

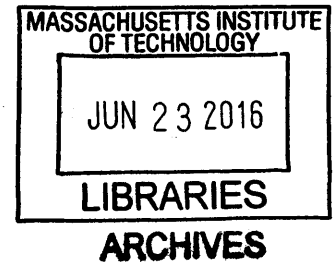
Can Sustainability Be Local?

An Examination of Neighborhood Sustainability Assessment in Denver, Colorado

by

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Abstract

While the challenge of achieving a sustainable built environment is global, governments and nonprofits working to advance sustainability are increasingly turning to the neighborhood scale (Luederitz, Lang, and von Wehrden 2013). This attention to the neighborhood has been accompanied by a corresponding increase in Neighborhood Sustainability Assessment (NSA) standards, which evaluate neighborhoods against sustainability criteria. Since 2001, when the first NSA standard was published (Sharifi 2016), the number of NSA standards in use worldwide has climbed to 32 (Criterion Planners 2016). Despite this volume, there is relatively little written on individual NSA standards, and even less on how these standards compare to one another or relate to city-led sustainability efforts (Haapio 2012; Sharifi and Murayama 2013; Berardi 2013; Reith and Orova 2015; Komeily and Srinivasan 2015).

This study addresses these gaps in the literature by studying four NSA standards in use in Denver, Colorado: LEED ND, 2030 Districts, EcoDistricts, and Sustainable Neighborhoods. This is the first study to examine the use of multiple NSA standards in the same city and the first to analyze the relationship between NSA standards and citywide sustainability efforts. I answer the following three questions: What are the similarities and differences between the intent, certification approach, and applicability of different NSA standards? Why are individuals, institutions, and cities adopting NSA standards and how satisfied are they with their choice? What is the relationship between NSA standards and city-led, city-scale planning?

I find that the four NSA standards I examine prioritize different elements of sustainability, employ different approaches to certification, and operate in different development contexts, and that this diversity helps advance neighborhood-scale sustainability in Denver. I find that individuals adopt specific NSA standards as a result of a tangle of iterative decisions that draw upon the initiator's personal and professional networks, their knowledge of the variety of standards available, and the authority they possess. Finally, I find that these four NSA projects are well connected to the City of Denver but that rather than working through Denver's Office of Sustainability, they intersect with multiple City agencies, thus benefiting from Denver's mandate that all City departments support sustainability initiatives.

Thesis Supervisor: Brent D. Ryan

Title: Associate Professor of Urban Design and Public Policy

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Table of Contents

Chapter 1: Introduction	5
<i>Background</i>	5
<i>Study Purpose and Research Questions</i>	6
<i>Definitions of Sustainability</i>	7
<i>Literature Review</i>	9
<i>Methodology</i>	14
<i>Thesis Organization</i>	16
Chapter 2: Citywide and Neighborhood-Level Sustainability Initiatives in Denver	18
<i>Citywide Initiatives</i>	18
<i>Neighborhood Sustainability Assessment Standards</i>	22
<i>Conclusions</i>	37
Chapter 3: Establishing Profiles for the Four Neighborhood Sustainability Assessment Standards	42
<i>Intent</i>	42
<i>Certification Approach</i>	48
<i>Applicability</i>	50
<i>Conclusions</i>	53
Chapter 4: Explaining the Trend of Neighborhood Sustainability Assessment Standards	55
<i>Why Work at the Neighborhood Scale?</i>	55
<i>Why Certify a Project?</i>	59
<i>Why This Standard?</i>	62
<i>Conclusions</i>	65
Chapter 5: Defining the Relationship between Neighborhood Sustainability Assessment Standards and City Planning	66
<i>Denver City Government</i>	66
<i>Denver NSA Projects</i>	67
<i>Office of Sustainability</i>	69
<i>Conclusions</i>	69
Chapter 6: Conclusions	71
<i>Summary of Findings</i>	71
<i>Suggestions for Further Research</i>	74
<i>Concluding Thoughts</i>	75
Appendix	77
<i>Interview Questions</i>	78
<i>List of Tables and Figures</i>	79
<i>Bibliography</i>	80

Chapter One: Introduction

Background

In 1987, the World Commission on Environment and Development published a report titled *Our Common Future*. In it, they defined sustainable development as “development that meets the needs of current generations without compromising the ability of future generations to meet their own needs” (Brundtland et al. 1987).

In the past three decades, a multitude of efforts have sought to transition our built environment to one that abides by this 1987 definition. The need to achieve sustainability is made even more pressing by climate change, which is both a product of our unsustainable inhabitation of the Earth, and a barrier to sustainability in itself (Contribution of Working Group III 2007; Luederitz, Lang, and Von Wehrden 2013). The coming decades present both tremendous opportunity and risk, as 900 billion square feet—an area roughly equal to 60 percent of the world’s current building stock—will either be built or rebuilt worldwide by 2030 (Architecture 2030 2014).

While the challenge of achieving sustainability is global, governments and nonprofits working to advance sustainability are increasingly turning to the neighborhood scale (Luederitz et al. 2013): areas within a city that are defined by physical, social, or programmatic boundaries. This development is not necessarily surprising. Starting with Ebenezer Howard’s 1898 Garden City proposal, the neighborhood has consistently been understood as “an important geographic and social unit for organizing planning efforts” (Rohe 2009). Sharifi (2016) identifies five major neighborhood-level planning movements over the past century: Garden City (1900s), Neighborhood Unit (1920s), Modernism (1930s), Neo-traditional (1980s), and Eco-urbanism (1980s). While Eco-urbanism is the only one of these movements focused explicitly on the environment, Garden City, Neighborhood Unit, Modernism and Neo-traditional approaches all advance goals that we now understand to relate to sustainability, such as inclusiveness, accessibility, and the introduction of green space (Sharifi 2016).

This attention to the neighborhood has been accompanied by a corresponding increase in Neighborhood Sustainability Assessment (NSA) standards, which evaluate a new or existing community against sustainability criteria. Since the development of the first NSA standard, HQE²R, in France in

2001, the number of NSA standards has grown dramatically (Sharifi and Murayama 2013). Presently, there are over 32 standards across the globe, eight of which are utilized within the United States. Of these, 24 are intended for new neighborhoods, three are intended for existing neighborhoods, and five are for use in either (Criterion Planners 2016). And the universe of standards has by no means stabilized. Since I began this thesis, one of the eight U.S. standards changed its criteria for certification and removed four years worth of projects from its website (EcoDistricts 2015b), and three of the eight U.S. standards announced plans for a New York City project that combines all three of their approaches (NYC Districts 2015).

Understanding the use of NSA is a critical component of advancing the sustainability of the built environment. Yet, because these standards are barely a decade old, there is relatively little written on individual NSA standards, and even less on how multiple standards compare. The existing literature also has yet to examine the relationship between city planning and NSA standards, or the use of multiple different standards in a single city (Haapio 2012; Sharifi and Murayama 2013; Berardi 2013; Sharifi and Murayama 2014; Sharifi and Murayama 2015; Reith and Orova 2015; Komeily and Srinivasan 2015).

Study Purpose and Research Questions

Given that few NSA-certified projects are even five years old, it is far too early to evaluate the performance of these standards for their ability to generate sustainable neighborhoods. There is, however, much to be gained through an analysis of the early stages of certified projects.

The purpose of this study is to advance our knowledge of neighborhood sustainability assessment by (1) comparing and contrasting multiple NSA standards in use in a single U.S. city, (2) analyzing the reasons project initiators selected a particular NSA standard and their level of satisfaction with the standard several years into the project, and (3) examining the relationship between NSA standards and city-led sustainability planning, and the ways in which they can be mutually supportive. This is the first study to examine the use of multiple NSA standards in the same city, and the first study to analyze the relationship between NSA standards and citywide sustainability initiatives.

To achieve my study purpose, I pose three research questions:

1. What are the similarities and differences between the intent, certification approach, and applicability of different NSA standards?

-
2. Why are individuals, institutions, and cities adopting NSA standards and how satisfied are they with their choice?
 3. What is the relationship between city-led, city-scale planning and NSA standards?

Definitions of Sustainability

The Brundtland Definition

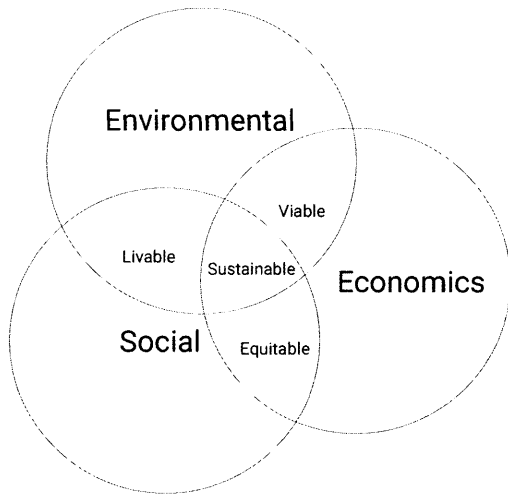
There is no universal definition for the term sustainability (Robinson 2004; Hopwood, Mellor, and O'Brien 2005; Bell and Morse 2008; Turcu 2013; Sharifi and Murayama 2013; Berardi 2013; Sharifi 2016). Bond, Morrison-Saunders, and Pope (2012) attribute the lack of a universal definition to the fact that sustainability is a value-laden concept open to multiple interpretations. All authors do, however, recognize the widespread use of the definition used in my thesis opening, in which sustainable development is defined as “development that meets the needs of current generations without compromising the ability of future generations to meet their own needs”(Brundtland et al. 1987). This definition is often referred to as the Brundtland Definition, named for the report in which it first appeared.

The Three Pillars of Sustainability, Plus One

In this loose consensus around the Brundtland Definition, many scholars also accept the Three Pillars of Sustainability, a framework published in the same document. This framework describes sustainability as consisting of three dimensions: environmental, social, and economic (Valentin and Spangenberg 2000; Boyko et al. 2006; Tanguay et al. 2009; Sharifi and Murayama 2013; Sharifi 2016). Environmental dimensions consider whether a development is ecologically sound, social dimensions consider whether a development advances equity and livability, and economic dimensions consider whether a development is financially feasible (Sharifi 2016). A development is said to be viable if it addresses environmental and economic dimensions; livable, if it addresses environmental and social dimensions; and equitable, if it addresses economic and social dimensions (Reith and Orova 2015). These three dimensions are often pictured as a Venn diagram, illustrated in Figure 1.1 below.

Figure 1.1: The Three Pillars of Sustainability

Source: Adapted from Bayulken and Huisingsh (2014)



Sustainability rests at the center, and only at the center of these three dimensions (Reith and Orova 2015); it is not enough to advance just one or two. Edwards (2005) describes:

A world where poverty is endemic will always be prone to ecological and other [i.e. economic] catastrophes. Hence, our inability to promote the common interest in sustainable development is often a product of the relative neglect of economic and social justice within and amongst nations (Edwards 2005, 18).

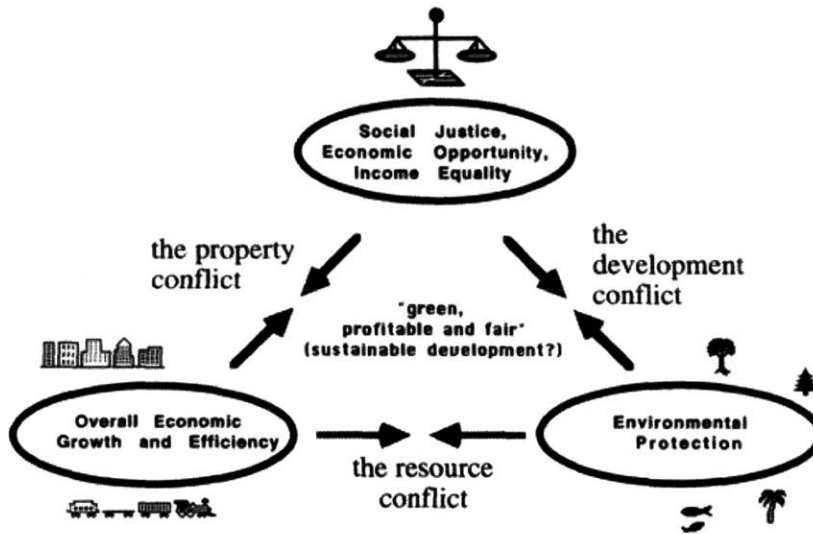
Berardi (2013), Sharifi and Murayama (2013), Komeily and Srinivasan (2015) and Sharifi (2016) complicate the three pillars of sustainability through the addition of a fourth component, institutional. Institutional dimensions of sustainability reflect stakeholder involvement in the planning process and the existence of governmental support. In other words, this last criterion considers whether the development is feasible.

The Planner's Triangle

While the integration of the environmental, social, and economic dimensions of sustainability is necessary, reaching agreement between these three concepts is immensely difficult, as each dimension tends to exist in opposition to the others. Scott Campbell (2003) refers to this tension as the "Planner's Triangle", illustrated in Figure 1.2.

Figure 1.2: The Planner's Triangle

Source: Campbell (2003)



Campbell (2003) summarizes, "In short, the planner must reconcile not two, but at least three conflicted interests: to 'grow' the economy, distribute this growth fairly, and in the process not degrade the ecosystem". This perspective is essential because it removes sustainable development from an alluring "misty-eyed eco-topia" (Campbell 2003) and recognizes the true difficulty of the task at hand.

Literature Review

The existing literature on Neighborhood Sustainability Assessment (NSA) provides the foundation for this study. There are two key divisions within this research. The first is whether the author considers a single, or multiple, NSA standards. The majority of studies conducted to date have focused on a single standard. Given the large number of NSA standards available, the relative lack of comparative studies is a significant gap.

The second division in the NSA literature is whether the author evaluates a standard using the standard's manual or the projects the standard generated. Assessing the manual is referred to as a Development Phase Comparison while assessing the resulting project is called an Application Phase Comparison (Sharifi and Murayama 2013). While Application Phase Comparisons are possible with a few of the oldest NSA standards, most of the standards are far too new to have projects developed enough to be critically evaluated.

There are seven different studies that fall into the Development Phase Comparison category,

which were all published in the past four years. Two of these studies—Sharifi and Murayama (2014) and Naji and Gwilliam (2016)—asked dramatically different questions than I pose: Sharifi and Murayama (2014) considered the potential of a universal NSA standard, while Naji and Gwilliam (2016) looked at how NSA standards could further adaptive capacity to climate change. I chose to eliminate these two studies from my literature review, choosing just to focus on the five Development Phase Comparisons of multiple standards that aligned with my research questions.

As shown in Table 1.1, these five studies examined nine different NSA standards. Five standards appeared in just one study, but three of the standards—LEED ND, BREEAM Communities, and CASBEE-UD—were consistently reviewed. Just two of the standards considered—EarthCraft Communities and LEED ND—were based in the United States.

Table 1.1: Standards Evaluated in Development Phase Comparisons

Compiled by author with information from Haapio (2012), Sharifi and Murayama (2013), Berardi (2013), Reith and Orova (2015), and Komeily and Srinivasan (2015)

Standard	Instituted	Region	Haapio (2012)	Sharifi & Murayama (2013)	Berardi (2013)	Reith & Orova (2015)	Komeily & Srinivasan (2015)
HQE ² R	2001	EU	—	<i>Yes!</i>	—	—	—
EcoCity	2002	EU	—	<i>Yes!</i>	—	—	—
EarthCraft	2003	US	—	<i>Yes!</i>	—	—	—
CASBEE	2006	Japan	<i>Yes!</i>	<i>Yes!</i>	<i>Yes!</i>	<i>Yes!</i>	<i>Yes!</i>
SCR	2007	Australia	—	<i>Yes!</i>	—	—	—
DGNB	2008	Germany	—	—	—	<i>Yes!</i>	<i>Yes!</i>
BREEAM	2006	UK	<i>Yes!</i>	<i>Yes!</i>	<i>Yes!</i>	<i>Yes!</i>	<i>Yes!</i>
LEED ND	2009	US	<i>Yes!</i>	<i>Yes!</i>	<i>Yes!</i>	<i>Yes!</i>	<i>Yes!</i>
Pearl	2010	UAE	—	—	—	—	<i>Yes!</i>

The earliest study examining multiple standards was written by Appu Haapio in 2012. Haapio provided a general overview of three standards, covering categories and ratings, region of origin, and site location. While this study was purely descriptive, subsequent research has taken a more analytical approach (Sharifi and Murayama 2013; Berardi 2013; Komeily and Srinivasan 2015; Reith and Orova 2015).

