for example, proximity and usability) of green spaces, and its tree planting policy | Scored on a scale of 0 to 10 |
| | Urban sprawl | Assessment of how rigorously a city promotes containment of urban sprawl and reuse of brownfield areas. | |
| **Food Management** | Farmers' markets | Number of farmers' markets per capita | Combined score of indicators and city is ranked relative to its peers. |
| | Community gardens | Number of community gardens per city | |
| | Farmers' markets vouchers | Number of farmers' markets accepting Women, Infants & Children (WIC) federal program vouchers and Food Stamp vouchers | |
| **Business & Economic Development** | Clean technology incubator | Presence of a clean technology incubator in the city | Combined score of indicators and city is ranked relative to its peers |
| | Green business directory | Presence of a city or private green business directory | |
| | Farmers' markets | Average number of farmers' markets per capita | |
| | LEED Buildings | Number of LEED Buildings per capita | |
| **Waste Management** | Percent of municipal solid waste recycled | Percentage of municipal solid waste recycled | Scored on a scale of 0 to 10 based on a min/max of data for all cities |
| | Waste reduction policies | Assessment of measures to reduce waste and make waste disposal more sustainable | Scored on a scale of 0 to 10 |

Table A – 6 (Continued)

| Subsystem | Indicator | Description | Scoring Method |
|---|---|---|---|
| **Buildings and Infrastructure** | Number of LEED certified buildings | Number of LEED certified buildings (silver, gold or platinum) per 1,000 persons | Scored on a scale of 0 to 10 based on a min/max of data for all cities |
| | Energy efficient building standards | Assessment of whether a city requires energy audits and whether energy regulations require that new buildings satisfy energy efficiency standards | Scored on a scale of 0 to 10 |
| | Energy efficient building incentives | Assessment of a city's incentives for retrofitting buildings to improve energy efficiency and how widely it promotes energy efficiency in homes and offices | |
| **Transportation** | Share of workers travelling by public transit, bicycle or foot | Percent of workers travelling to work by public transportation, bicycle or foot | Scored on a scale of 0 to 10 based on a min/max of data for all cities |
| | Public transportation supply | Evaluation of availability of public transportation, including length of public transportation network | |
| | Average commute time from residence to work | Average commute time from residence to work, in minutes | |
| | Green transport promotion | Assessment of how extensively the city promotes public transportation and offers incentives for less carbon-intensive travel | Scored on a scale of 0 to 10 |
| | Congestion reduction policies | Assessment of a city's efforts to reduce congestion | |
| **Community Governance** | Green action plan | Measure of the rigor of a city's green action plan | Scored on a scale of 0 to 10 |
| | Green management | Measure of the extensiveness of environmental management undertaken by the city | |
| | Public participation in green policy | Measure of the city's efforts to involve the public in monitoring its environmental performance | |

Table A - 7 Scores for Nine Subsystems of Community Development

| City | Water Management[a] ($H2O_M$) | Energy Management[a] ($E_M$) | Urban Design[a] ($U_D$) | Food Management[b] ($F_M$) | Business & Economic Development[b] ($B_{ED}$) | Waste Management[a] ($W_M$) | Transportation[a] ($T_S$) | Buildings & Infrastructure[a] ($B_G$) | Community Governance[a] ($C_G$) |
|---|---|---|---|---|---|---|---|---|---|
| Boston | 91.8 | 82.4 | 74.9 | 50 | 38 | 54.7 | 50.2 | 62.1 | 84.4 |
| Charlotte | 84.8 | 55.7 | 64.6 | 23 | 20 | 40.9 | 40.8 | 26.2 | 88.9 |
| Chicago | 82.2 | 75.9 | 56 | 33 | 42 | 55.2 | 64.7 | 51.3 | 87.8 |
| Dallas | 78.7 | 65.8 | 43.1 | 3 | 31 | 41.8 | 54.4 | 49.6 | 82.2 |
| Denver | 85.6 | 86 | 53.3 | 41 | 45 | 51.9 | 60.7 | 68.8 | 100 |
| Detroit | 38.8 | 27.3 | 35.8 | 13 | 16 | 0 | 37.5 | 18.1 | 16.7 |
| Houston | 80.5 | 71 | 56.8 | 7 | 28 | 59.5 | 53.6 | 66.4 | 94.4 |
| Los Angeles | 81.7 | 77.8 | 45.3 | 15 | 31 | 81.9 | 42.9 | 53.5 | 94.4 |
| Minneapolis | 88.2 | 76.5 | 80.1 | 49 | 39 | 72.6 | 63.9 | 37 | 93.3 |
| New York City | 88.8 | 53.8 | 93 | 34 | 32 | 53.1 | 76.6 | 68.7 | 100 |
| Philadelphia | 70.4 | 72.5 | 67.7 | 48 | 47 | 57.6 | 47.2 | 29.5 | 94.4 |
| Phoenix | 77.4 | 72.9 | 49.6 | 11 | 39 | 40.5 | 38.0 | 26.7 | 62.2 |
| Sacramento | 76.3 | 49.0 | 44.4 | 37 | 48 | 72.2 | 56.0 | 41.7 | 76.7 |
| San Francisco | 87.4 | 81.1 | 66.6 | 39 | 46 | 100 | 67.0 | 85.6 | 93.3 |
| Seattle | 83.3 | 69.8 | 56.2 | 46 | 49 | 83.1 | 59.8 | 98.2 | 96.7 |
| Washington DC | 67.3 | 69.4 | 69.9 | 47 | 40 | 44.8 | 52.0 | 79.3 | 100 |
| $\bar{x}$ | 79.0 | 67.9 | 59.8 | 31.0 | 36.9 | 56.9 | 54.1 | 53.9 | 85.3 |
| $\sigma$ | 12.6 | 15.0 | 15.2 | 16.5 | 9.9 | 22.9 | 11.2 | 23.3 | 20.8 |

[a] Data obtained from US and Canada Green City Index (2011).
[b] Data obtained from SustainLane US Green City Rankings (2006)

Table A - 8 Gallup Healthways Well-Being Index[a] Scores for Sixteen Cities of Interest

| City | Score | City | Score | City | Score | City | Score |
|---|---|---|---|---|---|---|---|
| Boston | 68.6 | Denver | 68.4 | Minneapolis | 69.6 | Sacramento | 67 |
| Charlotte | 69.4 | Detroit | 65.3 | New York City | 66.2 | San Francisco | 69.6 |
| Chicago | 66.5 | Houston | 67.8 | Philadelphia | 66 | Seattle | 68.3 |
| Dallas | 67.9 | Los Angeles | 67.9 | Phoenix | 67.7 | Washington DC | 69.9 |

$\bar{x} = 67.88$; $\sigma = 1.39$

[a]Obtained from Gallup (2011).

# APPENDIX B

Table B - 1 The Sustainable Neighborhoods Index Data Collections Sheet (1 of 2)

| **City/Town/Neighborhood:** | | | Data Collection Researcher: | | |
|---|---|---|---|---|---|
| Category | **Indicator** | **Potential Sources** | **Collected Data** | **Actual Source** | **Notes** |
| Energy Management | Electricity consumption per unit of GDP(TJ/US$m) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | | | |
| | Electricity consumption per person (GJ) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | | | |
| | Measure of a city's commitment to promoting green energies, developing green energy projects and increasing the amount of locally produced energy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | | | |
| Urban Design | Green Space as % of total land area (%) | Planning Department; US Census Bureau; Trust for Public Land | | | |
| | Population density (person/mi$^2$) | US Census Bureau | | | |
| | Assessment of a city's efforts to sustain and improve the quantity and quality (for example, proximity and usability) of green spaces, and its tree planting policy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | | | |
| | Assessment of how rigorously a city promotes containment of urban sprawl and reuse of brownfield areas (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | | | |
| Buildings | Number of LEED certified buildings (buildings/100,00 persons) | USGBC | | | |
| | Assessment of whether a city requires energy audits and whether energy regulations require that new buildings satisfy energy efficiency standards (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | | | |
| | Assessment of a city's incentives for retrofitting buildings to improve energy efficiency and how widely it promotes energy efficiency in homes and offices (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | | | |
| Transportation | Share of workers traveling bu public transit, bike or foot (%) | US Census Bureau American Community Survey | | | |
| | Length of public transit (mi/mi2) | National Transit Database | | | |
| | Annual vehicle revenue miles (miles/person) | National Transit Database | | | |
| | Maximum public transit vehicles available per square mile (vehicles/mi$^2$) | National Transit Database | | | |

Table B – 1 (Continued) The Sustainable Neighborhoods Index Data Collections Sheet (2 of 2)

| **City/Town/Neighborhood:** | | | Data Collection Researcher: | | |
|---|---|---|---|---|---|
| Category | **Indicator** | **Potential Sources** | **Collected Data** | **Actual Source** | **Notes** |
| Transportation (cont'd) | Average commute time from residence to work (minutes) | US Census Bureau American Community Survey | | | |
| | Assessment of how extensively the city promotes public transportation and offers incentives for less carbon-intensive travel (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | | | |
| | Assessment of a city's efforts to reduce congestion (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | | | |
| Waste Management | Recycled municipal waste (%) | Department of Public Works | | | |
| | Assessment of measures to reduce waste and make waste disposal more sustainable (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | | | |
| Water Management | Total water consumption per person per day (gallons) | USGS | | | |
| | Water leakages in water distribution system (%) | Public Works Department | | | |
| | Assessment of the level and quality of a city's main water sources (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | | | |
| | Indication of whether or not a city has a stormwater management plan (zero=1; 1=yes) | Advisory Panel or Committee | | | |
| Food Management | Number of farmers' markets per 100,000 people | Community Contacts & Websites | | | |
| | Number of community gardens per 100,000 residents | Community Contacts & Websites | | | |
| | Easily obtained resources on presence of farmers' markets accepting Women, Infants & Children (WIC) federal program vouchers and Food Stamp vouchers (zero=no; 1=yes) | Advisory Panel or Committee | | | |
| Business & Economic Development | Presence of a clean technology incubator in the city (zero=1; 1=yes) | Community Contacts & Websites | | | |
| | Presence of a city or private green business directory (zero=no; 1=yes) | Community Contacts & Websites | | | |
| | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | | | |
| | Number of LEED Buildings per 100,000 residents | USGBC | | | |
| Community Governance | Measure of the rigor of a city's green action plan (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | | | |
| | Measure of the extensiveness of environmental management undertaken by the city (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | | | |
| | Measure of the city's efforts to involve the public in monitoring its environmental performance (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | | | |

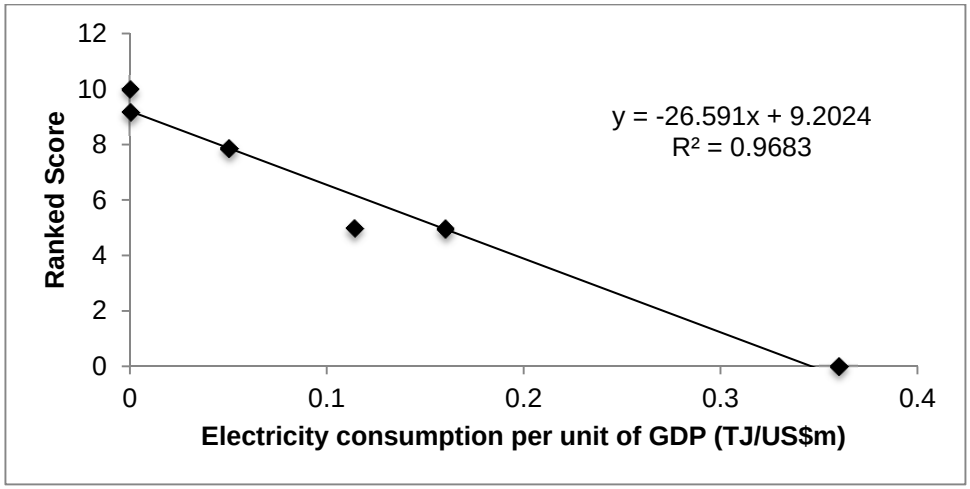



Figure B - 1 Linear Regression for Ranked Scoring of Electricity Consumption per unit of GDP