These four analytical Development Phase Comparisons—Sharifi and Murayama (2013),

Berardi (2013), Komeily and Srinivasan (2015) and Reith and Orova (2015)—all sought to understand the same two questions: Are the standards faithful to the principles of sustainable development? What are the similarities and differences between how each standard approaches neighborhood sustainability assessment? Thus, these four studies contributed to the field not by introducing new conversations about NSA standards, but by expanding the number of NSA standards that have been studied, by analyzing more recent versions of NSA standards reviewed in earlier studies, and by developing slightly new methods of comparison.

All four studies evaluated standards using a technique called Sustainability Coverage Analysis. In Sustainability Coverage Analysis, authors sort a standard's indicators—the qualities that the NSA standard requires a certified project to achieve—into a predefined list of themes, which reflect principles of sustainable development projects. The number of indicators in each theme is then totaled, enabling a comparison of standards both to principles of sustainable development and to each other. The themes used in these four re-categorization analyses vary slightly but are not significantly different. The only important distinction I observed is whether the study's authors look at institutional dimensions of sustainability in addition to the environmental, economic, and social dimensions. Sharifi and Murayama (2013) and Komeily and Srinivasan (2015) looked at institutional dimensions while Berardi (2013) and Reith and Orova (2015) did not.

Authors supplemented this Sustainability Coverage Analysis by comparing tools across a set of additional measures detailed in Table 1.2 below. Unlike the sustainability themes, which are relatively consistent across all four studies, the additional measures varied greatly. The only commonality I observed was whether the authors considered site eligibility requirements and mandatory indicators.

[Text Continues Next Page]

Table 1.2: Measures Compared in Analytical Development Phase Comparisons

Compiled by author with information from Haapio (2012), Sharifi and Murayama (2013), Berardi (2013), Reith and Orova (2015), and Komeily and Srinivasan (2015)

Measures Compared	Sharifi & Murayama (2013)	Berardi (2013)	Reith & Orova (2015)	Komeily & Srinivasan (2015)
Sustainability Coverage	<i>Yes!</i>	<i>Yes!</i>	<i>Yes!</i>	<i>Yes!</i>
Inclusion of Prerequisites	<i>Yes!</i>	—	<i>Yes!</i>	—
Inclusion of Mandatory Indicators	—	—	<i>Yes!</i>	<i>Yes!</i>
Adaption to Locality	<i>Yes!</i>	—	—	<i>Yes!</i>
Scoring and Weighting	<i>Yes!</i>	—	—	<i>Yes!</i>
Participation	<i>Yes!</i>	—	—	—
Presentation of Results	<i>Yes!</i>	—	—	—
Applicability	<i>Yes!</i>	—	—	—
Water Efficiency	—	—	—	<i>Yes!</i>

The processes employed by these four studies enable three key conclusions about Neighborhood Sustainability Assessment standards: (1) Variation in Intent: NSA standards demonstrate a high degree of variation between standards; (2) Unbalanced Coverage: NSA standards take an unbalanced approach to environmental, economic, and social dimensions of sustainability; and (3) Differences in Applicability: some NSA standards achieve better applicability than others. While authors did remark on the relative strengths and weaknesses of each of the standards they compare, I do not review these observations here, as they do not relate to my research questions.

Variation in Intent

While one might assume, given that they all seek to advance sustainability at the neighborhood level, that NSA standards would be relatively consistent, all four authors found that NSA standards vary substantively in terms of their sustainability coverage and the additional measures evaluated in each study (Table 1.2). Sharifi and Murayama (2013) attributed these variations to “how, where, and why” each standard was developed and their intended application to planning. Despite variation among NSA standards, Reith and Orova (2015) observed that all the standards in their investigation (CASBEE, DGNB, BREEAM, and LEED ND) employed the same approach to certification, in which projects are evaluated

against a checklist of indicators reflecting qualities of sustainable development projects.

Unbalanced in Coverage

While some standards performed better than others, the nine standards consistently favored environmental dimensions of sustainability at the cost of economic and social dimensions of sustainability (Sharifi and Murayama 2013; Berardi 2013). Sharifi and Murayama (2013) and Komeily and Srinivasan (2015), the authors that included institutional dimensions of sustainability in their analyses, found that institutional dimensions were equally ignored.

Applicability

Sharifi and Murayama (2013) and Komeily and Srinivasan (2015) also considered the notion of standard applicability, a dimension that considers whether the standard is appealing to the community and whether it is compliant with earlier planning documents. These authors found that standards that were developed with input from government and multiple stakeholders and that were inserted into planning frameworks had greater applicability (Sharifi and Murayama 2013).

Research Gap

There are three gaps in this body of research that I aim to address in this thesis:

- *New Standards.* EcoDistricts, 2030 Districts and Sustainable Neighborhoods are three NSA standards that have been developed since 2009. My study is the first to examine these new standards both individually and together.
- *New Questions.* While most authors did touch on the general value of NSA standards in their papers, not one asked a project team why they elected to use a standard to begin with, or why they selected a particular standard over other options. I also consider the working relationship between standards and city planning, another topic that is only considered in the abstract.
- *New Methods.* Due to these new questions and the fact that three of the standards I compare have vastly different structures than the standards considered in the existing literature, my study required new research methods. I elaborate on these methods below.

Methodology

Site

I explore my three research questions using the City of Denver, Colorado as a case. Denver has achieved national recognition for its sustainability efforts. In 2006, the City was included in both SustainLane's and the Green Guide's lists of Top Ten Cities in the Nation for Sustainable Practices (Greenprint Denver 2010). In 2009, Mayor John Hickenlooper received first place for the Mayor's Climate Protection Award (Greenprint Denver 2010). In 2011, Denver placed fifth in the U.S. and Canada Green City Index (Alliance for Sustainable Colorado 2011) and in 2016, was ranked by the U.S. EPA as ninth in U.S. Cities with the most Energy Star Certified buildings (Denver Office of Sustainability 2016).

Denver is also noteworthy for both the quantity and diversity of Neighborhood Sustainability Assessment (NSA) standards in use. Twelve different projects using four different NSA standards are currently underway in Denver. In addition, the City has been the site of one failed standard (Living City Block 2014) and a series of private sector-initiated neighborhood-scale sustainability initiatives that have not sought certification (Schmiechen 2016).

Cases

For this thesis, I define a NSA standard as any documented, intentionally replicable, approach to sustainability that operates at a neighborhood scale, an area within a city that is defined by physical, social, or programmatic boundaries. At present, Denver is home to four standards that meet this definition: LEED for Neighborhood Development (LEED ND), EcoDistricts, 2030 Districts, and Sustainable Neighborhoods. This study looks at the application of each of these four NSA standards in the City of Denver.

There are four Denver-based LEED ND developments listed in the U.S. Green Building Council's Project Directory. Of these, just two—Park Avenue Redevelopment and the Mariposa District—have achieved certification. I chose to study the Mariposa District over Park Avenue because Park Avenue achieved certification through the LEED ND pilot rating system in 2009; I felt Mariposa, which achieved certification through LEED ND v3 in 2015, would reflect more current perspectives on LEED ND certification (USGBC 2016a).

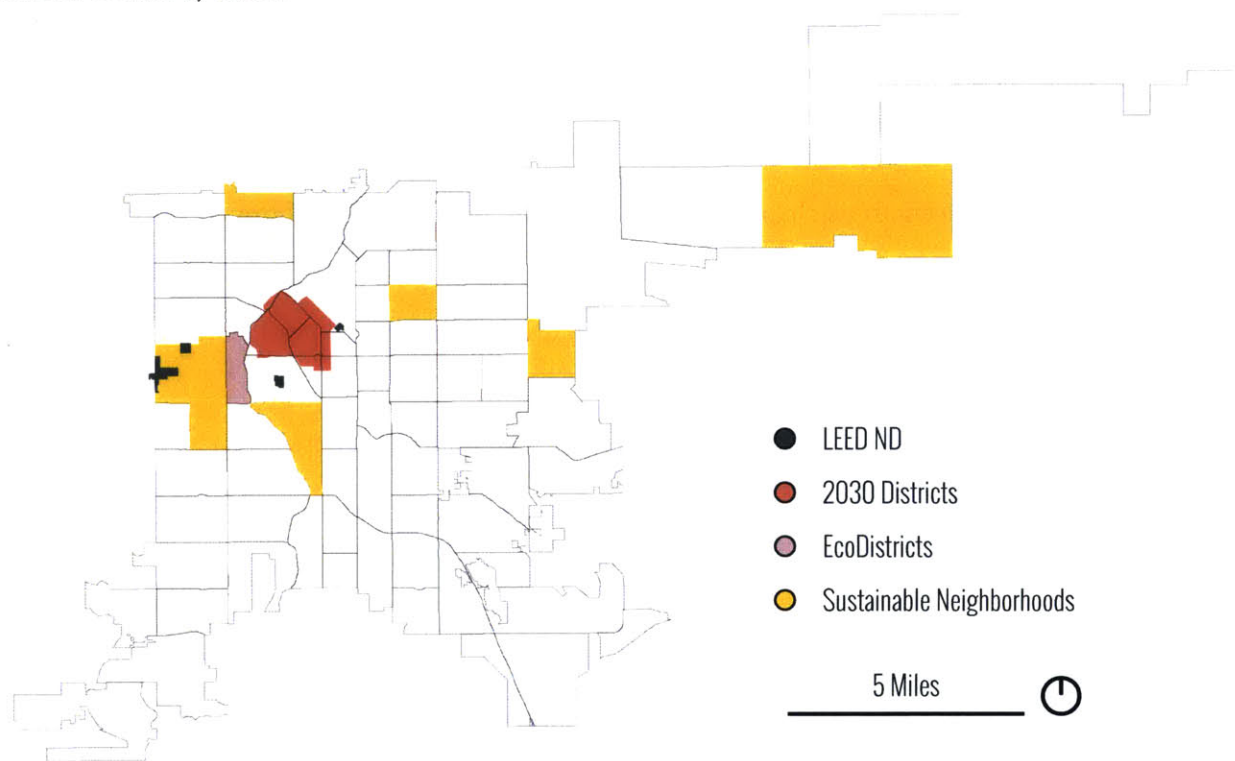
2030 Districts and EcoDistricts, each have just one certified project in the City: Denver 2030 and

the Sun Valley EcoDistrict. These were thus the two projects included in my study.

There are six Sustainable Neighborhoods projects in Denver. Although I had selected one of these to study at the onset of my investigation, I ultimately decided to look more broadly at the use of the Sustainable Neighborhoods NSA standard throughout the City of Denver because of the nature of the Sustainable Neighborhoods program. Sustainable Neighborhoods is a city-led resident engagement program; residents of a participating neighborhood would not have been able to comment on my interview questions. By interviewing Denver City employee Taylor Moellers, who oversees all six Sustainable Neighborhoods projects, I was better able to address my research questions and obtain data more comparable to the other NSA projects. In the case of Sustainable Neighborhoods, the term project refers to the Denver-specific iteration of the Sustainable Neighborhoods program.

Figure 1.3: Map of Denver NSA Projects

Source: Created by author



Data

To understand the similarities and differences between the four standards I study, I completed

a content analysis of their respective manuals. I used the development phase comparison framework developed by Sharifi and Murayama (2013) to structure this analysis, altering this structure slightly to accommodate the different certification approaches of the NSA standards in my study. I discuss these alterations during my content analysis in Chapter Three.

To understand why these program initiators adopted these four standards and the relationship between these neighborhood-scale initiatives and City-led sustainability efforts, I conducted six semi-structured interviews with key players in Denver's sustainability initiatives. Five of these interviews were with individuals who initiated and/or managed one of the four certified projects in my investigation. I asked these five individuals a series of set questions, which allowed me to compare their responses. The questions I asked touched upon their selection of a given standard, their current satisfaction with it, and how they saw their work relating to the sustainability efforts of the City of Denver. See Appendix A for a full list of questions. My sixth interview was with Jerry Tinianow, Chief Officer of Sustainability for the City of Denver. He discussed Denver's citywide approach to sustainability and commented on the NSA standards I analyzed.

Thesis Organization

My thesis is divided into six chapters. In Chapter One, I provide the background and purpose for the study, its three research questions, sustainability definitions, and a review of the literature on neighborhood sustainability assessment. I also introduce my methodology and provide a summary of the organization of my thesis.

In Chapter Two, I provide an overview of citywide and neighborhood-level sustainability initiatives in the City of Denver. I first review government-led initiatives, and follow with an introduction of LEED ND, 2030 Districts, EcoDistricts, and Sustainable Neighborhoods, the four Neighborhood Sustainability Assessment standards, and the certified projects I study: Mariposa LEED ND, Denver 2030 District, Sun Valley EcoDistrict and Sustainable Neighborhoods Denver.

In Chapter Three, I conduct a content analysis of the manuals of the four NSA standards. I use this evaluation to respond to my first research question: What are the similarities and differences between the intent, certification approach, and applicability of different NSA standards?

In Chapter Four, I use results from my six interviews with individuals to respond to my second research question: Why are individuals, institutions, and cities adopting NSA standards and how satisfied

are they with their choice?

In Chapter Five, I answer my final research question: What is the relationship between city-led, city-scale planning and NSA standards? This chapter examines the multiple intersections between Denver city government and the four NSA projects, and the role of Denver's Office of Sustainability.

In Chapter Six, I summarize my findings from Chapters Three, Four, and Five and suggest future research. This section also reflects on how NSAs can contribute to overall city sustainability.

Chapter Two: Citywide and Neighborhood-Level Sustainability Initiatives in Denver

This chapter provides an overview of citywide and neighborhood-level sustainability initiatives in the City of Denver. I begin by reviewing government-led initiatives. I then introduce LEED ND, 2030 Districts, EcoDistricts, and Sustainable Neighborhoods—the four Neighborhood Sustainability Assessment standards in use in Denver—and the certified projects I study: Mariposa LEED ND, Denver 2030 District, Sun Valley EcoDistrict and Sustainable Neighborhoods Denver.

Citywide Initiatives

2020 Sustainability Goals

Sustainability planning in the City of Denver began in 2000 with the publication of *Comprehensive Plan 2000* and its corresponding land use and transportation plan, *Blueprint Denver* (City and County of Denver 2002). Both plans established that sustainability was to be a central priority for the City moving forward. Four years later, in 2006, the City launched the *Greenprint Denver Initiative*, Denver's first initiative specifically focused on advancing sustainability (Greenprint Denver 2006). A key outcome of this initiative was the three-person Greenprint Denver Office, which was tasked with implementing this plan.

When Mayor Michael Hancock took office in 2011, he replaced the *Greenprint Denver Initiative* sustainability targets with the *2020 Sustainability Goals* and the Greenprint Denver office with the Denver Office of Sustainability. The *2020 Sustainability Goals* direct sustainability planning in Denver today. As shown on the next page in Figure 2.1, the *2020 Sustainability Goals* are two pages in length and consist of 24 specific sustainability targets to be achieved by the year 2020. The 24 targets are organized into twelve resource areas: (1) Air Quality, (2) Climate, (3) Energy, (4) Food, (5) Health, (6) Housing, (7) Land Use, (8) Materials, (9) Mobility, (10) Water Quantity, (11) Water Quality, and (12) Workforce. Each of the twelve Resource Areas contains Government Goals, which correspond to government operations, and Community Goals, which can only be accomplished in participation with residents.