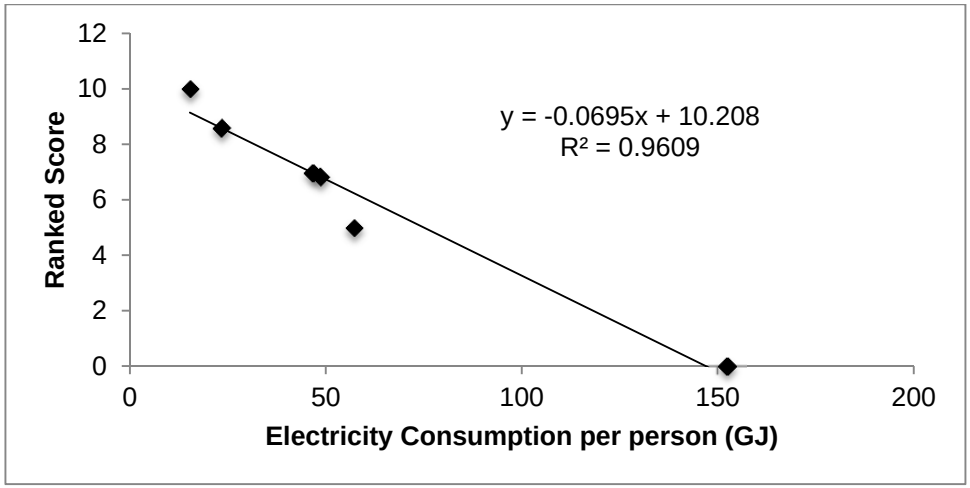



Figure B - 2 Linear Regression for Annual Electricity Consumption per Person

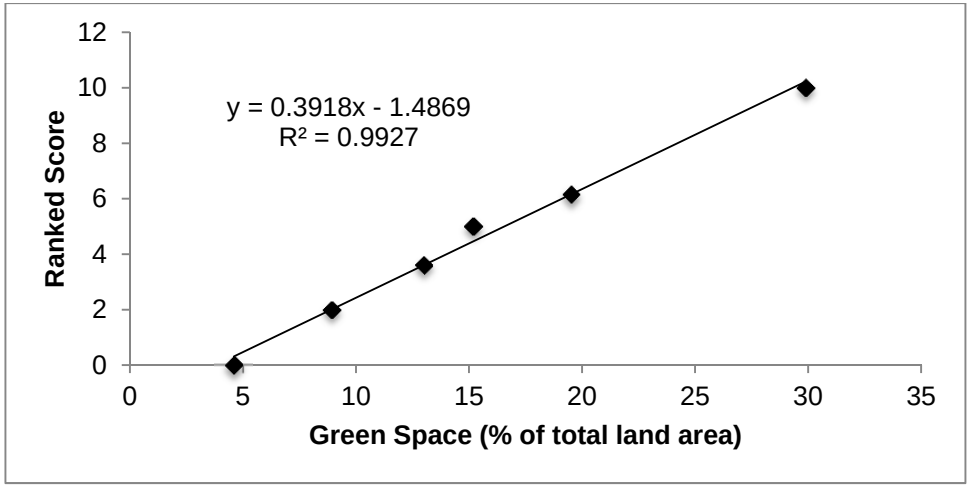



Figure B - 3 Linear Regression for Green Space as a Percent of Total Land Area

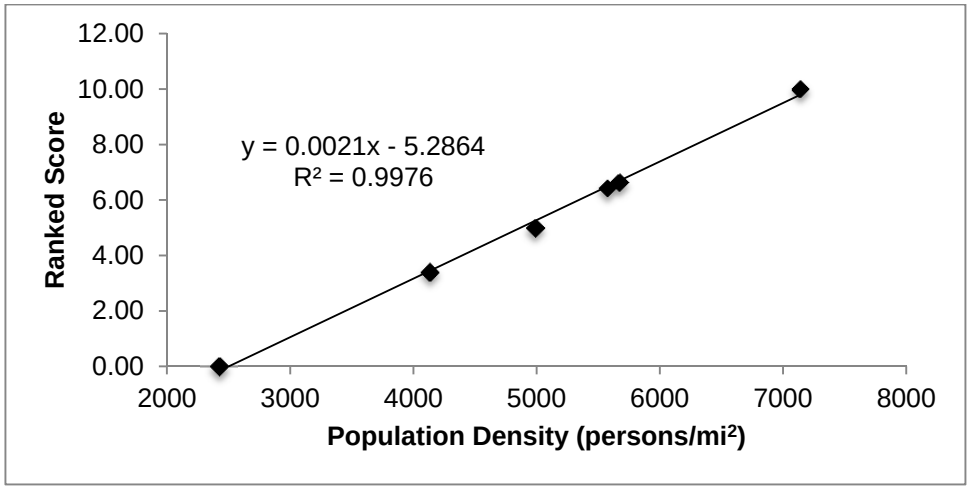



Figure B - 4 Linear Regression for Population Density

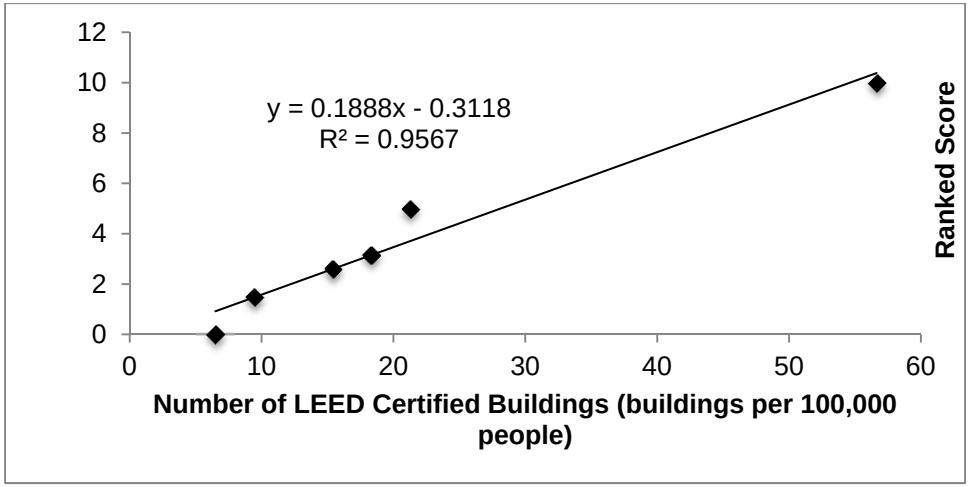



Figure B - 5 Linear Regression for Number of LEED Certified Buildings

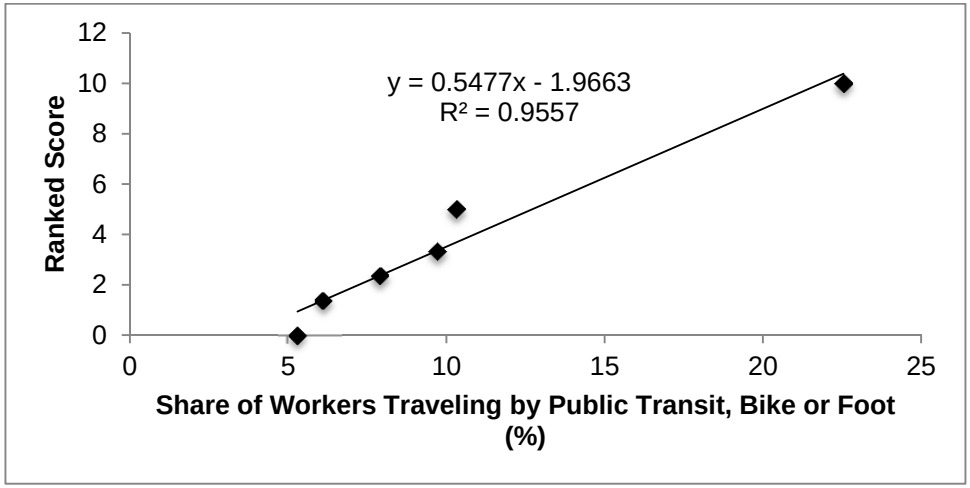



Figure B - 6 Linear Regression for Number of LEED Certified Buildings

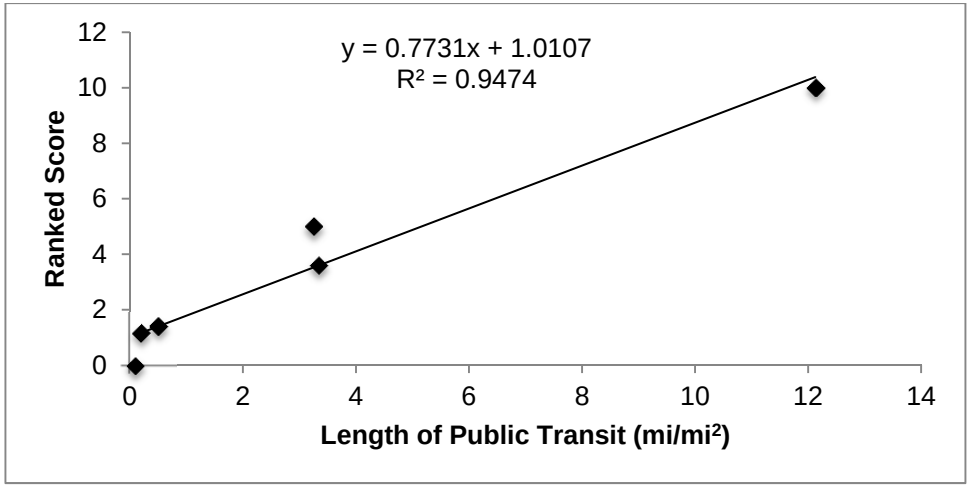



Figure B - 7 Linear Regression for Length of Public Transit

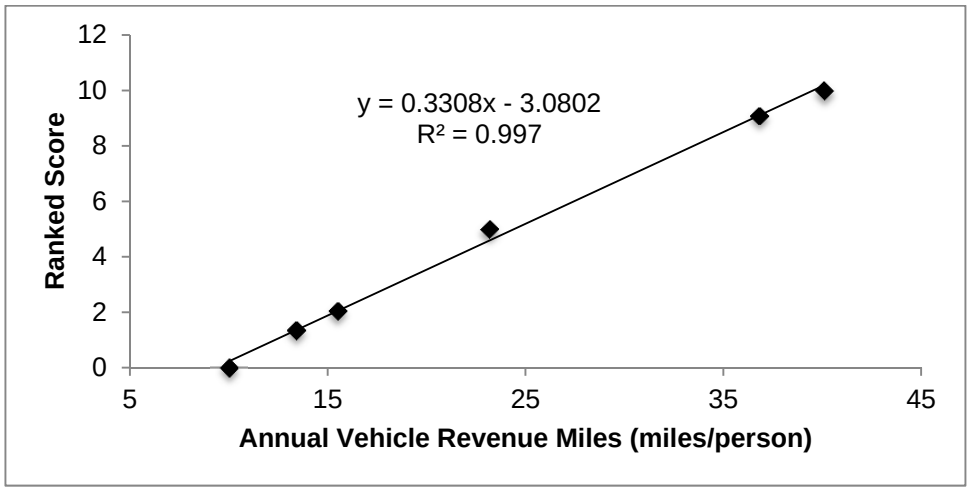



Figure B - 8 Linear Regression for Annual Vehicle Revenue Miles

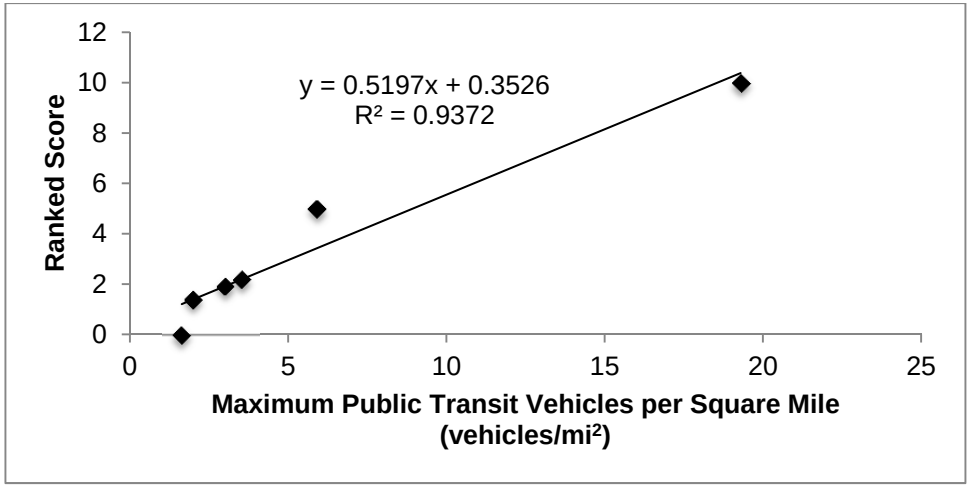



Figure B - 9 Linear Regression for Maximum Public Transit Vehicles Available

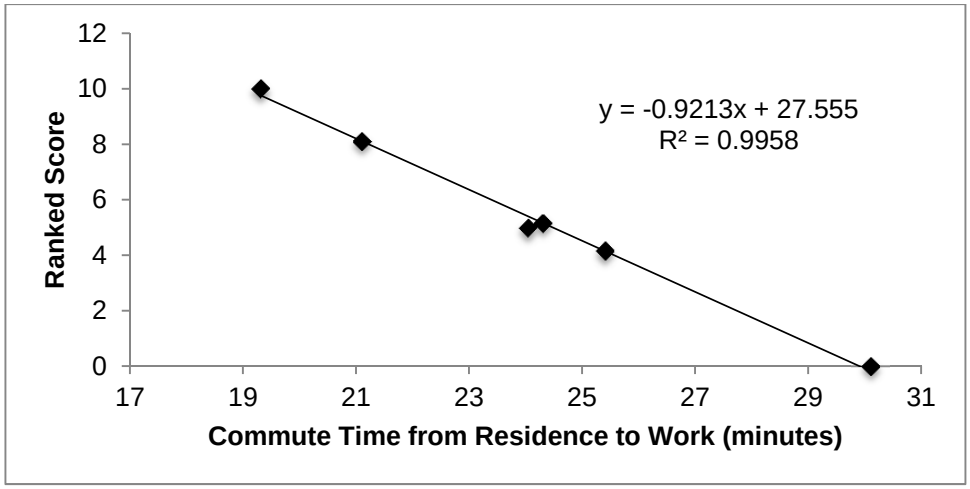



Figure B - 10 Linear Regression for Commute Time from Residence to Work

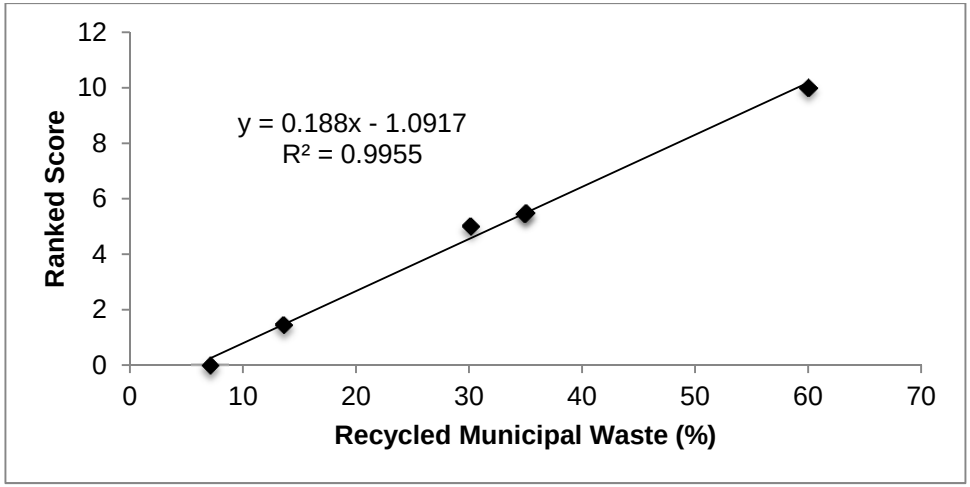



Figure B - 11 Linear Regression for Recycled Municipal Waste

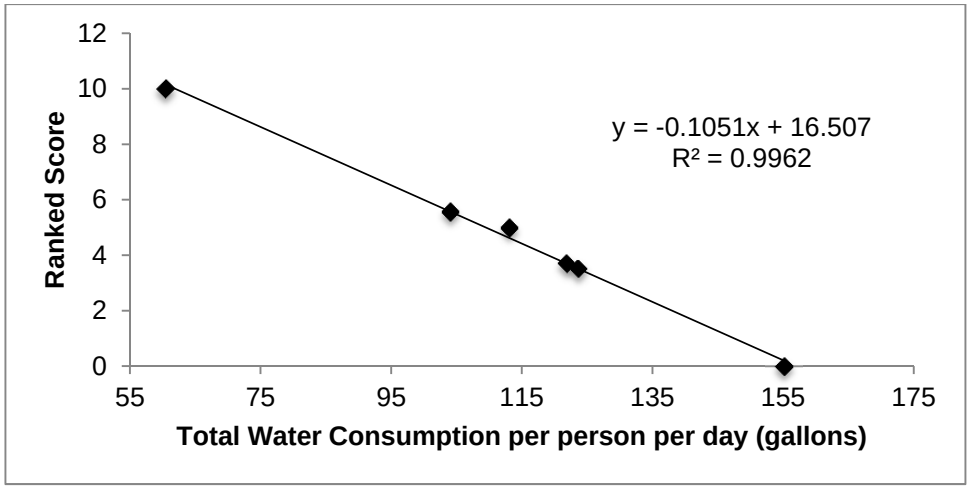



Figure B - 12 Linear Regression for Total Water Consumption

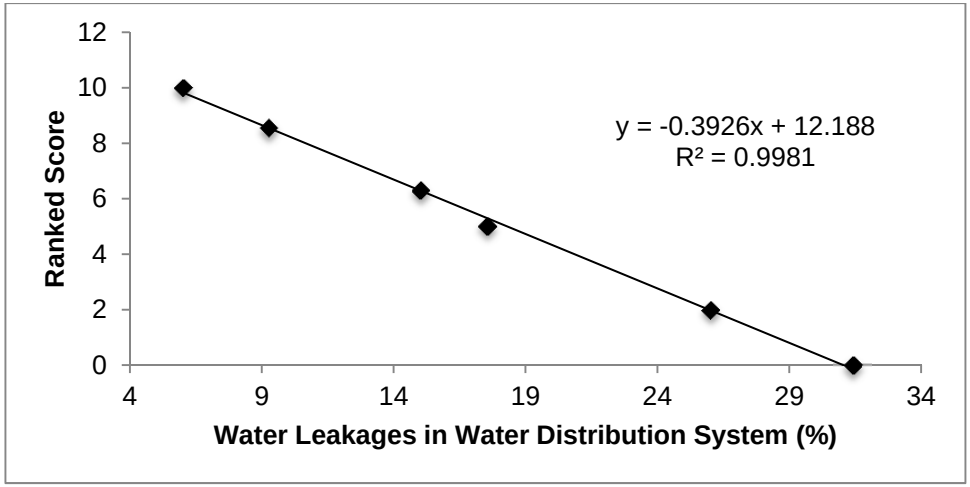



Figure B - 13 Linear Regression for Water Leakages in Distribution System

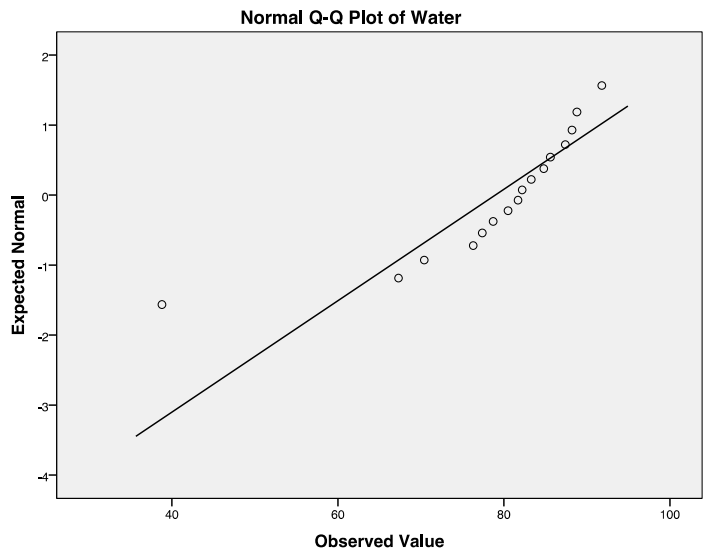



Figure B - 14 Q-Q Plot for Water Management Subsystem

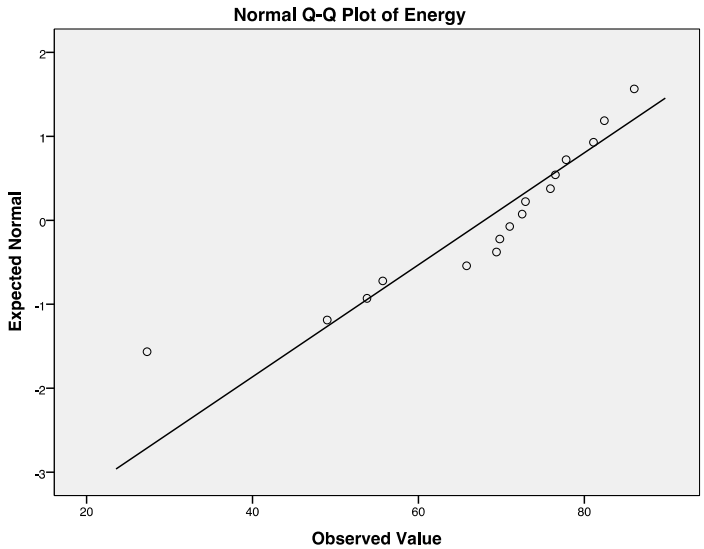



Figure B - 15 Q-Q Plot for Energy Management Subsystem

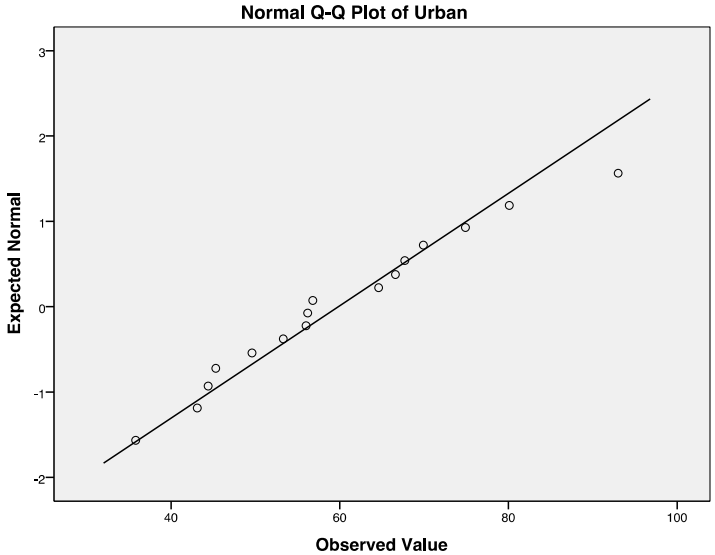



Figure B - 16 Q-Q Plot for Urban Design Subsystem

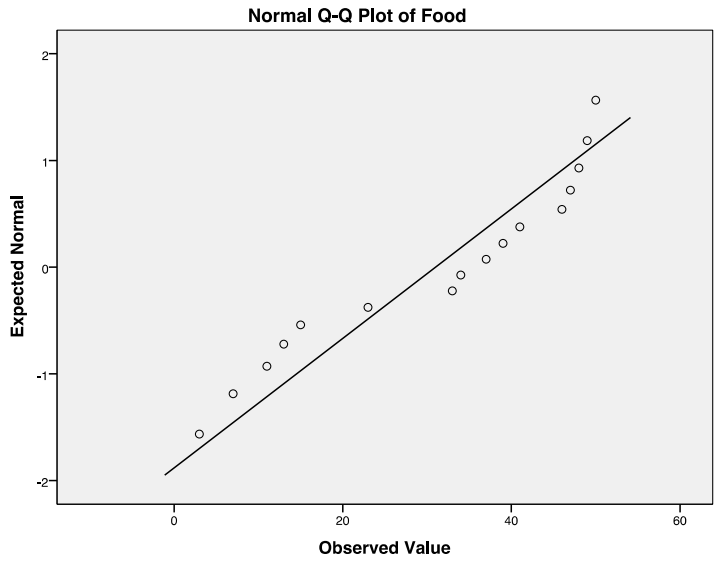


Figure B - 17 Q-Q Plot for Food Management Subsystem

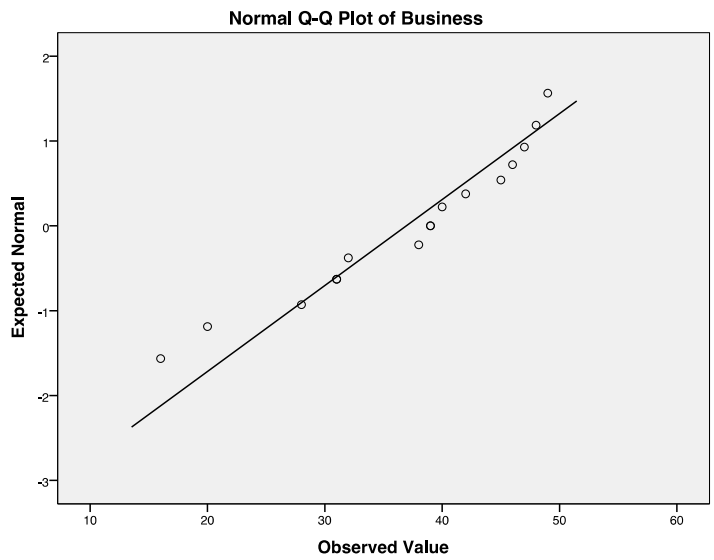


Figure B - 18 Q-Q Plot for Business & Economic Development Subsystem

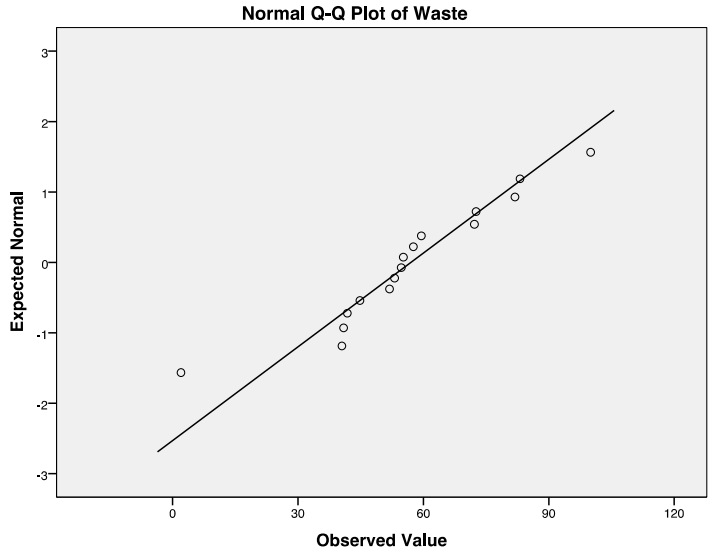


Figure B - 19 Q-Q Plot for Waste Management Subsystem

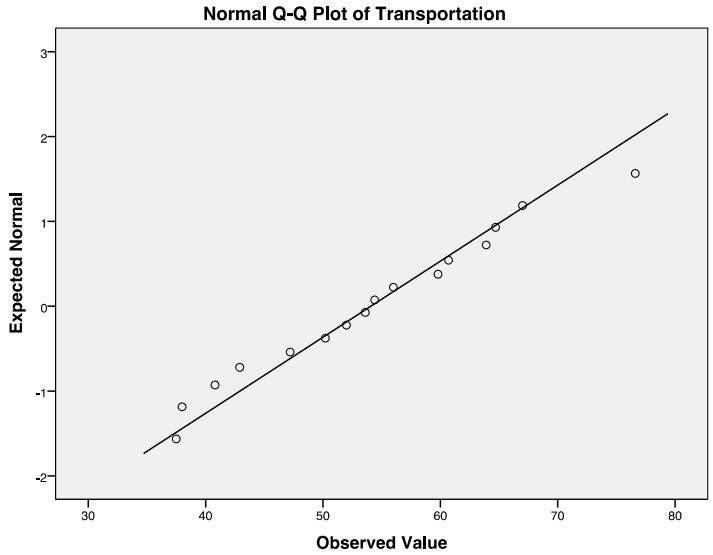


Figure B - 20 Q-Q Plot for Transportation Subsystem

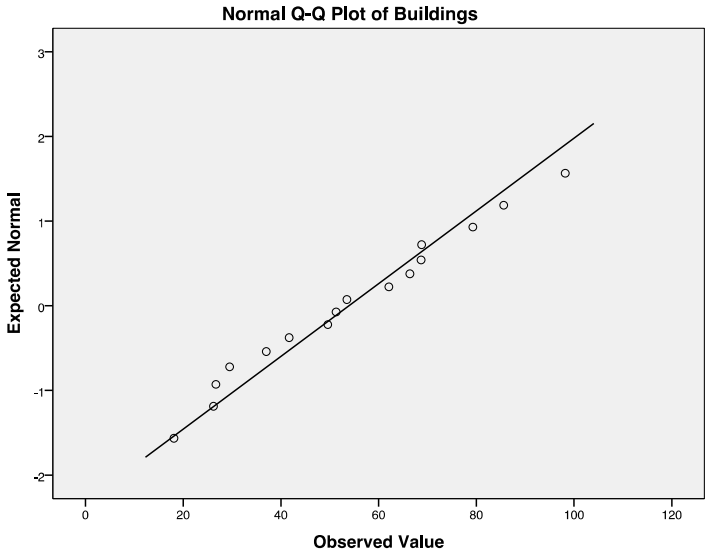



Figure B - 21 Q-Q Plot for Buildings & Infrastructure Subsystem

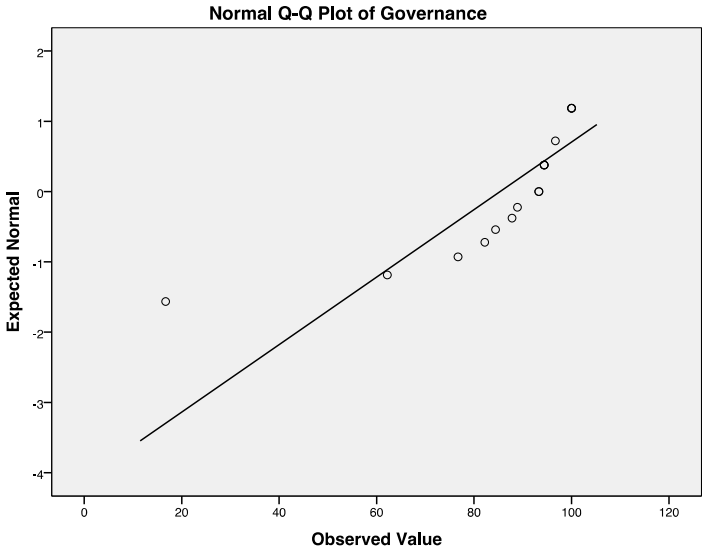



Figure B - 22 Q-Q Plot for Environmental Governance Subsystem

Table B - 2 Obtained raw data for Athens, Georgia and Ithaca, New York and Peers

| Category | Source | Indicator | Weighting | Athens | Ithaca | Atlanta | Minneapolis | Sacramento |
|---|---|---|---|---|---|---|---|---|
| **Energy** | Mayors office of sustainability/US Bureau of Economic Analysis | Electricity consumption per unit of GDP(TJ/US$m) | 0.33 | 3.86E-04 | 3.27E-05 | 0.36 | 0.05 | 0.16 |
| | Mayors office of sustainability/US Bureau of Economic Analysis | Electricity consumption per person (GJ) | 0.33 | 46.76 | 15.31 | 152.40 | 23.30 | 48.60 |
| | Panel | Measure of a city's commitment to promoting green energies, developing green energy projects and increasing the amount of locally produced energy | 1.11 | 2.00 | 2.00 | 25, 44.8 | 7, 76.5 | 24, 49 |
| **Urban Design** | Planning Department; US Census Bureau | Green Space as % of total land area (%) | 0.25 | 29.90 | 12.99 | 4.60 | 19.50 | 8.90 |
| | US Census Bureau | Population density (person/mi$^2$) | 0.25 | 2425.20 | 5570.50 | 4129.20 | 7136.60 | 5666.30 |
| | Panel | Assessment of a city's efforts to sustain and improve the quantity and quality (for example, proximity and usability) of green spaces, and its tree planting policy | 1.11 | 3.00 | 2.00 | 25, 36.7 | 2, 80.1 | 22, 44.4 |
| | Panel | Assessment of how rigorously a city promotes containment of urban sprawl and reuse of brownfield areas. | 1.11 | 3.00 | 2.00 | | | |

Table B - 2 (Continued)

| Category | Source | Indicator | Weighting | Athens | Ithaca | Atlanta | Minneapolis | Sacramento |
|---|---|---|---|---|---|---|---|---|
| **Buildings** | USGBC | Number of LEED certified buildings (buildings/100,00 persons) | 1.00 | 9.48 | 56.64 | 18.30 | 6.50 | 15.40 |
| | Panel | Assessment of whether a city requires energy audits and whether energy regulations require that new buildings satisfy energy efficiency standards | 1.00 | 1.00 | 1.00 | 8, 66.7 | 18, 37 | 17, 41.7 |
| | Panel | Assessment of a city's incentives for retrofitting buildings to improve energy efficiency and how widely it promotes energy efficiency in homes and offices | 1.00 | 1.00 | 1.00 | | | |
| **BED** | Websites/Community Contacts | Presence of a clean technology incubator in the city | 0.00 | 0.00 | 0.00 | - | 12.00 | 2.00 |
| | Websites/Community Contacts | Presence of a city or private green business directory | 0.00 | 0.00 | 1.00 | | | |
| | Community Websites | Average number of farmers' markets per capita | 0.00 | 0.00 | 0.00 | | | |
| | USGBC | Number of LEED Buildings per capita | 0.00 | 0.00 | 0.00 | | | |

Table B - 2 (Continued)

| Category | Source | Indicator | Weighting | Athens | Ithaca | Atlanta | Minneapolis | Sacramento |
|---|---|---|---|---|---|---|---|---|
| Transport | US Census Bureau American Community Survey | Share of workers traveling bu public transit, bike or foot (%) | 0.14 | 6.10 | 22.55 | 5.30 | 7.90 | 9.70 |
| | National Transit Database | Length of public transit (mi/mi2) | 0.14 | 3.34 | 12.13 | 0.20 | 0.50 | 0.10 |
| | National Transit Database | Annual vehicle revenue miles (miles/person) | 0.14 | 10.02 | 40.09 | 36.80 | 13.40 | 15.50 |
| | National Transit Database | Maximum public transit vehicles available per square mile (vehicles/mi²) | 0.14 | 1.64 | 3.52 | 2.20 | 1.50 | 25.30 |
| | US Census Bureau American Community Survey | Average commute time from residence to work (minutes) | 0.14 | 21.10 | 19.30 | 30.10 | 24.30 | 25.40 |
| | Panel | Assessment of how extensively the city promotes public transportation and offers incentives for less carbon-intensive travel | 0.48 | 2.00 | 3.00 | 20, 47.6 | 7, 63.9 | 10, 56 |
| | Panel | Assessment of a city's efforts to reduce congestion | 0.48 | 2.00 | 2.00 | | | |
| Waste | Department of Public Works | Recycled municipal waste (%) | 0.5 | 35.00 | 60.00 | 7.10 | 34.90 | 13.60 |
| | Panel | Assessment of measures to reduce waste and make waste disposal more sustainable | 1.67 | 3.00 | 3.00 | 22, 29.6 | 18, 37.0 | 6, 72.2 |

Table B - 2 (Continued)

| Category | Source | Indicator | Weighting | Athens | Ithaca | Atlanta | Minneapolis | Sacramento |
|---|---|---|---|---|---|---|---|---|
| Water | USGS | Total water consumption per person per day (gallons) | 0.25 | 60.35 | 104.04 | 121.90 | 123.60 | 155.10 |
| | Public Works Department | Water leakages in water distribution system (%) | 0.25 | 9.25 | 15.00 | 31.40 | 6.00 | 26.00 |
| | Panel | Assessment of the level and quality of a city's main water sources | 0.83 | 3.00 | 2.00 | 21, 71.7 | 4, 88.2 | 20, 76.3 |
| | Panel | Indication of whether or not a city has a stormwater management plan | 0.83 | 3.00 | 3.00 | | | |
| Food | Community Websites | Number of farmers' markets per capita | 1.11 | 0.00 | 0.00 | 39.00 | 2.00 | 14.00 |
| | Community Websites | Number of community gardens per city | 1.11 | 13.00 | 4.00 | | | |
| | Panel | Number of farmers' markets accepting Women, Infants & Children (WIC) federal program vouchers and Food Stamp vouchers | 1.11 | 0.00 | 1.00 | | | |
| CG | Panel | Measure of the rigor of a city's green action plan | 1.11 | 2.00 | 3.00 | 12, 87.8 | 8, 93.3 | 18, 76.7 |
| | Panel | Measure of the extensiveness of environmental management undertaken by the city | 1.11 | 2.00 | 2.00 | | | |
| | Panel | Measure of the city's efforts to involve the public in monitoring its environmental performance | 1.11 | 2.00 | 2.00 | | | |

Table B - 3 Ranked Scores for Athens, Georgia and Ithaca, New York

| Category | Source | Indicator | Athens | Ithaca | Atlanta | Minneapolis | Sacramento | Final Athens | Final Ithaca |
|---|---|---|---|---|---|---|---|---|---|
| **Energy** | Mayors office of sustainability/US Bureau of Economic Analysis | Electricity consumption per unit of GDP(TJ/US$m) | 9.19 | 10.00 | 0.00 | 7.87 | 4.95 | 7.61 | 8.89 |
| | Mayors office of sustainability/US Bureau of Economic Analysis | Electricity consumption per person (GJ) | 6.96 | 10.00 | 0.00 | 8.59 | 6.83 | | |
| | Panel | Measure of a city's commitment to promoting green energies, developing green energy projects and increasing the amount of locally produced energy | 2.00 | 2.00 | 25, 44.8 | 7, 76.5 | 24, 49 | | |
| **Urban Design** | Planning Department; US Census Bureau | Green Space as % of total land area (%) | 10.00 | 3.60 | 0.00 | 6.15 | 2.00 | 9.17 | 6.95 |
| | US Census Bureau | Population density (person/mi²) | 0.00 | 6.43 | 3.40 | 10.00 | 6.63 | | |
| | Panel | Assessment of a city's efforts to sustain and improve the quantity and quality (for example, proximity and usability) of green spaces, and its tree planting policy | 3.00 | 2.00 | 25, 36.7 | 2, 80.1 | 22, 44.4 | | |
| | **Panel** | Assessment of how rigorously a city promotes containment of urban sprawl and reuse of brownfield areas. | 3.00 | 2.00 | | | | | |

Table B - 3 (Continued)

| Category | Source | Indicator | Athens | Ithaca | Atlanta | Minneapolis | Sacramento | Final Athens | Final Ithaca |
|---|---|---|---|---|---|---|---|---|---|
| **Buildings** | USGBC | Number of LEED certified buildings (buildings/100,00 persons) | 1.48 | 10.00 | 3.14 | 0.00 | 2.60 | 2.71 | 5.52 |
| | Panel | Assessment of whether a city requires energy audits and whether energy regulations require that new buildings satisfy energy efficiency standards | 1.00 | 1.00 | 8, 66.7 | 18, 37 | 17, 41.7 | | |
| | Panel | Assessment of a city's incentives for retrofitting buildings to improve energy efficiency and how widely it promotes energy efficiency in homes and offices | 1.00 | 1.00 | | | | | |
| **BED** | Websites/Community Contacts | Presence of a clean technology incubator in the city | 0.00 | 0.00 | - | 12 | 2 | 3.70 | 5.83 |
| | Websites/Community Contacts | Presence of a city or private green business directory | 2.00 | 2.00 | 1.00 | | | | |
| | Community Websites | Average number of farmers' markets per capita | 2.00 | 2.00 | 0.00 | | | | |
| | USGBC | Number of LEED Buildings per capita | 1.48 | 10.00 | 0.00 | | | | |

Table B - 3 (Continued)

| Category | Source | Indicator | Athens | Ithaca | Atlanta | Minneapolis | Sacramento | Final Athens | Final Ithaca |
|---|---|---|---|---|---|---|---|---|---|
| Transport | US Census Bureau American Community Survey | Share of workers traveling bu public transit, bike or foot (%) | 1.37 | 10.00 | 0 | 2.36 | 3.35 | 3.77 | 8.41 |
| | National Transit Database | Length of public transit (mi/mi2) | 3.59 | 10.00 | 1.17 | 1.40 | 0.00 | | |
| | National Transit Database | Annual vehicle revenue miles (miles/person) | 0.00 | 10.00 | 9.09 | 1.35 | 2.05 | | |
| | National Transit Database | Maximum public transit vehicles available per square mile (vehicles/mi$^2$) | 0.00 | 2.18 | 10 | 1.91 | 1.39 | | |
| | US Census Bureau American Community Survey | Average commute time from residence to work (minutes) | 8.11 | 10.00 | 0 | 5.17 | 4.15 | | |
| | Panel | Assessment of how extensively the city promotes public transportation and offers incentives for less carbon-intensive travel | 2.00 | 3.00 | 20, 47.6 | 7, 63.9 | 10, 56 | | |
| | Panel | Assessment of a city's efforts to reduce congestion | 2.00 | 2.00 | | | | | |
| Waste | Department of Public Works | Recycled municipal waste (%) | 5.49 | 10.00 | 0 | 5.47 | 1.46 | 7.74 | 10.00 |
| | Panel | Assessment of measures to reduce waste and make waste disposal more sustainable | 3.00 | 3.00 | 22, 29.6 | 18, 37.0 | 6, 72.2 | | |

Table B - 3 (Continued)

| Category | Source | Indicator | Athens | Ithaca | Atlanta | Minneapolis | Sacramento | Final Athens | Final Ithaca |
|---|---|---|---|---|---|---|---|---|---|
| **Water** | USGS | Total water consumption per person per day (gallons) | 10.00 | 5.57 | 3.70 | 3.52 | 0.00 | 9.64 | 7.13 |
| | Public Works Department | Water leakages in water distribution system (%) | 8.56 | 6.30 | 0.00 | 10.00 | 1.98 | | |
| | Panel | Assessment of the level and quality of a city's main water sources | 3.00 | 2.00 | 21, 71.7 | 4, 88.2 | 20, 76.3 | | |
| | Panel | Indication of whether or not a city has a stormwater management plan | 3.00 | 3.00 | | | | | |
| **Food** | Community Websites | Number of farmers' markets per capita | 1.00 | 2.00 | 39 | 2 | 14 | 5.56 | 6.67 |
| | Community Websites | Number of community gardens per city | 3.00 | 2.00 | | | | | |
| | Panel | Number of farmers' markets accepting Women, Infants & Children (WIC) federal program vouchers and Food Stamp vouchers | 1.00 | 2.00 | | | | | |
| **CG** | Panel | Measure of the rigor of a city's green action plan | 2.00 | 3.00 | 12, 87.8 | 8, 93.3 | 18, 76.7 | 6.67 | 7.78 |
| | Panel | Measure of the extensiveness of environmental management undertaken by the city | 2.00 | 2.00 | | | | | |
| | Panel | Measure of the city's efforts to involve the public in monitoring its environmental performance | 2.00 | 2.00 | | | | | |

# APPENDIX C

Table C - 1 The Sustainable Neighborhoods Index Data Collection Sheet for Baltimore (Two Tables)

## The Sustainable Neighborhoods Index Data Collection Sheet (Page 1 of 2)

City/Town/Neighborhood: **Baltimore** | Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| **Energy Management** | Electricity consumption per unit of GDP(TJ/US$m) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | **0.0003** | **EIA** | **Called Susan Carroll (410-927-6088), Program Coordinator of Baltimore office of sustainability (http://www.baltimoresustainability.org/contact/index.aspx) at 1:18 p.m. on 3.11.13(left message) Obtained state level data from EIA (http://www.eia.gov/state/seds/sep_sum/html/pdf/rank_use_per_cap.pdf)** |
| | Electricity consumption per person (GJ) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | **6.18** | | |
| | Measure of a city's commitment to promoting green energies, developing green energy projects and increasing the amount of locally produced energy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Scott Cloutier, as informed by Baltimore Office of Sustainability** | **Locally produced renewable energy is a goal for the city in its sustainability plan, although not yet achieved. Obtained 3.11.13 from http://cleanergreener.highrockhosting2.com/uploads/files/AnnualReport2011web.pdf** |
| **Urban Design** | Green Space as % of total land area (%) | Planning Department; US Census Bureau; Trust for Public Land | **9.47** | **Trust for Public Land; US Census Bureau** | **Collected 3.9.13 from http://cloud.tpl.org/pubs/ccpe-cityparkfacts-2012.pdf and http://quickfacts.census.gov/qfd/index.htm** |
| | Population density (person/mi$^2$) | US Census Bureau | **7,653.73** | **US Census Bureau** | **Collected 3.8.13 from http://quickfacts.census.gov/qfd/index.htm** |
| | Assessment of a city's efforts to sustain and improve the quantity and quality (for example, proximity and usability) of green spaces, and its tree planting policy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by Baltimore Office of Sustainability** | **Detailed plans and results for planting trees and improving/increasing green space within the city. Obtained 3.11.13 from http://cleanergreener.highrockhosting2.com/uploads/files/AnnualReport2011web.pdf** |
| | Assessment of how rigorously a city promotes containment of urban sprawl and reuse of brownfield areas (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Scott Cloutier, as informed by Baltimore Sun** | **Some brief mention of anti –sprawl attempts by Maryland but nothing available from city. However, Baltimore is running out of land so they are using brownfields for development. Story obtained 3.11.13 from http://www.baltimoresun.com/business/bal-brownfields012604,0,7638944.story** |
| **Buildings** | Number of LEED certified buildings (buildings/100,00 persons) | USGBC | **10.33** | **USGBC** | **Obtained on 3.5.13 from https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx** |
| | Assessment of whether a city requires energy audits and whether energy regulations require that new buildings satisfy energy efficiency standards (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by Baltimore Office of Sustainability** | **Solid plans for increasing energy efficiency and new standards being implemented for aggressive energy efficiency. Obtained 3.11.13 from http://cleanergreener.highrockhosting2.com/uploads/files/AnnualReport2011web.pdf** |
| | Assessment of a city's incentives for retrofitting buildings to improve energy efficiency and how widely it promotes energy efficiency in homes and offices (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Scott Cloutier, as informed by Baltimore Office of Sustainability** | **Good plans are detailed to be in the works. Obtained 3.11.13 from http://cleanergreener.highrockhosting2.com/uploads/files/AnnualReport2011web.pdf** |
| **Transportation** | Share of workers traveling bu public transit, bike or foot (%) | US Census Bureau American Community Survey | **25.50** | **American Community Survey** | **Obtained 3.9.13 from http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_11_1YR_S0801&prodType=table** |
| | Length of public transit (mi/mi2) | National Transit Database | **0.29** | **National Transit Database** | **(MTA) - Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm** |
| | Annual vehicle revenue miles (miles/person) | National Transit Database | **22.28** | **National Transit Database** | **(MTA) - Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm** |
| | Maximum public transit vehicles available per | National Transit Database | **0.96** | **National Transit Database** | **(MTA) - Obtained on 3.9.13 from** |

| | | | | | |
|---|---|---|---|---|---|
| | square mile (vehicles/mi$^2$) | | | | http://www.ntdprogram.gov/ntdprogram/data.htm |

# The Sustainable Neighborhoods Index Data Collection Sheet (Page 2 of 2)

City/Town/Neighborhood: **Baltimore** | Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| **Transportation (cont'd)** | Average commute time from residence to work (minutes) | US Census Bureau American Community Survey | **29.6** | **American Community Survey** | **Obtained 3.9.13 from** http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_11_1YR_S0801&prodType=table |
| | Assessment of how extensively the city promotes public transportation and offers incentives for less carbon-intensive travel (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Scott Cloutier, as informed by Baltimore Office of Sustainability** | **Many good plans in the works for alternate mode promotion. Obtained 3.11.13 from** http://cleanergreener.highrockhosting2.com/uploads/files/AnnualReport2011web.pdf |
| | Assessment of a city's efforts to reduce congestion (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Scott Cloutier, as informed by Baltimore Office of Sustainability** | **Many plans in works for carpooling and other means to decrease number of vehicles on road. Obtained 3.11.13 from** http://cleanergreener.highrockhosting2.com/uploads/files/AnnualReport2011web.pdf |
| **Waste Management** | Recycled municipal waste (%) | Department of Public Works | **33.28** | **State of Maryland** | **Obtained 3.9.13 from** http://www.mde.state.md.us/programs/Land/SolidWaste/PermittedFacilities/Documents/'10%20mswmdr.pdf |
| | Assessment of measures to reduce waste and make waste disposal more sustainable (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Scott Cloutier, as informed by Baltimore Office of Sustainability** | **Moderate level of recycled MW and some plans to reduce it further in works. Obtained 3.11.13 from** http://cleanergreener.highrockhosting2.com/uploads/files/AnnualReport2011web.pdf |
| **Water Management** | Total water consumption per person per day (gallons) | USGS | **331.00** | **USGS** | **(Baltimore County) Obtained 3.9.13 from** http://waterdata.usgs.gov/usa/nwis/wu |
| | Water leakages in water distribution system (%) | Public Works Department | **16.00** | **Baltimore Water Department** | **Called Thak Bakhru, Acting Chief Engineer of Bureau of Water and Wastewater (**http://publicworks.baltimorecity.gov/Bureaus/WaterWastewater.aspx**) 410-396-1460. Redirected to 410-396-1470 (Water Engineering Department) and supplied information.** |
| | Assessment of the level and quality of a city's main water sources (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **1.00** | **Environmental Working Group** | **Obtained 3.11.13 (3-ranked in top third, 2 middle, 1 bottom third) from** http://www.ewg.org/tap-water/rating-big-city-water.php |
| | Indication of whether or not a city has a stormwater management plan (zero=1; 1=yes) | Advisory Panel or Committee | **1.00** | **Scott Cloutier, as informed by State of MD** | **Obtained 3.11.13 from** http://www.baltimorecountymd.gov/Agencies/environment/stormwater/index.html |
| **Food Management** | Number of farmers' markets per 100,000 people | Community Contacts & Websites | **1.45** | **Welcome to Baltimore** | **Obtained 3.9.13 from** http://welcometobaltimorehon.com/farmers-markets |
| | Number of community gardens per 100,000 residents | Community Contacts & Websites | **2.42** | **U of Maryland** | **Obtained 3.10.13 from** http://growit.umd.edu/CommunityGardens1/BaltimoreCountyCommunityGardens.cfm |
| | Easily obtained resources on presence of farmers' markets accepting Women, Infants & Children (WIC) federal program vouchers and Food Stamp vouchers (zero=no; 1=yes) | Advisory Panel or Committee | **1.00** | **Scott Cloutier, as informed by State of MD** | **Obtained 3.10.13 from** http://phpa.dhmh.maryland.gov/wic/SitePages/wic-farmers.aspx |
| **Business & Economic Development** | Presence of a clean technology incubator in the city (zero=1; 1=yes) | Community Contacts & Websites | **1.00** | **Choose Maryland** | **Obtained 3.11.13 from** http://www.choosemaryland.org/businessresources/Pages/GreaterBaltimoreIncubators.aspx |
| | Presence of a city or private green business directory (zero=no; 1=yes) | Community Contacts & Websites | **1.00** | **Baltimore Open for Business** | **Obtained 3.11.13 from** http://business.baltimorecity.gov/BusinessGuides/GreenBusiness.aspx |
| | Number of farmers' markets per 100,000 | Community Contacts & | **1.45** | **Welcome to Baltimore** | **Obtained 3.9.13 from** http://welcometobaltimorehon.com/farmers- |

| | | | | | |
|---|---|---|---|---|---|
| | residents | Websites | | | markets |
| | Number of LEED Buildings per 100,000 residents | USGBC | **10.33** | **USGBC** | **Obtained on 3.5.13 from** https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx |
| **Community Governance** | Measure of the rigor of a city's green action plan (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by Baltimore Office of Sustainability** | **Many green plans in the works. Obtained 3.11.13 from** http://cleanergreener.highrockhosting2.com/uploads/files/AnnualReport2011web.pdf |
| | Measure of the extensiveness of environmental management undertaken by the city (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by Baltimore Office of Sustainability** | **Many green plans in the works. Obtained 3.11.13 from** http://cleanergreener.highrockhosting2.com/uploads/files/AnnualReport2011web.pdf |
| | Measure of the city's efforts to involve the public in monitoring its environmental performance (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by Baltimore Office of Sustainability** | **Education a big component of their plan. Obtained 3.11.13 from** http://cleanergreener.highrockhosting2.com/uploads/files/AnnualReport2011web.pdf |

Table C - 2 The Sustainable Neighborhoods Index Data Collection Sheet for Boston (Two Tables)

## The Sustainable Neighborhoods Index Data Collection Sheet (Page 1 of 2)

City/Town/Neighborhood: **Boston** | Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| **Energy Management** | Electricity consumption per unit of GDP(TJ/US$m) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | **0.10** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from** http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Electricity consumption per person (GJ) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | **40.6** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from** http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Measure of a city's commitment to promoting green energies, developing green energy projects and increasing the amount of locally produced energy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by City of Boston** | **Several projects in the works to improve the city;s renewable portfolio. Obtained 3.12.13 from** http://www.cityofboston.gov/environment/ **They even have a solar GIS map!!** http://gis.cityofboston.gov/solarboston/# **Also hope for 25 MW solar capacity by 2015!** http://www.cityofboston.gov/environmentalandenergy/conservation/solar.asp |
| **Urban Design** | Green Space as % of total land area (%) | Planning Department; US Census Bureau; Trust for Public Land | **15.88** | **Trust for Public Land; US Census Bureau** | **Collected 3.9.13 from** http://cloud.tpl.org/pubs/ccpe-cityparkfacts-2012.pdf **and** http://quickfacts.census.gov/qfd/index.htm |
| | Population density (person/mi$^2$) | US Census Bureau | **12,947.12** | **US Census Bureau** | **Collected 3.8.13 from** http://quickfacts.census.gov/qfd/index.htm |
| | Assessment of a city's efforts to sustain and improve the quantity and quality (for example, proximity and usability) of green spaces, and its tree planting policy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by City of Boston** | **Obtained 3.12.13. City set a goal to plant 100,000 new trees by the end of the decade!** http://www.cityofboston.gov/parks/streettrees/ **They even have a tree planting party** http://kristenbaumlier.com/2013/01/20/boston-tree-party-planting-one-tree-at-a-time/ **and a Bruins player said he would plant 50 trees for every goal his teammate scores!** http://boston.cbslocal.com/2013/01/08/bruins-ference-to-plant-50-trees-for-every-goal-seguin-scores/ |
| | Assessment of how rigorously a city promotes containment of urban sprawl and reuse of brownfield areas (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by City of Boston** | **Boston has a Brownfields reuse** |
| **Buildings** | Number of LEED certified buildings (buildings/100,00 persons) | USGBC | **16.64** | **USGBC** | **Obtained on 3.5.13 from** https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx |

| | | | | | |
|---|---|---|---|---|---|
| | Assessment of whether a city requires energy audits and whether energy regulations require that new buildings satisfy energy efficiency standards (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by City of Boston** | **Obtained 3.12.13 Boston provides free home energy audits. http://www.renewboston.org/ and also is the first city to require a green building standard throughout the city. http://www.cityofboston.gov/environmentalandenergy/buildings/** |
| | Assessment of a city's incentives for retrofitting buildings to improve energy efficiency and how widely it promotes energy efficiency in homes and offices (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by City of Boston** | |
| **Transportation** | Share of workers traveling by public transit, bike or foot (%) | US Census Bureau American Community Survey | **18.30** | **American Community Survey** | **Obtained 3.9.13 from http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_11_1YR_S0801&prodType=table** |
| | Length of public transit (mi/mi2) | National Transit Database | **0.29** | **National Transit Database** | **(MBTA) - Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm** |
| | Annual vehicle revenue miles (miles/person) | National Transit Database | **23.05** | **National Transit Database** | **(MBTA) - Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm** |
| | Maximum public transit vehicles available per square mile (vehicles/mi$^2$) | National Transit Database | **0.86** | **National Transit Database** | **(MBTA) - Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm** |

# The Sustainable Neighborhoods Index Data Collection Sheet (Page 2 of 2)

City/Town/Neighborhood: **Boston** | Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| **Transportation (cont'd)** | Average commute time from residence to work (minutes) | US Census Bureau American Community Survey | **28.40** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf** |
| | Assessment of how extensively the city promotes public transportation and offers incentives for less carbon-intensive travel (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Scott Cloutier, as informed by City of Boston; Hubway** | **Obtained 3.12.13. Public transit system has been accused of being limited. (GCI 2011). Some alternatives provided such as bike share http://www.thehubway.com/stations and zip car http://www.zipcar.com/webch?gclid=CO2a3N3K97UCFeZFMgodOW8Adg but not heavily advertised by Boston.** |
| | Assessment of a city's efforts to reduce congestion (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Scott Cloutier, as informed by City of Boston** | |
| **Waste Management** | Recycled municipal waste (%) | Department of Public Works | **20.0** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf** |
| | Assessment of measures to reduce waste and make waste disposal more sustainable (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **The Green City Index, City of Boston** | **Obtained 3.11.13. The percent recycled rate is low, however, the city is a single stream city now http://www.cityofboston.gov/news/default.aspx?id=4250; http://beaconhill.patch.com/articles/boston-schools-implementing-new-single-stream-recycling-program-1eb53bad** |
| **Water Management** | Total water consumption per person per day (gallons) | USGS | **74.00** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf** |
| | Water leakages in water distribution system (%) | Public Works Department | **9.00** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf** |
| | Assessment of the level and quality of a city's main water sources (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Environmental Working Group** | **Obtained 3.11.13 (3-ranked in top third, 2 middle, 1 bottom third) from http://www.ewg.org/tap-water/rating-big-city-water.php** |
| | Indication of whether or not a city has a | Advisory Panel or Committee | **1.00** | **Scott Cloutier, as informed by** | **Obtained 3.11.13 from** |

| | | | | | |
|---|---|---|---|---|---|
| | stormwater management plan (zero=1; 1=yes) | | | City of Boston | http://www.bwsc.org/ABOUT_BWSC/systems/stormwater_mgt/stormwater_mgmt.asp |
| **Food Management** | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | 3.52 | Scott Cloutier, as informed by City of Boston | Obtained 3.9.13 from http://welcometobaltimorehon.com/farmers-markets |
| | Number of community gardens per 100,000 residents | Community Contacts & Websites | 32.00 | Boston Natural | Obtained 3.10.13 from http://www.bostonnatural.org/cgFind.htm |
| | Easily obtained resources on presence of farmers' markets accepting Women, Infants & Children (WIC) federal program vouchers and Food Stamp vouchers (zero=no; 1=yes) | Advisory Panel or Committee | 1.00 | Get Out Mass | Obtained 3.10 .13 from http://getoutma.org/massachusetts-farmers-markets/ |
| **Business & Economic Development** | Presence of a clean technology incubator in the city (zero=1; 1=yes) | Community Contacts & Websites | 1.00 | MABI | Obtained 3.12.13 from http://www.massincubators.org/ |
| | Presence of a city or private green business directory (zero=no; 1=yes) | Community Contacts & Websites | 1.00 | Boston GreenScene | Obtained 3.12.13 from http://www.bostongreenscene.net/local-green-directory.html |
| | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | 3.52 | Scott Cloutier, as informed by City of Boston | Obtained 3.9.13 from http://welcometobaltimorehon.com/farmers-markets |
| | Number of LEED Buildings per 100,000 residents | USGBC | 16.64 | USGBC | Obtained on 3.5.13 from https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx |
| **Community Governance** | Measure of the rigor of a city's green action plan (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 3.00 | Scott Cloutier, as informed by City of Boston | Many green action plans and incentives in place. Obtained 3.12.13 from http://www.cityofboston.gov/environment/ |
| | Measure of the extensiveness of environmental management undertaken by the city (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 3.00 | Scott Cloutier, as informed by City of Boston | A very proactive city. Obtained 3.12.13 from http://www.cityofboston.gov/environment/ |
| | Measure of the city's efforts to involve the public in monitoring its environmental performance (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 2.00 | Scott Cloutier, as informed by City of Boston | Not a whole lot to get people involved (such as education and awareness campaigns) but there is an effort to have homes audited and this helps. Obtained 3.12.13 from http://www.cityofboston.gov/environmentalandenergy/buildings/ |
| | | | | | |

Table C - 3 The Sustainable Neighborhoods Index Data Collection Sheet for Chicago (Two Tables)

## The Sustainable Neighborhoods Index Data Collection Sheet (Page 1 of 2)

City/Town/Neighborhood: **Chicago** | Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| **Energy Management** | Electricity consumption per unit of GDP(TJ/US$m) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | 0.20 | The Green City Index US and Canada Report | Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Electricity consumption per person (GJ) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | 30.8 | The Green City Index US and Canada Report | Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Measure of a city's commitment to promoting green energies, developing green energy projects and increasing the amount of locally produced energy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 3.00 | Scott Cloutier, as informed by City of Chicago | City has been awarded grants to install several solar panels http://www.cityofchicago.org/content/dam/city/depts/mayor/Press%20Room/Press%20Releases/2011/December/12.3.11SolarPanels.pdf and is encouraging SmartGrid http://www.cityofchicago.org/city/en/progs/env/energy_efficiencyandrenewables.html and renewable energy inclusion http://www.chicagoclimateaction.org/pages/renewable_energy_sources/13.php |
| **Urban Design** | Green Space as % of total land area (%) | Planning Department; US Census Bureau; Trust for Public | 8.53 | Trust for Public Land; US Census Bureau | Collected 3.9.13 from http://cloud.tpl.org/pubs/ccpe-cityparkfacts-2012.pdf and http://quickfacts.census.gov/qfd/index.htm |

| | | | | | |
|---|---|---|---|---|---|
| | Land | | | | |
| | Population density (person/mi$^2$) | US Census Bureau | **11,892.63** | **US Census Bureau** | **Collected 3.8.13 from** http://quickfacts.census.gov/qfd/index.htm |
| | Assessment of a city's efforts to sustain and improve the quantity and quality (for example, proximity and usability) of green spaces, and its tree planting policy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by City of Chicago** | **Chicago is well known for green roofs and providing green space. Obtained 3.12.13 from** http://www.cityofchicago.org/city/en/depts/dcd/supp_info/green_urban_design.html |
| | Assessment of how rigorously a city promotes containment of urban sprawl and reuse of brownfield areas (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Scott Cloutier, as informed by City of Chicago** | **Aggressive Brownfield Reuse Program – Obtained 3.12.13 from** http://www.csu.edu/cerc/documents/ChicagoBrownfieldsInitiativeRecyclingOurPastInvestinginOurFuture.pdf **Not much out there on sprawl containment.** |
| **Buildings** | Number of LEED certified buildings (buildings/100,00 persons) | USGBC | **10.93** | **USGBC** | **Obtained on 3.5.13 from** https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx |
| | Assessment of whether a city requires energy audits and whether energy regulations require that new buildings satisfy energy efficiency standards (1=below expectations; 2=meets expectations; 3=exceeds expectations) (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by City of Chicago** | **City is doing a lot to promote energy efficiency and audits. Obtained 3.11.13 from** http://www.cityofchicago.org/city/en/progs/env/retrofit_chicago.html **and** http://www.cityofchicago.org/city/en/depts/bldgs/supp_info/chicago_energy_conservationcodeoverview.html |
| | Assessment of a city's incentives for retrofitting buildings to improve energy efficiency and how widely it promotes energy efficiency in homes and offices (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by City of Chicago** | |
| **Transportation** | Share of workers traveling by public transit, bike or foot (%) | US Census Bureau American Community Survey | **15.20** | **American Community Survey** | **Obtained 3.9.13 from** http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_11_1YR_S0801&prodType=table |
| | Length of public transit (mi/mi2) | National Transit Database | **0.65** | **National Transit Database** | **(CTA) - Obtained on 3.9.13 from** http://www.ntdprogram.gov/ntdprogram/data.htm |
| | Annual vehicle revenue miles (miles/person) | National Transit Database | **33.02** | **National Transit Database** | **(CTA) - Obtained on 3.9.13 from** http://www.ntdprogram.gov/ntdprogram/data.htm |
| | Maximum public transit vehicles available per square mile (vehicles/mi$^2$) | National Transit Database | **9.17** | **National Transit Database** | **(CTA) - Obtained on 3.9.13 from** http://www.ntdprogram.gov/ntdprogram/data.htm |

# The Sustainable Neighborhoods Index Data Collection Sheet (Page 2 of 2)

City/Town/Neighborhood: **Chicago** Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| **Transportation (cont'd)** | Average commute time from residence to work (minutes) | US Census Bureau American Community Survey | **30.7** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from** http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Assessment of how extensively the city promotes public transportation and offers incentives for less carbon-intensive travel (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by City of Chicago** | **City is clearly invested in increasing public transit and reducing congestion; all connected to lower carbon emissions. Obtained 3.11.13 from** http://www.chicagoclimateaction.org/pages/transportation/14.php |
| | Assessment of a city's efforts to reduce congestion (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by City of Chicago** | |
| **Waste Management** | Recycled municipal waste (%) | Department of Public Works | **8.00** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from** http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |

| | | | | | |
|---|---|---|---|---|---|
| | Assessment of measures to reduce waste and make waste disposal more sustainable (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 2.00 | Scott Cloutier, as informed by City of Chicago | The city is committed to managing waste but still has a very low recycled waste stream percentage. Obtained. 3.11.13 from http://www.chicagoclimateaction.org/pages/waste/15.php |
| **Water Management** | Total water consumption per person per day (gallons) | USGS | 184.0 | USGS | (Cook County) Obtained 3.9.13 from http://waterdata.usgs.gov/usa/nwis/wu |
| | Water leakages in water distribution system (%) | Public Works Department | 2.00 | The Green City Index US and Canada Report | Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Assessment of the level and quality of a city's main water sources (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 2.00 | Scott Cloutier, as informed by Environmental Working Group | Obtained 3.11.13 (3-ranked in top third, 2 middle, 1 bottom third) from http://www.ewg.org/tap-water/rating-big-city-water.php |
| | Indication of whether or not a city has a stormwater management plan (zero=1; 1=yes) | Advisory Panel or Committee | 1.00 | Scott Cloutier, as informed by City of Chicago | Obtained 3.11.13 from http://www.cityofchicago.org/city/en/depts/water/provdrs/engineer/svcs/2009_sewer_constructionandstormwatermanagementrequirements.html |
| **Food Management** | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | 0.81 | City of Chicago | Obtained 3.9.13 from http://www.cityofchicago.org/content/dam/city/depts/dca/Farmers%20Market/FMapplication2013.pdf |
| | Number of community gardens per 100,000 residents | Community Contacts & Websites | 22.16 | Greener Chicago | Obtained 3.10.13 from http://greennetchicago.org/gardens/map |
| | Easily obtained resources on presence of farmers' markets accepting Women, Infants & Children (WIC) federal program vouchers and Food Stamp vouchers (zero=no; 1=yes) | Advisory Panel or Committee | 1.00 | Scott Cloutier, as informed by Illinois Department of Agriculture | Obtained 3.10.13 from http://www.agr.state.il.us/agrihappenings/farmlist.php |
| **Business & Economic Development** | Presence of a clean technology incubator in the city (zero=1; 1=yes) | Community Contacts & Websites | 1.00 | Scott Cloutier, as informed by World Business Chicago | Obtained 3.11.13 from http://www.worldbusinesschicago.com/info-tech-ecosystem/incubators-investors |
| | Presence of a city or private green business directory (zero=no; 1=yes) | Community Contacts & Websites | 0.00 | Scott Cloutier | No city green directory is evident and some private ones exist but are very weak. |
| | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | 0.81 | City of Chicago | Obtained 3.9.13 from http://www.cityofchicago.org/content/dam/city/depts/dca/Farmers%20Market/FMapplication2013.pdf |
| | Number of LEED Buildings per 100,000 residents | USGBC | 10.93 | USGBC | Obtained on 3.5.13 from https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx |
| **Community Governance** | Measure of the rigor of a city's green action plan (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 3.00 | Scott Cloutier, as informed by City of Chicago | City has extensive plans and action to make the city greener. Engaging the public is a part of their strategy, as well. Obtained 3.11.13 from http://www.chicagoclimateaction.org/ |
| | Measure of the extensiveness of environmental management undertaken by the city (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 3.00 | | |
| | Measure of the city's efforts to involve the public in monitoring its environmental performance (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 3.00 | | |

Table C - 4 The Sustainable Neighborhoods Index Data Collection Sheet for Cleveland (Two Tables)

## The Sustainable Neighborhoods Index Data Collection Sheet (Page 1 of 2)

City/Town/Neighborhood: **Cleveland** Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| **Energy** | Electricity consumption per unit of | Mayors office of sustainability; | 0.25 | The Green City Index US and | Obtained 3.1.13 from |

| | | | | | |
|---|---|---|---|---|---|
| **Management** | GDP(TJ/US$m) | US Bureau of Economic Analysis; US Census | | **Canada Report** | http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Electricity consumption per person (GJ) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | **10.3** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from** http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Measure of a city's commitment to promoting green energies, developing green energy projects and increasing the amount of locally produced energy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by City of Cleveland Office of Sustainability** | **City is pushing hard for energy efficiency, wind turbines on Lake Erie, Solar Thermal installations etc. Obtained 3.11.13 from** http://www.city.cleveland.oh.us/CityofCleveland/Home/Government/CityAgencies/OfficeOfSustainability/AdvancedAndRenewableEnergy?_piref34_1132432_34_1122469_1122469.tabstring=Tab1 |
| **Urban Design** | Green Space as % of total land area (%) | Planning Department; US Census Bureau; Trust for Public Land | **6.29** | **Trust for Public Land; US Census Bureau** | **Collected 3.9.13 from** http://cloud.tpl.org/pubs/ccpe-cityparkfacts-2012.pdf **and** http://quickfacts.census.gov/qfd/index.htm |
| | Population density (person/mi$^2$) | US Census Bureau | **5068.29** | **US Census Bureau** | **Collected 3.8.13 from** http://quickfacts.census.gov/qfd/index.htm |
| | Assessment of a city's efforts to sustain and improve the quantity and quality (for example, proximity and usability) of green spaces, and its tree planting policy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Scott Cloutier, as informed by City of Cleveland Office of Sustainability and internet search** | **Good Greenspace Plan in the works (**http://planning.co.cuyahoga.oh.us/green/index.html**) but no clear tree planting program. Obtained 3.11.13.** |
| | Assessment of how rigorously a city promotes containment of urban sprawl and reuse of brownfield areas (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Scott Cloutier, as informed by Cuyahoga County** | **Brownfield development is a big focus (**http://www.development.cuyahogacounty.us/en-US/brownfield-redevelopment.aspx**) as is reducing sprawl** http://planning.city.cleveland.oh.us/cwp/planIntro.php **Still unclear on action taken. Obtained 3.11.13** |
| **Buildings** | Number of LEED certified buildings (buildings/100,00 persons) | USGBC | **14.22** | **USGBC** | **Obtained on 3.5.13 from** https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx |
| | Assessment of whether a city requires energy audits and whether energy regulations require that new buildings satisfy energy efficiency standards (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Scott Cloutier, as informed by the City of Cleveland** | **Energy audits not required but provided for a small fee (**http://www.city.cleveland.oh.us/CityofCleveland/Home/Government/CityAgencies/OfficeOfSustainability/EnergyEfficiencyAndGreenBuilding?_piref34_1122663_34_1122455_1122455.tabstring=Tab1**) No obvious green policies in place yet. Encourages participation in energy efficiency. Obtained 3.11.13.** |
| | Assessment of a city's incentives for retrofitting buildings to improve energy efficiency and how widely it promotes energy efficiency in homes and offices (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Scott Cloutier, as informed by the City of Cleveland** | |
| **Transportation** | Share of workers traveling by public transit, bike or foot (%) | US Census Bureau American Community Survey | **6.30** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from** http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Length of public transit (mi/mi2) | National Transit Database | **0.19** | **National Transit Database** | **(GCRTA) - Obtained on 3.9.13 from** http://www.ntdprogram.gov/ntdprogram/data.htm |
| | Annual vehicle revenue miles (miles/person) | National Transit Database | **13.92** | **National Transit Database** | **(GCRTA) - Obtained on 3.9.13 from** http://www.ntdprogram.gov/ntdprogram/data.htm |
| | Maximum public transit vehicles available per square mile (vehicles/mi$^2$) | National Transit Database | **1.34** | **National Transit Database** | **(GCRTA) - Obtained on 3.9.13 from** http://www.ntdprogram.gov/ntdprogram/data.htm |

# The Sustainable Neighborhoods Index Data Collection Sheet (Page 2 of 2)

City/Town/Neighborhood: **Cleveland** | Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| **Transportation (cont'd)** | Average commute time from residence to work (minutes) | US Census Bureau American Community Survey | **24.4** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from** http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |

| | | | | | |
|---|---|---|---|---|---|
| | Assessment of how extensively the city promotes public transportation and offers incentives for less carbon-intensive travel (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **1.00** | **Scott Cloutier, as informed by the Green City Index** | **Efforts are going into improving access to alternative modes. However, public transit use and promotion is quite low. Obtained 3.11.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf** |
| | Assessment of a city's efforts to reduce congestion (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Scott Cloutier, as informed by** | |
| **Waste Management** | Recycled municipal waste (%) | Department of Public Works | **8.50** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf** |
| | Assessment of measures to reduce waste and make waste disposal more sustainable (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Scott Cloutier, as informed by the Green City Index and the City of Cleveland** | **A low recycling rate but they have set zero waste as a goal by 2019. Obtained 3.11.13 from http://www.city.cleveland.oh.us/CityofCleveland/Home/Government/CityAgencies/OfficeOfSustainability/WasteReductionAndRecycling** |
| **Water Management** | Total water consumption per person per day (gallons) | USGS | **181.00** | **USGS** | **(Cuyahoga County) Obtained 3.9.13 from http://waterdata.usgs.gov/usa/nwis/wu** |
| | Water leakages in water distribution system (%) | Public Works Department | **28.7** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf** |
| | Assessment of the level and quality of a city's main water sources (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **1.00** | **Environmental Working Group** | **Obtained 3.11.13 (3-ranked in top third, 2 middle, 1 bottom third) from http://www.ewg.org/tap-water/rating-big-city-water.php** |
| | Indication of whether or not a city has a stormwater management plan (zero=1; 1=yes) | Advisory Panel or Committee | **1.00** | **Northeast Ohio Regional Sewer District** | **Obtained 3.11.13 from http://www.cityofchicago.org/city/en/depts/water/provdrs/engineer/svcs/2009_sewer_constructionandstormwatermanagementrequirements.html** |
| **Food Management** | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | **7.62** | **Local Food Cleveland** | **Obtained 3.9.13 from http://www.localfoodcleveland.org/farmersmarkets** |
| | Number of community gardens per 100,00 residents | Community Contacts & Websites | **50.79** | **Our Ohio** | **Obtained 3.9.13 from http://ourohio.org/index.php?page=growing-green-communities-2** |
| | Easily obtained resources on presence of farmers' markets accepting Women, Infants & Children (WIC) federal program vouchers and Food Stamp vouchers (zero=no; 1=yes) | Advisory Panel or Committee | **1.00** | **Food Policy Coalition** | **Obtained 3.10.13 from http://cccfoodpolicy.org/document/integrating-food-assistance-programs-farmers-markets-ohio** |
| **Business & Economic Development** | Presence of a clean technology incubator in the city (zero=1; 1=yes) | Community Contacts & Websites | **1.00** | **Scott Cloutier** | **Examples exist, including http://clevelandincubator.com/ Accessed 3.11.13.** |
| | Presence of a city or private green business directory (zero=no; 1=yes) | Community Contacts & Websites | **0.00** | **Scott Cloutier, as informed by** | **No clear directory exists.** |
| | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | **7.62** | **Local Food Cleveland** | **Obtained 3.9.13 from http://www.localfoodcleveland.org/farmersmarkets** |
| | Number of LEED Buildings per 100,000 residents | USGBC | **14.22** | **USGBC** | **Obtained on 3.5.13 from https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx** |
| **Community Governance** | Measure of the rigor of a city's green action plan (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Scott Cloutier, as informed by City of Cleveland** | **Good plans in place but still more to be done, with respect to action. Including the public is part of the plan for Cleveland as well. Obtained 3.11.13 from http://www.city.cleveland.oh.us/CityofCleveland/Home/Government/CityAgencies/OfficeOfSustainability** |
| | Measure of the extensiveness of environmental management undertaken by the city (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | | |
| | Measure of the city's efforts to involve the public in monitoring its environmental performance (1=below expectations; 2=meets | Advisory Panel or Committee | **2.00** | | |

| | |
|---|---|
| | expectations; 3=exceeds expectations) |

Table C - 5 The Sustainable Neighborhoods Index Data Collection Sheet for Detroit (Two Tables)

## The Sustainable Neighborhoods Index Data Collection Sheet (Page 1 of 2)

City/Town/Neighborhood: **Detroit** | Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| Energy Management | Electricity consumption per unit of GDP(TJ/US$m) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | 1.03 | The Green City Index US and Canada Report | Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Electricity consumption per person (GJ) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | 86.9 | The Green City Index US and Canada Report | Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Measure of a city's commitment to promoting green energies, developing green energy projects and increasing the amount of locally produced energy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 1.00 | Scott Cloutier, as informed by internet search | Very limited information on this available. There is talk of becoming green, but nothing more than this. |
| Urban Design | Green Space as % of total land area (%) | Planning Department; US Census Bureau; Trust for Public Land | 6.67 | Trust for Public Land; US Census Bureau | Collected 3.9.13 from http://cloud.tpl.org/pubs/ccpe-cityparkfacts-2012.pdf and http://quickfacts.census.gov/qfd/index.htm |
| | Population density (person/mi$^2$) | US Census Bureau | 5,092.50 | US Census Bureau | Collected 3.8.13 from http://quickfacts.census.gov/qfd/index.htm |
| | Assessment of a city's efforts to sustain and improve the quantity and quality (for example, proximity and usability) of green spaces, and its tree planting policy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 2.00 | Scott Cloutier, as informed by Greening of Detroit and Green Space Today | There is not much going on from the government but private organizations are on board. Obtained 3.11.13 from http://greeningofdetroit.com/what-we-do/ and http://www.greenspacetoday.com/green-city/reclamation-detroit |
| | Assessment of how rigorously a city promotes containment of urban sprawl and reuse of brownfield areas (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 2.00 | Scott Cloutier, as informed by internet search | Not a lot specifically exists on Detroit's brownfield and sprawl strategies but there are some examples of brownfield cleanups. Obtained 3.11.13 from http://www.greenspacetoday.com/green-city/reclamation-detroit |
| Buildings | Number of LEED certified buildings (buildings/100,00 persons) | USGBC | 1.84 | USGBC | Obtained on 3.5.13 from https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx |
| | Assessment of whether a city requires energy audits and whether energy regulations require that new buildings satisfy energy efficiency standards (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 1.00 | Scott Cloutier, as informed by internet search | Not much available on either of these for Detroit. |
| | Assessment of a city's incentives for retrofitting buildings to improve energy efficiency and how widely it promotes energy efficiency in homes and offices (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 1.00 | Scott Cloutier, as informed by | |
| Transportation | Share of workers traveling by public transit, bike or foot (%) | US Census Bureau American Community Survey | 3.60 | American Community Survey | Obtained 3.9.13 from http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_11_1YR_S0801&prodType=table |
| | Length of public transit (mi/mi2) | National Transit Database | 0.00 | National Transit Database | (City of Detroit) - Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm |
| | Annual vehicle revenue miles (miles/person) | National Transit Database | 22.17 | National Transit Database | (City of Detroit) - Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm |
| | Maximum public transit vehicles available per square mile (vehicles/mi$^2$) | National Transit Database | 4.65 | National Transit Database | (City of Detroit) - Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm |

# The Sustainable Neighborhoods Index Data Collection Sheet (Page 2 of 2)

City/Town/Neighborhood: **Detroit** | Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| **Transportation (cont'd)** | Average commute time from residence to work (minutes) | US Census Bureau American Community Survey | **26.00** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf** |
| | Assessment of how extensively the city promotes public transportation and offers incentives for less carbon-intensive travel (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **1.00** | **Scott Cloutier, as informed by internet search** | **Fairly weak plans when it comes to sustainable transportation.** |
| | Assessment of a city's efforts to reduce congestion (1=below expectations; 2=meets expectations; 3=exceeds expectation | Advisory Panel or Committee | **1.00** | **Scott Cloutier, as informed by internet search** | |
| **Waste Management** | Recycled municipal waste (%) | Department of Public Works | **0.10** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf** |
| | Assessment of measures to reduce waste and make waste disposal more sustainable (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **1.00** | **Scott Cloutier, as informed by the Green City Index** | **Obtained 3.11.13 fromhttp://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf** |
| **Water Management** | Total water consumption per person per day (gallons) | USGS | **230.00** | **USGS** | **(Wayne County) Obtained 3.9.13 from http://waterdata.usgs.gov/usa/nwis/wu** |
| | Water leakages in water distribution system (%) | Public Works Department | **15.90** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf** |
| | Assessment of the level and quality of a city's main water sources (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **1.00** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf** |
| | Indication of whether or not a city has a stormwater management plan (zero=1; 1=yes) | Advisory Panel or Committee | **1.00** | **City of Detroit** | **Obtained 3.11.13 from http://www.detroitmi.gov/DepartmentsandAgencies/DepartmentofEnvironmentalAffairs/StormWaterManagement.aspx** |
| **Food Management** | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | **3.40** | **Summer Tomato** | **Obtained 3.9.13 from http://welcometobaltimorehon.com/farmers-markets** |
| | Number of community gardens per 100,000 residents | Community Contacts & Websites | **25.90** | **Urban Farming** | **Obtained 3.10.13 from http://www.urbanfarming.org/garden-locations.html** |
| | Easily obtained resources on presence of farmers' markets accepting Women, Infants & Children (WIC) federal program vouchers and Food Stamp vouchers (zero=no; 1=yes) | Advisory Panel or Committee | **1.00** | **Detroit Health and Wellness** | **Obtained 3.10.13 from http://www.visionmoore.com/~cidetroi/index.php?id=156** |
| **Business & Economic Development** | Presence of a clean technology incubator in the city (zero=1; 1=yes) | Community Contacts & Websites | **1.00** | **Scott Cloutier, as informed by internet search** | **Obtained 3.11.13 Examples exist including http://techtowndetroit.org/** |
| | Presence of a city or private green business directory (zero=no; 1=yes) | Community Contacts & Websites | **1.00** | **Scott Cloutier, as informed by internet search** | **Obtained 3.11.13 http://sustainabledetroit.org/?cat=9** |
| | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | **3.40** | **Summer Tomato** | **Obtained 3.9.13 from http://welcometobaltimorehon.com/farmers-markets** |
| | Number of LEED Buildings per 100,000 residents | USGBC | **1.84** | **USGBC** | **Obtained on 3.5.13 from https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx** |
| **Community Governance** | Measure of the rigor of a city's green action plan (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **1.00** | **Scott Cloutier** | **More can definitely be done on the part of Detroit. While it does look like things are on the up-swing, improvement will be needed to reach a higher score.** |

| | | | | | |
|---|---|---|---|---|---|
| | Measure of the extensiveness of environmental management undertaken by the city (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 1.00 | | |
| | Measure of the city's efforts to involve the public in monitoring its environmental performance (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 1.00 | | |

Table C - 6 The Sustainable Neighborhoods Index Data Collection Sheet for Houston (Two Tables)

## The Sustainable Neighborhoods Index Data Collection Sheet (Page 1 of 2)

City/Town/Neighborhood: **Houston** | Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| **Energy Management** | Electricity consumption per unit of GDP(TJ/US$m) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | 0.40 | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf** |
| | Electricity consumption per person (GJ) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | 50.4 | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf** |
| | Measure of a city's commitment to promoting green energies, developing green energy projects and increasing the amount of locally produced energy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 2.00 | **Scott Cloutier, as informed by Transportation Nation and internet search** | **Houston was leader of green power purchasing from 2008-1012. http://transportationnation.org/2012/02/07/city-of-houston-top-purchaser-of-green-energy/ Several green energy companies exist within Houston but it is not clear if energy is produced there. Obtained 3.11.13** |
| **Urban Design** | Green Space as % of total land area (%) | Planning Department; US Census Bureau; Trust for Public Land | 12.93 | **Trust for Public Land; US Census Bureau** | **Collected 3.9.13 from http://cloud.tpl.org/pubs/ccpe-cityparkfacts-2012.pdf and http://quickfacts.census.gov/qfd/index.htm** |
| | Population density (person/mi$^2$) | US Census Bureau | 3,577.69 | **US Census Bureau** | **Collected 3.8.13 from http://quickfacts.census.gov/qfd/index.htm** |
| | Assessment of a city's efforts to sustain and improve the quantity and quality (for example, proximity and usability) of green spaces, and its tree planting policy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 2.00 | **Scott Cloutier, as informed by the Green City Index and internet search** | **Houston has a tree planting program and is also aggressively using brownfields, yet, no clear measures exist to preserve or develop greenspace. Obtained 3.11.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf** |
| | Assessment of how rigorously a city promotes containment of urban sprawl and reuse of brownfield areas (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 2.00 | | |
| **Buildings** | Number of LEED certified buildings (buildings/100,00 persons) | USGBC | 9.88 | **USGBC** | **Obtained on 3.5.13 from https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx** |
| | Assessment of whether a city requires energy audits and whether energy regulations require that new buildings satisfy energy efficiency standards (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 3.00 | **Scott Cloutier, as informed by DSIRE** | **Set guidelines for municipal buildings to adhere to LEED guidelines. Obtained 3.11.13 from http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=TX23R City also offered an opportunity for commercial buildings to have energy audits. http://www.houstontx.gov/mayor/press/20110106.html and weatherized homes in the Houston area with grant http://www.houstontx.gov/reep/** |
| | Assessment of a city's incentives for retrofitting buildings to improve energy efficiency and how widely it promotes energy efficiency in homes and offices (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 3.00 | | |
| **Transportation** | Share of workers traveling by public transit, bike or foot (%) | US Census Bureau American Community Survey | 4.00 | **American Community Survey** | **Obtained 3.9.13 from http://factfinder2.census.gov/faces/tableservices/jsf/pages/product** |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | view.xhtml?pid=ACS_11_1YR_S0801&prodType=table |
| | Length of public transit (mi/mi2) | National Transit Database | 0.25 | National Transit Database | (Metro) - Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm |
| | Annual vehicle revenue miles (miles/person) | National Transit Database | 19.21 | National Transit Database | (Metro) - Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm |
| | Maximum public transit vehicles available per square mile (vehicles/mi$^2$) | National Transit Database | 1.93 | National Transit Database | (Metro) - Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm |

# The Sustainable Neighborhoods Index Data Collection Sheet (Page 2 of 2)

City/Town/Neighborhood: **Houston** Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| Transportation (cont'd) | Average commute time from residence to work (minutes) | US Census Bureau American Community Survey | 27.6 | The Green City Index US and Canada Report | Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Assessment of how extensively the city promotes public transportation and offers incentives for less carbon-intensive travel (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 3.00 | Scott Cloutier, as informed by The Green City Index US and Canada Report and the City of Houston | Excellent incentives for green transport modes, including extensive bike paths, electric vehicles and extension of its light rail service. Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf and http://www.greenhoustontx.gov/bikeways.html |
| | Assessment of a city's efforts to reduce congestion (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 3.00 | | |
| Waste Management | Recycled municipal waste (%) | Department of Public Works | 14.7 | The Green City Index US and Canada Report | Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Assessment of measures to reduce waste and make waste disposal more sustainable (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 3.00 | Scott Cloutier, as informed by the Green City Index | Houston is working hard to make its waste system more sustainable by providing single stream recycling, mulching and pickup of organic material. Obtained 3.11.13 from http://www.greenhoustontx.gov/bikeways.html |
| Water Management | Total water consumption per person per day (gallons) | USGS | 158.00 | The Green City Index US and Canada Report | Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Water leakages in water distribution system (%) | Public Works Department | 11.8 | The Green City Index US and Canada Report | Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Assessment of the level and quality of a city's main water sources (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 1.00 | Environmental Working Group | Obtained 3.11.13 (3-ranked in top third, 2 middle, 1 bottom third) from http://www.ewg.org/tap-water/rating-big-city-water.php |
| | Indication of whether or not a city has a stormwater management plan (zero=1; 1=yes) | Advisory Panel or Committee | 1.00 | City of Houston | Obtained 3.11.13 from http://www.swmp.org/ |
| Food Management | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | 0.37 | Houston Visitors Bureau | Obtained 3.9.13 from http://www.visithoustontexas.com/shopping/farmers-markets/ |
| | Number of community gardens per 100,000 residents | Community Contacts & Websites | 6.99 | Houston Chronicle | Obtained 3.10.13 from http://www.chron.com/life/gardening/article/Community-gardening-Learn-to-grow-in-many-ways-1612529.php |
| | Easily obtained resources on presence of farmers' markets accepting Women, Infants & Children (WIC) federal program vouchers and Food Stamp vouchers (zero=no; 1=yes) | Advisory Panel or Committee | 0.00 | n/a | One blog was found stating a woman used WIC at a Houston Farmers' Market but nothing is easily found to confirm this. |
| Business & | Presence of a clean technology incubator in the | Community Contacts & | 1.00 | City Biz List | Obtained 3.11.13 http://houston.citybizlist.com/article/houston- |

| | | | | | |
|---|---|---|---|---|---|
| **Economic Development** | city (zero=1; 1=yes) | Websites | | | incubator-launches-cleantech-startups-oil-capital-forbes-cbl |
| | Presence of a city or private green business directory (zero=no; 1=yes) | Community Contacts & Websites | **1.00** | **Houston Green Chamber** | **Obtained 3.11.13** http://houstongreenchamber.org/member-directory |
| | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | **0.37** | **Houston Visitors Bureau** | **Obtained 3.9.13 from** http://www.visithoustontexas.com/shopping/farmers-markets/ |
| | Number of LEED Buildings per 100,000 residents | USGBC | **9.88** | **USGBC** | **Obtained on 3.5.13 from** https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx |
| **Community Governance** | Measure of the rigor of a city's green action plan (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier** | **Houston is doing well in many areas, like energy, waste and transportation. However, there could be more done to include resident in the projects within the city.** |
| | Measure of the extensiveness of environmental management undertaken by the city (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | | |
| | Measure of the city's efforts to involve the public in monitoring its environmental performance (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **1.00** | | |

Table C - 7 The Sustainable Neighborhoods Index Data Collection Sheet for Jacksonville (Two Tables)