Figure 2.1: Denver’s 2020 Sustainability Goals

Source: City and County of Denver (2016)



2020 Sustainability Goals

Resource	Government Operations Goal	Community Goal
Air Quality	Reduce emissions of federal criteria pollutants from municipal operations by 1.5 percent per year below the baseline year of 2012 or, if more stringent, to a level of full compliance with all federal, state and local laws relating to air emissions.	Attain all National Ambient Air Quality Standards.
Climate	Reduce greenhouse gas emissions from City government and DIA activities so that they contribute less than three percent of the level of emissions that would allow the community to meet the Community Goal (i.e. less than 354,000 mtCO2e).	Reduce total community-wide CO ₂ e emissions from Denver to below the level of emissions in 1990, (i.e., less than 11.8 million mtCO2e).
Energy	Reduce energy consumed in city-operated buildings and vehicles by 20% while doubling renewable energy produced from city facilities over the 2012 baseline.	Hold total energy consumed in Denver for buildings, mobility and industrial processes below the total consumed in 2012, while cutting fossil fuel consumption by 50% from 2012 levels.
Food	Acquire at least 25 percent of food purchased through Denver's municipal government supply chain from sources that are produced (grown or processed) entirely within Colorado.	Grow or process at least 20% of the food purchased in Denver entirely within Colorado.
Health	Work with health care providers (including Denver Health) to ensure that 95% of Denver residents have access to primary medical care.	Increase the percentage of children and adolescents in Denver who are at a healthy weight from 69% to 74%.
Housing	Develop at least 3,000 80% AMI Housing Units while siting at least 75% of them within 1/2 mile of a light rail station or 1/4 mile of an enhanced bus corridor	Ensure that at least 80 percent of neighborhoods in Denver are rated as "affordable" using the Center for Neighborhood Technology's H+T Index while preserving the diversity of the neighborhoods.
Land Use	Increase the walkability of Denver neighborhoods from Low to Medium and Medium to High as measured by the Denver-specific "walkscore" metric.	Move Denver's Walk Friendly rating to Platinum from Gold.

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Figure 2.1: Denver's 2020 Sustainability Goals (Continued)

Source: City and County of Denver (2016)



2020 Sustainability Goals

Resource	Government Operations Goal	Community Goal
Materials	Increase the City facility recycling rate to 40% or greater.	Increase the citywide recycling rate to 34% or greater.
Mobility	Provide incentives and other programs to City employees so that no more than 55% of these employees commute in single-occupant vehicles.	Provide mobility options (transit, car-pooling, biking, walking) that reduce commuting travel in Denver done in single-occupant vehicles to no more than 60% of all trips.
Water Quantity	Reduce use of potable water for irrigation of parks and golf courses by 22% to an 18 gpf average, and reduce use of potable water in city buildings by 20% over the 2012 baseline.	Work with Denver Water to reduce per capita use of potable water in Denver by 22% (down to 165 gallons per day) over a 2001 baseline, and take additional steps using the City's independent authority, in partnership with the Denver community, to keep the rate of increase in absolute consumption of potable water below the rate of population increase.
Water Quality	Achieve and maintain 100% compliance with existing and future MS4 permit requirements and reduce storm water outfall <i>E. coli</i> dry weather discharges in priority S. Platte river basins under current permit to 126 cfu/100 ml.	Make all Denver rivers and creeks swimmable and fishable.
Workforce	Provide workforce training and mobility incentive programs to CCD employees who live in transit deserts in Denver so that less than 55 percent of them drive to work alone most of the time.	Provide workforce training and mobility incentive programs so that less than 60 percent of workers who live in transit deserts and work in Denver drive to work alone most of the time.

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In December 2015, the City was well ahead of schedule for Government Operations and on track to meet Community Goals in all twelve Resource Areas (Denver Office of Sustainability 2015).

Denver's Office of Sustainability works to implement the *2020 Sustainability Goals* through a two-pronged approach that Chief Sustainability Officer Jerry Tinianow describes as "scale" and "everybody plays". To satisfy "scale", Tinianow qualifies policies by assessing whether they will advance the City's progress towards one of the 24 *2020 Sustainability Goals* targets by one percentage point or more. For example, Tinianow decided not to put a fee on the use of plastic bags in Denver despite requests to do so after conducting an analysis that demonstrated that the "percentage of waste in a landfill by weight that is plastic bags is three-tenths of one percent" (Tinianow 2016).

"Everybody plays" means that all City departments, regardless of focus, are expected to contribute to meeting the *2020 Sustainability Goals*. The Office of Sustainability does not directly operate any programs itself, but rather provides support to other departments in developing their sustainability initiatives, such the Denver Energy Challenge, which is run by the Department of Environmental Health, and Denver Recycles, which is run by the Department of Public Works.

Climate Action and Adaptation Plans

In addition to the *2020 Sustainability Goals*, Denver has a climate action plan and a climate adaptation plan. The *Climate Action Plan*, which was published in 2007 and updated in 2015, works to halt the progression of climate change through the reduction of greenhouse gas emissions and the introduction of carbon sinks, such as green space and street trees (City and County of Denver 2015a). The *Climate Adaptation Plan*, which was published in 2014 and revised in 2015, helps prepare the City for current and expected impacts of climate change. Both plans were developed by the Division of Environmental Quality within the City's Department of Environmental Health (City and County of Denver 2015b).

These climate-focused initiatives provide an important implementation strategy for nine of the twelve *2020 Sustainability Goal* Resource Areas. Where these intersections occur, the *Climate Action Plan* and the *Climate Adaptation Plan* pull their targets directly from the relevant *2020 Sustainability Goal*. The only *2020 Sustainability Goal* Resource Areas that are not included in these two climate plans are the Air Quality, Water Quality, and Workforce Resource Areas.

Neighborhood Sustainability Assessment Standards

I now describe LEED ND, 2030 Districts, EcoDistricts, and Sustainable Neighborhoods, and introduce the certified projects I studied.

Figure 2.2: Map of Certified Projects Considered in this Study

Source: Created by author.



LEED for Neighborhood Development

The United States Green Building Council launched Leadership in Energy and Environmental Design (LEED), a building-level sustainability certification standard, in August 1998. LEED Version 2.0 followed in March 2000, Version 2.1 in 2002, and Version 2.2 in 2005. Over the years, the U.S. Green Building Council has expanded its offerings to include alternate project scopes, such as interior design and construction, and different sectors, such as schools, retail, healthcare and homes (USGBC 2009, xi–xii). LEED is the most widely used third party green building standard in the world (USGBC 2016b).

In 2005, the U.S. Green Building Council partnered with the National Resource Defense Council and the Congress for the New Urbanism to develop a neighborhood-level iteration of the LEED standard. LEED for Neighborhood Development (LEED ND) launched in 2007 (USGBC 2009, xi–xii). This rating system has been revised twice since its release, once in 2009 (v3) and once in 2014 (v4) (USGBC 2014b). There are currently 139 LEED ND-certified projects listed in the U.S. Green Building Council’s Project Directory. Six of these projects are located in Colorado; two are in Denver (USGBC 2016a).

To achieve LEED ND certification, a project must satisfy twelve Prerequisites, listed in Table 2.1 below, and advance numerous sustainability indicators. These indicators, which LEED ND calls Credits, are predefined and are each worth a certain number of points based on how essential the three authors of the LEED ND standard deemed the credit to be in creating a sustainable neighborhood. The base-level LEED ND credential, “Certified”, requires 40 points. Projects that exceed this minimum can earn Silver (50–59 points), Gold (60–79 points), or Platinum (80–110 points) level certification.

Table 2.1: LEED Neighborhood Development Certification Prerequisites
 Compiled by author with information from USGBC (2014b)

LEED ND Credit Category	Certification Prerequisites
Smart Location and Linkage	Smart Location
	Imperiled Species and Ecological Communities
	Wetland and Water Body Conservation
	Agricultural Land Conservation
	Flood Plain Avoidance
Neighborhood Pattern and Design	Walkable Streets
	Compact Development
	Connected and Open Community
Green Infrastructure and Buildings	Certified Green Building
	Minimum Building Energy Performance
	Indoor Water Use Reduction
	Construction Activity Pollution Prevention
Innovation and Design Process	—
Regional Priority	—

LEED ND Prerequisites and Credits are organized into five credit categories:

- *Smart Location and Linkage (SLL)*. Five (5) Prerequisites and 28 possible points. This category ensures

that a project's location will not neutralize its sustainability outcomes. Specifically, these credits reduce the conversion of open space to built land and ensure that non-vehicle transportation options are available to future inhabitants (USGBC 2014b, 59–60).

- *Neighborhood Pattern and Design (NPD)*. Three (3) Prerequisites and 41 possible points. The NPD category directs the creation of walkable, compact, mixed-use communities. This development pattern will ideally activate public spaces and decrease vehicle trips within the community. Like SLL, it will also preserve open space (USGBC 2014b, 169)
- *Green Infrastructure and Buildings (GIB)*. Four (4) Prerequisites and 31 possible points. GIB credits ensure that the built components of the project do as little harm to the environment as possible. This category includes credits for measures like including LEED-certified buildings and developing district-scale heating and cooling systems (USGBC 2014b, 305).
- *Innovation and Design Process (IN)*. Six (6) possible points. The IN group consists of just two items: LEED Accredited Professional, worth one point, and Innovation, which can be worth no more than five. To receive credits for Innovation, the project team must generate an idea and seek approval from the U.S. GBC (USGBC 2009, 111).
- *Regional Priority (RP)*. Four (4) possible points. These credits provide room for a development to address sustainability issues specific to the region. In Denver, projects can receive points for measures like compact development and water efficient landscaping (USGBC 2014b, 497).

While these five credit categories structure certification, Prerequisites and Credits are also associated with one or multiple Policy Areas. These eight Policy Areas—(1) Climate Protection, (2) Infrastructure Efficiency, (3) Public Health, (4) Walkable Amenities, (5) Water Protection, (6) Smart Growth, (7) Social Equity, (8) Natural Resource Protection—reflect the outcome or outcomes of a Prerequisite or Credit. In the standard's manual, they are used to show synergies between Credits. For instance, the Smart Location Prerequisite, from the Smart Location and Linkage Credit Category, satisfies all eight Policy Areas while the Tree-Lined and Shaded Streetscapes Credit, from the Neighborhood Pattern and Design Credit Category, advances just (1) Climate Protection and (4) Walkable Amenities. There is no relationship between the number of Policy Areas advanced by a Credit and the number of points it is worth (USGBC 2014b, 40–44).

Figure 2.3 Rendering of the Mariposa LEED ND District

Source: Mithun (2016)



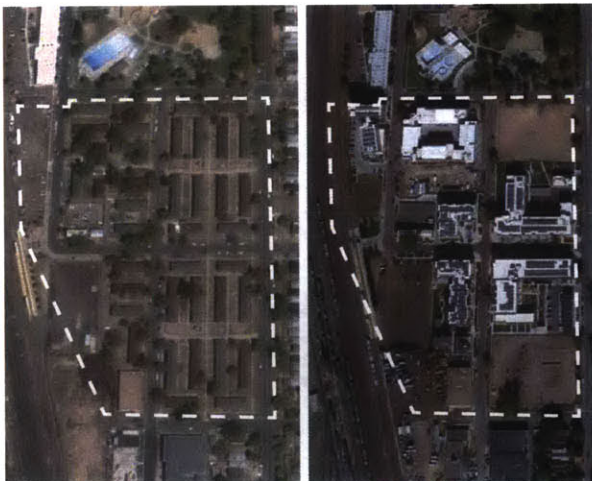
The Mariposa District, located in the La Alma-Lincoln Park neighborhood of Denver, is a project of the Denver Housing Authority (DHA). This 800-unit, 17.5-acre development was initiated in 2006 when the City of Denver began plans for transit-oriented development surrounding the 10th Avenue and Osage Street RTD light rail station. The project combines the Housing Authority's 254-unit, 15.1-acre South Lincoln Park Homes, located a few blocks away from the light rail station, and a 2.4 acre parcel located adjacent to 10th and Osage. The Housing Authority hired Mithun, a Seattle-based design firm, to develop a master plan for the full 17.5 acres (PD&R Edge 2014). The *South Lincoln Redevelopment Master Plan* was published in January 2010. The Housing Authority subsequently began referring to the project as the Mariposa District. The Mariposa District attained LEED Gold certification in January 2015 for its overall plan. The Housing Authority has currently completed the first six of nine phases; the final phase is scheduled to begin in 2017 ("LEED Mariposa" 2016).

Articles about the Mariposa District praise the development for advancing resident health through

the introduction of wellness classes, vegetable gardens, and a bike share station (Jones 2013) and highlight the development’s natural lighting and alternative energy production—up to 60 percent of the project’s energy will come from geothermal or solar sources (Gose 2013).

Construction of the Mariposa District is expected to be concluded in 2018, seven years after construction started (PD&R Edge 2014).

Figure 2.4 Project Site in 2006 (Left) and 2016 (Right)
Source: Satellite Imagery from Google



2030 Districts

2030 Districts are a program of Architecture 2030, a nonprofit research organization founded by New Mexico-based architect Edward Mazria in 2002. Mazria developed Architecture 2030 to address climate change: the organization’s mission is to “rapidly transform the built environment from the major contributor of greenhouse gas emissions to a central part of the solution to the climate and energy crisis” (Architecture 2030 2016a). In 2006, to facilitate this transformation, Architecture 2030 issued the 2030 Challenge (Architecture 2030 2016c), a building-level fossil fuel reduction schedule designed to maximize the possibility that global average temperatures will never increase more than 2°C above pre-industrial levels. This schedule requires all participating buildings to be carbon neutral by 2030 (Architecture 2030 2016b).

Though Architecture 2030 now oversees 2030 Districts, the concept for a neighborhood-scale implementation of the 2030 Challenge was developed by a third party: Brian Geller, a sustainability specialist at ZGF Architects in Seattle. Geller started work on what was to become the first 2030 District

in 2009 after learning about a de-carbonization study taking place in Chicago (Geller 2013). Geller sought to take the de-carbonization study idea one step further by creating a structure that would encourage key players in downtown Seattle to work together to reduce their carbon footprint. He began by identifying on a map of downtown Seattle a small district steam utility that was building a biomass boiler that would reduce their carbon footprint and that of the 200 buildings attached to them by 50%. He then added the “ten largest property owners and managers that [he] knew downtown”, a number of whom were undertaking portfolio-wide certification, and observed that the area he had mapped would be impacted by a new city ordinance that would require building owners to benchmark their property’s energy usage and disclose some of the data to the city (Geller 2013). As Geller observed, “All of this stuff was happening, but it was happening somewhat siloed”. Geller shared his map with Seattle architects, engineers, and property owners, and said:

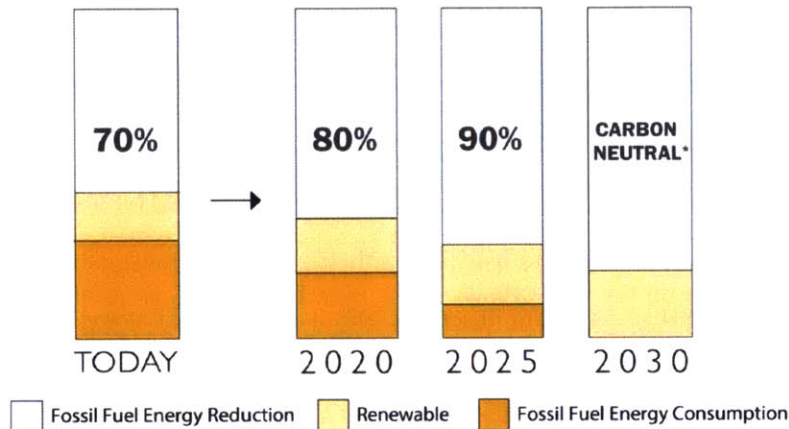
‘Look, this is what they’re doing in Chicago. They’re doing a study. But if we did something like this here, and instead of doing a study, invited these people on this map in, we would cover a lot of downtown. We could get all of these large entities measuring their progress the same way, united around one set of goals.’ I told them, ‘You’ll get a lot farther together than you would on your own.’ They’d learn a lot from each other. They wouldn’t be duplicating efforts. Hopefully, they’d be generating more work for everybody in the city. People liked the idea (Geller 2013).