## The Sustainable Neighborhoods Index Data Collection Sheet (Page 1 of 2)

City/Town/Neighborhood: **Jacksonville** Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| **Energy Management** | Electricity consumption per unit of GDP(TJ/US$m) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | **.001** | **EIA** | **Called Kevin Grant at 1:38 p.m. (left message) on 3.11.13 (904-255-7240) (**http://www.coj.net/departments/neighborhoods/environmental-quality/office-of-sustainability-initiatives/energy-efficiency-and-conservation-block-grant.aspx**) Called JEA (904) 665-6000 for both energy and water at 1:59 p.m. on 3.11.13, left name and put request in with public info department. Obtained state level data from EIA (**http://www.eia.gov/state/seds/sep_sum/html/pdf/rank_use_per_cap.pdf**)** |
| | Electricity consumption per person (GJ) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | **16.37** | **EIA** | |
| | Measure of a city's commitment to promoting green energies, developing green energy projects and increasing the amount of locally produced energy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Scott Cloutier, as informed by City of Jacksonville** | **The city won a grant to provide retrofits for energy efficiency. Not much on locally produced green energy. Obtained 3.11.13** http://www.coj.net/departments/neighborhoods/environmental-quality/office-of-sustainability-initiatives/energy-efficiency-and-conservation-block-grant.aspx |
| **Urban Design** | Green Space as % of total land area (%) | Planning Department; US Census Bureau; Trust for Public Land | **12.34** | **Trust for Public Land; US Census Bureau** | **Collected 3.9.13 from** http://cloud.tpl.org/pubs/ccpe-cityparkfacts-2012.pdf **and** http://quickfacts.census.gov/qfd/index.htm |
| | Population density (person/mi$^2$) | US Census Bureau | **1,108.31** | **US Census Bureau** | **Collected 3.8.13 from** http://quickfacts.census.gov/qfd/index.htm |
| | Assessment of a city's efforts to sustain and improve the quantity and quality (for example, proximity and usability) of green spaces, and its tree planting policy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Scott Cloutier, as informed by City of Jacksonville** | **Private groups focused on green space (**http://www.meetup.com/sustainablejacksonville/pages/The_Importance_of_Green_Space/**), another on tree planting (**http://jacksonville.com/news/metro/2011-01-20/story/jacksonville-planners-eye-new-rules-discourage-urban-sprawl**) and the mayor is too! (**http://jacksonville.com/news/metro/2012-09-21/story/riverfront-green-space-mulled-help-downtown-jacksonville**) However, these are just talk for now. Obtained 3.12.13** |
| | Assessment of how rigorously a city promotes containment of urban sprawl and reuse of brownfield areas (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by City of Jacksonville** | **City has a solid brownfields reuse plan (**http://www.coj.net/departments/planning-and-development/community-planning-division/brownfields-program/national-brownfields-initiative.aspx**) and plans to discourage** |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | sprawl (http://jacksonville.com/news/metro/2011-01-20/story/jacksonville-planners-eye-new-rules-discourage-urban-sprawl) Obtained 3.11.13 |
| Buildings | Number of LEED certified buildings (buildings/100,00 persons) | USGBC | 5.68 | USGBC | Obtained on 3.5.13 from https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx |
| | Assessment of whether a city requires energy audits and whether energy regulations require that new buildings satisfy energy efficiency standards (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 3.00 | Scott Cloutier, as informed by City of Jacksonville | The city won a grant to provide energy audits/retrofits for energy efficiency. Not much on locally produced green energy. Obtained 3.11.13 http://www.coj.net/departments/neighborhoods/environmental-quality/office-of-sustainability-initiatives/energy-efficiency-and-conservation-block-grant.aspx City also requires energy efficiency for its buildings. Local energy provider, JEA, also provides assistance for residents. http://www1.eere.energy.gov/buildings/betterbuildings/neighborhoods/jacksonville_profile.html Obtained 3.11.13 |
| | Assessment of a city's incentives for retrofitting buildings to improve energy efficiency and how widely it promotes energy efficiency in homes and offices (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 3.00 | | |
| Transportation | Share of workers traveling by public transit, bike or foot (%) | US Census Bureau American Community Survey | 3.70 | American Community Survey | Obtained 3.9.13 from http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_11_1YR_S0801&prodType=table |
| | Length of public transit (mi/mi2) | National Transit Database | 0.02 | National Transit Database | (JTA) - Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm |
| | Annual vehicle revenue miles (miles/person) | National Transit Database | 15.13 | National Transit Database | (JTA) - Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm |
| | Maximum public transit vehicles available per square mile (vehicles/mi$^2$) | National Transit Database | 0.99 | National Transit Database | (JTA) - Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm |

# The Sustainable Neighborhoods Index Data Collection Sheet (Page 2 of 2)

City/Town/Neighborhood: **Jacksonville** Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| Transportation (cont'd) | Average commute time from residence to work (minutes) | US Census Bureau American Community Survey | 23.30 | American Community Survey | Obtained 3.9.13 from http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_11_1YR_S0801&prodType=table |
| | Assessment of how extensively the city promotes public transportation and offers incentives for less carbon-intensive travel (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 1.00 | Scott Cloutier, as informed by internet search | Jacksonville has been criticized for poor public transit and their failed shuttle over the river. It also has high levels of sprawl, making it a car-reliant city. http://jacksonville.about.com/od/gettingherestayinghere/a/Cons-Of-Living-In-Jacksonville.htm. However, the city has been awarded 78 million to reduce traffic congestion on I-95 (http://www.sunshinestatenews.com/story/rick-scott-transportation-budget-will-reduce-jacksonvilles-i-95-congrestion) |
| | Assessment of a city's efforts to reduce congestion (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 2.00 | | |
| Waste Management | Recycled municipal waste (%) | Department of Public Works | 34.00 | City of Jacksonville | Obtained 3.9.13 from http://jaxairnews.jacksonville.com/news/premium-news/2013-01-08/story/jacksonville-mulling-wide-open-approach-recycling |
| | Assessment of measures to reduce waste and make waste disposal more sustainable (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 3.00 | Scott Cloutier, as informed by City of Jacksonville | City is focused on materials and waste management and increasing recycling percentages. (http://www.coj.net/departments/environmental-and-compliance/office-of-sustainability-initiatives.aspx) City currently recycles a high rate of the waste stream too. |
| Water Management | Total water consumption per person per day (gallons) | USGS | 170.00 | USGS | (Duval County) Obtained 3.9.13 from http://waterdata.usgs.gov/usa/nwis/wu |
| | Water leakages in water distribution system (%) | Public Works Department | 7.60 | City of Jacksonville Beach | Called JEA (904) 665-6000 for both energy and water at 1:59 p.m. on 3.11.13, left name and put request in with public info department. No |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | **word, as of 3.19.13 and contacted city of Jacksonville Beach (904)247-6278. Told they would email me an audit of the system. Received email from Michael Taylor (Michael Taylor MTaylor@jaxbchfl.net) at 3:50 p.m. on 3.19.13.** |
| | Assessment of the level and quality of a city's main water sources (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **1.00** | **Environmental Working Group** | **Obtained 3.11.13 (3-ranked in top third, 2 middle, 1 bottom third) from http://www.ewg.org/tap-water/rating-big-city-water.php** |
| | Indication of whether or not a city has a stormwater management plan (zero=1; 1=yes) | Advisory Panel or Committee | **1.00** | **City of Jacksonville** | **Obtained 3.11.13 from http://www.coj.net/departments/planning-and-development/development-services-division/master-storm-water-management-plan.aspx** |
| **Food Management** | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | **0.60** | **Yahoo** | **Obtained 3.9.13 from http://voices.yahoo.com/where-find-farmers-markets-jacksonville-florida-4948070.html?cat=22** |
| | Number of community gardens per 100,000 resident | Community Contacts & Websites | **1.09** | **EU Jacksonville** | **Obtained 3.10.13 from http://www.eujacksonville.com/story2.php?storyid=2159** |
| | Easily obtained resources on presence of farmers' markets accepting Women, Infants & Children (WIC) federal program vouchers and Food Stamp vouchers (zero=no; 1=yes) | Advisory Panel or Committee | **0.00** | **n/a** | **n/a** |
| **Business & Economic Development** | Presence of a clean technology incubator in the city (zero=1; 1=yes) | Community Contacts & Websites | **0.00** | **Scott Cloutier via internet search** | **None evident as of 3.11.13.** |
| | Presence of a city or private green business directory (zero=no; 1=yes) | Community Contacts & Websites | **1.00** | **Sustainable North Florida** | **Obtained 3.12.13 http://sustainablenorthflorida.org/jacksonville-green-business-directory/** |
| | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | **0.60** | **Yahoo** | **Obtained 3.9.13 from http://voices.yahoo.com/where-find-farmers-markets-jacksonville-florida-4948070.html?cat=22** |
| | Number of LEED Buildings per 100,000 residents | USGBC | **5.68** | **USGBC** | **Obtained on 3.5.13 from https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx** |
| **Community Governance** | Measure of the rigor of a city's green action plan (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Scott Cloutier, as informed by Office of Sustainability Initiatives** | **City has good focus in some areas but could use more in the area of transportation and encouraging technology incubators. It would be good to see the city include residents in the sustainability plan for the future as well. http://www.coj.net/departments/environmental-and-compliance/office-of-sustainability-initiatives.aspx** |
| | Measure of the extensiveness of environmental management undertaken by the city (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | | |
| | Measure of the city's efforts to involve the public in monitoring its environmental performance (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **1.00** | | |

Table C - 8 The Sustainable Neighborhoods Index Data Collection Sheet for Long Beach (Two Tables)

## The Sustainable Neighborhoods Index Data Collection Sheet (Page 1 of 2)

City/Town/Neighborhood: **Long Beach** | Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| **Energy Management** | Electricity consumption per unit of GDP(TJ/US$m) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | **0.001** | **Long Beach Office of Sustainability (2007); US Bureau of Economic Analysis** | **Accessed 3.9.13 from http://www.longbeach.gov/citymanager/sustainability/energy.asp; GDP data from http://www.bea.gov/national/index.htm** |
| | Electricity consumption per person (GJ) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | **22.42** | **Long Beach Office of Sustainability (2007); US Census** | **Accessed 3.9.13 from http://www.longbeach.gov/citymanager/sustainability/energy.asp; Population from http://quickfacts.census.gov/qfd/index.html** |
| | Measure of a city's commitment to promoting green energies, developing green energy projects and increasing the amount of locally produced energy (1=below expectations; | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by City of Long Beach** | **Several examples of renewables and promotion of green energy in the cities, including sun tracking solar panels at the airport and solar powered trash bins in town. http://www.longbeach.gov/citymanager/sustainability/energy/proje** |

| | | | | | |
|---|---|---|---|---|---|
| | 2=meets expectations; 3=exceeds expectations) | | | | cts.asp **Obtained 3.12.13** |
| **Urban Design** | Green Space as % of total land area (%) | Planning Department; US Census Bureau; Trust for Public Land | **9.69** | **Trust for Public Land; US Census Bureau** | **Collected 3.9.13 from** http://cloud.tpl.org/pubs/ccpe-cityparkfacts-2012.pdf **and** http://quickfacts.census.gov/qfd/index.htm |
| | Population density (person/mi$^2$) | US Census Bureau | **9,257.82** | **US Census Bureau** | **Collected 3.8.13 from** http://quickfacts.census.gov/qfd/index.htm |
| | Assessment of a city's efforts to sustain and improve the quantity and quality (for example, proximity and usability) of green spaces, and its tree planting policy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by City of Long Beach** | **Several examples of conserving and improving green space including a tree planting program, edible gardens, a nature reserve, wetlands restoration and greening the Los Angeles River (**http://www.longbeach.gov/citymanager/sustainability/urban_nature/projects.asp**) Obtained 3.12.13** |
| | Assessment of how rigorously a city promotes containment of urban sprawl and reuse of brownfield areas (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Scott Cloutier, as informed by OC Weekly** | **Not a lot of information direct from the city of Long Beach on preventing sprawl or brownfield cleanup. However, sources do exist on brownfields. It seems as though sprawl isn't an issue for Long Beach given that it sits on the sea and is surrounded by LA. Obtained 3.11.13 from** http://blogs.ocweekly.com/navelgazing/a-clockwork-orange/long-beach-brownfield-epa-jobs/ |
| **Buildings** | Number of LEED certified buildings (buildings/100,00 persons) | USGBC | **4.30** | **USGBC** | **Obtained on 3.5.13 from** https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx |
| | Assessment of whether a city requires energy audits and whether energy regulations require that new buildings satisfy energy efficiency standards (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by City of Long Beach** | **All new municipal buildings and private development must meet LEED standards. Obtained 3.11.13** http://www.lbds.info/planning/advance_planning/green_building/default.asp#private_dev **Several links and information provided by the City of Long Beach to help residents become green as well.** http://www.lbds.info/planning/advance_planning/green_building/residential_green_building.asp |
| | Assessment of a city's incentives for retrofitting buildings to improve energy efficiency and how widely it promotes energy efficiency in homes and offices (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | | |
| **Transportation** | Share of workers traveling by public transit, bike or foot (%) | US Census Bureau American Community Survey | **8.40** | **American Community Survey** | **Obtained 3.9.13 from** http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_11_1YR_S0801&prodType=table |
| | Length of public transit (mi/mi2) | National Transit Database | **0.01** | **National Transit Database** | **(LBT) - Obtained on 3.9.13 from** http://www.ntdprogram.gov/ntdprogram/data.htm |
| | Annual vehicle revenue miles (miles/person) | National Transit Database | **8.57** | **National Transit Database** | **(LBT) - Obtained on 3.9.13 from** http://www.ntdprogram.gov/ntdprogram/data.htm |
| | Maximum public transit vehicles available per square mile (vehicles/mi$^2$) | National Transit Database | **0.15** | **National Transit Database** | **(LBT) - Obtained on 3.9.13 from** http://www.ntdprogram.gov/ntdprogram/data.htm |

# The Sustainable Neighborhoods Index Data Collection Sheet (Page 2 of 2)

City/Town/Neighborhood: **Long Beach** Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| **Transportation (cont'd)** | Average commute time from residence to work (minutes) | US Census Bureau American Community Survey | **29.10** | **American Community Survey** | **Obtained on 3.9.13 from** http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_11_1YR_S0801&prodType=table |
| | Assessment of how extensively the city promotes public transportation and offers incentives for less carbon-intensive travel (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by City of Long Beach** | **One of America's Greenest fleets of city owned vehicles, strategies for a greener air and seaport, more bike lanes, and investment in more public transportation Obtained 3.12.13 from** http://www.longbeach.gov/citymanager/sustainability/transportation/projects.asp |
| | Assessment of a city's efforts to reduce congestion (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | | |

| | | | | | |
|---|---|---|---|---|---|
| **Waste Management** | Recycled municipal waste (%) | Department of Public Works | **23.76** | **City of Long Beach** | **Obtained 3.9.13 from http://www.longbeachny.gov/vertical/sites/%7BC3C1054A-3D3A-41B3-8896-814D00B86D2A%7D/uploads/Solid_Waste_Management_Plan_Update.pdf (2009 data)** |
| | Assessment of measures to reduce waste and make waste disposal more sustainable (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **City of Long Beach** | **Long Beach is a leader in diverting and reducing waste. Obtained 3.12.13 from http://www.longbeach.gov/citymanager/sustainability/waste_reduction/projects.asp** |
| **Water Management** | Total water consumption per person per day (gallons) | USGS | **205** | **USGS** | **(Los Angeles County) Obtained 3.9.13 from http://waterdata.usgs.gov/usa/nwis/wu** |
| | Water leakages in water distribution system (%) | Public Works Department | **1.14** | **Matthew Lyons** | **3.11.13 at 2:10 p.m. called Matthew Lyons Director, Planning & Water Conservation 562-570-2315 Email: matthew.lyons@lbwater.org (http://www.lbwater.org/contact-lbwd) (Said he would email info) Received email at 2:38 p.m. with information.** |
| | Assessment of the level and quality of a city's main water sources (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Environmental Working Group** | **Obtained 3.11.13 (3-ranked in top third, 2 middle, 1 bottom third) from http://www.ewg.org/tap-water/rating-big-city-water.php** |
| | Indication of whether or not a city has a stormwater management plan (zero=1; 1=yes) | Advisory Panel or Committee | **1.00** | **City of Long Beach** | **Obtained 3.11.13 from http://www.longbeach.gov/stormwater/lb_stormwater_plan.asp** |
| **Food Management** | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | **1.72** | **City of Long Beach** | **Obtained 3.9.13 from http://www.longbeach.gov/citymanager/sustainability/about/sustainable_events_calendar.asp** |
| | Number of community gardens per 100,000 residents | Community Contacts & Websites | **4.08** | **City of Long Beach** | **Obtained.3.10.13 from http://www.longbeach.gov/park/recreation/cultural_programs/gardens.asp** |
| | Easily obtained resources on presence of farmers' markets accepting Women, Infants & Children (WIC) federal program vouchers and Food Stamp vouchers (zero=no; 1=yes) | Advisory Panel or Committee | **1.00** | **City of Long Beach** | **Obtained 3.10.13 from http://www.longbeach.gov/health/mcah/wic.asp** |
| **Business & Economic Development** | Presence of a clean technology incubator in the city (zero=1; 1=yes) | Community Contacts & Websites | **1.00** | **Clean Tech Incubator** | **Obtained 3.12.13 – Based in LA but Long Beach is covered. http://laincubator.org/** |
| | Presence of a city or private green business directory (zero=no; 1=yes) | Community Contacts & Websites | **1.00** | **City of Long Beach** | **Obtained 3.11.13 from http://www.longbeach.gov/citymanager/sustainability/green_business.asp** |
| | Average number of farmers' markets per 100,00 residents | Community Contacts & Websites | **1.72** | **City of Long Beach** | **Obtained 3.9.13 from http://www.longbeach.gov/citymanager/sustainability/about/sustainable_events_calendar.asp** |
| | Number of LEED Buildings per 100,000 residents | USGBC | **4.30** | **USGBC** | **Obtained on 3.5.13 from https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx** |
| **Community Governance** | Measure of the rigor of a city's green action plan (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by the City of Long Beach** | **Extremely well-rounded approach to sustainability and a plan for action. They also have internships and links to show people how they can help and participate. Obtained 3.11.13 from http://www.longbeach.gov/citymanager/sustainability/default.asp** |
| | Measure of the extensiveness of environmental management undertaken by the city (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | | |
| | Measure of the city's efforts to involve the public in monitoring its environmental performance (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | | |

Table C - 9 The Sustainable Neighborhoods Index Data Collection Sheet for Los Angeles (Two Tables)

## The Sustainable Neighborhoods Index Data Collection Sheet (Page 1 of 2)

City/Town/Neighborhood: **Los Angeles** | Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| **Energy Management** | Electricity consumption per unit of GDP(TJ/US$m) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | **0.17** | **The Green City Index US and Canada Report** | **Obtained 3.1.13** |
| | Electricity consumption per person (GJ) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | **26.7** | **The Green City Index US and Canada Report** | **Obtained 3.1.13** |
| | Measure of a city's commitment to promoting green energies, developing green energy projects and increasing the amount of locally produced energy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by the City of Los Angeles** | **Department of water uses** |
| **Urban Design** | Green Space as % of total land area (%) | Planning Department; US Census Bureau; Trust for Public Land | **14.10** | **Trust for Public Land; US Census Bureau** | **Collected 3.9.13 from http://cloud.tpl.org/pubs/ccpe-cityparkfacts-2012.pdf and http://quickfacts.census.gov/qfd/index.htm** |
| | Population density (person/mi$^2$) | US Census Bureau | **8,150.09** | **US Census Bureau** | **Collected 3.8.13 from http://quickfacts.census.gov/qfd/index.htm** |
| | Assessment of a city's efforts to sustain and improve the quantity and quality (for example, proximity and usability) of green spaces, and its tree planting policy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by the City of Los Angeles** | **City is dedicated to "unpaving paradise" by creating 35 new parks, revitalizing the Los Angeles river and developing locations for stormwater infiltration. Also a goal to plant 1 million trees! Obtained 3.11.13 from http://www.ci.la.ca.us/mayor/villaraigosaplan/EnergyandEnvironment/LACITY_004467.htm** |
| | Assessment of how rigorously a city promotes containment of urban sprawl and reuse of brownfield areas (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **http://www.environmentla.org/brownfields/index.htm** | **City is focused on redeveloping brownfields http://www.environmentla.org/brownfields/index.htm and low impact development to rebuild areas and not grow to new ones.** |
| **Buildings** | Number of LEED certified buildings (buildings/100,00 persons) | USGBC | **3.64** | **USGBC** | **Obtained on 3.5.13 from https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx** |
| | Assessment of whether a city requires energy audits and whether energy regulations require that new buildings satisfy energy efficiency standards (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by the City of Los Angeles** | **LA Green Building Code went into effect in 2011 for all new buildings (residential and non-residential) and require higher efficiencies and green standards. Obtained 3.11.13 from http://ladbs.org/LADBSWeb/green-bldg.jsf** |
| | Assessment of a city's incentives for retrofitting buildings to improve energy efficiency and how widely it promotes energy efficiency in homes and offices (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | | |
| **Transportation** | Share of workers traveling by public transit, bike or foot (%) | US Census Bureau American Community Survey | **9.70** | **American Community Survey** | **Obtained 3.9.13 from http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_11_1YR_S0801&prodType=table** |
| | Length of public transit (mi/mi2) | National Transit Database | **0.13** | **National Transit Database** | **(LADOT) – Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm** |
| | Annual vehicle revenue miles (miles/person) | National Transit Database | **1.00** | **National Transit Database** | **(LADOT) – Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm** |
| | Maximum public transit vehicles available per square mile (vehicles/mi$^2$) | National Transit Database | **1.00** | **National Transit Database** | **(LADOT) – Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm** |

# The Sustainable Neighborhoods Index Data Collection Sheet (Page 2 of 2)

City/Town/Neighborhood: **Los Angeles** Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| **Transportation** | Average commute time from residence to work | US Census Bureau American | **27.90** | **The Green City Index US and** | **Obtained 3.1.13 from** |

| | | | | | |
|---|---|---|---|---|---|
| **(cont'd)** | (minutes) | Community Survey | | **Canada Report** | http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Assessment of how extensively the city promotes public transportation and offers incentives for less carbon-intensive travel (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by the City of Los Angeles** | **City is dedicated to alternative fuel vehicles, reducing diesel emissions, increasing bicycle programs, utilizing Automatic Traffic Surveillance and Control to reduce congestion and has several means of public transit. Obtained 3.11.13 from** http://www.environmentla.org/2_airtrans.html |
| | Assessment of a city's efforts to reduce congestion (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | | |
| **Waste Management** | Recycled municipal waste (%) | Department of Public Works | **62.0** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from** http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Assessment of measures to reduce waste and make waste disposal more sustainable (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by the City of Los Angeles** | **The Mayor has challenged the city to divert 70% of its waste from landfills. Good stuff! Obtained 3.11.13 from** http://mayor.lacity.org/Issues/Environment/index.htm |
| **Water Management** | Total water consumption per person per day (gallons) | USGS | **205.00** | **USGS** | **(Los Angeles County) Obtained 3.9.13 from** http://waterdata.usgs.gov/usa/nwis/wu |
| | Water leakages in water distribution system (%) | Public Works Department | **5.30** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from** http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Assessment of the level and quality of a city's main water sources (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Environmental Working Group** | **Obtained 3.11.13 (3-ranked in top third, 2 middle, 1 bottom third) from** http://www.ewg.org/tap-water/rating-big-city-water.php |
| | Indication of whether or not a city has a stormwater management plan (zero=1; 1=yes) | Advisory Panel or Committee | **1.00** | **LA Stormwater** | **Obtained 3.11.13 from** http://www.lastormwater.org/ |
| **Food Management** | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | **2.12** | **LA Times** | **Obtained 3.9.13 from** http://www.latimes.com/features/food/la-fo-farmersmarketlist,0,2141302.htmlstory |
| | Number of community gardens per 100,000 residents | Community Contacts & Websites | **2.36** | **UCLA** | **Obtained 3.10.13 from** http://celosangeles.ucanr.edu/Common_Ground_Garden_Program/Community_Gardens/ |
| | Easily obtained resources on presence of farmers' markets accepting Women, Infants & Children (WIC) federal program vouchers and Food Stamp vouchers (zero=no; 1=yes) | Advisory Panel or Committee | **1.00** | **California WIC** | **Obtained 3.10. 13 from** http://www.cdph.ca.gov/programs/wicworks/Documents/FarmersMarket/WEB-WICAuthorizedMarkets.pdf |
| **Business & Economic Development** | Presence of a clean technology incubator in the city (zero=1; 1=yes) | Community Contacts & Websites | **1.00** | **Clean Tech Incubator** | **Obtained 3.12.13 – Based in LA but Long Beach is covered.** http://laincubator.org/ |
| | Presence of a city or private green business directory (zero=no; 1=yes) | Community Contacts & Websites | **0.00** | **Scott Cloutier via internet search** | **Nothing evident.** |
| | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | **2.12** | **LA Times** | **Obtained 3.9.13 from** http://www.latimes.com/features/food/la-fo-farmersmarketlist,0,2141302.htmlstory |
| | Number of LEED Buildings per 100,000 residents | USGBC | **3.64** | **USGBC** | **Obtained on 3.5.13 from** https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx |
| **Community Governance** | Measure of the rigor of a city's green action plan (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by the City of Los Angeles** | **Mayor is very progressive and has set great goals and tasks for his city to become green. Information is very easy to find and even mentioned involving the community as a whole so all are stewards. Obtained 3.12.13 from** http://www.environmentla.org/ead_sustainability.htm |
| | Measure of the extensiveness of environmental management undertaken by the city (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | | |
| | Measure of the city's efforts to involve the public in monitoring its environmental performance (1=below expectations; 2=meets | Advisory Panel or Committee | **3.00** | | |

| | | | | | |
|---|---|---|---|---|---|
| | expectations; 3=exceeds expectations) | | | | |

Table C - 10 The Sustainable Neighborhoods Index Data Collection Sheet for Miami (Two Tables)

## The Sustainable Neighborhoods Index Data Collection Sheet (Page 1 of 2)

City/Town/Neighborhood: **Miami** | Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| **Energy Management** | Electricity consumption per unit of GDP(TJ/US$m) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | **0.08** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf** |
| | Electricity consumption per person (GJ) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | **37.9** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf** |
| | Measure of a city's commitment to promoting green energies, developing green energy projects and increasing the amount of locally produced energy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by the City of Miami** | **On the right path! Efforts include methane sequestration from landfill, library daylighting, and solar power demonstrations for powering county park buildings. Obtained 3.12.13 from http://www.miamidade.gov/green/eecbg.asp** |
| **Urban Design** | Green Space as % of total land area (%) | Planning Department; US Census Bureau; Trust for Public Land | **5.20** | **Trust for Public Land; US Census Bureau** | **Collected 3.9.13 from http://cloud.tpl.org/pubs/ccpe-cityparkfacts-2012.pdf and http://quickfacts.census.gov/qfd/index.htm** |
| | Population density (person/mi$^2$) | US Census Bureau | **11,354.17** | **US Census Bureau** | **Collected 3.8.13 from http://quickfacts.census.gov/qfd/index.htm** |
| | Assessment of a city's efforts to sustain and improve the quantity and quality (for example, proximity and usability) of green spaces, and its tree planting policy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by the City of Miami** | **Plans include a parks and open space master plan to preserve and protect greenspace. The goal of the master plan is to be able to travel on foot, skates or bike through a safe pathway of connecting parks and green spaces from northern Miami-Dade County to its southernmost tip. http://www.miamidade.gov/green/build-green.asp Soild brownfield development group as well. http://www.miamidade.gov/development/pollution/brownfields.asp** |
| | Assessment of how rigorously a city promotes containment of urban sprawl and reuse of brownfield areas (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | | |
| **Buildings** | Number of LEED certified buildings (buildings/100,00 persons) | USGBC | **14.68** | **USGBC** | **Obtained on 3.5.13 from https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx** |
| | Assessment of whether a city requires energy audits and whether energy regulations require that new buildings satisfy energy efficiency standards (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by the City of Miami** | **City provides energy audits. http://www.dasolar.com/energy-audit/florida/miami-dade-county and recongnizes the importance of building efficiency, including conducting its own audits and retrofitting residential homes. http://www.miamigov.com/msi/pages/Climate%20Action/Default.asp Obtained 3.13.13.** |
| | Assessment of a city's incentives for retrofitting buildings to improve energy efficiency and how widely it promotes energy efficiency in homes and offices (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | | |
| **Transportation** | Share of workers traveling by public transit, bike or foot (%) | US Census Bureau American Community Survey | **5.90** | **American Community Survey** | **Obtained 3.9.13 from http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_11_1YR_S0801&prodType=table** |
| | Length of public transit (mi/mi2) | National Transit Database | **0.48** | **National Transit Database** | **(Miami-Dade) - Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm** |
| | Annual vehicle revenue miles (miles/person) | National Transit Database | **19.84** | **National Transit Database** | **(Miami-Dade) - Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm** |
| | Maximum public transit vehicles available per square mile (vehicles/mi$^2$) | National Transit Database | **4.51** | **National Transit Database** | **(Miami-Dade) - Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm** |

# The Sustainable Neighborhoods Index Data Collection Sheet (Page 2 of 2)

City/Town/Neighborhood: **Miami** | Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| **Transportation (cont'd)** | Average commute time from residence to work (minutes) | US Census Bureau American Community Survey | **26.7** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf** |
| | Assessment of how extensively the city promotes public transportation and offers incentives for less carbon-intensive travel (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by the City of Miami** | **Miami is focused on promoting carpooling, has included hybrid buses in its fleet, improving and adding bike trails, and on-demand public transit. Obtained 3.13.13 from http://www.miamidade.gov/green/transportation.asp** |
| | Assessment of a city's efforts to reduce congestion (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | | |
| **Waste Management** | Recycled municipal waste (%) | Department of Public Works | **18.00** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf** |
| | Assessment of measures to reduce waste and make waste disposal more sustainable (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Scott Cloutier, as informed by the City of Miami** | **Good information on recycling and where to go etc. but Miami doesn't clearly state that it is focused on increasing its waste diverted percentage etc. Obtained 3.13.13 from http://www.miamigov.com/msi/pages/Recycling/default.asp and http://www.miamidade.gov/green/recycling.asp** |
| **Water Management** | Total water consumption per person per day (gallons) | USGS | **167.00** | **USGS** | **(Miami-Dade County) Obtained 3.9.13 from http://waterdata.usgs.gov/usa/nwis/wu** |
| | Water leakages in water distribution system (%) | Public Works Department | **8.30** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf** |
| | Assessment of the level and quality of a city's main water sources (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Environmental Working Group** | **Obtained 3.11.13 (3-ranked in top third, 2 middle, 1 bottom third) from http://www.ewg.org/tap-water/rating-big-city-water.php** |
| | Indication of whether or not a city has a stormwater management plan (zero=1; 1=yes) | Advisory Panel or Committee | **1.00** | **City of Miami** | **Obtained 3.11.13 from http://www.miamidade.gov/development/stormwater.asp** |
| **Food Management** | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | **1.96** | **Go Miami** | **Obtained 3.9.13 from http://gomiami.about.com/od/shopping/a/Farmers-Markets-In-Miami.htm** |
| | Number of community gardens per 100,000 residents | Community Contacts & Websites | **2.94** | **Local Food South Florida** | **Obtained 3.10.13 from http://localfoodsouthflorida.org/commgardens.html** |
| | Easily obtained resources on presence of farmers' markets accepting Women, Infants & Children (WIC) federal program vouchers and Food Stamp vouchers (zero=no; 1=yes) | Advisory Panel or Committee | **1.00** | **Super News** | **Obtained 3.10.13 from http://supermarketnews.com/latest-news/farmers-market-take-wic-snap** |
| **Business & Economic Development** | Presence of a clean technology incubator in the city (zero=1; 1=yes) | Community Contacts & Websites | **0.00** | **Scott Cloutier via internet search** | **None evident as of 3.11.13** |
| | Presence of a city or private green business directory (zero=no; 1=yes) | Community Contacts & Websites | **0.00** | **Scott Cloutier via internet search** | **Cool resource for going green as a business but no directory.** |
| | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | **1.96** | **Go Miami** | **Obtained 3.9.13 from http://gomiami.about.com/od/shopping/a/Farmers-Markets-In-Miami.htm** |
| | Number of LEED Buildings per 100,000 residents | USGBC | **14.68** | **USGBC** | **Obtained on 3.5.13 from https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx** |

| | | | | | |
|---|---|---|---|---|---|
| **Community Governance** | Measure of the rigor of a city's green action plan (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Scott Cloutier, as informed by the City of Miami** | **Miami is doing some great things when it comes to being green but there could be more about improving waste management and including the general public.** |
| | Measure of the extensiveness of environmental management undertaken by the city (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | | |
| | Measure of the city's efforts to involve the public in monitoring its environmental performance (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | | |

Table C - 11 The Sustainable Neighborhoods Index Data Collection Sheet for Milwaukee (Two Tables)

## The Sustainable Neighborhoods Index Data Collection Sheet (Page 1 of 2)

City/Town/Neighborhood: **Milwaukee** Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| **Energy Management** | Electricity consumption per unit of GDP(TJ/US$m) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | **.003** | **EIA** | **Called Milwaukee Office of Sustainability (http://city.milwaukee.gov/about) 3.11.13 at 2:20 p.m. 414-286-8317 (left message w/ Kyle). Received call back at 9:05 a.m. on 3.12.13 and told he has data for city only. He will email it to me. Obtained state level data from EIA (http://www.eia.gov/state/seds/sep_sum/html/pdf/rank_use_per_cap.pdf)** |
| | Electricity consumption per person (GJ) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | **6.51** | **EIA** | |
| | Measure of a city's commitment to promoting green energies, developing green energy projects and increasing the amount of locally produced energy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by the City of Milwaukee** | **City has incentives for solar panels for homeowners (2k cash-back) and a solar group purchasing program plus they collaborate with a local credit union to offer low-interest solar loans. (http://city.milwaukee.gov/milwaukeeshines) They have also installed EV stations around town. (http://city.milwaukee.gov/sustainability/EVCharging) and have a 100kW wind turbine near lake Michigan to power a city building (http://city.milwaukee.gov/sustainability/WindProject) Obtained 3.13.13** |
| **Urban Design** | Green Space as % of total land area (%) | Planning Department; US Census Bureau; Trust for Public Land | **10.41** | **Trust for Public Land; US Census Bureau** | **Collected 3.9.13 from http://cloud.tpl.org/pubs/ccpe-cityparkfacts-2012.pdf and http://quickfacts.census.gov/qfd/index.htm** |
| | Population density (person/mi$^2$) | US Census Bureau | **2,476.67** | **US Census Bureau** | **Collected 3.8.13 from http://quickfacts.census.gov/qfd/index.htm** |
| | Assessment of a city's efforts to sustain and improve the quantity and quality (for example, proximity and usability) of green spaces, and its tree planting policy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by the City of Milwaukee** | **City is clearly dedicated to increasing green space and accessibility (http://city.milwaukee.gov/ImageLibrary/Groups/cityDCD/planning/plans/Citywide/plan/Natural.pdf) and has been noted for preventing further use of water from Lake Michigan to combat sprawl (http://www.jsonline.com/blogs/purple-wisconsin/159768445.html). Obtained 3.13.13** |
| | Assessment of how rigorously a city promotes containment of urban sprawl and reuse of brownfield areas (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | | |
| **Buildings** | Number of LEED certified buildings (buildings/100,00 persons) | USGBC | **5.35** | **USGBC** | **Obtained on 3.5.13 from https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx** |
| | Assessment of whether a city requires energy audits and whether energy regulations require that new buildings satisfy energy efficiency standards (1=below expectations; 2=meets | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by the City of Milwaukee** | **The city has the federally funded Milwaukee Energy Efficiency Program (ME$^2$) that assists homes and businesses in becoming more energy efficient. They also provide grants from 30-300k for efficiency improvements. http://www.smartenergypays.com/** |

| | | | | | |
|---|---|---|---|---|---|
| | expectations; 3=exceeds expectations) | | | | |
| | Assessment of a city's incentives for retrofitting buildings to improve energy efficiency and how widely it promotes energy efficiency in homes and offices (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 3.00 | | |
| **Transportation** | Share of workers traveling by public transit, bike or foot (%) | US Census Bureau American Community Survey | 15.8 | American Community Survey | Obtained 3.9.13 from http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_11_1YR_S0801&prodType=table |
| | Length of public transit (mi/mi2) | National Transit Database | 0.00 | National Transit Database | (MCTS) – Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm |
| | Annual vehicle revenue miles (miles/person) | National Transit Database | 20.67 | National Transit Database | (MCTS) – Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm |
| | Maximum public transit vehicles available per square mile (vehicles/mi$^2$) | National Transit Database | 3.68 | National Transit Database | (MCTS) – Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm |

# The Sustainable Neighborhoods Index Data Collection Sheet (Page 2 of 2)

City/Town/Neighborhood: **Milwaukee** Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| **Transportation (cont'd)** | Average commute time from residence to work (minutes) | US Census Bureau American Community Survey | 21.7 | American Community Survey | Obtained on 3.9.13 from http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_11_1YR_S0801&prodType=table |
| | Assessment of how extensively the city promotes public transportation and offers incentives for less carbon-intensive travel (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 2.00 | Scott Cloutier, as informed by the City of Milwaukee | The city is focused on including EV stations (http://city.milwaukee.gov/sustainability/EVCharging) and has included a fleet of clean diesel buses (http://www.sustainablecitynetwork.com/topic_channels/transportation/article_0529b2e6-1e5b-11e0-bad9-00127992bc8b.html?mode=image&photo=0). However, there is great concern (http://www.facebook.com/notes/representative-jon-richards/mass-transit-should-get-help-in-next-state-budget/10151350210885746) about the lack of an efficient public transit sytem. The city is high on the congestion list nationally and needs to do more about it. (http://www.bizjournals.com/milwaukee/blog/2013/02/milwaukee-ranks-57th-in-congestion.html) |
| | Assessment of a city's efforts to reduce congestion (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 2.00 | | |
| **Waste Management** | Recycled municipal waste (%) | Department of Public Works | 21.40 | City of Milwaukee | Obtained on 3.9.13 from http://www.milwaukeerecycles.com/documents/DPW_Annual_Recycling_Rpt_2010.pdf |
| | Assessment of measures to reduce waste and make waste disposal more sustainable (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 1.00 | Scott Cloutier, as informed by internet search | No evident information exists on Milwaukees plans to reduce the waste stream. Furthermore, they are below the mean when it comes to percent waste diverted. |
| **Water Management** | Total water consumption per person per day (gallons) | USGS | 151.00 | USGS | (Milwaukee County) Obtained 3.9.13 from http://waterdata.usgs.gov/usa/nwis/wu |
| | Water leakages in water distribution system (%) | Public Works Department | 11.90 | Carrie Lewis, Superintendent of Milwaukee Water Works | Called Milwaukee Water Works on 3.11.13 at 2:26 p.m. 414-286-2830. Asked to email watwebcs@milwaukee.gov (Did so at 2:32 pm on 3.11.13) Received reply email from Carrie Lewis with 2012 data at 3:04 pm 3.11.13 |
| | Assessment of the level and quality of a city's main water sources (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 3.00 | Environmental Working Group | Obtained 3.11.13 (3-ranked in top third, 2 middle, 1 bottom third) from http://www.ewg.org/tap-water/rating-big-city-water.php |

| | | | | | |
|---|---|---|---|---|---|
| | Indication of whether or not a city has a stormwater management plan (zero=1; 1=yes) | Advisory Panel or Committee | **1.00** | **City of Milwaukee** | **Obtained 3.11.13 from** http://city.milwaukee.gov/stormwatermanagement |
| **Food Management** | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | **3.35** | **About Milwaukee** | **Obtained 3.9.13 from** http://milwaukee.about.com/od/sportsrecreationhealth/qt/FarmersMarkets.htm |
| | Number of community gardens per 100,000 residents | Community Contacts & Websites | **1.51** | **U of Wisconsin** | **Obtained 3.10.13 from** http://milwaukee.uwex.edu/agriculture/garden-rental/milwaukeegardens/ |
| | Easily obtained resources on presence of farmers' markets accepting Women, Infants & Children (WIC) federal program vouchers and Food Stamp vouchers (zero=no; 1=yes) | Advisory Panel or Committee | **1.00** | **Express Milwaukee** | **Obtained 3.10.13 from** http://expressmilwaukee.com/article-18840-2012-farmers'-market-guide.html |
| **Business & Economic Development** | Presence of a clean technology incubator in the city (zero=1; 1=yes) | Community Contacts & Websites | **0.00** | **Scott Cloutier via internet search** | **None evident as of 3.11.13** |
| | Presence of a city or private green business directory (zero=no; 1=yes) | Community Contacts & Websites | **1.00** | **City of Milwaukee** | **Obtained 3.11.13 from** http://city.milwaukee.gov/Projects/CenturyCity.htm |
| | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | **3.35** | **About Milwaukee** | **Obtained 3.9.13 from** http://milwaukee.about.com/od/sportsrecreationhealth/qt/FarmersMarkets.htm |
| | Number of LEED Buildings per 100,000 residents | USGBC | **5.35** | **USGBC** | **Obtained on 3.5.13 from** https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx |
| **Community Governance** | Measure of the rigor of a city's green action plan (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by the City of Milwaukee** | **Milwaukee is in the upper echelon of the class when looking at their sustainability goals and efforts. It would be nice to see more done in waste but they are definitely excelling in many other areas.** |
| | Measure of the extensiveness of environmental management undertaken by the city (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | | |
| | Measure of the city's efforts to involve the public in monitoring its environmental performance (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | | |

Table C - 12 The Sustainable Neighborhoods Index Data Collection Sheet for New York City (Two Tables)

## The Sustainable Neighborhoods Index Data Collection Sheet (Page 1 of 2)

City/Town/Neighborhood: **New York City** | Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| **Energy Management** | Electricity consumption per unit of GDP(TJ/US$m) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | **0.50** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from** http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Electricity consumption per person (GJ) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | **64.7** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from** http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Measure of a city's commitment to promoting green energies, developing green energy projects and increasing the amount of locally produced energy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Scott Cloutier, as informed by the Green City Index and internet sources** | **They city has not clearly identified goals to include more renewables in its plans even though there is evidence (**http://www.renewableenergyworld.com/rea/blog/post/2011/09/new-york-citys-solar-windfall-illuminates-americas-clean-energy-future**) that solar panels would help immensely. However, recent work (**http://www1.cuny.edu/mu/law/2013/03/05/nick-widzowski-14-helps-draft-nyc-bill-on-renewable-energy-website/**) has shown a new renewable bill in place for NYC and could mean great change.** |
| **Urban Design** | Green Space as % of total land area (%) | Planning Department; US | **19.72** | **Trust for Public Land; US** | **Collected 3.9.13 from** http://cloud.tpl.org/pubs/ccpe-cityparkfacts- |

| | | | | | |
|---|---|---|---|---|---|
| | | Census Bureau; Trust for Public Land | | **Census Bureau** | 2012.pdf **and** http://quickfacts.census.gov/qfd/index.htm |
| | Population density (person/mi$^2$) | US Census Bureau | **27,243.29** | **US Census Bureau** | **Collected 3.8.13 from** http://quickfacts.census.gov/qfd/index.htm |
| | Assessment of a city's efforts to sustain and improve the quantity and quality (for example, proximity and usability) of green spaces, and its tree planting policy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by the Green City Index** | **The city is very progressive and has maintained a huge amount of green space and progressive brownfield reuse policies. Obtained 3.13.13 from** http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Assessment of how rigorously a city promotes containment of urban sprawl and reuse of brownfield areas (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | | |
| **Buildings** | Number of LEED certified buildings (buildings/100,00 persons) | USGBC | **2.91** | **USGBC** | **Obtained on 3.5.13 from** https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx |
| | Assessment of whether a city requires energy audits and whether energy regulations require that new buildings satisfy energy efficiency standards (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by the Green City Index** | **New York City mandates energy audits and has strict energy efficiency policies for new buildings; they are the most comprehensive set of efficiency policies in the US. Obtained 3.13.13 from** http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Assessment of a city's incentives for retrofitting buildings to improve energy efficiency and how widely it promotes energy efficiency in homes and offices (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | | |
| **Transportation** | Share of workers traveling by public transit, bike or foot (%) | US Census Bureau American Community Survey | **37.2** | **American Community Survey** | **Obtained 3.9.13 from** http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_11_1YR_S0801&prodType=table |
| | Length of public transit (mi/mi2) | National Transit Database | **1.73** | **National Transit Database** | **(NYCT) - Obtained on 3.9.13 from** http://www.ntdprogram.gov/ntdprogram/data.htm |
| | Annual vehicle revenue miles (miles/person) | National Transit Database | **39.68** | **National Transit Database** | **(NYCT) - Obtained on 3.9.13 from** http://www.ntdprogram.gov/ntdprogram/data.htm |
| | Maximum public transit vehicles available per square mile (vehicles/mi$^2$) | National Transit Database | **34.60** | **National Transit Database** | **(NYCT) - Obtained on 3.9.13 from** http://www.ntdprogram.gov/ntdprogram/data.htm |

# The Sustainable Neighborhoods Index Data Collection Sheet (Page 2 of 2)

City/Town/Neighborhood: **New York City** | Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| **Transportation (cont'd)** | Average commute time from residence to work (minutes) | US Census Bureau American Community Survey | **34.6** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from** http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Assessment of how extensively the city promotes public transportation and offers incentives for less carbon-intensive travel (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by the Green City Index** | **New York City is well-known for its extensive bus and subway networks. They also have bike sharing and encourage lots of walking and alternative modes of transit given the high density and costs to store a car. Obtained 3.13.13 from** http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Assessment of a city's efforts to reduce congestion (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | | |
| **Waste** | Recycled municipal waste (%) | Department of Public Works | **30.4** | **The Green City Index US and** | **Obtained 3.1.13 from** |

| | | | | | |
|---|---|---|---|---|---|
| **Management** | | | | **Canada Report** | http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Assessment of measures to reduce waste and make waste disposal more sustainable (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Scott Cloutier, as informed by the Green City Index** | **NYC has a decent waste diversion rate but lacks in a sustainable waste management plan. Obtained 3.13.13 from** http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| **Water Management** | Total water consumption per person per day (gallons) | USGS | **69.00** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from** http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Water leakages in water distribution system (%) | Public Works Department | **14.2** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from** http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Assessment of the level and quality of a city's main water sources (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Environmental Working Group** | **Obtained 3.11.13 (3-ranked in top third, 2 middle, 1 bottom third) from** http://www.ewg.org/tap-water/rating-big-city-water.php |
| | Indication of whether or not a city has a stormwater management plan (zero=1; 1=yes) | Advisory Panel or Committee | **1.00** | **PlaNYC** | **Obtained 3.11.13 from** http://nytelecom.vo.llnwd.net/o15/agencies/planyc2030/pdf/report_10_2010.pdf |
| **Food Management** | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | **1.66** | **NYC Open Data** | **Obtained 3.9.13 from** https://nycopendata.socrata.com/Business-and-Economic/2012-NYC-Farmers-Market-List/b7kx-qikm |
| | Number of community gardens per 100,000 residents | Community Contacts & Websites | **7.28** | **City of New York** | **Obtained 3.10.13 from** http://www.nycgovparks.org/about/history/community-gardens/movement |
| | Easily obtained resources on presence of farmers' markets accepting Women, Infants & Children (WIC) federal program vouchers and Food Stamp vouchers (zero=no; 1=yes) | Advisory Panel or Committee | **1.00** | **State of New York** | **Obtained 3.10.13 from** http://www.health.ny.gov/prevention/nutrition/fmnp/ |
| **Business & Economic Development** | Presence of a clean technology incubator in the city (zero=1; 1=yes) | Community Contacts & Websites | **1.00** | **NYU-Poly** | **Obtained 3.11.13 from** http://www.poly.edu/business/incubators |
| | Presence of a city or private green business directory (zero=no; 1=yes) | Community Contacts & Websites | **1.00** | **Scott Cloutier via internet search** | **None evident as of 3.11.13** |
| | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | **1.66** | **NYC Open Data** | **Obtained 3.9.13 from** https://nycopendata.socrata.com/Business-and-Economic/2012-NYC-Farmers-Market-List/b7kx-qikm |
| | Number of LEED Buildings per 100,000 residents | USGBC | **2.91** | **USGBC** | **Obtained on 3.5.13 from** https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx |
| **Community Governance** | Measure of the rigor of a city's green action plan (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Scott Cloutier as informed by internet search and GCI** | **The city is very progressive in areas, including transportation and urban design but could use some work pushing waste diversion rates up and decreasing energy use per capita. Furthermore, there needs to be a larger visible effort to include the general public in sustainability and a push to improve the NYC sustainability dept.** |
| | Measure of the extensiveness of environmental management undertaken by the city (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | | |
| | Measure of the city's efforts to involve the public in monitoring its environmental performance (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **1.00** | | |

Table C - 13 The Sustainable Neighborhoods Index Data Collection Sheet for Oakland (Two Tables)

## The Sustainable Neighborhoods Index Data Collection Sheet (Page 1 of 2)

City/Town/Neighborhood: **Oakland** | Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| **Energy Management** | Electricity consumption per unit of GDP(TJ/US$m) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | **.001** | **EIA** | **Called PG&E 3.11.13 (800-743-5000) and told to reach out to City of Oakland, as information is private. Called Garrett Fitzgerald at 510-238-6179 on 3.11.13 at 3:18 p.m and left message. (http://www.oaklandnet.com/citydirectory/Default.asp?q=&d=Public+Works%5EEnv+Svcs+Sustainability&Submit=Find) Obtained state level data from EIA (http://www.eia.gov/state/seds/sep_sum/html/pdf/rank_use_per_cap.pdf)** |
| | Electricity consumption per person (GJ) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | **24.46** | **EIA** | |
| | Measure of a city's commitment to promoting green energies, developing green energy projects and increasing the amount of locally produced energy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by the City of Oakland** | **Oakland is focused on increasing solar power-generation capacity and is focused on meeting ten percent of the city's peak electrical load. The city has also installed 1 MW of solar panels on roofs of municipal buildings. Obtained 3.13.13 from http://www2.oaklandnet.com/Government/o/PWA/s/SO/OAK025281** |
| **Urban Design** | Green Space as % of total land area (%) | Planning Department; US Census Bureau; Trust for Public Land | **16.63** | **Trust for Public Land; US Census Bureau** | **Collected 3.9.13 from http://cloud.tpl.org/pubs/ccpe-cityparkfacts-2012.pdf and http://quickfacts.census.gov/qfd/index.htm** |
| | Population density (person/mi$^2$) | US Census Bureau | **7,094.77** | **US Census Bureau** | **Collected 3.8.13 from http://quickfacts.census.gov/qfd/index.htm** |
| | Assessment of a city's efforts to sustain and improve the quantity and quality (for example, proximity and usability) of green spaces, and its tree planting policy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by City of Oakland** | **Oakland recently celebrated 100 years of providing parks and is focused on new affordable green developments that incorporate green space. There are also policies protecting green space and promoting conservation. Obtained 3.13.13 from http://www2.oaklandnet.com/Government/o/PWA/o/FE/s/SO/OurFocusAreas/HousingLandUseTransportation/index.htm There are also several examples of brownfield redevelopment within Oakland from http://www2.oaklandnet.com/Government/o/PWA/o/FE/s/BAC/index.htm** |
| | Assessment of how rigorously a city promotes containment of urban sprawl and reuse of brownfield areas (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | | |
| **Buildings** | Number of LEED certified buildings (buildings/100,00 persons) | USGBC | **11.87** | **USGBC** | **Obtained on 3.5.13 from https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx** |
| | Assessment of whether a city requires energy audits and whether energy regulations require that new buildings satisfy energy efficiency standards (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by City of Oakland** | **Oakland has a Civic Green Building Ordinance and a green building portal for residents to learn how to build green. They also provide assistance for private developers and have a green building resources center, an Oakland green buildings map and a green roofs for healthy cities group. They also help residents weatherize their homes and improve energy efficiency. Obtained 3.13.13 from http://www2.oaklandnet.com/Government/o/PWA/o/FE/s/SO/OurFocusAreas/Legislation/index.htm#greenbuildings** |
| | Assessment of a city's incentives for retrofitting buildings to improve energy efficiency and how widely it promotes energy efficiency in homes and offices (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | | |
| **Transportation** | Share of workers traveling by public transit, bike or foot (%) | US Census Bureau American Community Survey | **27.30** | **American Community Survey** | **Obtained 3.9.13 from http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_11_1YR_S0801&prodType=table** |
| | Length of public transit (mi/mi2) | National Transit Database | **0.15** | **National Transit Database** | **(AC Transit) - Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm** |
| | Annual vehicle revenue miles (miles/person) | National Transit Database | **18.07** | **National Transit Database** | **(AC Transit) - Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm** |
| | Maximum public transit vehicles available per square mile (vehicles/mi$^2$) | National Transit Database | **2.26** | **National Transit Database** | **(AC Transit) - Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm** |

# The Sustainable Neighborhoods Index Data Collection Sheet (Page 2 of 2)

| City/Town/Neighborhood: **Oakland** | | | Data Collection Researcher: **Scott Cloutier** | | |
|---|---|---|---|---|---|
| **Category** | **Indicator** | **Potential Sources** | **Collected Data** | **Actual Source** | **Notes** |
| **Transportation (cont'd)** | Average commute time from residence to work (minutes) | US Census Bureau American Community Survey | **29.30** | **American Community Survey** | **Obtained on 3.9.13 from http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_11_1YR_S0801&prodType=table** |
| | Assessment of how extensively the city promotes public transportation and offers incentives for less carbon-intensive travel (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by City of Oakland** | **Oakland offers a free shuttle for use downtown, has a bicycle implementation plan, the inclusion of EVs to its fleet of city vehicles, alternative fueling stations, transit oriented development policies, and new housing downtown to reduce the need to personal vehicles. Obtained 3.13.13 from http://www2.oaklandnet.com/Government/o/PWA/o/FE/s/SO/OurFocusAreas/HousingLandUseTransportation/index.htm** |
| | Assessment of a city's efforts to reduce congestion (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | | |
| **Waste Management** | Recycled municipal waste (%) | Department of Public Works | **72.30** | **City of Oakland** | **Obtained on 3.9.13 from http://www2.oaklandnet.com/Government/o/PWA/o/FE/s/GAR/index.htm** |
| | Assessment of measures to reduce waste and make waste disposal more sustainable (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by City of Oakland** | **Oakland has a zero waste goal by 2020, a solid waste reduction goal, a bring your own bag campaign, residential and business recycling, C7D recycling and a polystyrene foam ban. They also have a very high recycling rate. Obtained on 3.13.13 from http://www2.oaklandnet.com/Government/o/PWA/o/FE/s/SO/OurFocusAreas/NaturalResourcesWasteEnvironmentalHealth/index.htm** |
| **Water Management** | Total water consumption per person per day (gallons) | USGS | **109.00** | **USGS** | **(Alameda County) Obtained 3.9.13 from http://waterdata.usgs.gov/usa/nwis/wu** |
| | Water leakages in water distribution system (%) | Public Works Department | **22.39** | **Abby Figueroa, City of Oakland** | **Called East Bay Municipal Utility District 3.11.13 at 2:46 p.m. Transferred to water conservation department and shifted to public information department. 866-403-2683. (Confirmation number – 4710655) Called back by Abby Figueroa on 3.14.13 at 9:00 p.m. and she left a message. Called her back (510) 287-0134 on 3.15.13 and asked for data. Said she would return it to me asap. Received email on 3.19.13 with number.** |
| | Assessment of the level and quality of a city's main water sources (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Environmental Working Group** | **Obtained 3.11.13 (3-ranked in top third, 2 middle, 1 bottom third) from http://www.ewg.org/tap-water/rating-big-city-water.php** |
| | Indication of whether or not a city has a stormwater management plan (zero=1; 1=yes) | Advisory Panel or Committee | **1.00** | **City of Oakland** | **Obtained 3.11.13 from http://www2.oaklandnet.com/Government/o/PWA/DOWD000876** |
| **Food Management** | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | **3.03** | **Visit Oakland** | **Obtained 3.9.13 from http://visitoakland.org/visiting_dining_farmers.cfm** |
| | Number of community gardens per 100,000 residents | Community Contacts & Websites | **4.04** | **City of Oakland** | **Obtained 3.9.13 from http://www2.oaklandnet.com/Government/o/opr/s/cgardening/index.htm** |
| | Easily obtained resources on presence of farmers' markets accepting Women, Infants & Children (WIC) federal program vouchers and Food Stamp vouchers (zero=no; 1=yes) | Advisory Panel or Committee | **1.00** | **Alameda County** | **Obtained 3.10.13 from http://www.acphd.org/media/102170/farmers_market.pdf** |
| **Business & Economic Development** | Presence of a clean technology incubator in the city (zero=1; 1=yes) | Community Contacts & Websites | **1.00** | **East Bay Corridor** | **Obtained 3.11.13 from http://www.ebgreencorridor.org/start.php** |
| | Presence of a city or private green business directory (zero=no; 1=yes) | Community Contacts & Websites | **1.00** | **City of Oakland** | **Obtained 3.11.13 from http://www2.oaklandnet.com/oakca1/groups/ceda/documents/report/oak037850.pdf** |
| | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | **3.03** | **Visit Oakland** | **Obtained 3.9.13 from http://visitoakland.org/visiting_dining_farmers.cfm** |
| | Number of LEED Buildings per 100,000 | USGBC | **11.87** | **USGBC** | **Obtained on 3.5.13 from** |

| | | | | | |
|---|---|---|---|---|---|
| | residents | | | | https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx |
| **Community Governance** | Measure of the rigor of a city's green action plan (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 3.00 | **Scott Cloutier, as informed by City of Oakland** | **The city of Oakland is very progressive and has made great strides to move toward sustainability. It is clear that their agenda is centered on being green and their policies are allowing this. They also have workshops to include the public and educate them.** http://www2.oaklandnet.com/Government/o/PWA/o/FE/s/SO/index.htm |
| | Measure of the extensiveness of environmental management undertaken by the city (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 3.00 | | |
| | Measure of the city's efforts to involve the public in monitoring its environmental performance (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 3.00 | | |

Table C - 14 The Sustainable Neighborhoods Index Data Collection Sheet for Portland (Two Tables)

## The Sustainable Neighborhoods Index Data Collection Sheet (Page 1 of 2)

City/Town/Neighborhood: **Portland** Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| **Energy Management** | Electricity consumption per unit of GDP(TJ/US$m) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | **0.002** | **Portland Online** | **Electricity (2007) found 3.10.13 from** http://www.portlandonline.com/portlandplan/index.cfm?a=270874&c=51427 **27% of 105,077,140 MBtu** |
| | Electricity consumption per person (GJ) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | **50.41** | **Portland Online** | |
| | Measure of a city's commitment to promoting green energies, developing green energy projects and increasing the amount of locally produced energy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **City of Portland** | **Several examples of renewable energy incentives and installations by the city.** http://www.portlandoregon.gov/bps/41462 |
| **Urban Design** | Green Space as % of total land area (%) | Planning Department; US Census Bureau; Trust for Public Land | **30.82** | **Trust for Public Land; US Census Bureau** | **Collected 3.9.13 from** http://cloud.tpl.org/pubs/ccpe-cityparkfacts-2012.pdf **and** http://quickfacts.census.gov/qfd/index.htm |
| | Population density (person/mi$^2$) | US Census Bureau | **4,450.42** | **US Census Bureau** | **Collected 3.8.13 from** http://quickfacts.census.gov/qfd/index.htm |
| | Assessment of a city's efforts to sustain and improve the quantity and quality (for example, proximity and usability) of green spaces, and its tree planting policy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by the City of Portland** | **Portland is well known for its green spaces and sustainable growth.** http://www.travelportland.com/media/press-kits-1/green-portland-sustainability-parks-gardens **and has done a great deal with respect to brownfield development.** http://www.portlandoregon.gov/bes/35008 **A city wide tree improvement project is in action too.** |
| | Assessment of how rigorously a city promotes containment of urban sprawl and reuse of brownfield areas (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | | |
| **Buildings** | Number of LEED certified buildings (buildings/100,00 persons) | USGBC | **30.82** | **USGBC** | **Obtained on 3.5.13 from** https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx |
| | Assessment of whether a city requires energy audits and whether energy regulations require that new buildings satisfy energy efficiency standards (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by the City of Portland** | **Several examples exist of incentives and methods to improve building efficiency as well as examples of projects completed. Obtained 3.13.13 from** http://www.portlandoregon.gov/bps/41481 |
| | Assessment of a city's incentives for retrofitting buildings to improve energy efficiency and how widely it promotes energy efficiency in homes and offices (1=below | Advisory Panel or Committee | **3.00** | | |

| | | | | | |
|---|---|---|---|---|---|
| | expectations; 2=meets expectations; 3=exceeds expectations) | | | | |
| **Transportation** | Share of workers traveling by public transit, bike or foot (%) | US Census Bureau American Community Survey | **24.20** | **American Community Survey** | **Obtained 3.9.13 from** http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_11_1YR_S0801&prodType=table |
| | Length of public transit (mi/mi2) | National Transit Database | **0.25** | **National Transit Database** | **(TriMat) - Obtained on 3.9.13 from** http://www.ntdprogram.gov/ntdprogram/data.htm |
| | Annual vehicle revenue miles (miles/person) | National Transit Database | **23.54** | **National Transit Database** | **(TriMat) - Obtained on 3.9.13 from** http://www.ntdprogram.gov/ntdprogram/data.htm |
| | Maximum public transit vehicles available per square mile (vehicles/mi$^2$) | National Transit Database | **1.86** | **National Transit Database** | **(TriMat) - Obtained on 3.9.13 from** http://www.ntdprogram.gov/ntdprogram/data.htm |

# The Sustainable Neighborhoods Index Data Collection Sheet (Page 2 of 2)

City/Town/Neighborhood: **Portland** Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| **Transportation (cont'd)** | Average commute time from residence to work (minutes) | US Census Bureau American Community Survey | **24.7** | **American Community Survey** | **Obtained on 3.9.13 from** http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_11_1YR_S0801&prodType=table |
| | Assessment of how extensively the city promotes public transportation and offers incentives for less carbon-intensive travel (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by the City of Portland** | **Portland is very focused on both accessibility and mobility and has extensive bikepaths, a light rail and car sharing.** http://www.travelportland.com/things-to-see-and-do/green-portland/portlands-green-leadership **They also developed the urban growth boundary to control sprawl.** |
| | Assessment of a city's efforts to reduce congestion (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | | |
| **Waste Management** | Recycled municipal waste (%) | Department of Public Works | **67.00** | **Carolina Recycling Association** | **Obtained on 3.9.13 from** http://www.cra-recycle.org/assets/2012-Conference/2012-Presentations/Outstanding-Local-Government-Best-Practices.pdf |
| | Assessment of measures to reduce waste and make waste disposal more sustainable (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by the City of Portland** | **Portland has a high rate of recycling and is focused on sustainable waste management.** http://www.portlandoregon.gov/bps/41461 |
| **Water Management** | Total water consumption per person per day (gallons) | USGS | **61.00** | **USGS** | **(Multnomah and Washington County) Obtained 3.9.13 from** http://waterdata.usgs.gov/usa/nwis/wu |
| | Water leakages in water distribution system (%) | Public Works Department | **10.00** | **Tim Hall** | **Called Portland Water Bureau at 3:22 p.m. on 3.11.13 503-823-7770. Transferred to Tim Hall and left message. Tim returned my call on 3.13.13 at 2:58 p.m. and gave me number.** |
| | Assessment of the level and quality of a city's main water sources (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Environmental Working Group** | **Obtained 3.11.13 (3-ranked in top third, 2 middle, 1 bottom third) from** http://www.ewg.org/tap-water/rating-big-city-water.php |
| | Indication of whether or not a city has a stormwater management plan (zero=1; 1=yes) | Advisory Panel or Committee | **1.00** | **City of Portland** | **Obtained 3.11.13 from** http://www.portlandoregon.gov/bes/37842 |
| **Food Management** | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | **4.04** | **Oregon Farmers Markets** | **Obtained 3.9.13 from** http://www.oregonfarmersmarkets.org/wordpress/wp-content/uploads/2012/04/ofma-printed-directory-revised-RL-4-26-12.pdf |
| | Number of community gardens per 100,000 residents | Community Contacts & Websites | **7.91** | **City of Portland** | **Obtained 3.10.13 from** http://www.portlandoregon.gov/parks/article/388440 |
| | Easily obtained resources on presence of farmers' markets accepting Women, Infants & Children (WIC) federal program vouchers and Food Stamp vouchers (zero=no; 1=yes) | Advisory Panel or Committee | **1.00** | **Portland Farmers Markets** | **Obtained 3.10.13 from** http://www.emoregon.org/pdfs/IFFP/2010_Portland_EBT_Farmers_Markets.pdf |

| | | | | | |
|---|---|---|---|---|---|
| **Business & Economic Development** | Presence of a clean technology incubator in the city (zero=1; 1=yes) | Community Contacts & Websites | **1.00** | **Portland Incubators** | **Obtained 3.11.13 from http://www.oen.org/entrepreneurs/get-connected/local-incubators/?** |
| | Presence of a city or private green business directory (zero=no; 1=yes) | Community Contacts & Websites | **1.00** | **Sustainability at Work** | **Obtained 3.11.13 from http://www.sustainabilityatworkpdx.com/find-a-green-business/business-directory/** |
| | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | **4.04** | **Oregon Farmers Markets** | **Obtained 3.9.13 from http://www.oregonfarmersmarkets.org/wordpress/wp-content/uploads/2012/04/ofma-printed-directory-revised-RL-4-26-12.pdf** |
| | Number of LEED Buildings per 100,000 residents | USGBC | **30.82** | **USGBC** | **Obtained on 3.5.13 from https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx** |
| **Community Governance** | Measure of the rigor of a city's green action plan (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by the City of Portland** | **Portland is focused on sustainability through policy, plans and action and includes its public. Obtained 3.13.13 from http://www.portlandoregon.gov/bps/** |
| | Measure of the extensiveness of environmental management undertaken by the city (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | | |
| | Measure of the city's efforts to involve the public in monitoring its environmental performance (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | | |

Table C - 15 The Sustainable Neighborhoods Index Data Collection Sheet for San Diego (Two Tables)

## The Sustainable Neighborhoods Index Data Collection Sheet (Page 1 of 2)

City/Town/Neighborhood: **San Diego** | Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| **Energy Management** | Electricity consumption per unit of GDP(TJ/US$m) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | **0.002** | **EIA** | **Called Environmental Services Department 858-694-7000 on 3.11.13 (http://www.sandiego.gov/environmental-services/energy/index.shtml) Transferred to Jose. Gave reference for Water Department (858-614-5795) and took my info to return call on energy questions. Obtained state level data from EIA (http://www.eia.gov/state/seds/sep_sum/html/pdf/rank_use_per_cap.pdf)** |
| | Electricity consumption per person (GJ) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | **24.46** | **EIA** | |
| | Measure of a city's commitment to promoting green energies, developing green energy projects and increasing the amount of locally produced energy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by the City of San Diego** | **City produces 2.3 MW of solar electricity on several city buildings http://www.sandiego.gov/environmental-services/energy/programsprojects/saving/renewable.shtml and has plan for more building installations. Also embracing biofuels and EVs http://www.utsandiego.com/news/2012/may/24/embracing-renewable-energy/ Obtained 3.13.13** |
| **Urban Design** | Green Space as % of total land area (%) | Planning Department; US Census Bureau; Trust for Public Land | **22.54** | **Trust for Public Land; US Census Bureau** | **Collected 3.9.13 from http://cloud.tpl.org/pubs/ccpe-cityparkfacts-2012.pdf and http://quickfacts.census.gov/qfd/index.htm** |
| | Population density (person/mi$^2$) | US Census Bureau | **4,078.17** | **US Census Bureau** | **Collected 3.8.13 from http://quickfacts.census.gov/qfd/index.htm** |
| | Assessment of a city's efforts to sustain and improve the quantity and quality (for example, proximity and usability) of green spaces, and its tree planting policy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Scott Cloutier, as informed by the City of San Diego and internet search** | **SD has a ton of green space (http://www.sandiego.gov/park-and-recreation/parks/) but doesn't list much about how to protect it. The county has a nice program for redeveloping brownfields with accompanying guidelines http://www.sdcounty.ca.gov/deh/water/sam_brownfields.html) The city is also focused on combating sprawl (http://www.kpbs.org/news/2011/aug/03/san-diego-county-targets-sprawl-new-general-plan/) Obtained 3.13.13** |
| | Assessment of how rigorously a city promotes containment of urban sprawl and reuse of brownfield areas (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | | |
| **Buildings** | Number of LEED certified buildings | USGBC | **9.35** | **USGBC** | **Obtained on 3.5.13 from** |

| | | | | | |
|---|---|---|---|---|---|
| | (buildings/100,00 persons) | | | | https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx |
| | Assessment of whether a city requires energy audits and whether energy regulations require that new buildings satisfy energy efficiency standards (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 2.00 | Scott Cloutier, as informed by the City of San Diego | The city has a building energy efficiency program that newly built homes must comply with. http://www.sdcounty.ca.gov/pds/bldg/green.html and a green building incentive plan http://www.sdcounty.ca.gov/pds/bldg/green.html However, these guidelines aren't as intense as some of the city's counterparts. |
| | Assessment of a city's incentives for retrofitting buildings to improve energy efficiency and how widely it promotes energy efficiency in homes and offices (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 2.00 | | |
| **Transportation** | Share of workers traveling by public transit, bike or foot (%) | US Census Bureau American Community Survey | 8.00 | American Community Survey | Obtained 3.9.13 from http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_11_1YR_S0801&prodType=table |
| | Length of public transit (mi/mi2) | National Transit Database | 0.05 | National Transit Database | (MTS) - Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm |
| | Annual vehicle revenue miles (miles/person) | National Transit Database | 13.72 | National Transit Database | (MTS) - Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm |
| | Maximum public transit vehicles available per square mile (vehicles/mi$^2$) | National Transit Database | 1.08 | National Transit Database | (MTS) - Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm |

# The Sustainable Neighborhoods Index Data Collection Sheet (Page 2 of 2)

City/Town/Neighborhood: **San Diego** Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| **Transportation (cont'd)** | Average commute time from residence to work (minutes) | US Census Bureau American Community Survey | 22.40 | American Community Survey | Obtained on 3.9.13 from http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_11_1YR_S0801&prodType=table |
| | Assessment of how extensively the city promotes public transportation and offers incentives for less carbon-intensive travel (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 2.00 | Scott Cloutier, as informed by the City of San Diego | The city has extensive plans for sustainable transportation (http://www.sandiego.gov/environmental-services/pdf/sustainable/transportation.pdf) but it is not yet obvious what has been achieved. There is also a bike sharing program in the works http://www.kpbs.org/news/2012/nov/16/bike-sharing-come-san-diego-next-year/ but more needs to be done. Congestion is an issue that has yet to be addressed but there is a management plan in place (http://www.sandiego.gov/planning/programs/transportation/corridor/cmp.shtml) |
| | Assessment of a city's efforts to reduce congestion (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 2.00 | | |
| **Waste Management** | Recycled municipal waste (%) | Department of Public Works | 66.00 | One Earth Recycling | Obtained on 3.9.13 from http://www.recycle4life.com/blog/wp/archives/242 |
| | Assessment of measures to reduce waste and make waste disposal more sustainable (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 2.00 | Scott Cloutier, as informed by the City of San Diego | The city recycles a high percentage of the waste stream and they offer waste reduction tips (http://www.sandiego.gov/environmental-services/recycling/residential/consumer.shtml) but there is no evidence of a sustainable waste plan. |
| **Water Management** | Total water consumption per person per day (gallons) | USGS | 147.00 | USGS | (San Diego County) Obtained 3.9.13 from http://waterdata.usgs.gov/usa/nwis/wu |
| | Water leakages in water distribution system (%) | Public Works Department | 9.30 | City of San Diego | Called water department (858-614-5795) at 3:43 p.m. on 3.11.13. Need to call general Manager on Monday 3.18.13. (858) 522-6600. Called and transferred to Engineering and left message for Kris Schuman. Called again on 3.19.13 and told to call city. Called water quality lab and they told me to contact Arian Collins (acollins@sandiego.gov) (619-527-3121). Found document with 2011 info!! (http://docs.sandiego.gov/councilcomm_agendas_attach/2011/NRC_110803_3E.pdf) |

| | | | | | |
|---|---|---|---|---|---|
| | Assessment of the level and quality of a city's main water sources (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 1.00 | Environmental Working Group | Obtained 3.11.13 (3-ranked in top third, 2 middle, 1 bottom third) from http://www.ewg.org/tap-water/rating-big-city-water.php |
| | Indication of whether or not a city has a stormwater management plan (zero=1; 1=yes) | Advisory Panel or Committee | 1.00 | City of San Diego | Obtained 3.9.13 from http://www.sandiego.gov/stormwater/ |
| **Food Management** | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | 3.85 | San Diego Farm Bureau | Obtained 3.9.13 from http://sdfarmbureau.org/BuyLocal/Farmers-Markets.php |
| | Number of community gardens per 100,000 residents | Community Contacts & Websites | 2.71 | Master Gardener San Diego | Obtained 3.10.13 from http://www.mastergardenerssandiego.org/community/showmap.php |
| | Easily obtained resources on presence of farmers' markets accepting Women, Infants & Children (WIC) federal program vouchers and Food Stamp vouchers (zero=no; 1=yes) | Advisory Panel or Committee | 1.00 | Edible San Diego | Obtained 3.10.13 from http://www.ediblecommunities.com/sandiego/markets-and-csas/farmers-markets.htm |
| **Business & Economic Development** | Presence of a clean technology incubator in the city (zero=1; 1=yes) | Community Contacts & Websites | 1.00 | Glenn Mosier | Obtained 3.11.13 from http://www.glennmosier.com/ |
| | Presence of a city or private green business directory (zero=no; 1=yes) | Community Contacts & Websites | 0.00 | Scott Cloutier via internet search | None evident as of 3.11.13 but cool info on being a green business |
| | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | 3.85 | San Diego Farm Bureau | Obtained 3.9.13 from http://sdfarmbureau.org/BuyLocal/Farmers-Markets.php |
| | Number of LEED Buildings per 100,000 residents | USGBC | 9.35 | USGBC | Obtained on 3.5.13 from https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx |
| **Community Governance** | Measure of the rigor of a city's green action plan (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 2.00 | Scott Cloutier, as informed by the City of San Diego | San Diego is making efforts to become sustainable but, when compared to its peers, it has more distance to go. They should focus on waste and including the general public in the process. |
| | Measure of the extensiveness of environmental management undertaken by the city (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 2.00 | | |
| | Measure of the city's efforts to involve the public in monitoring its environmental performance (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 1.00 | | |

Table C - 16 The Sustainable Neighborhoods Index Data Collection Sheet for San Francisco (Two Tables)

## The Sustainable Neighborhoods Index Data Collection Sheet (Page 1 of 2)

City/Town/Neighborhood: **San Francisco** | Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| **Energy Management** | Electricity consumption per unit of GDP(TJ/US$m) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | 0.08 | The Green City Index US and Canada Report | Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Electricity consumption per person (GJ) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | 24.5 | The Green City Index US and Canada Report | Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Measure of a city's commitment to promoting green energies, developing green energy projects and increasing the amount of locally produced energy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 3.00 | Scott Cloutier via the Green City Index | Several installations of solar panels all over the city and incentives (up to 6k for residents and 10k for businesses) to go solar. City also fast tracks proposals and permits for wind power. Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| **Urban Design** | Green Space as % of total land area (%) | Planning Department; US Census Bureau; Trust for Public Land | 17.94 | Trust for Public Land; US Census Bureau | Collected 3.9.13 from http://cloud.tpl.org/pubs/ccpe-cityparkfacts-2012.pdf and http://quickfacts.census.gov/qfd/index.htm |

| | | | | | |
|---|---|---|---|---|---|
| | Population density (person/mi$^2$) | US Census Bureau | 17,331.04 | US Census Bureau | Collected 3.8.13 from http://quickfacts.census.gov/qfd/index.htm |
| | Assessment of a city's efforts to sustain and improve the quantity and quality (for example, proximity and usability) of green spaces, and its tree planting policy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 3.00 | Scott Cloutier, as informed by the Green City Index | Measures are in place to improve quantity and quality of greenspace but more could be done with respect to brownfields. Obtained 3.13.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Assessment of how rigorously a city promotes containment of urban sprawl and reuse of brownfield areas (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 2.00 | | |
| **Buildings** | Number of LEED certified buildings (buildings/100,00 persons) | USGBC | 27.19 | USGBC | Obtained on 3.5.13 from https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx |
| | Assessment of whether a city requires energy audits and whether energy regulations require that new buildings satisfy energy efficiency standards (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 3.00 | Scott Cloutier, as informed by the Green City Index | SF is very good at promoting and maintaining building efficiency and building standards. Obtained 3.13.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Assessment of a city's incentives for retrofitting buildings to improve energy efficiency and how widely it promotes energy efficiency in homes and offices (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 3.00 | | |
| **Transportation** | Share of workers traveling by public transit, bike or foot (%) | US Census Bureau American Community Survey | 20.1 | American Community Survey | Obtained 3.9.13 from http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_11_1YR_S0801&prodType=table |
| | Length of public transit (mi/mi2) | National Transit Database | 5.38 | National Transit Database | (San Francisco MUNI) - Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm |
| | Annual vehicle revenue miles (miles/person) | National Transit Database | 33.25 | National Transit Database | (San Francisco MUNI) - Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm |
| | Maximum public transit vehicles available per square mile (vehicles/mi$^2$) | National Transit Database | 53.90 | National Transit Database | (San Francisco MUNI) - Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm |

# The Sustainable Neighborhoods Index Data Collection Sheet (Page 2 of 2)

City/Town/Neighborhood: **San Francisco** Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| **Transportation (cont'd)** | Average commute time from residence to work (minutes) | US Census Bureau American Community Survey | 28.6 | The Green City Index US and Canada Report | Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Assessment of how extensively the city promotes public transportation and offers incentives for less carbon-intensive travel (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 3.00 | Scott Cloutier, as informed by the Green City Index | SF has great public transit but needs some more work on congestion and traffic. Obtained 3.13.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Assessment of a city's efforts to reduce congestion (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 2.00 | | |
| **Waste Management** | Recycled municipal waste (%) | Department of Public Works | 77.0 | The Green City Index US and Canada Report | Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Assessment of measures to reduce waste and make waste disposal more sustainable (1=below expectations; 2=meets expectations; | Advisory Panel or Committee | 3.00 | Scott Cloutier, as informed by the Green City Index | SF is a leader in waste management with a massive recycling rate and mandated composting. Obtained 3.13.13 from http://www.siemens.com/entry/cc/features/greencityindex_internat |

| | | | | | |
|---|---|---|---|---|---|
| | 3=exceeds expectations) | | | | ional/all/en/pdf/report_northamerica_en.pdf |
| **Water Management** | Total water consumption per person per day (gallons) | USGS | **102.00** | **USGS** | **(San Francisco County) Obtained 3.9.13 from** http://waterdata.usgs.gov/usa/nwis/wu |
| | Water leakages in water distribution system (%) | Public Works Department | **8.8** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from** http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Assessment of the level and quality of a city's main water sources (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Environmental Working Group** | **Obtained 3.11.13 (3-ranked in top third, 2 middle, 1 bottom third) from** http://www.ewg.org/tap-water/rating-big-city-water.php |
| | Indication of whether or not a city has a stormwater management plan (zero=1; 1=yes) | Advisory Panel or Committee | **1.00** | **City of San Francisco** | **Obtained 3.11.13 from** http://www.sfport.com/index.aspx?page=310 |
| **Food Management** | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | **3.08** | **Together in Food** | **Obtained 3.9.13 from** http://togetherinfood.wordpress.com/s-f-farmers-markets-the-full-list/ |
| | Number of community gardens per 100,000 residents | Community Contacts & Websites | **6.27** | **San Francisco Community Gardens** | **Obtained 3.10.13 from** http://www.sfgro.org/sfgardens.php |
| | Easily obtained resources on presence of farmers' markets accepting Women, Infants & Children (WIC) federal program vouchers and Food Stamp vouchers (zero=no; 1=yes) | Advisory Panel or Committee | **1.00** | **City of San Francisco** | **Obtained 3.10.13 from** http://www.sfdph.org/dph/files/MCHdocs/FeelingGood/SFFarmersMktSchedWIC07082009.pdf |
| **Business & Economic Development** | Presence of a clean technology incubator in the city (zero=1; 1=yes) | Community Contacts & Websites | **1.00** | **SFCED** | **Obtained 3.11.13 from** http://www.sfced.org/about-sfced/press/20111/cleantech-firms-will-get-boost-from-sf-incubator |
| | Presence of a city or private green business directory (zero=no; 1=yes) | Community Contacts & Websites | **1.00** | **SF Green Business Directory** | **Obtained 3.11.13 from** http://sfgreenbusiness.org/explore-the-directory/ |
| | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | **3.08** | **Together in Food** | **Obtained 3.9.13 from** http://togetherinfood.wordpress.com/s-f-farmers-markets-the-full-list/ |
| | Number of LEED Buildings per 100,000 residents | USGBC | **27.19** | **USGBC** | **Obtained on 3.5.13 from** https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx |
| **Community Governance** | Measure of the rigor of a city's green action plan (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by the Green City Index** | **SF has a great plan for sustainability and management but needs a bit more work focusing on the individual. Obtained 3.13.13 from** http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Measure of the extensiveness of environmental management undertaken by the city (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | | |
| | Measure of the city's efforts to involve the public in monitoring its environmental performance (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | | |

Table C - 17 The Sustainable Neighborhoods Index Data Collection Sheet for Seattle (Two Tables)

## The Sustainable Neighborhoods Index Data Collection Sheet (Page 1 of 2)

City/Town/Neighborhood: **Seattle** | Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| **Energy Management** | Electricity consumption per unit of GDP(TJ/US$m) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | **0.20** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from** http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Electricity consumption per person (GJ) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | **59.3** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from** http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Measure of a city's commitment to promoting green energies, developing green energy | Advisory Panel or Committee | **2.00** | **Scott Cloutier, as informed by the City of Seattle** | **Seattle has done a fair share to promote the use of renewables or projects focused on it but there is not much evidence that things have been moving forward.** |

| | | | | | |
|---|---|---|---|---|---|
| | projects and increasing the amount of locally produced energy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | | | | http://www.seattle.gov/light/green/greenpower/ **Obtained 3.13.13** |
| **Urban Design** | Green Space as % of total land area (%) | Planning Department; US Census Bureau; Trust for Public Land | **10.32** | **Trust for Public Land; US Census Bureau** | **Collected 3.9.13 from** http://cloud.tpl.org/pubs/ccpe-cityparkfacts-2012.pdf **and** http://quickfacts.census.gov/qfd/index.htm |
| | Population density (person/mi$^2$) | US Census Bureau | **7,395.50** | **US Census Bureau** | **Collected 3.8.13 from** http://quickfacts.census.gov/qfd/index.htm |
| | Assessment of a city's efforts to sustain and improve the quantity and quality (for example, proximity and usability) of green spaces, and its tree planting policy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by the Green City Index** | **The city if focused on improving green space but needs to work on promoting the redevelopment of brownfields. Also, percent of greenspace is pretty low. Obtained 3.13.13 from** http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Assessment of how rigorously a city promotes containment of urban sprawl and reuse of brownfield areas (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | | |
| **Buildings** | Number of LEED certified buildings (buildings/100,00 persons) | USGBC | **29.64** | **USGBC** | **Obtained on 3.5.13 from** https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx |
| | Assessment of whether a city requires energy audits and whether energy regulations require that new buildings satisfy energy efficiency standards (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by the Green City Index** | **Seattle has a large number of energy efficiency buildings and policies and incentives for efficiency. They also require many municipal buildings be LEED certified. Obtained 3.13.13 from Obtained 3.1.13 from** http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Assessment of a city's incentives for retrofitting buildings to improve energy efficiency and how widely it promotes energy efficiency in homes and offices (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | | |
| **Transportation** | Share of workers traveling by public transit, bike or foot (%) | US Census Bureau American Community Survey | **13.20** | **American Community Survey** | **Obtained 3.9.13 from** http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_11_1YR_S0801&prodType=table |
| | Length of public transit (mi/mi2) | National Transit Database | **0.18** | **National Transit Database** | **(King County) - Obtained on 3.9.13 from** http://www.ntdprogram.gov/ntdprogram/data.htm |
| | Annual vehicle revenue miles (miles/person) | National Transit Database | **30.37** | **National Transit Database** | **(King County) - Obtained on 3.9.13 from** http://www.ntdprogram.gov/ntdprogram/data.htm |
| | Maximum public transit vehicles available per square mile (vehicles/mi$^2$) | National Transit Database | **1.74** | **National Transit Database** | **(King County) - Obtained on 3.9.13 from** http://www.ntdprogram.gov/ntdprogram/data.htm |

# The Sustainable Neighborhoods Index Data Collection Sheet (Page 2 of 2)

City/Town/Neighborhood: **Seattle** Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| **Transportation (cont'd)** | Average commute time from residence to work (minutes) | US Census Bureau American Community Survey | **27.40** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from** http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Assessment of how extensively the city promotes public transportation and offers incentives for less carbon-intensive travel (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by the Green City Index** | **Seattle does a great job promoting green transportation, including public transport, walking, and cycling and is investing in EV charging stations. The also opened an electric light rail. Obtained 3.1.13 from** http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Assessment of a city's efforts to reduce congestion (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | | |

| | | | | | |
|---|---|---|---|---|---|
| **Waste Management** | Recycled municipal waste (%) | Department of Public Works | **51.0** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from** http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Assessment of measures to reduce waste and make waste disposal more sustainable (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by the Green City Index** | **Seattle is invested in a zero waste goal and has a high rank in waste diverted. Obtained 3.1.13 from** http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| **Water Management** | Total water consumption per person per day (gallons) | USGS | **116.00** | **USGS** | **(King County) Obtained 3.9.13 from** http://waterdata.usgs.gov/usa/nwis/wu |
| | Water leakages in water distribution system (%) | Public Works Department | **8.0** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from** http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Assessment of the level and quality of a city's main water sources (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Environmental Working Group** | **Obtained 3.11.13 (3-ranked in top third, 2 middle, 1 bottom third) from** http://www.ewg.org/tap-water/rating-big-city-water.php |
| | Indication of whether or not a city has a stormwater management plan (zero=1; 1=yes) | Advisory Panel or Committee | **1.00** | **City of Seattle** | **Obtained 3.11.13 from** http://www.seattle.gov/util/Documents/Plans/StormwaterManagementPlan/index.htm |
| **Food Management** | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | **4.03** | **Examiner** | **Obtained 3.9.13 from** http://www.examiner.com/article/food-101-seattle-farmers-markets-list-by-day-of-operation |
| | Number of community gardens per 100,000 residents | Community Contacts & Websites | **12.56** | **City of Seattle** | **Obtained 3.10.13 from** https://www.seattle.gov/neighborhoods/ppatch/ |
| | Easily obtained resources on presence of farmers' markets accepting Women, Infants & Children (WIC) federal program vouchers and Food Stamp vouchers (zero=no; 1=yes) | Advisory Panel or Committee | **1.00** | **Seattle Farmers Markets** | **Obtained 3.10.13 from** http://www.seattlefarmersmarkets.org/markets/ebt-senior-and-wic-fmnp-vouchers |
| **Business & Economic Development** | Presence of a clean technology incubator in the city (zero=1; 1=yes) | Community Contacts & Websites | **1.00** | **Puget Sound Business Journal** | **Obtained 3.11.13 from** http://www.bizjournals.com/seattle/blog/techflash/2011/03/clean-tech-incubator-adds-startups.html?page=all |
| | Presence of a city or private green business directory (zero=no; 1=yes) | Community Contacts & Websites | **1.00** | **Ecovian** | **Obtained 3.11.13 from** http://www.ecovian.com/s/seattle/all |
| | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | **4.03** | **Examiner** | **Obtained 3.9.13 from** http://www.examiner.com/article/food-101-seattle-farmers-markets-list-by-day-of-operation |
| | Number of LEED Buildings per 100,000 residents | USGBC | **29.64** | **USGBC** | **Obtained on 3.5.13 from** https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx |
| **Community Governance** | Measure of the rigor of a city's green action plan (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by the Green City Index** | **Seattle is quite progressive with a strong plan and could use just a bit of work with respect to renewable energies. Obtained 3.1.13 from** http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Measure of the extensiveness of environmental management undertaken by the city (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **300** | | |
| | Measure of the city's efforts to involve the public in monitoring its environmental performance (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | | |

Table C - 18 The Sustainable Neighborhoods Index Data Collection Sheet for Virginia Beach (Two Tables)

## The Sustainable Neighborhoods Index Data Collection Sheet (Page 1 of 2)

City/Town/Neighborhood: **Virginia Beach** Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| **Energy** | Electricity consumption per unit of | Mayors office of sustainability; | **.0003** | **EIA** | **Called Environment and Sustainability Office (757-385-4621) on 3.11.13** |

| | | | | | |
|---|---|---|---|---|---|
| **Management** | GDP(TJ/US$m) | US Bureau of Economic Analysis; US Census | | | **at 11:22 p.m. and left a message. Also, emailed eso@vbgov.com Obtained state level data from EIA (http://www.eia.gov/state/seds/sep_sum/html/pdf/rank_use_per_cap.pdf)** |
| | Electricity consumption per person (GJ) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | **10.77** | **EIA** | |
| | Measure of a city's commitment to promoting green energies, developing green energy projects and increasing the amount of locally produced energy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **1.00** | **Scott Cloutier, as informed by internet search** | **There have been discussion of off-shore wind power(http://www.virginiabeach.com/articles/virginia-beach-alternative-energy-initiatives) and several other alternatives (http://www.vbgov.com/government/offices/green/energy/Pages/wave-tidal-power.aspx) for VB but no real action yet.** |
| **Urban Design** | Green Space as % of total land area (%) | Planning Department; US Census Bureau; Trust for Public Land | **15.89** | **Trust for Public Land; US Census Bureau** | **Collected 3.9.13 from http://cloud.tpl.org/pubs/ccpe-cityparkfacts-2012.pdf and http://quickfacts.census.gov/qfd/index.htm** |
| | Population density (person/mi$^2$) | US Census Bureau | **1,777.80** | **US Census Bureau** | **Collected 3.8.13 from http://quickfacts.census.gov/qfd/index.htm** |
| | Assessment of a city's efforts to sustain and improve the quantity and quality (for example, proximity and usability) of green spaces, and its tree planting policy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Scott Cloutier, as informed by City of VB** | **The city is quite focused on protecting and increasing green space. http://www.vbgov.com/government/offices/green/open-space-green/pages/default.aspx and they have converted a landfill to a public park but not much else on brownfield redevelopment. http://www.urbanparks2012.org/Workshop/emeralds-in-the-rough/ Obtained 3.13.13** |
| | Assessment of how rigorously a city promotes containment of urban sprawl and reuse of brownfield areas (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | | |
| **Buildings** | Number of LEED certified buildings (buildings/100,00 persons) | USGBC | **2.94** | **USGBC** | **Obtained on 3.5.13 from https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx** |
| | Assessment of whether a city requires energy audits and whether energy regulations require that new buildings satisfy energy efficiency standards (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by the City of Virginia Beach** | **The city provides a special tax rate for qualified energy efficient buildings but it doesn't seem as though audits are a part of the process. Obtained 3.13.13 from http://www.vbgov.com/government/offices/green/energy/Pages/energy-efficient-buildings.aspx** |
| | Assessment of a city's incentives for retrofitting buildings to improve energy efficiency and how widely it promotes energy efficiency in homes and offices (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | | |
| **Transportation** | Share of workers traveling by public transit, bike or foot (%) | US Census Bureau American Community Survey | **4.30** | **American Community Survey** | **Obtained 3.9.13 from http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_11_1YR_S0801&prodType=table** |
| | Length of public transit (mi/mi2) | National Transit Database | **0.15** | **National Transit Database** | **(HRT) - Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm** |
| | Annual vehicle revenue miles (miles/person) | National Transit Database | **10.20** | **National Transit Database** | **(HRT) - Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm** |
| | Maximum public transit vehicles available per square mile (vehicles/mi$^2$) | National Transit Database | **0.85** | **National Transit Database** | **(HRT) - Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm** |

# The Sustainable Neighborhoods Index Data Collection Sheet (Page 2 of 2)

City/Town/Neighborhood: **Virginia Beach** Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| **Transportation (cont'd)** | Average commute time from residence to work (minutes) | US Census Bureau American Community Survey | **22.4** | **American Community Survey** | **Obtained on 3.9.13 from http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_11_1YR_S0801&prodType=table** |
| | Assessment of how extensively the city | Advisory Panel or Committee | **2.00** | **Scott Cloutier, as informed by** | **The city does not have a great public transit system but is focused on** |

| | | | | | |
|---|---|---|---|---|---|
| | promotes public transportation and offers incentives for less carbon-intensive travel (1=below expectations; 2=meets expectations; 3=exceeds expectations) | | | the City of Virginia Beach | improving that and developing bikeways and trails, and alternative methods of transportation. Obtained 3.13.13 from http://www.vbgov.com/government/offices/green/transportation/Pages/default.aspx |
| | Assessment of a city's efforts to reduce congestion (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 2.00 | | |
| **Waste Management** | Recycled municipal waste (%) | Department of Public Works | 17.00 | City of Virginia Beach | Obtained on 3.9.13 from http://www.vbgov.com/government/departments/budget-office-management-services/benchmarks_and_comparisons/Documents/community-indicators/qpe-community-indicators.pdf |
| | Assessment of measures to reduce waste and make waste disposal more sustainable (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 2.00 | Scott Cloutier, as informed by the City of Virginia Beach | The city is focused on maximizing recycling (http://www.vbgov.com/government/departments/public-works/pw-waste-management/Pages/default.aspx) but has more to do to catch its peers. |
| **Water Management** | Total water consumption per person per day (gallons) | USGS | 271.00 | USGS | (Fairfax County) Obtained 3.9.13 from http://waterdata.usgs.gov/usa/nwis/wu |
| | Water leakages in water distribution system (%) | Public Works Department | 18.90 | City of VB Water Engineer | Called VB Dept of Public Works (757-385-4167) on 3.11.13 at 11:26 p.m. Selected option 9 and left message. Called again on 3.14.13 and was transferred to public utilities department (757-385-4631) and transferred to operations department (575-385-1400). No luck. Called again and connected with engineer (Jim) and given value! |
| | Assessment of the level and quality of a city's main water sources (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 2.00 | Environmental Working Group | Obtained 3.11.13 (3-ranked in top third, 2 middle, 1 bottom third) from http://www.ewg.org/tap-water/rating-big-city-water.php |
| | Indication of whether or not a city has a stormwater management plan (zero=1; 1=yes) | Advisory Panel or Committee | 1.00 | City of VB | Obtained 3.11.13 from http://www.vbgov.com/government/offices/green/land-development/Pages/stormwater.aspx |
| **Food Management** | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | 0.23 | City of Virginia Beach | Obtained 3.9.13 from http://www.vbgov.com/government/departments/agriculture/programs-and-services/Pages/farmers-market.aspx |
| | Number of community gardens per 100,000 residents | Community Contacts & Websites | 0.45 | Facebook; Blogspot | Obtained 3.9.13 from http://www.facebook.com/pages/Nimmo-Community-Garden/190333071003398; http://hamptonroadscg.blogspot.com/ |
| | Easily obtained resources on presence of farmers' markets accepting Women, Infants & Children (WIC) federal program vouchers and Food Stamp vouchers (zero=no; 1=yes) | Advisory Panel or Committee | 0.00 | Scott Cloutier via internet search | Some stands accept WIC but not the entire market as of 3.11.13 |
| **Business & Economic Development** | Presence of a clean technology incubator in the city (zero=1; 1=yes) | Community Contacts & Websites | 0.00 | Scott Cloutier via internet search | None evident as of 3.11.13 |
| | Presence of a city or private green business directory (zero=no; 1=yes) | Community Contacts & Websites | 0.00 | Scott Cloutier via internet search | None evident as of 3.11.13 |
| | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | 0.23 | City of Virginia Beach | Obtained 3.9.13 from http://www.vbgov.com/government/departments/agriculture/programs-and-services/Pages/farmers-market.aspx |
| | Number of LEED Buildings per 100,000 residents | USGBC | 2.94 | USGBC | Obtained on 3.5.13 from https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx |
| **Community Governance** | Measure of the rigor of a city's green action plan (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 2.00 | Scott Cloutier, as informed by the City of Virginia Beach | The city does have a decent plan but could focus some more on action with respect to transportation and renewable energy. It doesn't seem as though the public is involved either. Obtained 3.13.13 from http://www.vbgov.com/government/offices/green/accomplishments/Pages/default.aspx |
| | Measure of the extensiveness of environmental management undertaken by the city (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 2.00 | | |

| | | | | | |
|---|---|---|---|---|---|
| | Measure of the city's efforts to involve the public in monitoring its environmental performance (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 1.00 | | |

Table C - 19 The Sustainable Neighborhoods Index Data Collection Sheet for Washington DC (Two Tables)

## The Sustainable Neighborhoods Index Data Collection Sheet (Page 1 of 2)

City/Town/Neighborhood: **Washington DC** | Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| **Energy Management** | Electricity consumption per unit of GDP(TJ/US$m) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | **0.13** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf** |
| | Electricity consumption per person (GJ) | Mayors office of sustainability; US Bureau of Economic Analysis; US Census | **70.4** | **The Green City Index US and Canada Report** | **Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf** |
| | Measure of a city's commitment to promoting green energies, developing green energy projects and increasing the amount of locally produced energy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Scott Cloutier, as informed by DC and the GCI** | **City has good plans to have 50 % of energy coming from renewables in 20 years http://sustainable.dc.gov/sites/default/files/dc/sites/sustainable/page_content/attachments/SDC%20Final%20Plan_0.pdf although action for green and local energy are not evident. Obtained 3.13.13** |
| **Urban Design** | Green Space as % of total land area (%) | Planning Department; US Census Bureau; Trust for Public Land | **19.65** | **Trust for Public Land; US Census Bureau** | **Collected 3.9.13 from http://cloud.tpl.org/pubs/ccpe-cityparkfacts-2012.pdf and http://quickfacts.census.gov/qfd/index.htm** |
| | Population density (person/mi$^2$) | US Census Bureau | **10,122.78** | **US Census Bureau** | **Collected 3.8.13 from http://quickfacts.census.gov/qfd/index.htm** |
| | Assessment of a city's efforts to sustain and improve the quantity and quality (for example, proximity and usability) of green spaces, and its tree planting policy (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by GCI** | **DC has a high amount of greenspace and strong policies to protect/promote it. Also an extensive tree planting program. Could use more effort with respect to brownfields and sprawl. Obtained 3.13.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf** |
| | Assessment of how rigorously a city promotes containment of urban sprawl and reuse of brownfield areas (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | | |
| **Buildings** | Number of LEED certified buildings (buildings/100,00 persons) | USGBC | **49.19** | **USGBC** | **Obtained on 3.5.13 from https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx** |
| | Assessment of whether a city requires energy audits and whether energy regulations require that new buildings satisfy energy efficiency standards (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | **Scott Cloutier, as informed by GCI** | **DC has great standards following LEED and a high number of LEED certified buildings. Obtained 3.13.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf** |
| | Assessment of a city's incentives for retrofitting buildings to improve energy efficiency and how widely it promotes energy efficiency in homes and offices (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **3.00** | | |
| **Transportation** | Share of workers traveling by public transit, bike or foot (%) | US Census Bureau American Community Survey | **17.90** | **American Community Survey** | **Obtained 3.9.13 from http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_11_1YR_S0801&prodType=table** |
| | Length of public transit (mi/mi2) | National Transit Database | **0.30** | **National Transit Database** | **(WMATA) - Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm** |
| | Annual vehicle revenue miles (miles/person) | National Transit Database | **34.70** | **National Transit Database** | **(WMATA) - Obtained on 3.9.13 from** |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | http://www.ntdprogram.gov/ntdprogram/data.htm |
| | Maximum public transit vehicles available per square mile (vehicles/mi$^2$) | National Transit Database | 3.59 | National Transit Database | (WMATA) - Obtained on 3.9.13 from http://www.ntdprogram.gov/ntdprogram/data.htm |

# The Sustainable Neighborhoods Index Data Collection Sheet (Page 2 of 2)

City/Town/Neighborhood: **Washington DC** Data Collection Researcher: **Scott Cloutier**

| Category | Indicator | Potential Sources | Collected Data | Actual Source | Notes |
|---|---|---|---|---|---|
| Transportation (cont'd) | Average commute time from residence to work (minutes) | US Census Bureau American Community Survey | 33.4 | The Green City Index US and Canada Report | Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Assessment of how extensively the city promotes public transportation and offers incentives for less carbon-intensive travel (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 2.00 | Scott Cloutier, as informed by the Green City Index | The city could do more to improve public transit. However, they do have a large bikeshare system in place. Obtained 3.13.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Assessment of a city's efforts to reduce congestion (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 2.00 | | |
| Waste Management | Recycled municipal waste (%) | Department of Public Works | 17.6 | The Green City Index US and Canada Report | Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Assessment of measures to reduce waste and make waste disposal more sustainable (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 2.00 | Scott Cloutier, as informed by the Green City Index | DC is very low on recycling rate but is focused on change. Obtained 3.13.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| Water Management | Total water consumption per person per day (gallons) | USGS | 150.00 | The Green City Index US and Canada Report | Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Water leakages in water distribution system (%) | Public Works Department | 14.4 | The Green City Index US and Canada Report | Obtained 3.1.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf |
| | Assessment of the level and quality of a city's main water sources (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | 1.00 | Environmental Working Group | Obtained 3.11.13 (3-ranked in top third, 2 middle, 1 bottom third) from http://www.ewg.org/tap-water/rating-big-city-water.php |
| | Indication of whether or not a city has a stormwater management plan (zero=1; 1=yes) | Advisory Panel or Committee | 1.00 | District of Columbia | Obtained 3.11.13 from http://ddoe.dc.gov/stormwater |
| Food Management | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | 5.18 | The Washington Post | Obtained 3.9.13 from http://www.washingtonpost.com/blogs/all-we-can-eat/post/2012-dc-farmers-market-listings/2012/04/24/gIQAwwuWeT_blog.html |
| | Number of community gardens per 100,000 residents | Community Contacts & Websites | 6.96 | Washington Gardener | Obtained 3.10.13 from http://www.washingtongardener.com/index_files/CommunityGardens.htm |
| | Easily obtained resources on presence of farmers' markets accepting Women, Infants & Children (WIC) federal program vouchers and Food Stamp vouchers (zero=no; 1=yes) | Advisory Panel or Committee | 1.00 | Fresh Farm Markets | Obtained 3.10.13 from http://freshfarmmarkets.org/programs/nutrition_assistance_programs.php |
| Business & Economic Development | Presence of a clean technology incubator in the city (zero=1; 1=yes) | Community Contacts & Websites | 1.00 | Reluminati | Obtained 3.11.13 from http://reluminati.com/blog1/about/strategic-alliances/headquarters-dc/ |
| | Presence of a city or private green business directory (zero=no; 1=yes) | Community Contacts & Websites | 0.00 | Scott Cloutier via internet search | None evident as of 3.11.13 |
| | Number of farmers' markets per 100,000 residents | Community Contacts & Websites | 5.18 | The Washington Post | Obtained 3.9.13 from http://www.washingtonpost.com/blogs/all-we-can-eat/post/2012-dc-farmers-market-listings/2012/04/24/gIQAwwuWeT_blog.html |

| | | | | | |
|---|---|---|---|---|---|
| | Number of LEED Buildings per 100,000 residents | USGBC | **49.19** | **USGBC** | **Obtained on 3.5.13 from https://www.usgbc.org/LEED/Project/CertifiedProjectList.aspx** |
| **Community Governance** | Measure of the rigor of a city's green action plan (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | **Scott Cloutier, as informed by the Green City Index** | **DC is focused on some aspects of sustainability like buildings and urban design but needs a good deal of work on waste, energy and transportation. However, the city has done a food job of including residents in many aspects of sustainability. Obtained on 3.13.13 from http://www.siemens.com/entry/cc/features/greencityindex_international/all/en/pdf/report_northamerica_en.pdf** |
| | Measure of the extensiveness of environmental management undertaken by the city (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **2.00** | | |
| | Measure of the city's efforts to involve the public in monitoring its environmental performance (1=below expectations; 2=meets expectations; 3=exceeds expectations) | Advisory Panel or Committee | **1.00** | | |

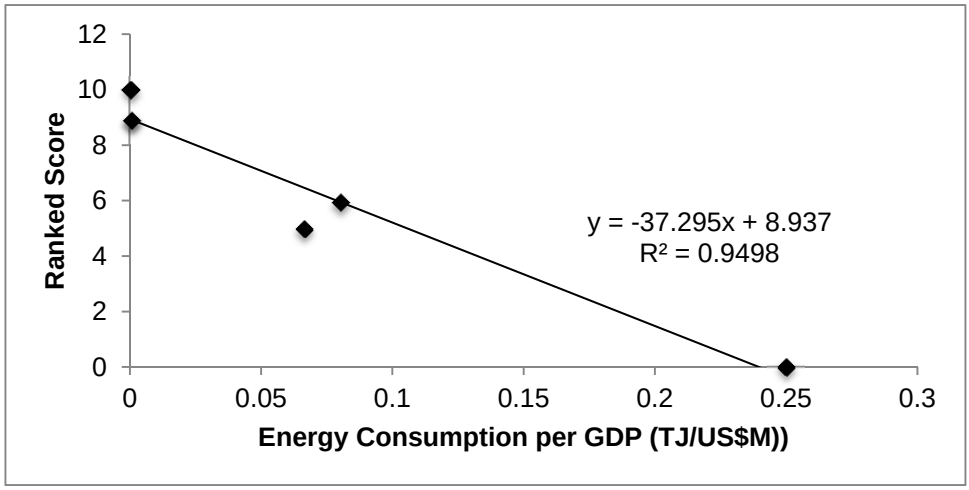



Figure C - 1 Linear Regression for Electricity Consumption per Unit of GDP for Low Population Cities