Geller’s search for a set of sustainability goals for his district led him to Architecture 2030, which was in the process of launching the 2030 Challenge for Planning, an iteration of the 2030 Challenge that names building-level water, energy, and transportation emissions targets for 2020, 2035, and 2050 in place of a single reduction schedule for fossil fuel consumption (2030 Districts 2015a). Geller appreciated the “clean, comprehensive set of performance goals” of the 2030 Challenge for Planning and consequently adopted the framework (Geller 2013). The Seattle 2030 District was formally launched September 2011 (Architecture 2030 2016c).

[Text Continues Next Page]

Figure 2.5 Reduction Schedule for 2030 Challenge for Planning

Source: Architecture 2030 (2015)



Over the past four years, the model Geller developed has been formalized into a type of sustainability standard. In the most basic sense, a 2030 District is a zone in which at least five property owners have committed to the 2030 Challenge for Planning. To meet the three reduction targets of the 2030 Challenge for Planning, property owners are expected to upgrade their buildings to be more water and energy efficient and introduce programs like car sharing, which decrease individual automobile trips. Water and energy reductions are measured against an actual baseline while transportation reductions are claimed based on the theoretical emissions reduction of a given measure. Importantly, reductions are measured across the full district, so efficient buildings compensate for those that are performing poorly (Knoff 2016a).

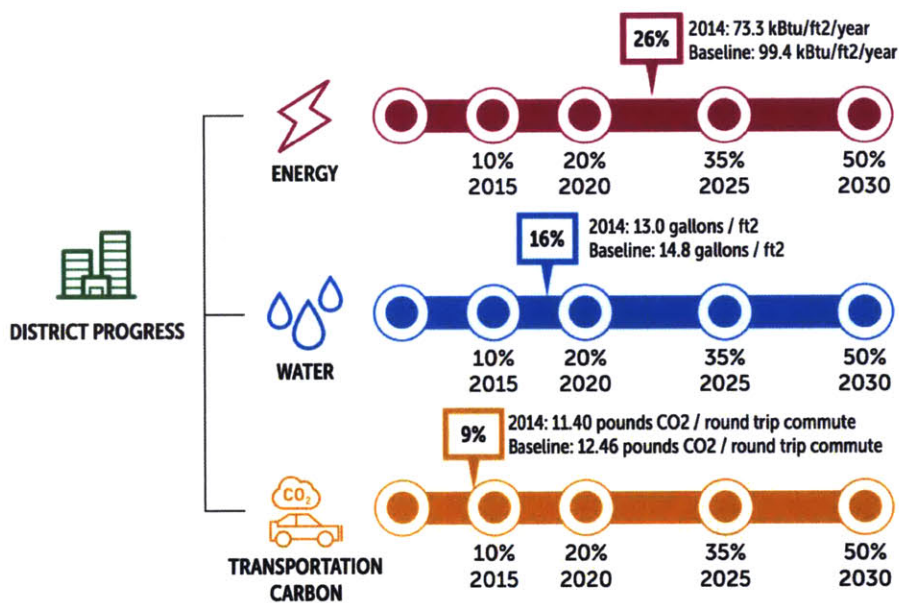
Architecture 2030 characterizes projects by development phase—Prospective, Emerging, or Established—and supplies commensurate support. For instance, the organization provides Prospective Districts with marketing materials and consultation services; Emerging Districts receive access to the 2030 Districts Network Collaboration Tool, entry to Architecture 2030 Events, and administration tools like a web portal and an enterprise email account (2030 Districts 2015c). These services help the District initiator recruit more members, and help existing members meet reduction targets.

The desired conclusion for all 2030 Districts is to become an Established District. By this point, a district must have a private sector-led Advisory or Leadership Board composed of a minimum of 40 percent property owners, managers, and developers; 20 percent professional stakeholders, such as architects, engineers, and utilities; and 20 percent community stakeholders, such as community groups,

2030 Districts at Greenbuild, the U.S. Green Building Council’s annual conference (Knoff 2016a). Wuertz and Hootman, who had also attended the Greenbuild lecture, no longer work at RNL Architects but do sit on the Board of the Denver 2030 District (Denver 2030 2015). When Denver 2030 first launched in 2013, it had 32 properties, far more than the Established District requirement of five. As of May 2016, 50 property owners had agreed to participate (Denver 2030 2016).

Figure 2.7 Denver 2030 District Goals and Progress to Date

Source: Denver 2030 (2015)



Denver 2030 has adopted the 2030 Challenge for Planning verbatim: existing buildings will strive towards a 10 percent reduction of baseline energy, water, and transportation emissions by 2015, a 20 percent reduction by 2020, a 35 percent reduction by 2025 and a 50 percent reduction by 2050; new buildings must use 50 percent less water and transportation carbon than the baseline upon construction and be net zero energy by 2050. As shown in Figure 2.7 above, Denver 2030 District has achieved a 26 percent reduction in energy use across its fifty buildings, exceeding the 2020 goal; a 16 percent reduction in water use, exceeding the 2015 goal; and a nine percent reduction in transportation carbon, just shy of the 2015 hurdle of ten percent (Denver 2030 2015).

Aside from increasing the number of participating properties, future work in the Denver 2030 District could involve a physical expansion of the district territory or a broadening of its goals.

Seattle 2030, for example, is customizing the standard by including an additional target for stormwater management (Seattle 2030 2016). Knoff recognizes that potable water is a huge challenge in Denver but does not plan to respond to this issue outside of the current water target, at least in the near future (Knoff 2016a).

EcoDistricts

In 2009, Portland's Mayor Sam Adams, in office 2008 to 2013 (Casey 2015) tasked the Portland Sustainability Institute (PoSI) with developing a framework for the redevelopment of five of the city's designated Urban Renewal Areas. Their work resulted in the EcoDistricts Framework, "a process management tool designed to implement and institutionalize sustainable district-scale best practices" (EcoDistricts 2015a, 8), and the EcoDistrict, the sustainable neighborhood-scale project that would result (Selzter et al. 2010). In 2010, the Portland Sustainability Institute changed its name to EcoDistricts and prepared the EcoDistricts framework for national circulation (EcoDistricts 2015a). Today, there are 51 EcoDistricts in the United States EcoDistricts, four in Canada, and one in Mexico (EcoDistricts 2015b; EcoDistricts 2016c).

To earn the right to call their project an EcoDistrict, project teams must attend the three day EcoDistricts Incubator where they learn about the EcoDistricts framework; participate in interactive sessions on district governance, assessment, and project development and management; and attend classes on topics relevant to their work, such as creative finance and innovation districts. Each project team leaves the Incubator with a "customized and comprehensive EcoDistricts project roadmap" (EcoDistricts 2016a, 1), which shows how the project team will address various sustainability objectives, over immediate, short-, mid-, and long-term time horizons (Ottawa Centre EcoDistrict 2014).

In June 2014, EcoDistricts launched their Target Cities Initiative, where over a two-year period, EcoDistricts will work as a strategic partner on eleven development projects throughout the US, helping project teams to "build robust governance models that will spur deep political and technical change, perform integrated assessment and goal setting tasks and accelerate the deployment of strategies to deepen their impact" (EcoDistricts 2014). Project teams will receive EcoDistricts certification if they have not already done so by attending an EcoDistrict Incubator.

In 2016, EcoDistricts will launch the EcoDistricts Protocol, which formalizes and expands upon the processes developed over the past five years (EcoDistricts 2016d). In contrast with other neighborhood

sustainability assessment standards, which evaluate the sustainability of the neighborhood as a product, the Protocol is process-based. This means that to achieve certification, project teams must adhere to a predetermined process that the EcoDistricts organization has decided will yield a sustainable output. This process includes three phases—District Formation, Roadmap, and Action—which each have a series of steps and corresponding deliverables. These deliverables, termed Certification Requirements, are detailed in Table 2.2 below.

Table 2.2: EcoDistricts Phases and Steps and Corresponding Certification Requirements
 Compiled by author with information from EcoDistricts (2016d).

Phase	Steps	Certification Requirements
District Formation	1. Assess Readiness and Prepare	Community-Based Asset Map Collaborative Governance Readiness Assessment Signed Declaration of Cooperation Short Report
	2. Build the Team and Vision	
	3. Commit to Action	
Roadmap	1. Set Context and Baseline	Context Template Data Plan Target Setting Template EcoDistricts Roadmap Short Report
	2. Set Targets and Strategies	
	3. Assemble Roadmap	
Action	1. Implement	Updated EcoDistricts Roadmap Annual Sustainability Report
	2. Report	
	3. Enhance	

The forthcoming Protocol is structured around three Imperatives and six Priority Areas. The Imperatives, (1) Equity, (2) Resilience, and (3) Climate, are to be embedded “across all aspects of a project”(EcoDistricts 2016d, 11). To ensure that this occurs, project teams develop an EcoDistricts Manifesto during the very first phase of their work. This manifesto “declares their motivation and intention with respect to the Imperatives” and states how their development project will advance each one by detailing an equity strategy, a resilience strategy and a climate pollution reduction strategy (EcoDistricts

2016d). Teams are encouraged to work with stakeholders in the development of their manifesto.

The six Priority Areas are: (1) Livable, (2) Prosperous, (3) Healthy, (4) Connected, (5) Restorative, and (6) Biodiversity. Priority Areas pinpoint “sustainability outcomes that are critical for projects to achieve” (EcoDistricts 2016d, 39) and are applied during the Roadmap phase, where they “help scope and define the project’s sustainability agenda” (EcoDistricts 2016d, 11). Each of the six Priority Areas is associated with a set of Objectives and recommended Metrics. For instance, one Objective in the (1) Livable Priority Area is “engagement processes are inclusive and representative” (EcoDistricts 2016d, 40). This Objective has two associated Metrics: “number of people engaged in public engagement processes (by race, ethnicity, and income)” and “number of opportunities provide for engagement (by type, duration, and location”. The EcoDistricts organization stresses that the Priority Areas Goals and Objectives “are non-negotiable” and that “each project that has registered for EcoDistricts Certification must demonstrate how they will progress toward these goals and objectives by creating a Roadmap of investments, strategies, and initiatives” (39). Importantly, Metrics are recommended and do not define specific hurdles.

Case: Sun Valley EcoDistrict

Paul Schmiechen, Environmental Systems Manager at Denver’s Department of Environmental Health, initiated the Sun Valley EcoDistrict in 2013 (Schmiechen 2016). Schmiechen attended the May 2013 EcoDistricts Incubator with a team of five: one individual from the Denver Housing Authority, one individual from Real Food Colorado, three individuals from Denver City Departments—one each from Public Works, Parks and Recreation, and Community Planning and Development. The project has since been accepted to the Target Cities Initiative.

The Sun Valley EcoDistrict spans all 415 acres of Denver’s Sun Valley neighborhood, which is located 1.5 miles from downtown and includes a power plant, a dead stretch of the South Platte River, the Sports Authority Field at Mile High Stadium, stadium-related surface parking lots, an elementary school, a recreation center, a new library and a new light rail station (EcoDistricts 2016b, 19). Sun Valley has a population of 1,500 (EcoDistricts 2016), 1,400 (93%) of whom live in Sun Valley Homes, a 324-unit residential development owned and operated by the Denver Housing Authority (Wolfe 2016). Sun Valley Homes occupies 40% of the land in Sun Valley, making the Denver Housing Authority the largest landowner in the neighborhood (Wolfe 2016).

The Denver Housing Authority took over the Sun Valley EcoDistrict in June 2014, right after the

project was accepted to the Target Cities Initiative. In the press release announcing their participation, the Housing Authority identified the following goals for the EcoDistrict:

District-scale energy infrastructure (photo-voltaic, geothermal, steam, etc) providing renewable and sustainable energy; district wastewater solutions; district water quality and detention; district recycling and any other implementable district solutions that conserve resources and enhance the lives of its residents. Additional district solutions around multi-modal transportation options and healthy locally grown food are also sought. We have a goal of reducing energy consumption by over 60% over local code standards (Denver Housing Authority 2014).

The Housing Authority funded planning for the Sun Valley EcoDistrict through a two million dollar 2013 CHOICE Neighborhoods Initiative Planning Grant from the Department of Housing and Urban Development. With these funds, the Housing Authority hired an extensive planning team, which is looking at matters ranging from green energy and infrastructure to community outreach to local food production. The Housing Authority is in the process of applying for a CHOICE Neighborhoods Initiative Implementation Grant, valued at thirty million dollars. This funding application is due in June 2016.

Figure 2.8 Sun Valley Master Plan (Draft)

Source: Provided by Wolfe (2016)



Sustainable Neighborhoods

Jonathan Wachtel, Sustainability Manager for Lakewood, Colorado, developed the Sustainable Neighborhoods program in 2012 to advance sustainability and neighborhood planning through direct citizen action (Sustainable Neighborhoods Program 2016b). The City of Denver adopted the program

two years later. At present, six Lakewood neighborhoods and six Denver neighborhoods have received Sustainable Neighborhoods certifications (Sustainable Neighborhoods Program 2016c). The Sustainable Neighborhoods program has not expanded beyond Lakewood and Denver, separating it from the 2030 Districts, and EcoDistricts standards, which are used throughout the United States, and LEED ND, which is used throughout the world.

To become a Sustainable Neighborhood, a community must first be admitted to the program. Taylor Moellers, the Denver Program Coordinator, solicits applications twice a year and selects participants based on three factors: the number of residents supporting the application, the quality of the initiatives they plan to undertake and whether she feels the neighborhood would greatly benefit from her assistance. She admits four neighborhoods to the program each year (Moellers 2016a).

If accepted, residents begin to earn credits by hosting workshops and special events, developing resources, completing inventories, and implementing projects. The number of credits earned depends on the impact of the chosen initiative. For instance, if 5 percent of neighborhood residents attend a xeriscaping workshop the community will earn four credits; 15 percent attendance is worth ten credits. To earn the title Participating Neighborhood, a community must accumulate sixty credits during their first year in the program reducing to forty credits each year thereafter. The Outstanding Neighborhood title requires one hundred credits the first year reducing to seventy in each subsequent year. A Participating Neighborhood may upgrade their status to Outstanding Neighborhood by obtaining one hundred credits in a single year (Sustainable Neighborhoods Program 2013).

Sustainable Neighborhoods is structured around five Goal Areas: Land, Air, Water, Energy, and People. For each one, Sustainable Neighborhoods specifies a goal, target areas, and suggested initiatives. For example, the goal for Air reads, “reduce emissions generated in the neighborhood and improve both indoor and outdoor air quality” (Sustainable Neighborhoods Program 2016a, 2). The related Target Areas are outdoor emissions, indoor air quality, trees and vegetation, and carbon footprint reduction. The Sustainable Neighborhood Network intends that participants will use Goal Areas to guide their work. No distribution requirement exists (Sustainable Neighborhoods Program 2016a).

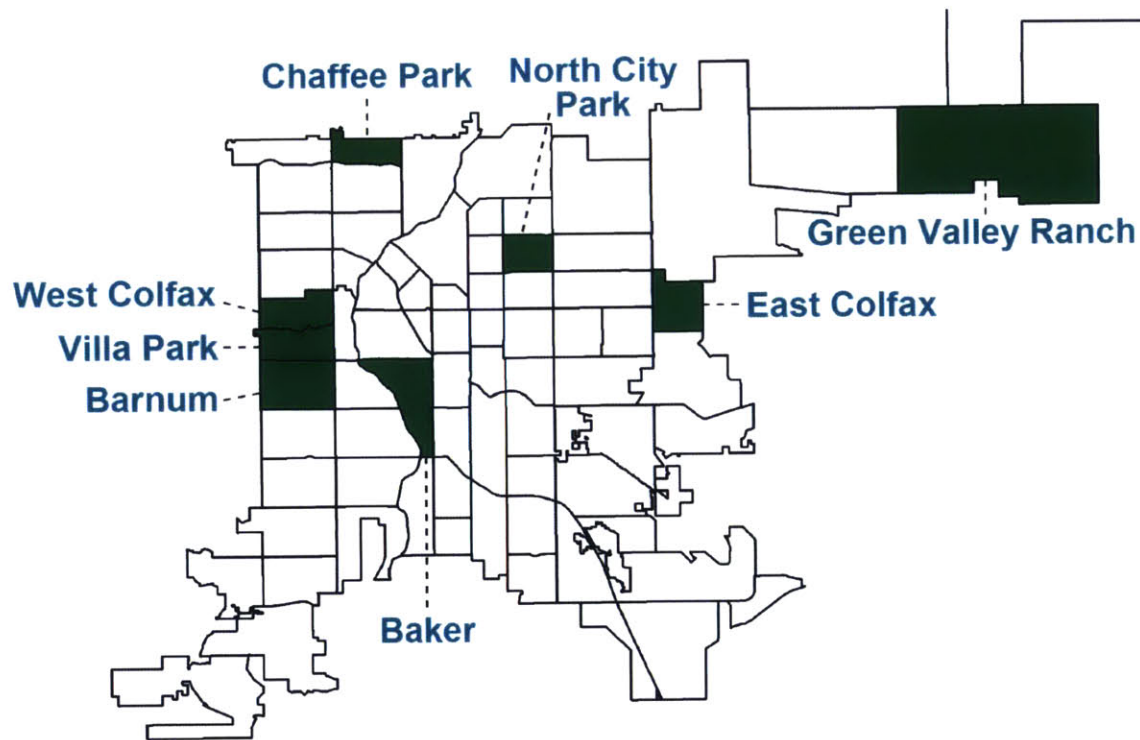
Sustainable Neighborhoods certification is designed to take one year. After this time, it is anticipated that the community will slightly reduce their sustainability efforts (Moellers 2016a). As stated above, maintaining a Participating Neighborhood title requires 40 credits, 20 fewer than the first year, and maintaining an Outstanding Neighborhood title requires 70 credits, 30 fewer than the initial certification.

This structure allows Moeller to enroll more communities without spreading herself too thin (Moellers 2016a).

Case

While I discuss the use of Sustainable Neighborhoods in Denver in the remaining chapters, as explained in Chapter 1, I elected to look at the implementation of this program as it applies to multiple neighborhoods, rather than just one.

Figure 2.9 Denver Neighborhoods Enrolled in the Sustainable Neighborhoods Program
Source: Sustainable Neighborhoods Program (2016a)



Conclusions

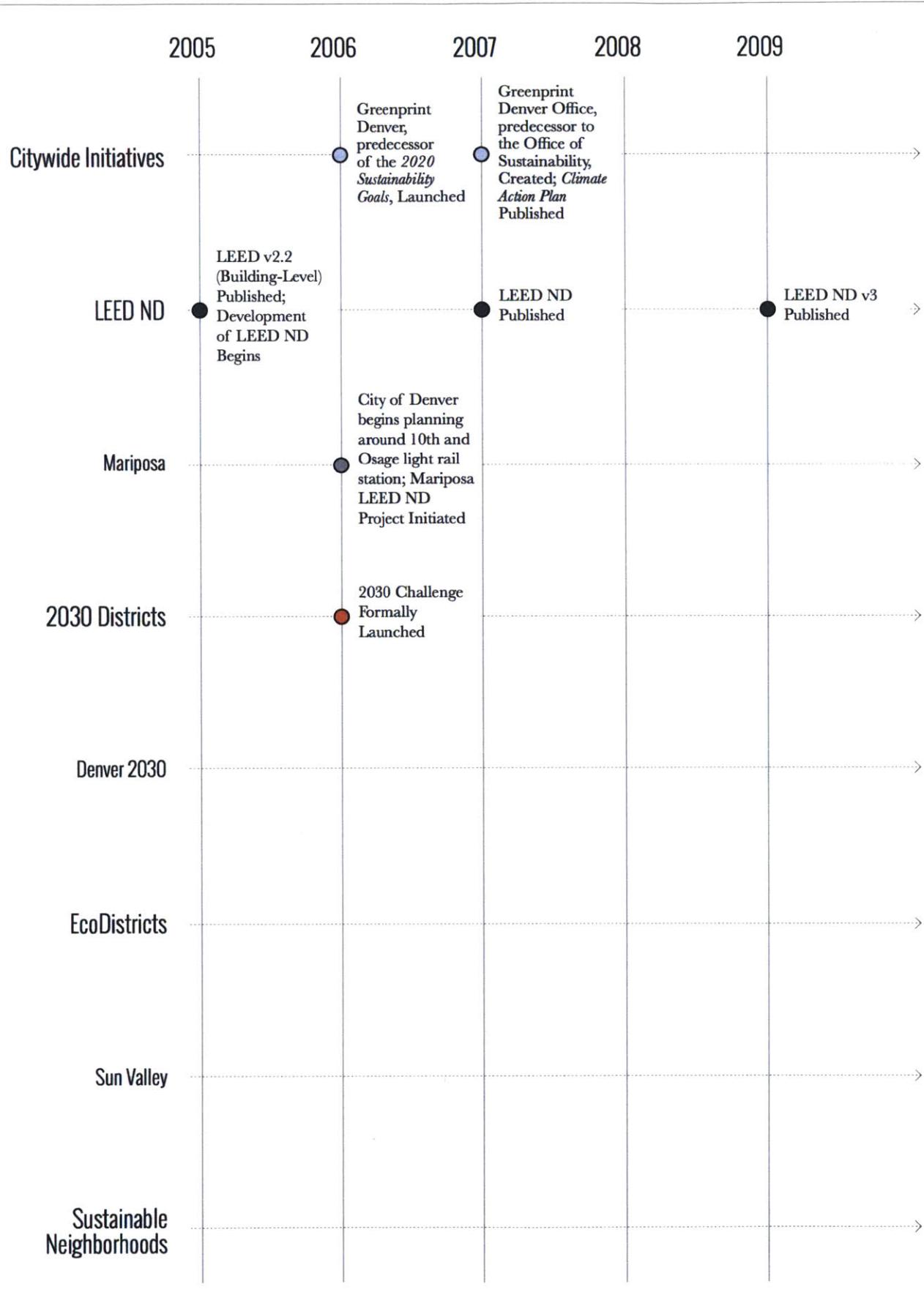
The City of Denver's efforts to advance sustainability date back to 2000, when its current citywide plan, *Plan 2000*, was published. Today, these efforts are guided by the *2020 Sustainability Goals* and an Office of Sustainability. This Office follows the directive "scale" and "everybody plays".

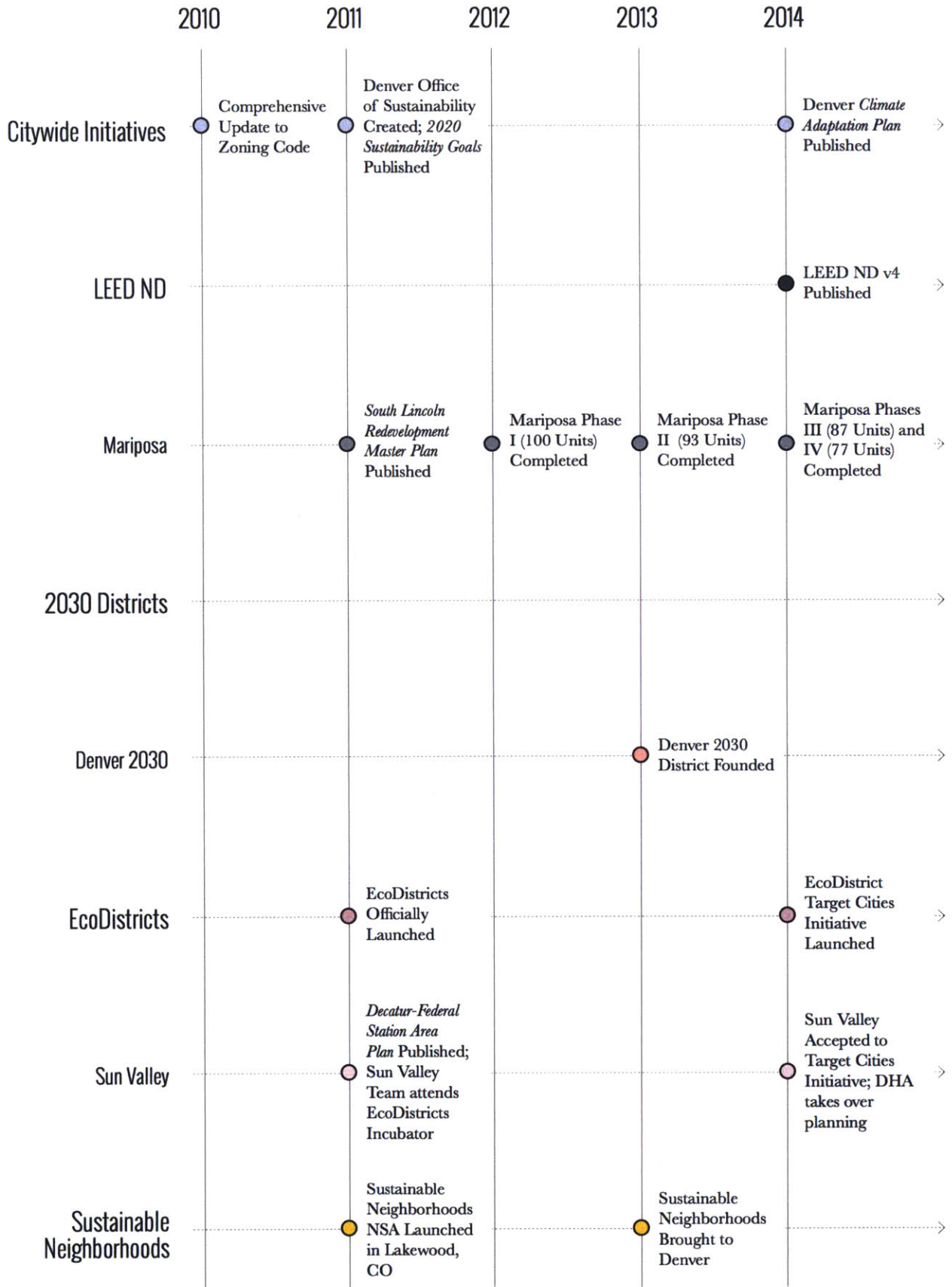
In addition to these coordinated efforts, the City is also home to twelve neighborhood sustainability assessment projects, which include four LEED ND projects, one 2030 District, one

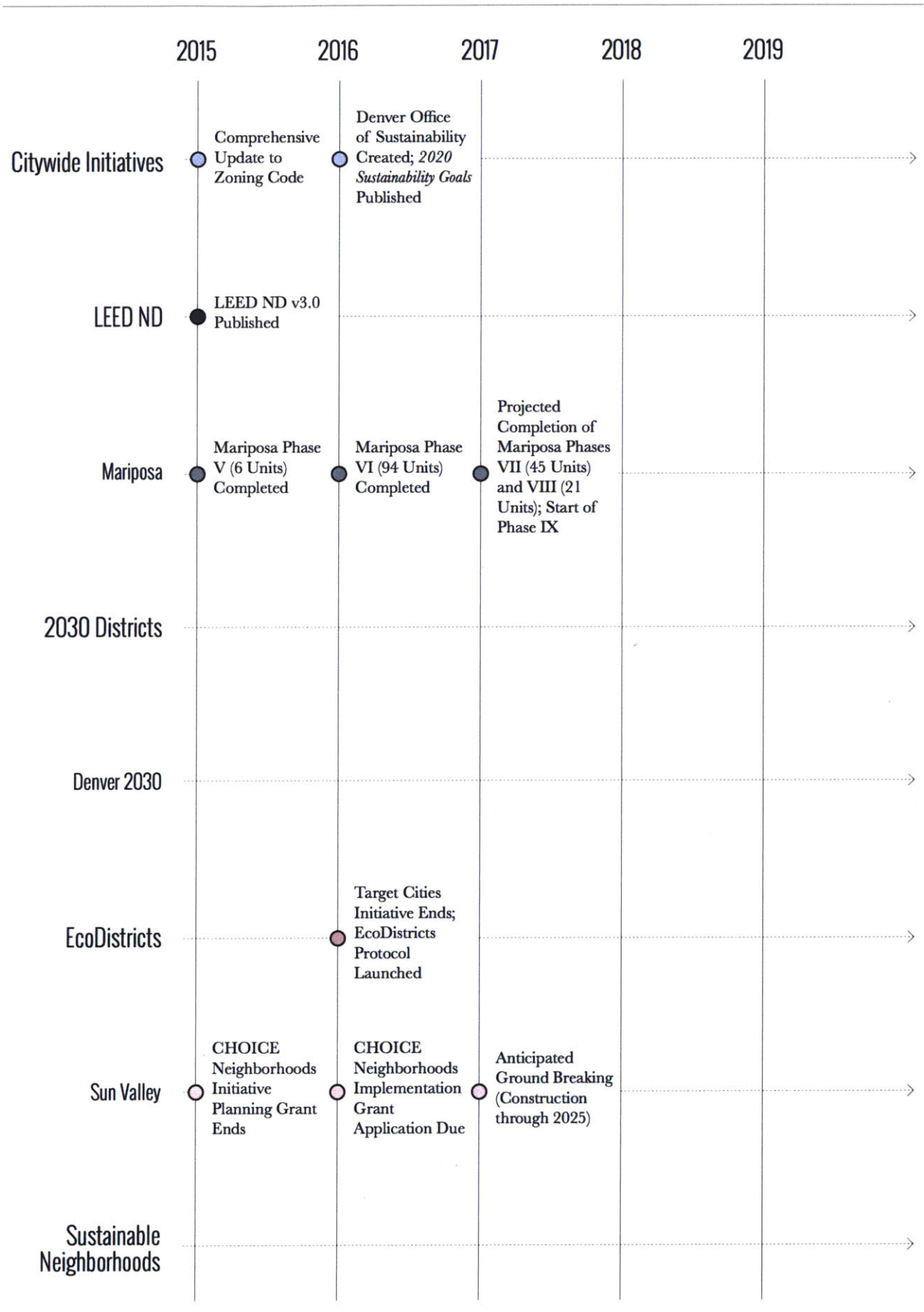
EcoDistrict, and six Sustainable Neighborhoods. I study the application of four of these standards in this thesis: the LEED ND Mariposa Mixed Use Development, the Denver 2030 District, the Sun Valley EcoDistrict, and Sustainable Neighborhoods Denver.

Figure 2.9 below provides a time line for Denver citywide initiatives, the development of the four NSA standards examined in the study, and the four applications of these four NSA standards in Denver.









Chapter Three: Establishing Profiles for the Four Neighborhood Sustainability Assessment Standards

Chapter Three answers my first research question: What are the similarities and differences between the intent, certification approach, and applicability of different NSA standards? I address each of these areas in turn.

Intent

In this section, I explain the intentions underlying the four NSA standards utilized in Denver: LEED ND, 2030 Districts, EcoDistricts and Sustainable Neighborhoods. I begin by conducting a sustainability coverage analysis. This analysis allows me to compare which aspects of sustainability each of the standards prioritize. I follow this analysis with an examination the origins of each of the four standards—two of which derived from building-level standards and two of which derived from citywide approaches—and what the standards sought to achieve by moving to a neighborhood scale.