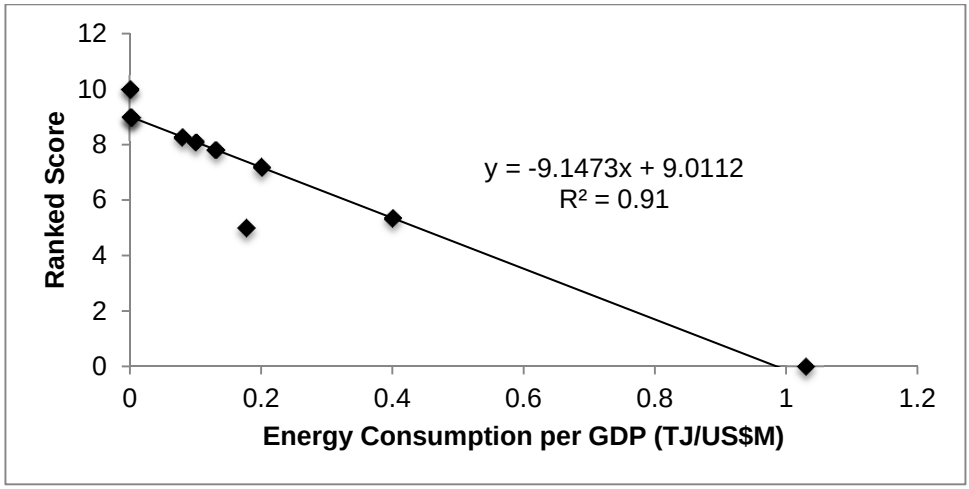



Figure C - 2 Linear Regression for Electricity Consumption per Unit of GDP for Medium Population Cities

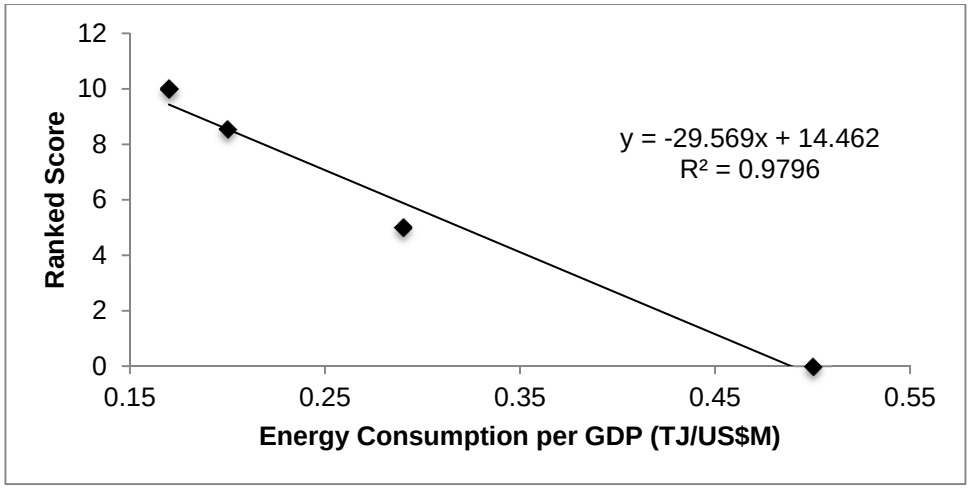



Figure C - 3 Linear Regression for Electricity Consumption per Unit of GDP for High Population Cities

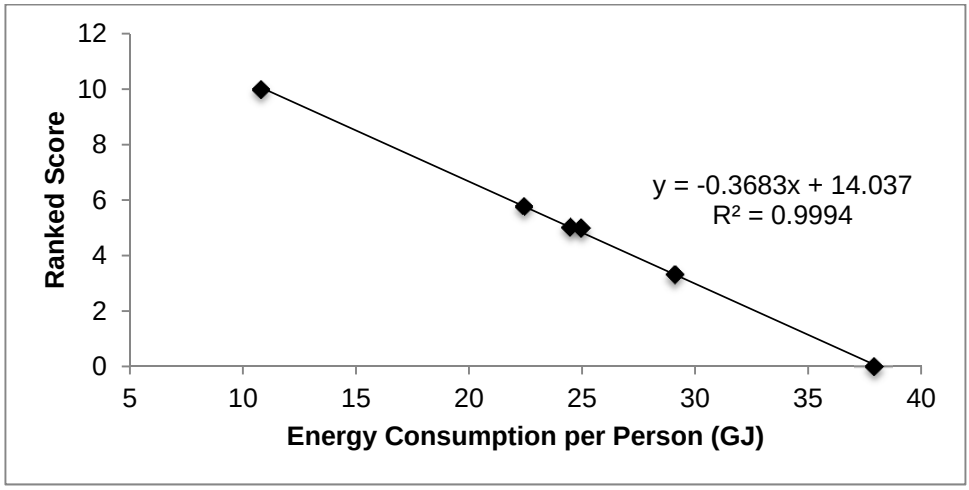



Figure C - 4 Linear Regression for Electricity Consumption per Person for Low Population Cities

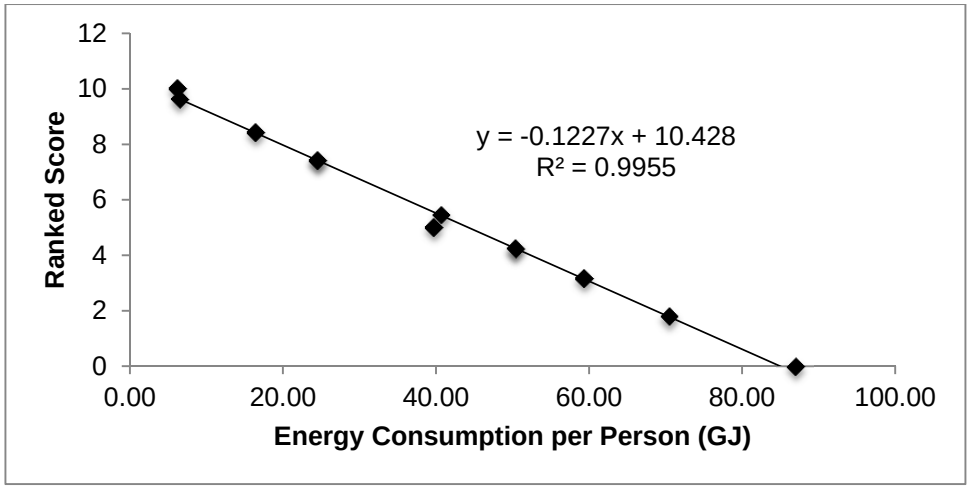



Figure C - 5 Linear Regression for Electricity Consumption per Person for Medium Population Cities

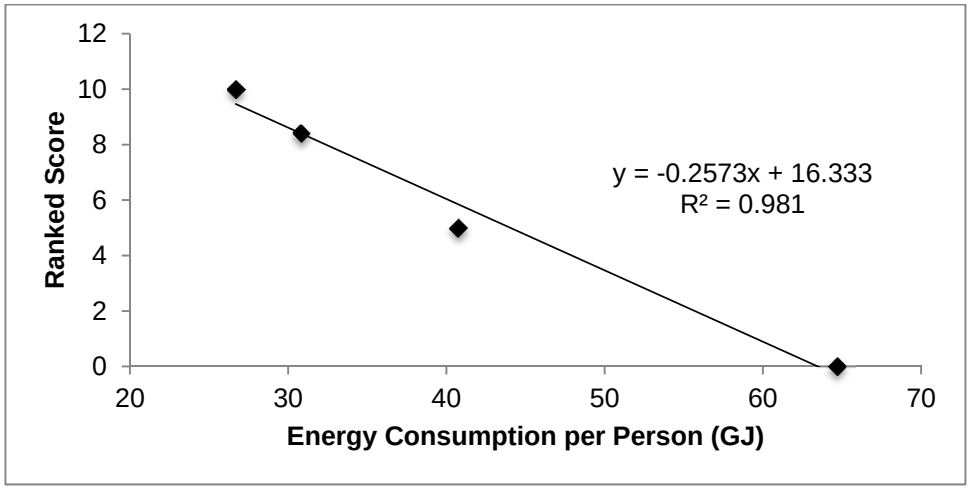



Figure C - 6 Linear Regression for Electricity Consumption per Person for High Population Cities

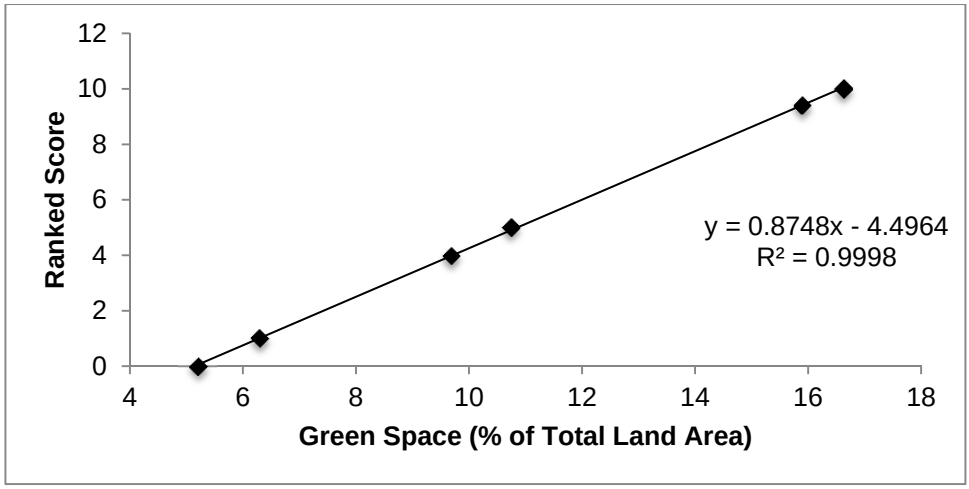



Figure C - 7 Linear Regression for Green Space for Low Population Cities

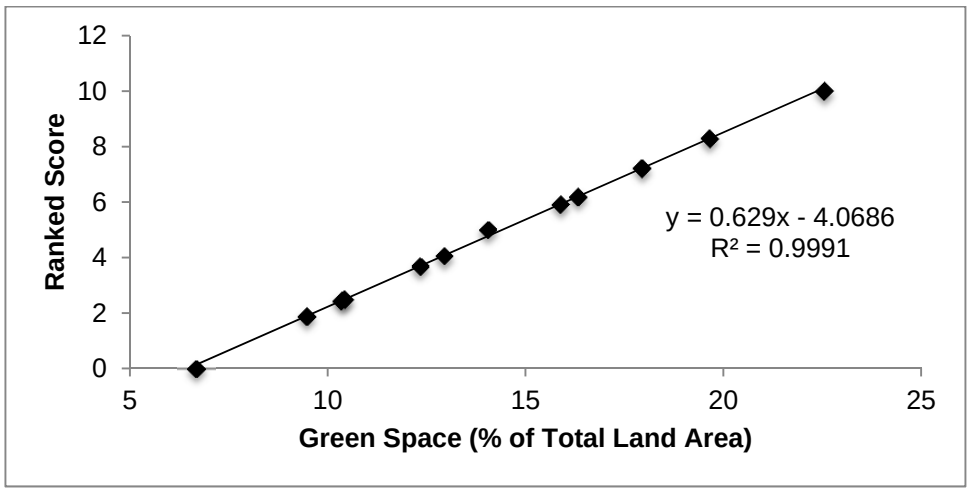



Figure C - 8 Linear Regression for Green Space for Medium Population Cities

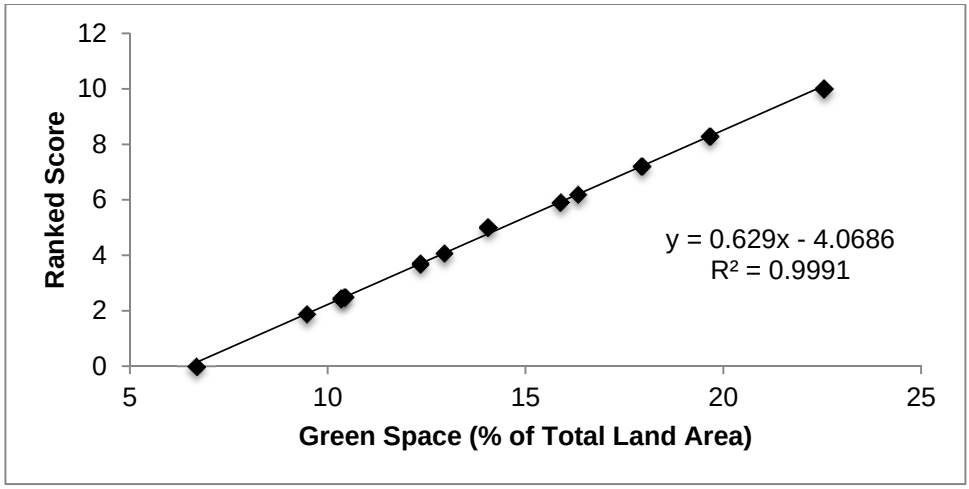



Figure C - 9 Linear Regression for Green Space for High Population Cities

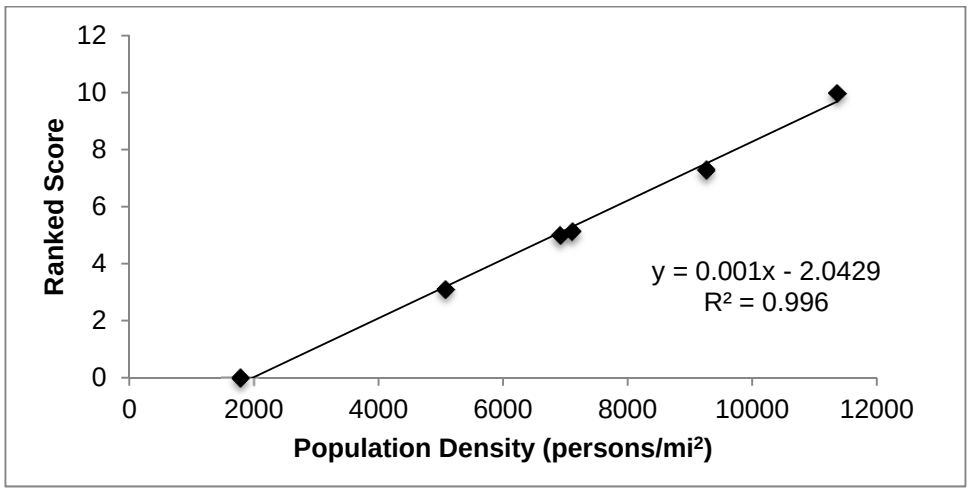



Figure C - 10 Linear Regression for Population Density for Low Population Cities

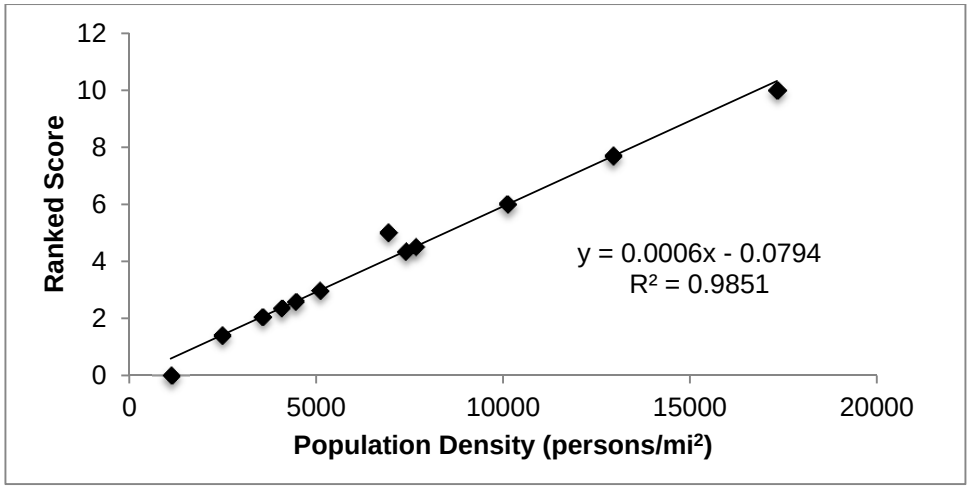



Figure C - 11 Linear Regression for Population Density for Medium Population Cities

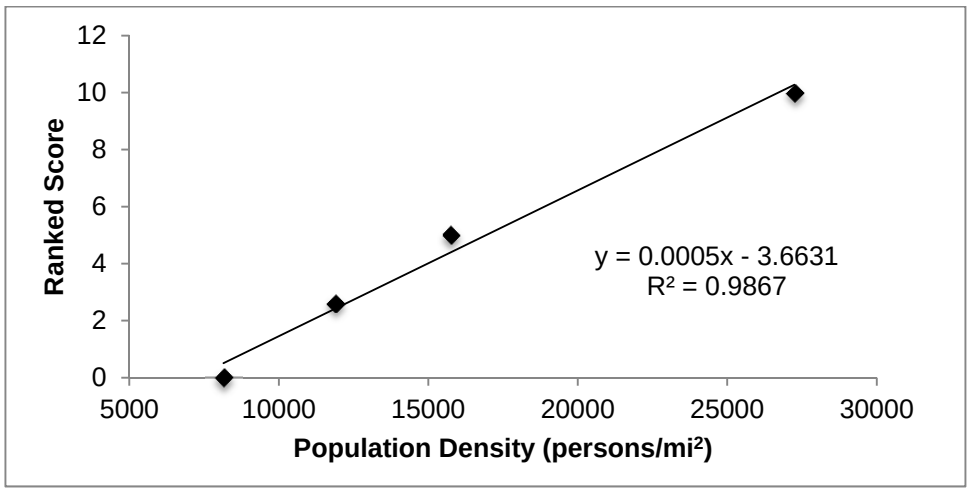



Figure C - 12 Linear Regression for Population Density for High Population Cities

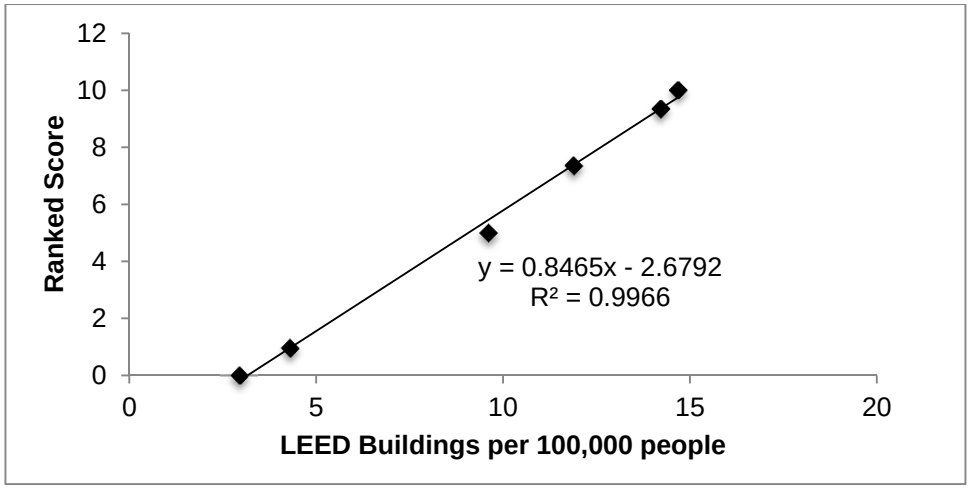



Figure C - 13 Linear Regression for Number of LEED Certified Buildings for Low Population Cities

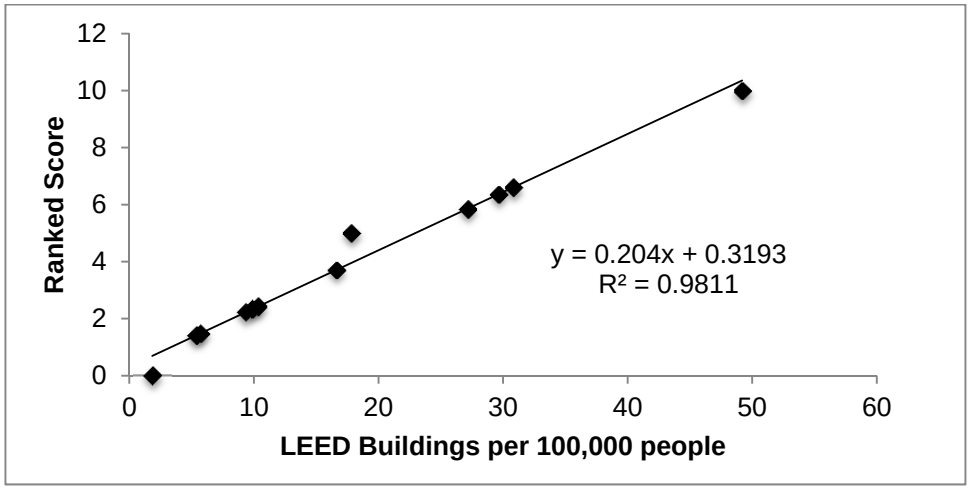



Figure C - 14 Linear Regression for Number of LEED Certified Buildings for Medium Population Cities

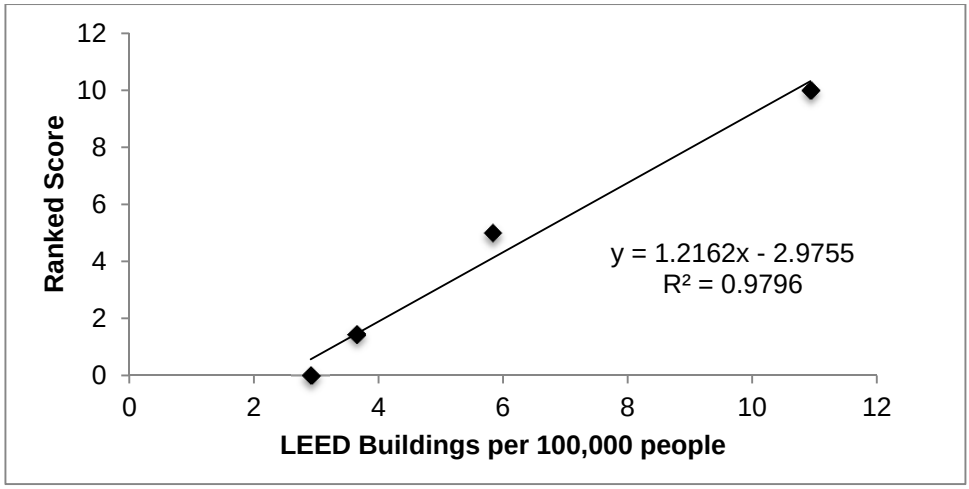



Figure C - 15 Linear Regression for Number of LEED Certified Buildings for High Population Cities

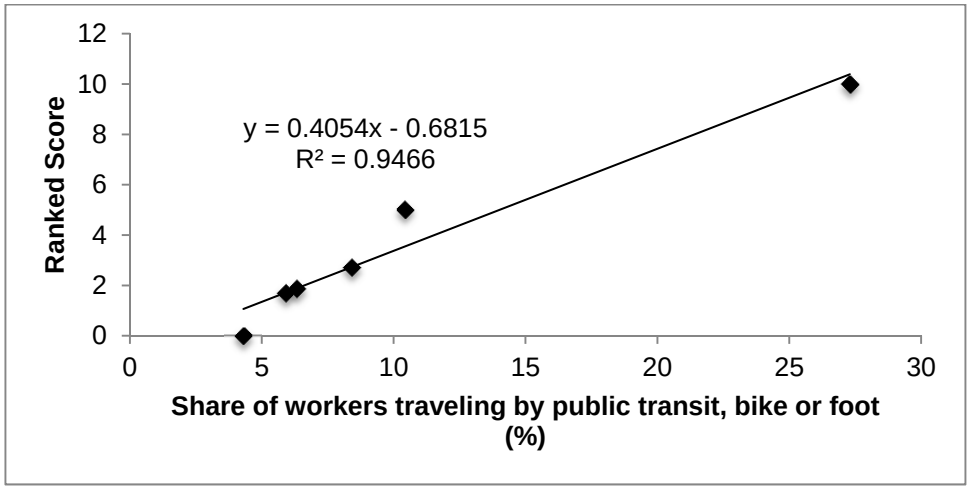



Figure C - 16 Linear Regression for Share of Workers Traveling by Public Transit, Bike or Foot for Low Population Cities

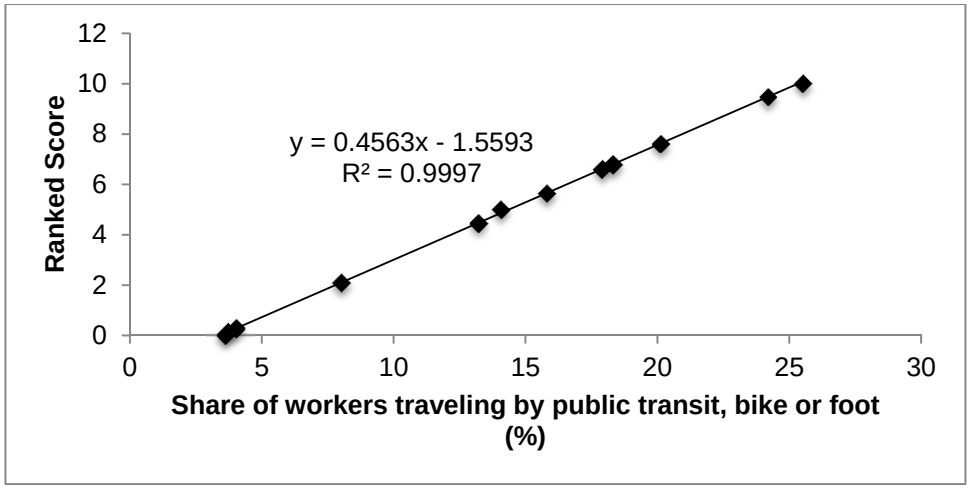



Figure C - 17 Linear Regression for Share of Workers Traveling by Public Transit, Bike or Foot for Medium Population Cities

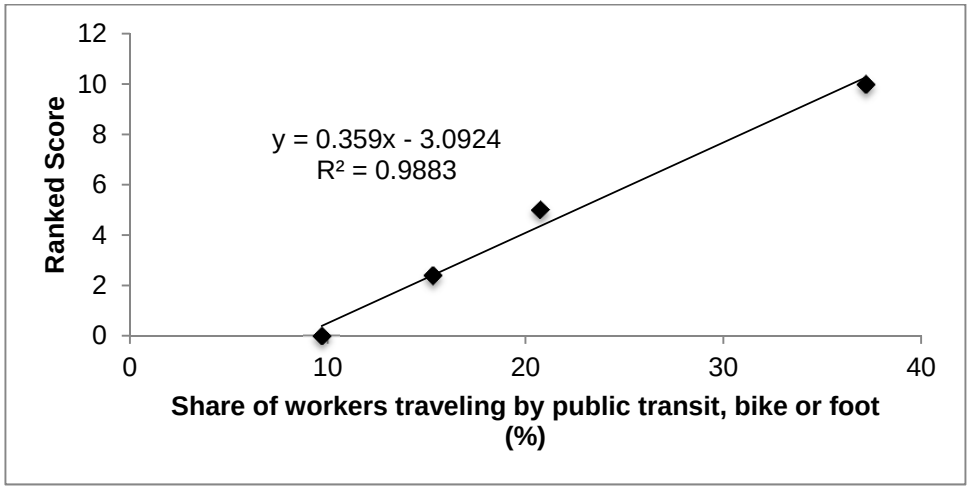



Figure C - 18 Linear Regression for Share of Workers Traveling by Public Transit, Bike or Foot for High Population Cities

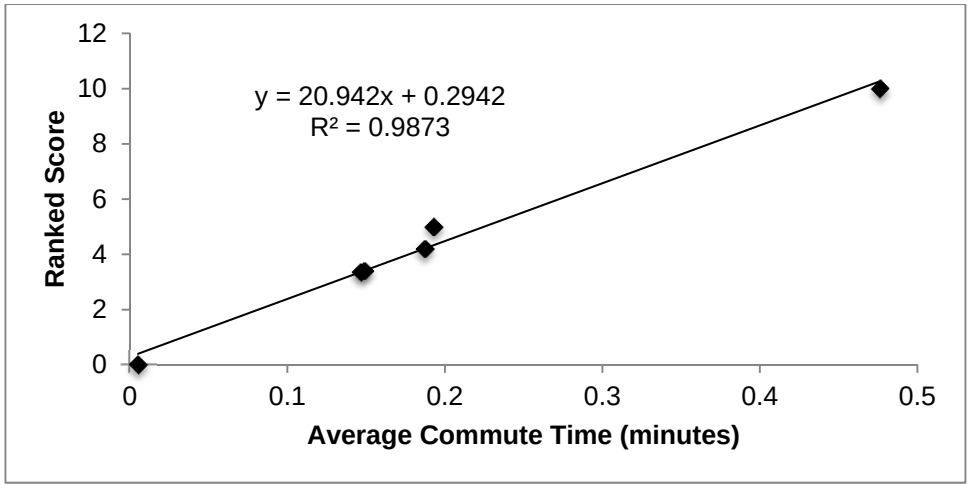



Figure C - 19 Linear Regression for Transit Length for Low Population Cities

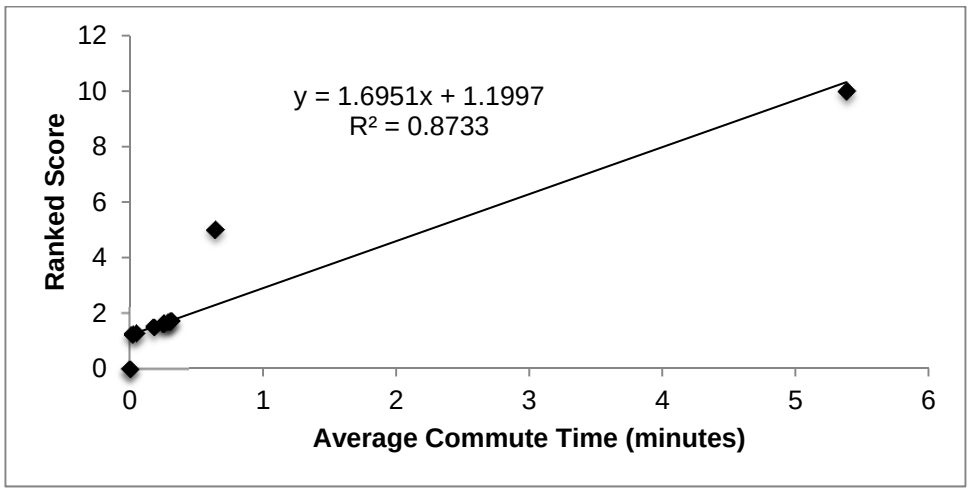



Figure C - 20 Linear Regression for Transit Length for Medium Population Cities

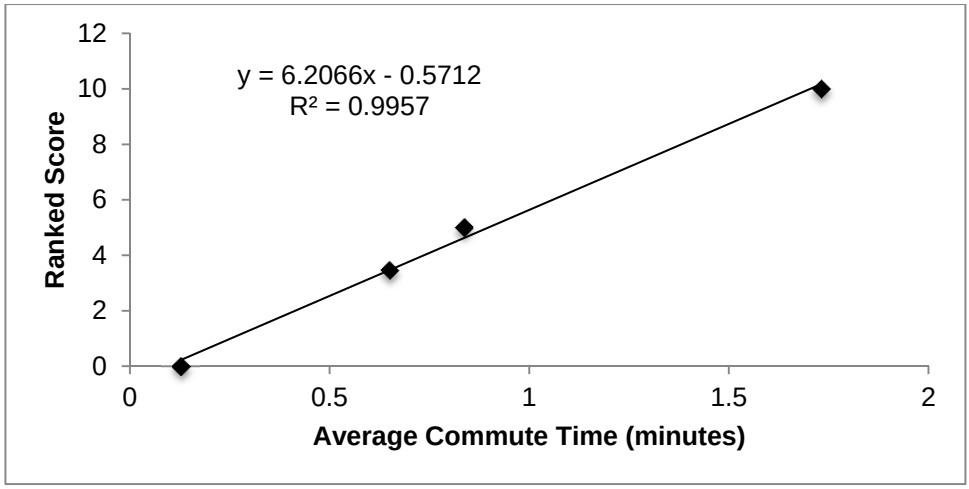



Figure C - 21 Linear Regression for Transit Length for High Population Cities

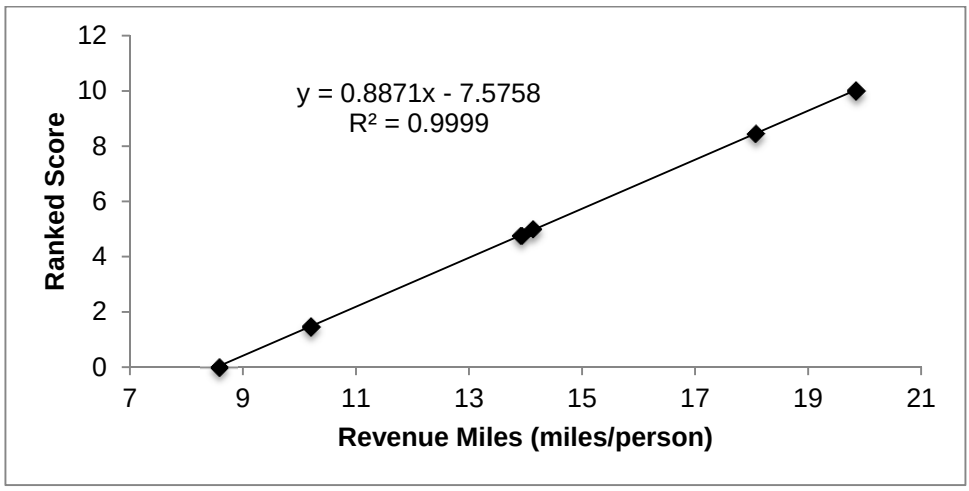



Figure C - 22 Linear Regression for Revenue Miles for Low Population Cities

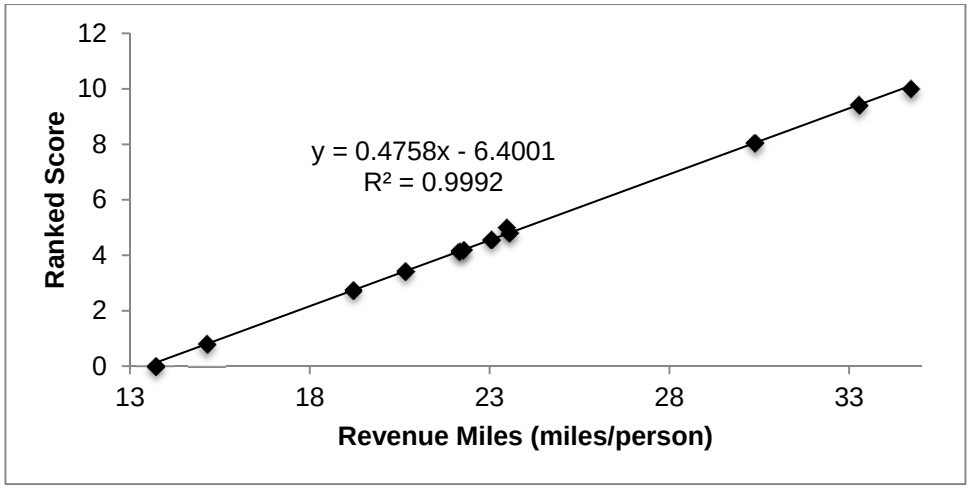



Figure C - 23 Linear Regression for Revenue Miles for Medium Population Cities

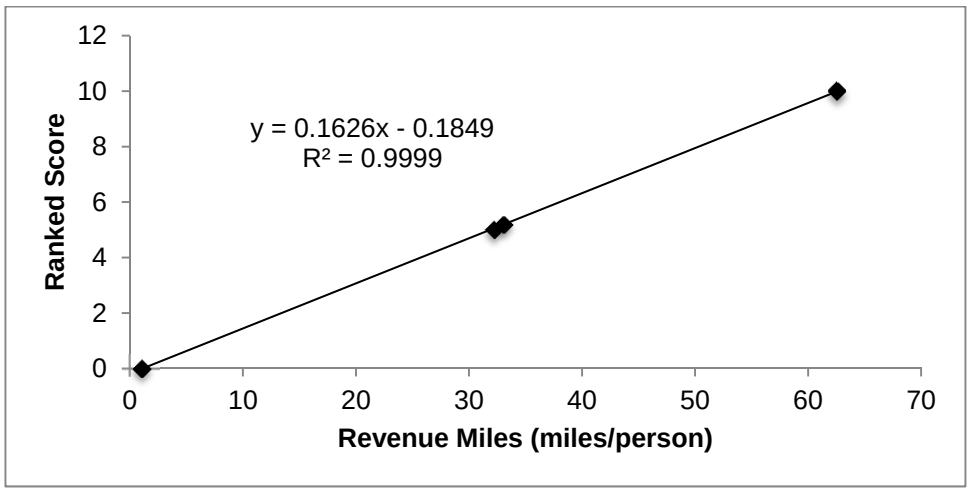



Figure C - 24 Linear Regression for Revenue Miles for High Population Cities

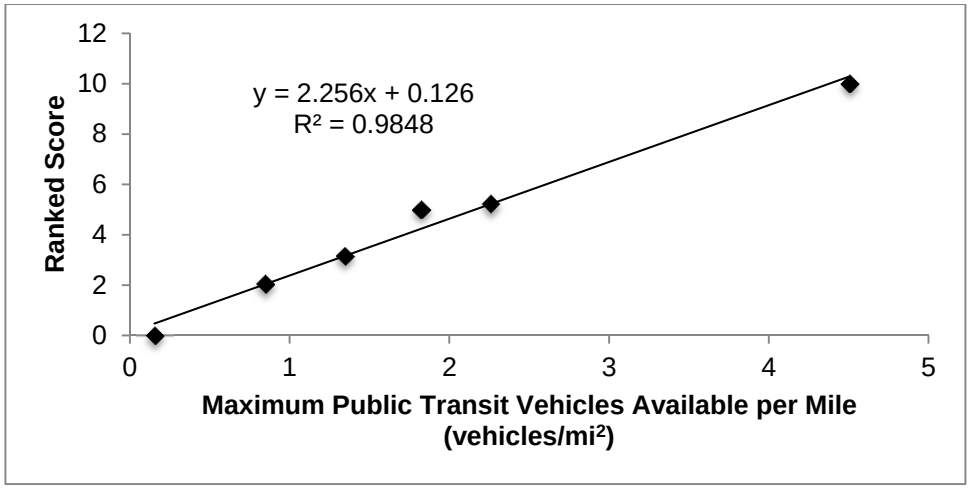



Figure C - 25 Linear Regression for Maximum Public Transit Vehicles Available for Low Population Cities