Sustainability

For my sustainability analysis, I draw upon frameworks developed by Haapio (2012), Sharifi and Murayama (2013), Berardi (2013), Reith and Orova (2015), and Komeily and Srinivasan (2015), the authors of the four analytical development phase comparisons I discussed in my literature review. To evaluate sustainability coverage, these authors employ a re-categorization process. In this method, the authors sort a standard's sustainability indicators into a series of pre-defined themes, defined by Sharifi and Murayama (2013) as “broad topics of concern to sustainability.” The exact themes used vary from study to study, but cluster around seven main categories:

- (1) Location and site selection
- (2) Transportation
- (3) Infrastructure, design, and innovation
- (4) Environment, ecology, and resource efficiency
- (5) Sociocultural quality
- (6) Economic quality
- (7) Institutional

For example, LEED ND's Access to Quality Transit indicator would be counted towards the (2)

Transportation theme while its Rainwater Management indicator would be placed in the (4) Environment, Ecology, and Resource Efficiency theme. Once a standard's sustainability indicators have been sorted into each of the seven themes, the authors tally the number of indicators in each one. This provides a clear picture of strengths and gaps in sustainability coverage.

I was not able to follow this protocol for three of the four standards—2030 Districts, EcoDistricts, and Sustainable Neighborhoods—as they do not include sustainability indicators. In place of indicators, I use the objectives set forth in the opening pages of each standard's manual. For 2030 Districts, I combine the mission of Architecture 2030, which focuses on climate change, with its three reduction target categories. For EcoDistricts, I use the three EcoDistricts Imperatives and the six EcoDistricts Priority Areas. For Sustainable Neighborhoods, I use the standard's five Goal Areas. While LEED ND does have sustainability indicators, to make my analysis consistent I use the standard's eight Policy Areas.

Table 3.1 below depicts my re-categorization of the sustainability objectives of the four NSA standards. I use the seven themes from Komeily and Srinivasan (2015), the most recent re-categorization study for my analysis, but add an eighth theme, climate. While this is the first time climate has been used, it represents an important area of focus for two of the NSA standards in this study. Because of the small number of objectives in my analysis, I allow objectives to align with multiple themes and make a binary statement as to whether a standard addresses a specific theme.

[Text Continues Next Page]

Table 3.1: Re-Categorization of Objectives Defined by LEED ND, 2030 Districts, EcoDistricts, and Sustainable Neighborhoods

Theme	Criteria	LEED ND	2030	EcoDistricts	SN
(1) Infrastructure, Design, Innovation	Design principles, mixed use, compact development, green infrastructures, heat island	<i>Yes!</i> Smart Growth	—	—	—
	Innovation	<i>Yes!</i> Credit Category	—	—	—
(2) Transportation	Connectivity to Bike Lane, Pedestrian-friendliness, Private Car, Parking, etc.	<i>Yes!</i> Walkable Amenities	<i>Yes!</i> Transportation	<i>Yes!</i> Connected	—
(3) Location and Site Selection	Location and Site Selection	<i>Yes!</i> Smart Growth & Credit Category	—	—	—
(4) Environment, Ecology, Resource Efficiency	Water	<i>Yes!</i> Water Protection	<i>Yes!</i> Water	—	<i>Yes!</i> Water
	Energy	<i>Yes!</i> Infrastructure Efficiency & Credit Category	<i>Yes!</i> Energy	—	<i>Yes!</i> Energy
	Materials, Resource Conservation, Waste Management	<i>Yes!</i> Infrastructure Efficiency	—	<i>Yes!</i> Biodiversity & Restorative	<i>Yes!</i> Land
	Biodiversity, Nature, Micro-climates	<i>Yes!</i> Natural Resource Protection	—	<i>Yes!</i> Biodiversity & Restorative	<i>Yes!</i> Air
(5) Sociocultural Quality	Safety, Well-being, Quality of Life, Sound Emission, Affordable Housing, Inclusive Communities, Social Networks and Infrastructure, Heritage	<i>Yes!</i> Social Equity & Public Health	—	<i>Yes!</i> Equity (Imperative), Livable & Healthy	<i>Yes!</i> People
(6) Economic Quality	Local Economy, Employment and Local Jobs, Business, Investments	—	—	<i>Yes!</i> Prosperous	—
(7) Institutional	Policies, Governing Principles, Structures	—	—	—	—
(8) Climate	Action	<i>Yes!</i> Climate Protection	<i>Yes!</i> Mission	<i>Yes!</i> Climate (Imperative)	—
	Adaptation	—	<i>Yes!</i> Mission	<i>Yes!</i> Resilience (Imperative)	—

Table structure from Komeily and Srinivasan (2015). Category 8 does not appear in this structure and was added by author.

Interpretation

My coverage analysis enables observations about the four NSA standards both as a group and in comparison to one another. My sustainability coverage analysis shows that as a group, the four standards did well responding to the environmental elements of sustainability—themes 1, 2, 3, 4, and 8—but underperformed on social, economic, and institutional aspects, themes 5, 6, and 7. This is consistent with the findings of Sharifi and Murayama (2013) and Komeily and Srinivasan (2015). Citing Lawrence (1997) and Pope, Annandale, & Morrison-Saunders (2004), Komeily and Srinivasan (2015) attribute this unbalanced focus to the “lack of equal knowledge on how to measure social, economic, and institutional sustainability (compared to environmental sustainability), and limited knowledge on conceptualization of both sustainability and sustainability assessment” (Komeily and Srinivasan 2015, 38).

My sustainability coverage analysis also enables a rough characterization of the four NSA standards in comparison to one another. LEED ND has the greatest coverage of the four standards, covering six of the eight themes. Despite this strong coverage, the standard fails to address the (6) Economic Quality and (7) Institutional themes. This finding is consistent with the results of the sustainability coverage analysis conducted by Komeily and Srinivasan, which finds that only 5% of LEED ND’s sustainability indicators address the theme of Economic Quality, and 0% of its indicators respond to the Institutional theme.

In contrast with LEED ND, the 2030 Districts standard pursues a narrower range of objectives: it focuses on just climate, water, energy, and transportation. This tighter scope reflects the fact that this standard was developed to respond to climate change, not to advance the economic, social and institutional dimensions of sustainability.

EcoDistricts, on the other hand, prioritizes the social and economic aspects of sustainability over environmental dimensions. This focus marks a departure from the nine NSA standards evaluated in the studies I described in my literature review, which were consistently found to favor environmental dimensions.

Lastly, the priorities of the Sustainable Neighborhood program are tightly clustered around the environmental dimensions of sustainability. The inclusion of the People Goal Area in the standard does, however, expand its coverage to (5) Sociocultural Quality.

Neighborhood Scale

In addition to prioritizing different aspects of sustainability, the four standards vary by what they sought to achieve by moving to a neighborhood scale. LEED ND, 2030 Districts, EcoDistricts, and Sustainable Neighborhoods each supplement earlier sustainability programs that were operated either at the building- or city-scale. In this sense, one group of standards is the result of a creator “scaling up” and a second group is the result of a creator “scaling down”. Importantly, none of these standards offer a definition for the neighborhood scale; LEED ND is the only tool that specifies a minimum or maximum project size. Its restriction, however, ranges from two buildings to 1,500 acres, which is hardly exclusive.

Scaling Up

LEED ND and 2030 Districts both grew out of building-level certifications. By operating at a larger scale, the two standards are able to advance projects that address more dimensions of sustainability. For example, the increased scale allows the standards to further environmental dimensions of sustainability, as they are able to introduce measures that are inappropriate at the building level. LEED ND, for example, includes credits for Walkable Streets and Mixed-Use Neighborhoods. Similarly, 2030 Districts uses an expanded 2030 Challenge, which replaces a schedule for fossil fuel energy reduction with targets for energy, water, and transportation.

These standards are also able to incorporate district-scale approaches not possible at the building level. LEED ND, for instance, includes a two-point credit for District Heating and Cooling. 2030 Districts also references district-scale infrastructure:

District-scale thinking and aggregated goals also allow for traction and support for larger discussions of shared infrastructure, such as district-wide heat recovery, distributed generation, and other district efficiencies that can reduce the demand for resources. Without the shared vision and network of support that 2030 Districts offer, this type of large-scale investment, involving multiple stakeholders and ownerships, is more difficult to achieve (2030 Districts 2015b, 4).

Finally, the increased scale brought by the neighborhood means these standards are able to advance their sustainability priorities at a faster rate. Simply: you cover more ground working neighborhood-by-neighborhood than building-by-building. The 2030 Districts standard also explains that the neighborhood-scale of their approach makes membership appealing:

A geographical boundary for a given 2030 District creates a sense of place and identifies the physical location nationally and internationally as a beacon of efficient resource practices, sound economic investments, and market leaders. Building owners, managers, and developers

participating in 2030 Districts understand that by working collectively toward the 2030 District goals they are improving not only their assets, but those of their neighbors, increasing the entire District's value and appeal to interested tenants and buyers, allowing them to better compete in the marketplace (2030 Districts 2015b, 4).

This increased appeal makes it easier to recruit participants.

In summary, by scaling up, the creators of LEED ND and 2030 Districts are able to advance projects that address more aspects of sustainability, at a faster rate (2030 Districts 2015d). Nevertheless, they realize these benefits at the expense of increasing project complexity. Rather than working with a single property owner, these neighborhood-scale projects require the coordination of multiple property owners and stakeholders.

Scaling Down

In contrast with LEED ND and 2030 Districts, EcoDistricts and Sustainable Neighborhoods emerged from city-scale approaches. One benefit they realize by operating at the neighborhood scale is ease of implementation. The neighborhood promises fewer jurisdictional boundaries and fewer stakeholders than working with the city as a whole (Chaskin 1998). Decreased project size also has the potential to improve project outcomes, as administrators can concentrate their efforts and get more immediate feedback on their initiatives (Chaskin 1998).

It is the neighborhood's ability to leverage citizen engagement, however, which is emphasized in the manuals of EcoDistricts and Sustainable Neighborhoods, both of which met theme (5) Sociocultural Equity in my sustainability coverage analysis (Table 3.1). EcoDistricts, for example, describes the neighborhood as the unit at which groups are "meaningfully empowered" (Selzter et al. 2010, 7) and establishes project boundaries using "community-defined geography" (EcoDistricts 2016d); Sustainable Neighborhoods says it provides "residents the opportunity to become active partners in making Denver a vibrant and sustainable community" (Sustainable Neighborhoods Program 2016c). The notion that the neighborhood is the appropriate place to engage citizens is supported by decades of research conducted by urban scholars.

People invest themselves in the places they live, even when they don't intend to do so. Everyday life in a setting builds familiarity and affection, care and concern, as empirically demonstrated by generations of urban scholars from Cook (1988), Fried (1963), Gans (1962), and Hester (1984), to Blake & Arreola (1996), Blokland (2003), Cloutier-Fisher & Harvey (2009), Duncan & Duncan (2004), Feldman (1996), Gallacher (2004), Lewicka (2009), Rollero & De Piccolia (2010), and Woolever (1992) (Engle and Luka 2014).

While engagement is necessary to advance an individual sustainability project, community empowerment resulting from the planning process helps create pressure for additional social change. Engle and Luka (2014) summarize: “We argue that it is precisely through participatory practices such as neighborhood planning for resilient and livable cities that we can raise expectations of the public and work to bring about social changes necessary to realize the kinds of neighborhoods for the cities we need.” In short, an empowered community demands more from its city.

In summary, by scaling down, EcoDistricts and Sustainable Neighborhoods are able to advance projects that are easier to implement and which better achieve citizen engagement. Nevertheless, they realize these benefits at the expense of not reaching all residents of a city at one time.

Summary of Intent

In this section, I explained the intentions underlying the four NSA standards utilized in Denver. My sustainability coverage analysis showed different priorities between the standards, with LEED ND pursuing the most complete set of sustainability themes, 2030 Districts pursuing a narrow range of objectives all centered around climate change, EcoDistricts focusing on the economic and social dimensions of sustainability, and Sustainable Neighborhoods focusing almost exclusively on environmental dimensions.

Second, I examined the origins of each of the four standards. The preceding analysis suggests that point of origin determines the precise outcome desired by a particular standard: LEED ND and 2030 Districts, which grew out of building-level approaches, see the neighborhood as a spatial unit that promises breadth while EcoDistricts and Sustainable Neighborhoods understand the neighborhood is a social unit that offers depth. For all four tools, movement towards the neighborhood scale requires the sacrifice of some of the benefits associated with the scale each creator had initially worked from. In gaining breadth, LEED ND and 2030 Districts took on greater complexity; in gaining depth, EcoDistricts and Sustainable neighborhoods sacrifice scope.

Certification Approach

NSA standards vary both by intent, as discussed in the previous section, and in the approach taken to certify that a project has met the standard. Previous development phase comparisons of Neighborhood Sustainability Assessment have all studied standards that employ the same approach to certification, in which projects are evaluated against a checklist of indicators reflecting qualities

of sustainable development projects (Reith and Orova 2015). Thus, there has never been cause for a discussion of certification approach.

My study identifies two additional approaches to certification. In this second section of Chapter Three, I analyze the differences in the three approaches, introduce three terms to characterize them, and discuss the implications of this diversity in certification approaches.

LEED ND is representative of the certification approach used in previous analyses, which I term Specification. As noted above, this type of NSA standard is a checklist that has been populated with various indicators of sustainability. Each indicator is associated with a certain number of points: a project attains certification only if it satisfies enough indicators to pass a predefined threshold.

Both EcoDistricts and Sustainable Neighborhoods utilize an approach to certification I term Procedure. In a Procedure certification, a standard puts forth a series of steps project teams must complete in order for their neighborhood sustainability project to become certified. For EcoDistricts, this process takes the form of the EcoDistricts Roadmap, which lays out how the project team will advance the six EcoDistricts Priority Areas (EcoDistricts 2016d); while residents of neighborhoods enrolled in the Sustainable Neighborhoods program must complete a certain number of Credit Eligible Activities, such as hosting educational events that provide information and resources related to sustainability (Sustainable Neighborhoods Program 2013). The procedure approach to certification is premised on the idea that a sustainable product will necessarily result from a sound process. The authors of the EcoDistricts Protocol describe: “We acknowledge that some may say it’s the outcomes that matter. And they do. But meaningful outcomes are a direct result of the conditions, leadership, and partnership put into place to achieve them” (EcoDistricts 2016d, 13).

2030 Districts represents a third approach to certification, one I term Commitment. In a commitment-type standard, a project becomes certified once a certain number of individuals within the project boundary have pledged to complete a series of actions; 2030 Districts requires that five property managers in the 2030 District have signed on to the 2030 Challenge for Planning.

Summary of Certification Approach

The certification approach employed by a standard greatly impacts the reliability of the standard’s product. Neighborhood-scale projects generated through Specification approaches like LEED ND, must all respond to the same checklist of indicators and will therefore be relatively consistent. In contrast,

projects generated with Procedure approaches such as EcoDistricts and Sustainable Neighborhoods, which do not make any stipulations about the completed project, will vary. While variation creates potential for a suboptimal result, the freedom it provides project teams also introduces the option for a product that is better tailored to local context, as it does not need to meet a universal checklist, and creates the potential for a more innovative result. Projects generated through Commitment certifications are likely to be similarly variable. This approach to certification also introduces the possibility of noncompliance. This said, a commitment style approach dictates a project outcome that aligns with the intent of the standard and the presence of multiple owners may create pressure for conformity.

Another important conclusion about approach to certification is that Procedure and Specification, the two new approaches observed in this study, create the potential for different NSA standards to be used simultaneously. It is entirely possible that a project team could utilize the EcoDistricts Protocol (Procedure) in a 2030 District (Commitment) to introduce a LEED ND (Specification). A sustainability district that combines multiple NSA standards is already underway in New York City: NYC Districts merges the 2030 Districts and EcoDistricts (NYC Districts 2015). This nesting may be impractical due to the limited resources of time and money, but is possible because of different approaches to certification.