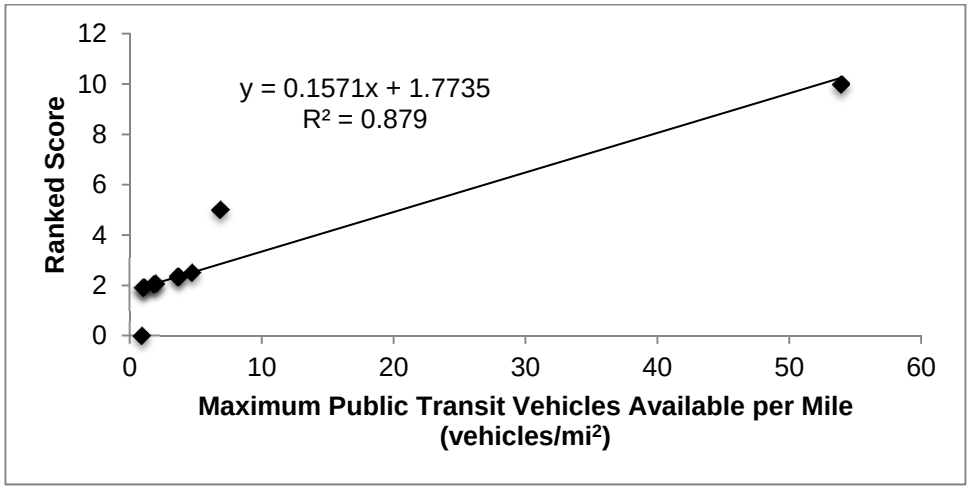



Figure C - 26 Linear Regression for Maximum Public Transit Vehicles Available for Medium Population Cities

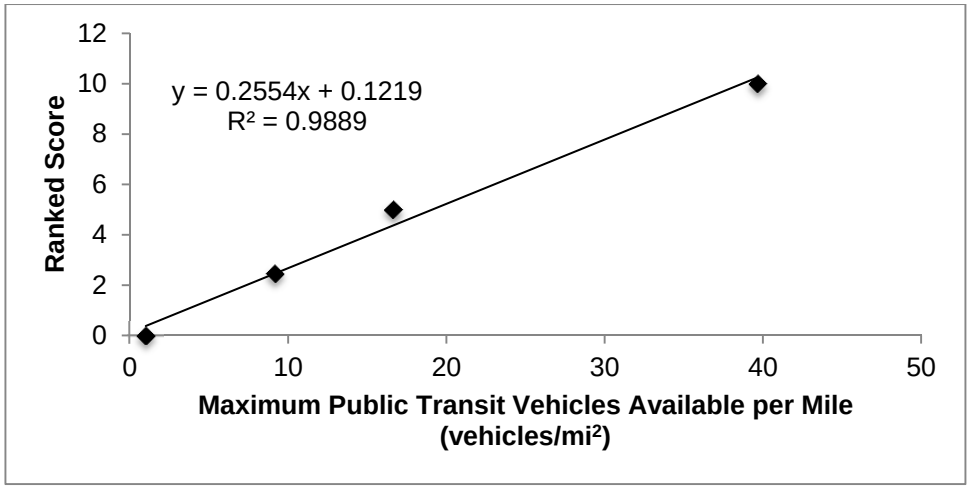



Figure C - 27 Linear Regression for Maximum Public Transit Vehicles Available for High Population Cities

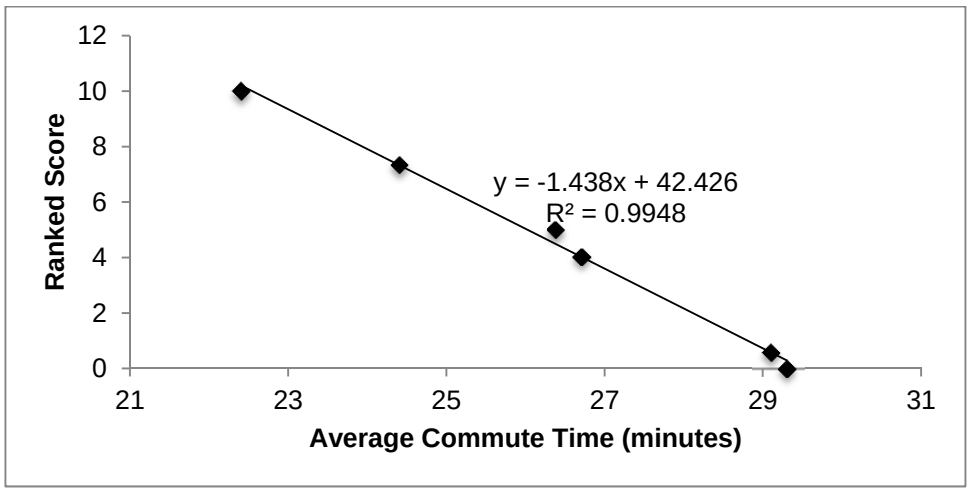



Figure C - 28 Linear Regression for Average Commute Time for Low Population Cities

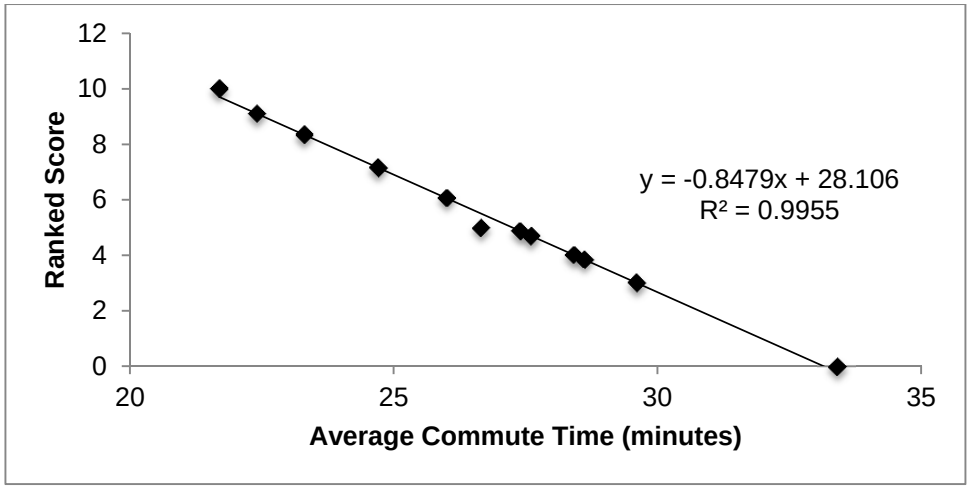



Figure C - 29 Linear Regression for Average Commute Time for Medium Population Cities

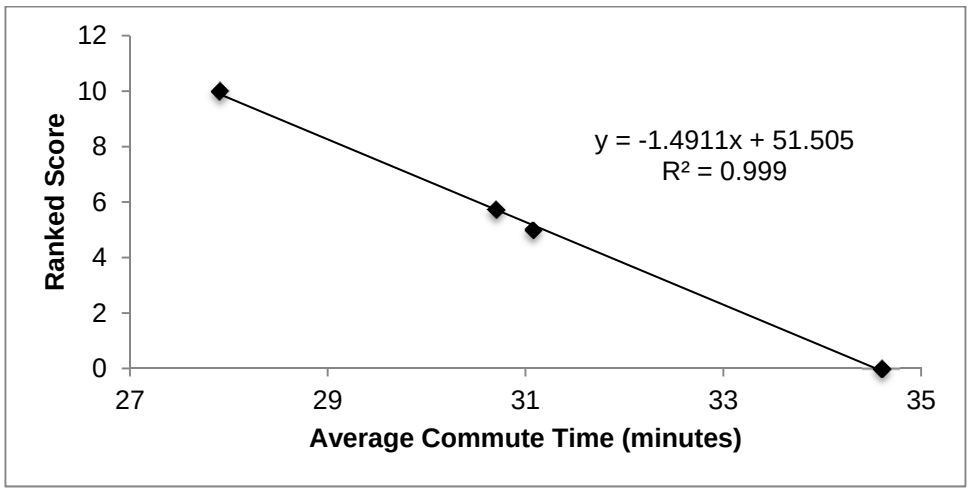



Figure C - 30 Linear Regression for Average Commute Time for High Population Cities

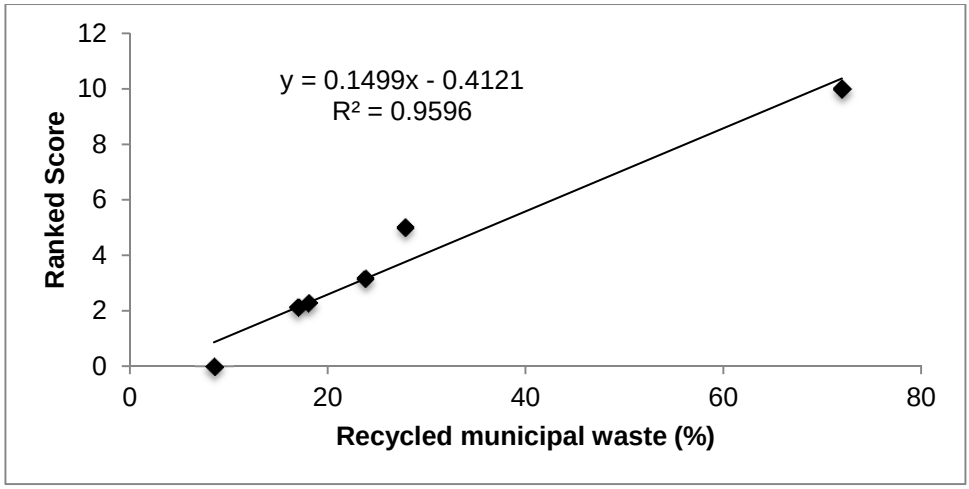



Figure C - 31 Linear Regression for Recycled Waste Percentage for Low Population Cities

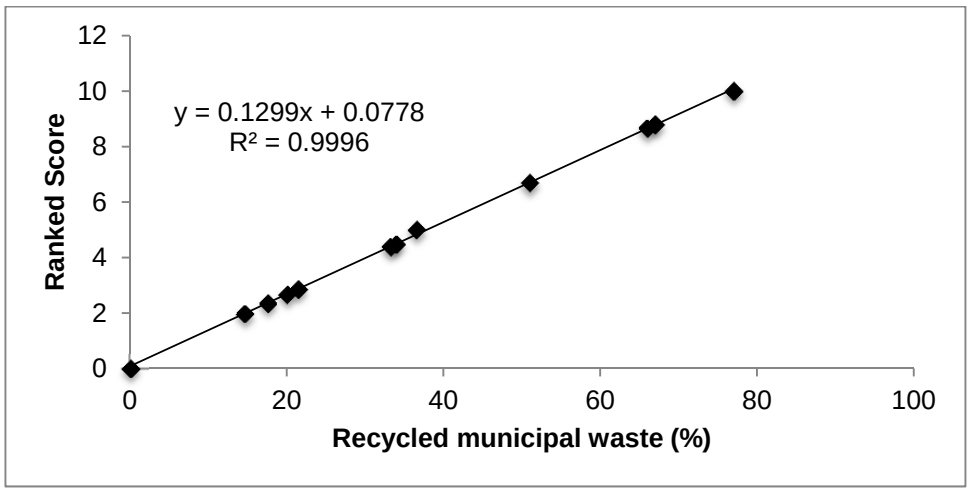



Figure C - 32 Linear Regression for Recycled Waste Percentage for Medium Population Cities

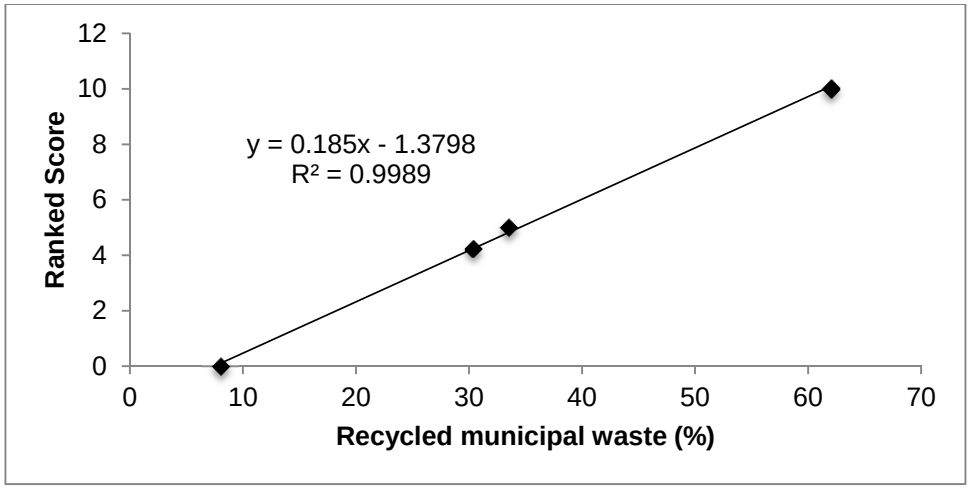



Figure C - 33 Linear Regression for Recycled Waste Percentage for High Population Cities

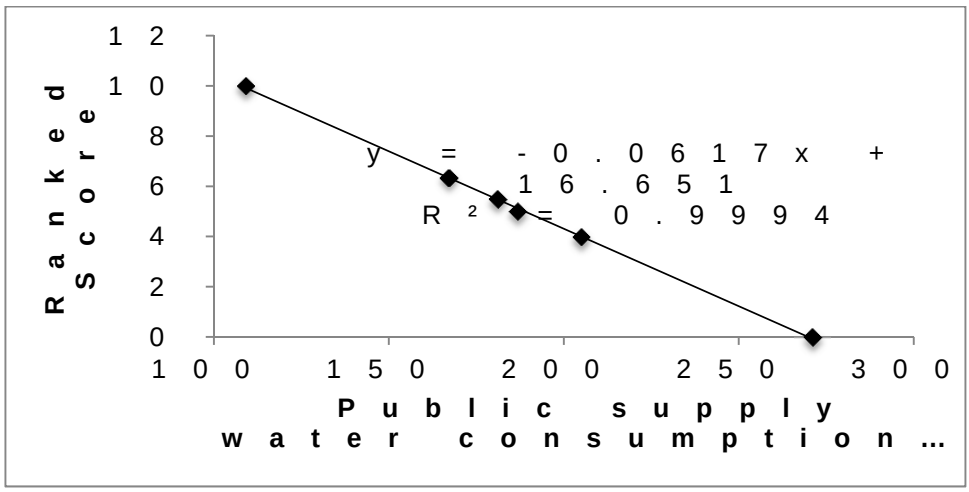



Figure C - 34 Linear Regression for Total Water Consumption for Low Population Cities

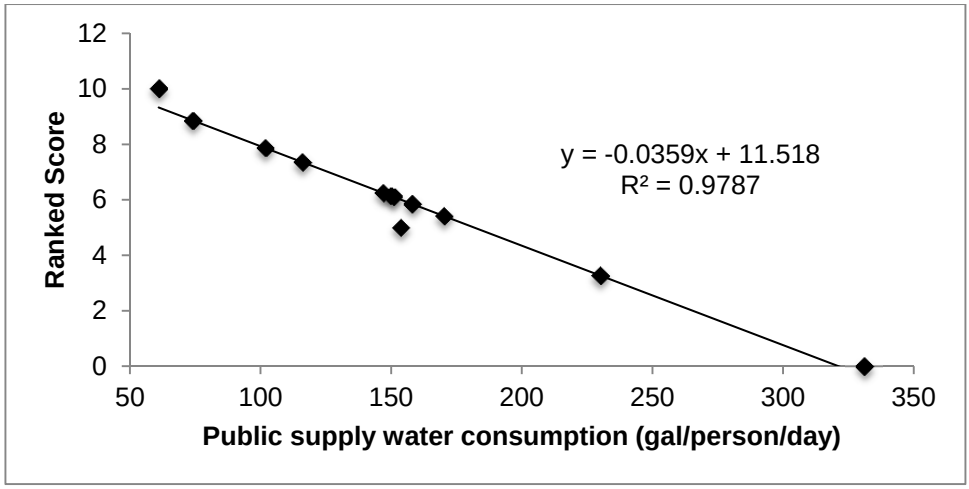



Figure C - 35 Linear Regression for Total Water Consumption for Medium Population Cities

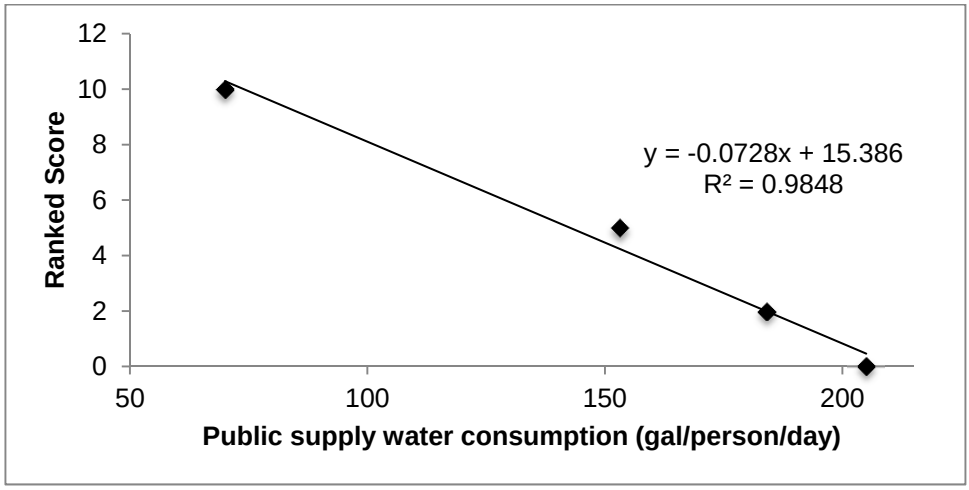



Figure C - 36 Linear Regression for Total Water Consumption for High Population Cities

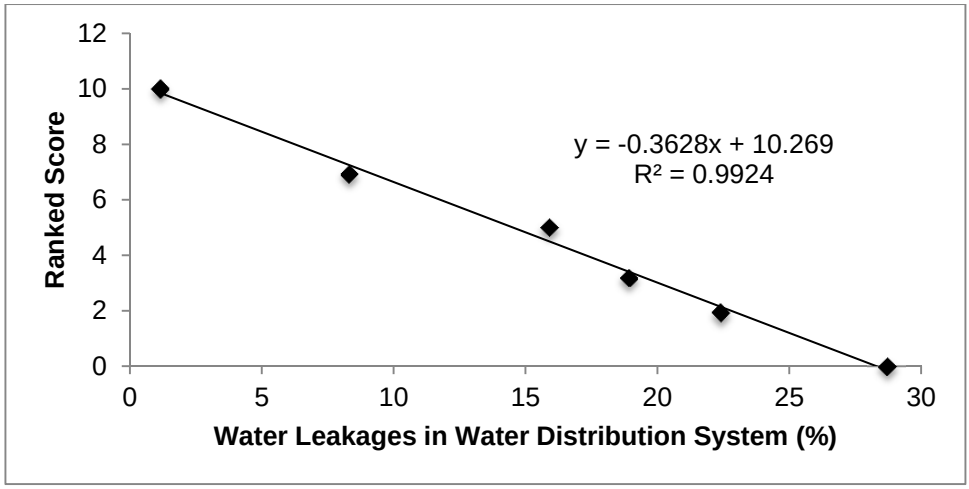



Figure C - 37 Linear Regression for Water Leakages in Distribution System for Low Population Cities

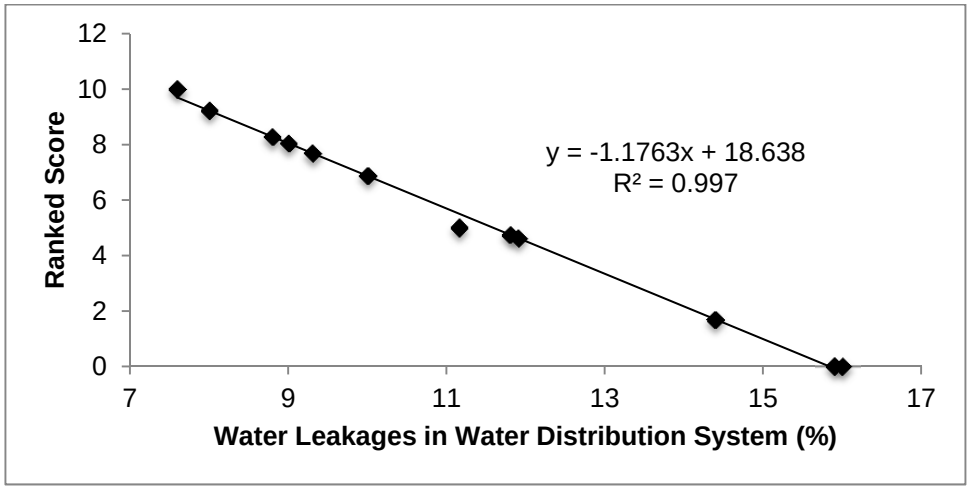



Figure C - 38 Linear Regression for Water Leakages in Distribution System for Medium Population Cities

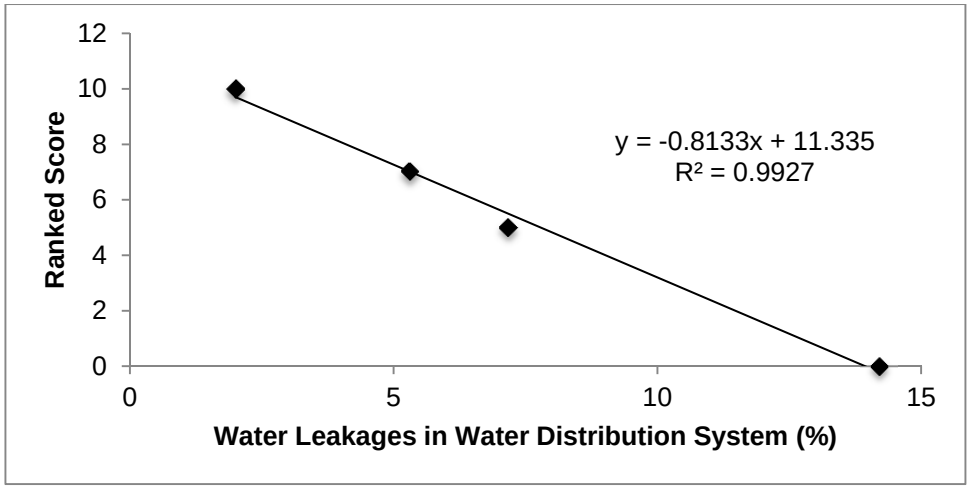



Figure C - 39 Linear Regression for Water Leakages in Distribution System for High Population Cities

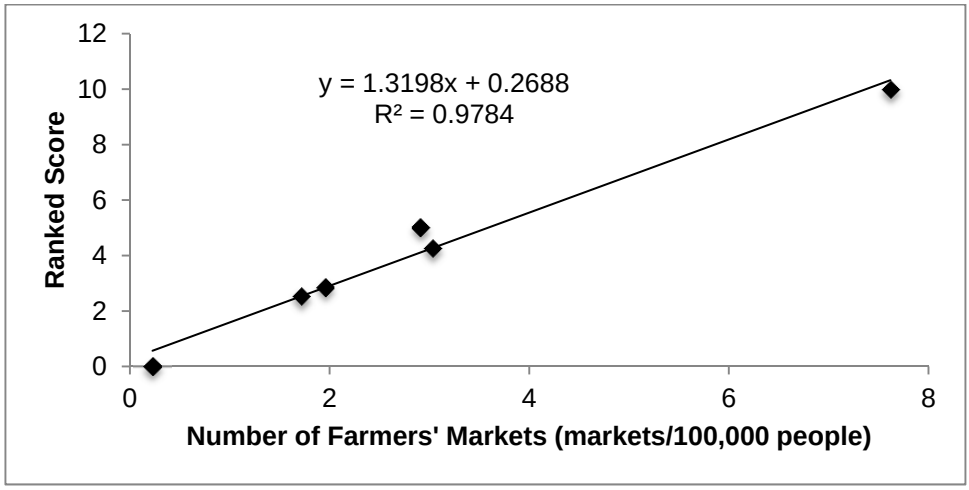



Figure C - 40 Linear Regression for Number of Farmers' Markets for Low Population Cities

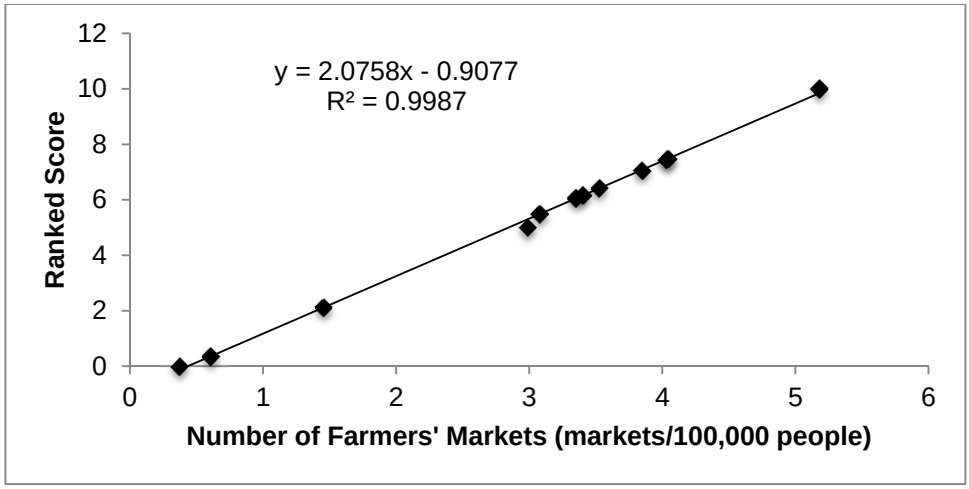



Figure C - 41 Linear Regression for Number of Farmers' Markets for Medium Population Cities

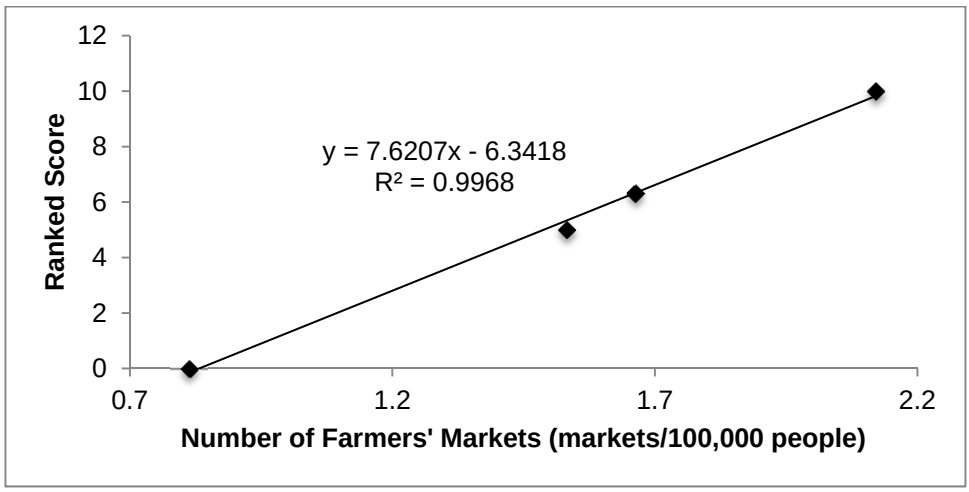



Figure C - 42 Linear Regression for Number of Farmers' Markets for High Population Cities

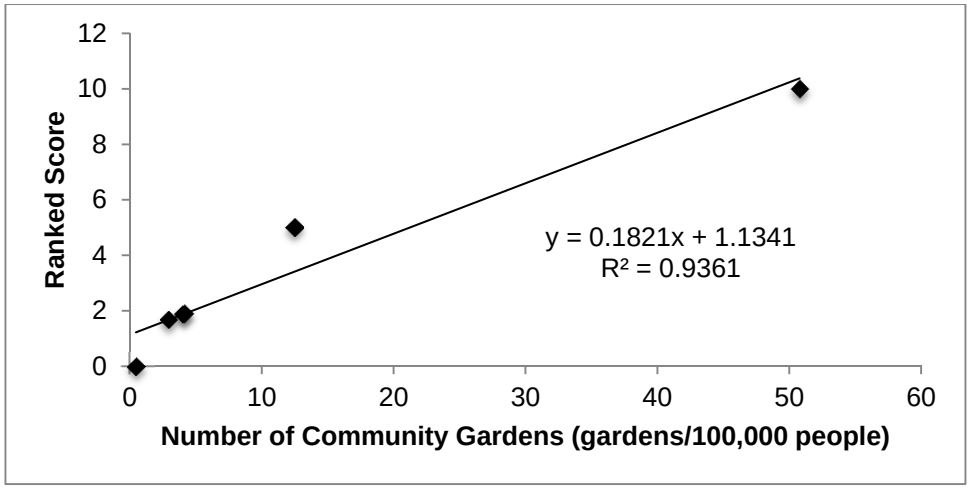



Figure C - 43 Linear Regression for Number of Community Gardens for Low Population Cities

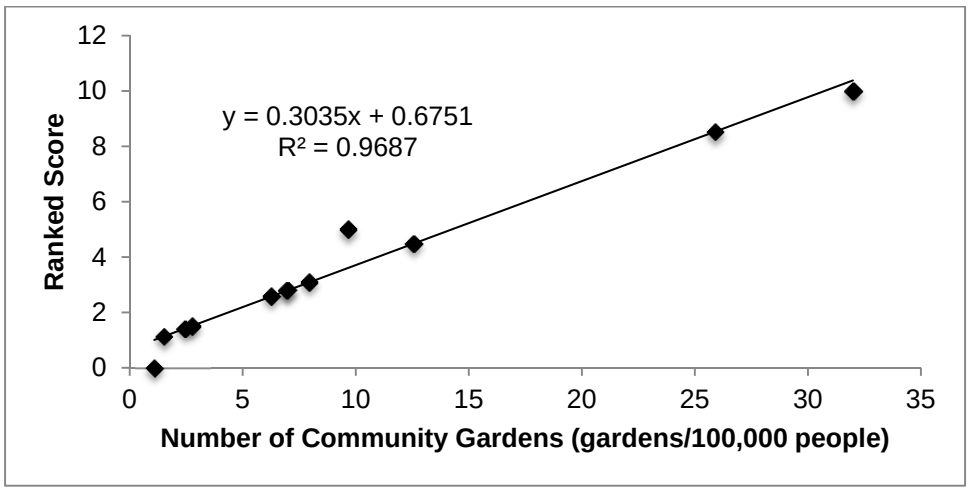



Figure C - 44 Linear Regression for Number of Community Gardens for Medium Population Cities

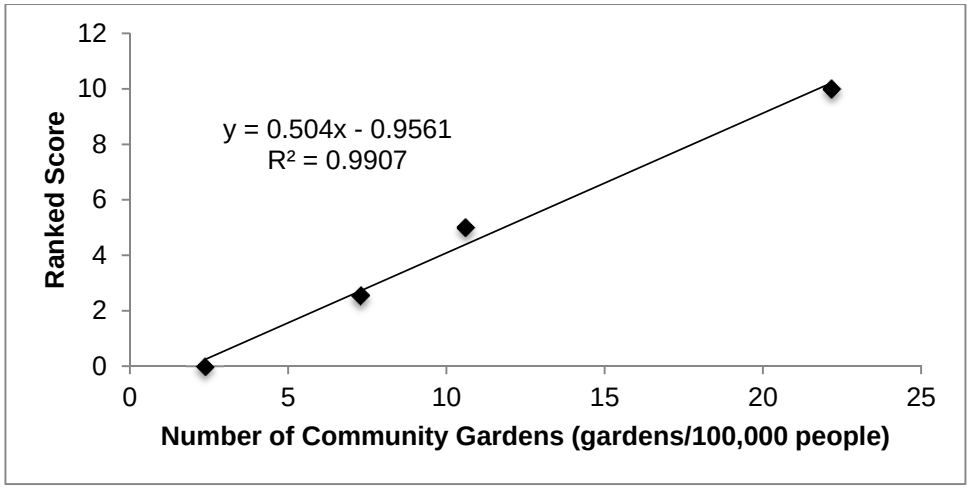



Figure C - 45 Linear Regression for Number of Community Gardens for High Population Cities