Applicability

A final distinction between LEED ND, 2030 Districts, EcoDistricts, and Sustainable Neighborhoods is the context in which these standards can feasibly be applied. The method for assessing applicability that I define below, like the analysis I developed to characterize each standard's approach to certification, is of my own creation; the existing literature does not consider the applicability of standards in different contexts.

Of the four standards I examined, only LEED ND set forth minimum requirements for a development site: to be eligible for certification, a project must be located on land that already exists and that is within or adjacent to an existing community or transit network. In addition, LEED ND prohibits development in locally- or state-designated agricultural districts. Beyond these absolute conditions, LEED ND requires projects on sites with certain undesirable attributes to take on additional measures that counteract the adverse quality (USGBC 2014b). For example, if a project team has identified that a threatened or endangered species is likely to exist on the development site, they must create a habitat conservation plan (USGBC 2014a).

While only LEED ND sets forth minimum requirements for the project site, not all standards work in all contexts. Their applicability is limited by their relative utility along three dimensions: whether the standard directs the construction of a new development project or improves the sustainability of an existing area (Intervention), whether the project requires participation from a single owner, multiple owners, or either (Ownership), and finally, whether the neighborhood-scale sustainability project is located in a commercial area, a residential area, or either (Zone). Some of these conditions are made explicit by the standard. For instance, the 2030 Districts manual states that “2030 Districts are predominantly focused on downtown and urban core areas” (2030 Districts 2015b). Other conditions are implied. For example, Sustainable Neighborhoods’ emphasis on resident engagement implies that the standard is most feasible in residential communities.

Intervention

NSA standards vary by the degree of intervention the standard requires. LEED ND, for example, recommends that a majority of a project’s square footage is new construction or major renovation, suggesting that a significant intervention is required in order for a project to achieve certification. 2030 Districts and Sustainable Neighborhoods, in contrast, are best applied to existing structures, as it would be illogical to improve the efficiency of buildings that were not yet standing or engage a community that did not yet exist. EcoDistricts is intended for use in both new and existing development contexts.

Figure 3.1 Intervention

Source: Created by author.



Ownership

A second aspect impacting NSA standards’ applicability to a given project is the number of project owners. 2030 Districts and Sustainable Neighborhoods assume that numerous property owners will participate in the program, while LEED ND requires that the project team implement such an array and such a depth of measures, that it would be incredibly difficult to execute any qualifying plan with more than one owner . Thus, LEED ND projects are typically owned by a single entity. EcoDistricts can

be implemented with a single or multiple owners.

Figure 3.2 Ownership

Source: Created by author.

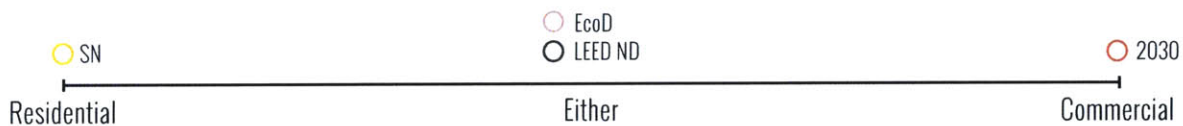


Zone

A final aspect of a NSA standard’s applicability to a final project is whether the project occurs in a residential or commercial zone. Brian Geller, the architect who created 2030 Districts, intended that 2030 Districts be established in central business districts where “per-acre energy usage soared” (Hanscom 2011). Though single-family homeowners could theoretically participate in the 2030 District Challenge, soliciting participation would be arduous. Furthermore, residential property owners may not have access to the resources needed to upgrade building performance to the extent the 2030 District initiative demands. In contrast, Sustainable Neighborhoods, as a community outreach program, is designed for use in residential areas. LEED ND and EcoDistricts could be implemented in any context.

Figure 3.3 Zone

Source: Created by author.



Summary of Applicability

The observations in this section about each NSA standard’s applicability to particular projects are important in establishing a profile for each of the four NSA standards in this study. It is also critical, however, to understand that none of the three elements of applicability identified here—Intervention, Ownership, Zone—are required by the standard itself. Nonetheless, the fact that such diversity in NSA standards exists and is made use of within the same city, indicates that variation in the standards’ applicability for different types of interventions, zones, and ownership, encourages more neighborhood sustainability projects than would be possible with a more uniform set of standards.

Conclusions

While the four NSA standards assessed in this study all seek to further sustainability at the neighborhood scale, my analysis demonstrates the large degree to which these standards differ. Each of the standards I analyze varies along three dimensions: (1) the objective of the creator regarding both the aspects of sustainability they prioritized and whether they sought to scale up from the building level or scale down from the city, (2) whether they used a specification, procedure, or commitment approach to certification, and (3) the applicability of the standard to different types of projects. I summarize these differences in Table 3.2.

Table 3.2: Similarities and Differences between LEED ND, 2030 Districts, EcoDistricts and Sustainable Neighborhoods

Created by author

Theme	Criteria	LEED ND	2030	EcoDistricts	SN
Intent	Sustainability	Furthest reaching; just fails to address economy	Emphasis on Climate Change	Emphasis on Sociocultural Equity and Economy	Emphasis on Environment
	Neighborhood Scale	Scaling Up: Seeks to Increase Breadth	Scaling Up: Seeks to Increase Breadth	Scaling Down: Seeks to Increase Depth	Scaling Down: Seeks to Increase Depth
Certification Approach		Specification: Indicator-Based	Commitment: Pledge-Based	Procedure: Process-Based	Procedure: Process-Based
Applicability	Intervention	New Neighborhood	Existing Neighborhood	New or Existing Neighborhood	Existing Neighborhood
	Ownership	One Owner	Multiple Owners	Multiple Owners	Multiple Owners
	Zone	Commercial or Residential	Commercial	Commercial or Residential	Residential

When I began my research, I expected that LEED ND, 2030 Districts, EcoDistricts, and Sustainable Neighborhoods would be similar to one another. This said, the degree of variation I find in my analysis makes sense given the lack of consensus around the definition of sustainability discussed in Chapter One. Furthermore, the tools are served by their differences. Each standard is able to remain

competitive in a saturated marketplace through its unique qualities.

The degree of variation between these four standards also advances sustainability overall, as the unique nature of each standard means that individuals seeking to develop a neighborhood-scale sustainability project can select the approach that best aligns with their priorities and that will work best in their context. This said, the number of standards in the marketplace may be detrimental if members of the community are not able interpret the differences between certified projects. The quantity and diversity of sustainability standards could appear indecisive and inefficient, generating fatigue on behalf of the community.

Chapter Four: Explaining the Trend of Neighborhood Sustainability Assessment Standards

In Chapter Three, I answered my first research question and established that each one of the Neighborhood Sustainability Assessment (NSA) standards in use in Denver is unique. In Chapter Four, I use results from the semi-structured interviews I conducted with project initiators and managers to respond to my second research question: Why are individuals, institutions, and cities adopting NSA standards and how satisfied are they with their choice? I understand this question to consist of three parts: why an initiator chose to work at the neighborhood scale, why they elected to certify these projects, and finally, why they selected a particular NSA standard for their project. I respond to each one below.

Why Work at the Neighborhood Scale?

LEED ND Mariposa Development - Mark Howard and Isabelle Wolfe, Denver Housing Authority

Mark Howard and Isabelle Wolfe are two members of the six-person Department of Real Estate Development at the Denver Housing Authority (DHA). Both Mark and Isabelle started working for DHA in August 2014, eight years after the Mariposa Project had started, but are familiar with the project through their current roles.

Denver Housing Authority, initiator of the Mariposa LEED Neighborhood Development (LEED ND) District, offers a purely pragmatic reason for working at the neighborhood scale: if a project is too large for building-level LEED certification, then neighborhood-scale certification is the better approach (Howard 2016; Wolfe 2016). For example, the Housing Authority used LEED building-level certification for their 0.7-acre Osage Senior Housing Project (USGBC 2015b), and LEED ND certification for 17.5-acre Mariposa District (USGBC 2015a). Moreover, this use of LEED ND for the Mariposa District did not signal a strategic decision to scale up its sustainability efforts to LEED ND for all projects moving forward: the Osage Senior Housing Project mentioned above was certified at the building level in March 2015, three months after Mariposa achieved its neighborhood-level certification. The Housing Authority's decision to work at the neighborhood scale can be thought of as a "right tool for the job" approach.

This functional reason for working at the neighborhood scale reflects the Housing Authority's role as a landowner. The Authority controls multiple parcels in Denver, ranging in size from less than an acre to multiple city blocks. Rather than start with a commitment to neighborhood level work and then look for

projects at this scale, the Housing Authority begins with a specific piece of land and decides on scale based on the size of the property.

Denver 2030 Districts - Adam Knoff, Unico Properties LLC

Adam Knoff is the Board Chair and co-founder of the Denver 2030 District.

Like the Denver Housing Authority, Adam Knoff comes to the neighborhood scale from building-level work. Knoff, however, takes a far more strategic perspective on the benefits of working at the neighborhood scale, and offered a range of reasons for why the neighborhood-scale deployment of 2030 Districts was advantageous.

The first of these reasons was the ability to reach all types of buildings, not just large commercial properties that typically self-select into building-level efficiency programs. In a 2030 District, reductions are averaged across all participating buildings. This means that reductions achieved by properties that are easier to retrofit, such as the large commercial properties referenced above, may subsidize reductions of historic and small-scale commercial buildings, in the case that these “lemons” fail to meet a particular target. Furthermore, the water, energy, and transportation reductions of individual buildings are never published, so owners are protected from negative press that could result from a failure to meet a particular reduction hurdle.

Another advantage Knoff named is that the scale of a district allows participants to access better pricing than they could attain if each property owner was proceeding individually. The 2030 Districts Network, the 2030 Districts umbrella organization, is in the process of formalizing these discounts through the 2030 Market Place, an online marketplace with reduced prices for building technology, only available to 2030 District participants (Knoff 2016).

Finally, Knoff believes that a 2030 District makes a city more attractive to business.

The beauty is when you take a district and say that it is inherently more efficient in terms of energy, water, transportation emissions, what you’re doing is driving down the cost of doing business in that city in a defensible way. You’re also, likely, increasing quality of life by reducing emissions... Right there, you’re making it easier for businesses to come to that City and you’re increasing quality of life, and those are probably the two biggest drivers of economic development for a city” (Knoff 2016).

As with the Denver Housing Authority, Knoff’s approach to neighborhood-scale sustainability reflects the platform from which he operates. In contrast with the Denver Housing Authority, which had

access to land, Adam Knoff approaches the neighborhood scale as a for-profit housing developer. While this role limited his ability to initiate a large scale development project, it did allow him with to understand the need for the 2030 Districts approach and meant he had the professional network required to pull the initiative off: Knoff estimates that 50% of District Members were recruited through his personal connections.

Sun Valley EcoDistrict - Paul Schmiechen, Denver Department of Environmental Health and Isabelle Wolfe, Denver Housing Authority

Paul Schmiechen, Business and Community Sustainability Manager at the Department of Environmental Health, initiated the Sun Valley EcoDistrict in 2013. The Denver Housing Authority took control of the project in 2014, following Sun Valley's acceptance into the EcoDistrict Target Cities Initiative. Isabelle Wolfe now helps to manage the project.

While the comparison point for the Denver Housing Authority's LEED ND Mariposa District and Adam Knoff's 2030 District was smaller projects certifiable at the building level, Sun Valley EcoDistrict initiator Paul Schmiechen contrasted the EcoDistricts neighborhood approach with working at a city scale. Schmiechen described two distinct strategic reasons for working at the neighborhood scale. The first was that Schmiechen saw the neighborhood scale as "much more doable" than citywide initiatives (Schmiechen 2016). This aligns with literature on the benefits of the neighborhood scale, which points out that neighborhood planning is more manageable than city-scaled approaches: fewer stakeholders, fewer organizations, and fewer jurisdictional boundaries (Chaskin 1998).

Second, Schmiechen (2016) explained that neighborhood-scale initiatives are in keeping with the City of Denver's approach to piloting new ideas. "There's some element of 'let's test it at a project scale before jumping to create ordinances'." In Denver, innovation happens at the neighborhood, not the city scale.

Sun Valley EcoDistrict manager Isabelle Wolfe also identified a pragmatic reason for working at the neighborhood scale: funding. In her interview, she related DHA's efforts in Sun Valley to a substantive shift that the U.S. Department of Housing and Urban Development (HUD), their primary funder, has made in the past five years to focus on neighborhood revitalization efforts. Though Sun Valley was not initiated to align with HUD's increased interest in the neighborhood scale, a two million dollar HUD Choice Neighborhoods Planning Grant made the Sun Valley EcoDistrict possible (Wolfe 2016).

Like the explanations I recorded for the Mariposa District and the 2030 District, Schmiechen and Wolfe's explanations of the benefits of neighborhood-scale projects reflect the platform on which

they are accustomed to working. Schmiechen works for the Department of Environmental Health, which coordinates citywide environmental programming. His strategic approach emphasizes the neighborhood as a more manageable scale than the city as a whole and the ideal place to test out new ideas. On the other hand, Wolfe, whose work at the Denver Housing Authority is dictated by parcel size, named a practical reason for working at the neighborhood scale. Notably, the only other pragmatic explanation I observed for work at the neighborhood scale, was named by Mark Howard, another employee of the Denver Housing Authority

Sustainable Neighborhoods Program - Elizabeth Babcock and Taylor Moellers, Denver Department of Environmental Health

Elizabeth Babcock brought the Sustainable Neighborhoods Program to Denver in 2014 but has since left the Department of Environmental Health. I was unable to reach her and instead spoke with Taylor Moellers, who took over Babcock's role as program coordinator in January 2015.

Of the four projects studied in this thesis, the Department of Environmental Health (DEH) demonstrates the greatest commitment to neighborhood-scale work. DEH adopted Sustainable Neighborhoods in response to resident requests for classes on sustainability topics such as composting, solar panels, and energy efficiency. Program Coordinator Taylor Moellers (2016a) explained there was a gap between the City's existing sustainability programs and "what residents saw being important to community building as well as neighborhood sustainability." Program initiator Elizabeth Babcock realized these requests could be met by expertise already existing in the neighborhood (Moellers 2016a). In this sense, the scale of the program matches its point of origin.

Given that Babcock sought a community-based initiative, the choice to work within preexisting administrative neighborhoods, as the program does, makes a great deal of sense. First, it means that the program can capitalize on existing social infrastructure, such as Registered Neighborhood Organizations, for program administration. Second, because much of Moellers' work as Program Coordinator involves linking participating communities up with city services, the use of boundaries already used by the City avoids confusion (Moellers 2016a).

Interestingly, DEH adopted Sustainable Neighborhoods only after it had a number of citywide sustainability initiatives, like Walk Denver, Denver Recycles, and Keep Denver Beautiful, in place. Through resident engagement, the Sustainable Neighborhoods program allowed the Department to connect existing programs with the individuals they were intended to serve.

Summary of the Benefits of the Neighborhood Scale

Through my interviews with initiators and managers of four Denver neighborhood-scale sustainability projects, I determined that the reasons to work at the neighborhood scale fell into one of two categories: functional or strategic. Mark Howard and Isabelle Wolfe, who both work at the Denver Housing Authority, named the only functional explanations I heard for neighborhood-scale work: parcel size and funding stream. Private developer Adam Knoff and Department of Environmental Health employees Paul Schmiechen and Taylor Moellers, in contrast, offered strategic explanations, which see the neighborhood as a tactical point of intervention. The particular explanation reflected the platform from which the interviewee was accustomed to working. Private developer Adam Knoff discussed the neighborhood scale as providing the volume of participants required to access better pricing. City employees Paul Schmiechen and Taylor Moellers talked about the neighborhood as a more manageable scale than the city as a whole, and the ideal location to engage residents.

Notably, none of the individuals I spoke with expressed an opinion that the neighborhood-scale was the only scale at which they would consider working to advance sustainability. Rather, the neighborhood scale offered clear advantages in some contexts, just as building or citywide did for others.

Why Certify a Project?

Certification is not necessary in conducting neighborhood-scale sustainability projects, as is demonstrated by the multiple projects underway in Denver that have chosen not to seek certification (Schmiechen 2016). This raises the question of why the four project initiators elected to go through a certification process for their work.

LEED ND Mariposa Development - Mark Howard and Isabelle Wolfe, Denver Housing Authority

Denver Housing Authority (DHA) program managers Mark Howard and Isabelle Wolfe discussed LEED certification as a means of expressing the Housing Authority's commitment to sustainability. Howard explains, "The certification for us was more about demonstrating our organization's overall commitment to sustainable building and healthy living."

One important audience for this demonstration of commitment was the U.S. Department of Housing and Urban Development. Explained Wolfe, "Sustainability has slowly become more important in applications for funding. It is not necessarily required, but expressing a commitment to LEED or to

Enterprise Green Communities does put our applications on the top of the list” (Wolfe 2016). Wolfe believes a reversion from certification would be perceived as a move backwards, suggesting she values the standard for its brand.

There’s a saying: ‘Once you go LEED you don’t go back.’ Now that we’ve achieved building scale efficiency in terms of LEED and the neighborhood development scale it would be pretty detrimental to go back from that. For us, LEED has become this constant (Wolfe 2016).

Howard, in a separate interview, communicated a different point of view and argued that, in the context of affordable housing, the LEED brand may not be worth the cost of attaining it.

LEED certification does have a cost [and] can stress the limited funding available for rental affordable housing development. Since we are an affordable housing provider and long-term owners, we don’t readily capitalize on the certification through higher rents or enhanced market value, but we do benefit from decreased building operating expenses, lower life cycle costs, and positive impact to our residents. From that standpoint, we will continue to incorporate the best strategies from LEED and other rating systems, but we may not always seek the certification (“LEED Mariposa” 2016).

Denver 2030 Districts - Adam Knoff, 2030 Districts

Like Denver Housing Authority Program Manager Mark Howard, Adam Knoff expressed that he valued 2030 Districts for the structure it provides in achieving more sustainable projects. He simply did not see the need to develop a new model for reducing water and energy consumption and transportation emissions, especially given fatigue resulting from the large quantity of green building programs in the market, and the success realized by earlier Districts (Knoff 2016b). As he put it, “Why reinvent the wheel?” I specifically asked Knoff whether he thought the 2030 Districts’ name lent any credibility to his work. Though he now recognizes some value through his project’s affiliation with the larger 2030 Districts Network, at the time Denver 2030 was established the 2030 Districts Network was non-existent (Knoff 2016b).

Sun Valley EcoDistrict - Paul Schmiechen, Denver Department of Environmental Health and Isabelle Wolfe, Denver Housing Authority

Sun Valley earned its designation as an EcoDistrict through participation in the EcoDistricts’ Incubator and membership in the EcoDistricts’ Target Cities Initiative. Thus, when Isabelle Wolfe spoke about the benefits of certification, she spoke of them as they related to the team’s participation in these two programs.

Wolfe isolated three general benefits that emerged from the Denver Housing Authority's use of a sustainability certification standard for its work in Sun Valley. The first of these was access to a network of organizations undergoing similar work, which Wolfe mentioned multiple times during our conversation. "EcoDistricts has facilitated a number of peer networks. Just sitting down and talking to someone who is three steps ahead of us or does this work professionally is hugely valuable" (Wolfe 2016). Like Howard and Knoff, Wolfe also valued the framework provided by using the standard. The EcoDistricts standard is helping the Housing Authority navigate new technologies like district energy, complexities like planning for an area where it does not control all of the land, and components of the 100-acre project that extend beyond housing (Wolfe 2016).

Finally, Wolfe felt the framework added legitimacy to their work, particularly in the early days of the project. "When we would go to meet with people and describe the Sun Valley project and try to describe district energy, what was helpful before [Sun Valley] was more established was to use the framework as a justification or evidence" (Wolfe 2016).

Though she clearly looked favorably on the model, Wolfe (2016) did not see the EcoDistricts brand to provide any "tangible incentives" at present. She did see potential for EcoDistricts certification to become valuable in the future if it became better known.

Sustainable Neighborhoods Program - Elizabeth Babcock and Taylor Moellers, Denver Department of Environmental Health

Sustainable Neighborhoods Program Manager Taylor Moellers spoke about the qualities of Sustainable Neighborhoods largely from the perspective of a program administrator. In this context, Sustainable Neighborhoods provides accountability and a certain consistency of product. She describes,

Certification is also a way for us to keep track of and quantify each neighborhoods progress and the impact their participation in Sustainable Neighborhoods has on the community...Having a set of categories for community activities, as well as a transparent method for calculating credits, allows us to award credits fairly and consistently across all neighborhoods and all types of activities (Moellers 2016b).

She also mentioned that certification motivates communities to participate in the Sustainable Neighborhoods program since their participation is recognized on the Department of Environmental Health's web page and through signage at the entrance to the neighborhood.

Summary of the Benefits of Certification

All four project teams valued NSA certification for providing a structure to achieve sustainability. DHA Program Manager Mark Howard, for example, discussed how the LEED ND standard provides a clear method for reducing operating costs; Adam Knoff, of 2030 Districts, saw the standard as saving him the time that inventing his own approach would have required. Moreover the successes of the other 2030 Districts following this structure decreased the risk of his initiative.

Interviewees named a number of other benefits of certification. For example, DHA Program Manager Isabelle Wolfe discussed LEED ND as providing a means to express the Housing Authority's commitment to sustainability, and liked that the EcoDistricts standard gave the Housing Authority access to a network of individuals completing similar projects. Taylor Moellers, Program Coordinator of Sustainable Neighborhoods, liked that the standard provided an incentive for residents to participate.

While the four project teams did mention that certification had the potential to demonstrate their commitment to sustainability, they shared differing opinions about its importance. Wolfe, in reference to DHA's work with the Mariposa LEED ND project, and Moellers, speaking about Sustainable Neighborhoods, saw the branding lent by certification as essential to their work, while others saw it to be less important. Perception of importance seemed to be associated with the popularity of the standard; in order for a certification to brand, it must be known. While this name recognition is important, it is not enough on its own to guarantee the use of the standard, as demonstrated by Mark Howard's observation that LEED ND, the most well-known of all the NSA standards, may prove to be too expensive for affordable housing projects.

Why This Standard?

In the following section I share the reasons each initiator supplied for selecting a particular standard and whether they believed the standard to have delivered that value.

LEED ND Mariposa Development - Mark Howard and Isabelle Wolfe, Denver Housing Authority

LEED ND was one of the few options for neighborhood sustainability certification at the time the Mariposa project began in 2006. LEED was also a standard that Denver Housing Authority (DHA) was familiar with due to the numerous building level LEED-certified projects they had completed in previous years. The Housing Authority's continued use of the LEED rating system suggests that they are pleased

with the results. This said, Howard did say that DHA would consider other certifications in the future given the costs of LEED certification, which exceed \$35,000 for fees alone (USGBC 2016c).

Denver 2030 Districts - Adam Knoff, 2030 Districts

Knoff did not choose 2030 Districts after considering a number of different NSA standards but rather began with a commitment to the 2030 Districts model: “I was skewed because Unico [the company he works for] had already started the Seattle 2030 District”. He was, however, quite clear about the value he saw in the program. He explained that the standard provided a mechanism, rather than a directive, to improve the energy efficiency of buildings and that it promised a more comprehensive approach than building-by-building efficiency models. Knoff did report being frustrated by how difficult it was to establish a baseline for all the buildings within the 2030 District—a requirement for certification—but was pleased with the model on the whole.

Sun Valley EcoDistrict - Paul Schmiechen, Denver Department of Environmental Health and Isabelle Wolfe, Denver Housing Authority

EcoDistricts caught Paul Schmiechen’s eye for its inclusion of community engagement. He explains:

That’s always the challenge that you face. You can build the greenest building in the world or the greenest district in the world but if you still have people exhibiting behaviors that are quote-unquote not sustainable then to a certain extent you’ve just defeated the purpose of your project. The EcoDistricts model was appealing because it focused both on the infrastructure piece—energy, water, and waste systems—and the people side.

Isabelle Wolfe, who now manages the Sun Valley EcoDistrict from her position in the Denver Housing Authority, valued EcoDistricts because it provided the Authority with a clear process for planning the project right from its inception:

What’s important about this program is that they’re in it from the planning phase, from the ground up. They actually define an improvement district. We were looking for a program that would really help define the project rather than certify it at the end. LEED is something that we will pursue eventually but only once we get into really schematic design.

Sustainable Neighborhoods Program - Elizabeth Babcock and Taylor Moellers, Denver Department of Environmental Health

The Department of Environmental Health was attracted to Sustainable Neighborhoods because

it allowed the Department to capitalize on the expertise available in the neighborhood. Taylor Moellers explains:

Sustainable Neighborhoods is really a platform for people to bring their ideas out and bring those skills and share their skills, with the added benefit of having some organizational help from us, a little financial help from us, and then the incentive of getting recognition.

Moellers expressed some dissatisfaction with the Sustainable Neighborhoods internal organization but saw this as a small matter that Sustainable Neighborhoods and the Department of Environmental Health were in the process of correcting.

Summary of Reasons for Standard Selection

Each of the five program initiators and managers I interviewed was familiar with and spoke highly of all four NSA standards in use in Denver. Knoff described EcoDistricts as a “great initiative”; Schmiechen described 2030 Districts as “impressive”. This support extends to action. EcoDistrict Initiator Schmiechen co-chairs the Membership and Benefits Committee of 2030 Districts and through his employ at the Department of Environmental Health, supervises Moellers who runs the Sustainable Neighborhoods Program. Likewise, the Denver Housing Authority, which has an extended history of LEED use, now oversees the Sun Valley EcoDistrict.

These cross-relationships suggest that these individuals are not making their selections because they believe a particular standard is universally superior, but rather because they felt that the standard they selected would be most valuable to the problem they were trying to solve. Howard and Wolfe attributed the Denver Housing Authority’s use of LEED ND to three factors: availability, familiarity, and shared philosophies about development. Knoff emphasized that 2030 Districts provided a structure that property owners could use to improve the water and energy efficiency of their buildings. Schmiechen valued EcoDistricts for its attention to community. Wolfe added that the standard helped DHA navigate the early planning phases of its work in Sun Valley. Moellers discussed that the Sustainable Neighborhoods program allowed DEH to capitalize on knowledge that already existed in the community.

Conclusions

When I initially conceptualized my second research question—Why are individuals, institutions, and cities adopting NSA standards and how satisfied are they with their choice?—I predicted tiered responses: first an initiator would decide that the neighborhood was the best place to advance

sustainability, then they would decide that a certification was the best way to do this work, and finally, they would carefully evaluate all NSA standards on the market and subsequently select the standard that they felt best advanced sustainability. This is not the pattern I observed.

Rather, the selection of a given standard is the product of a tangle of iterative decisions that draw upon the initiator's personal and professional networks, their knowledge of the marketplace, and the authority they possess. For example, Schmiechen happened upon the EcoDistricts framework through his professional network, appreciated it for its focus on community engagement—something that caught his eye due to his past work with the LEED standard—and then used his authority as a City employee to find a site where he could test the approach. Knoff, on the other hand, knew about 2030 Districts through his firm's work in another city, appreciated the approach because it allowed all property types to participate, and started the project by leveraging his professional network to recruit 2030 District participants.

This said, as I demonstrated in Chapter Three, every standard cannot be implemented in every context. LEED ND, for example, is really only feasible with one property owner, while the structure of the Sustainable Neighborhoods and 2030 Districts standards implies that there will be multiple participants. Furthermore, not all initiators can implement all standards. For example, Knoff, an employee of a private real estate investment firm, did not have the authority or land to implement anything other than a 2030 District; Schmiechen and Moellers, as City employees, are not permitted to start a 2030 District. This points to the importance of multiple standards in enabling multiple players with different assets to advance sustainability projects.

Chapter Five: Defining the Relationship between Neighborhood Sustainability Assessment and City Planning

In Chapter Five, I use results from my six interviews with key players in neighborhood scale and citywide sustainability initiatives in Denver to respond to my final research question: What is the relationship between City-led, city-scale planning and NSA standards? To answer this question, I provide a brief overview of the areas of Denver city government related to the four NSA standards I study. I then discuss the ways in which each of the four projects intersects with city government. Finally, I explain how these initiatives fit within the work of Denver’s Office of Sustainability.

Denver City Government

As discussed in Chapter Two, the Office of Sustainability is Denver’s lead agency for advancing citywide sustainability. Housed in the Mayor’s Office, the Office of Sustainability focuses on initiatives that advance the City’s progress towards one of the targets defined by the *2020 Sustainability Goals* by one percentage point or more. While the Office of Sustainability is Denver’s lead sustainability agency, a key element of Denver’s overall sustainability strategy is an “everybody plays” directive (Tinianow 2016), meaning that every City department—from the Department of Aviation to the Department of Human Services—is responsible for advancing sustainability in the city.

One Denver city department that plays a central role in Denver NSA projects is the Department of Environmental Health whose mission is to “create a city with a world class environment and healthy communities for all ages and incomes”(City and County of Denver 2016). The Denver Housing Authority, a quasi-municipal agency focused on “developing, owning, and operating safe, decent, and affordable housing” (Denver Housing Authority 2016) is also deeply involved in neighborhood level sustainability in Denver. Through their involvement with NSA projects, these two entities fulfill their role as team players in Denver’s citywide focus on sustainability, and advance their own mission. LEED ND, for example, helps the Housing Authority reduce operating costs and obtain capital (“LEED Mariposa” 2016; Wolfe 2016) while the Sustainable Neighborhoods program supports the Department of Environmental Health’s focus on healthy communities.

Denver NSA Projects

As a program of Denver's Department of Environmental Health, Sustainable Neighborhoods is naturally integrated with the municipality. This affiliation is readily apparent: project boundaries are defined by the City's administrative neighborhoods, and residents are encouraged to include signatures of support from their elected officials in their applications. In fact, Program Coordinator Taylor Moellers' work as Program Coordinator consists largely of connecting residents to existing City programs. Some of these programs, like Denver Recycles, are explicitly environmental, while others, like B-Cycle and Walk Denver, are not. This structure enables the City of Denver to accomplish a great deal with just Moellers and an intern staffing the initiative. Jon Wachtel, Sustainability Manager for the City of Lakewood, Colorado and creator of the Sustainable Neighborhoods Program, describes the benefit the city gains from the program:

For a small amount of money, we're getting an incredible amount of return... In 2014, if you just look at the value of the projects that were done by the neighborhoods, it's incredible. [The City of Lakewood] put about \$15,000 into supporting the neighborhoods, and they gave us an outcome of an estimated \$80,000 in direct benefits to our community (Elsby 2015).

Sun Valley EcoDistrict is also closely connected to the City of Denver. Schmiechen, a City employee, selected Sun Valley as the EcoDistrict location precisely because the City had identified that Sun Valley should undergo "catalytic change". Schmiechen's Incubator team was composed almost entirely of City employees, including representatives from the Community Planning and Development, Public Works, and Parks and Recreation departments. Denver Housing Authority, linked to the City by the Mayor's appointment authority, now runs the Sun Valley EcoDistrict.

In addition to its involvement with multiple city agencies, the Sun Valley EcoDistrict is connected to the City of Denver through planning documents. Since 2014, Denver Housing Authority has been developing a master plan for the portion of Sun Valley that it controls. This master plan combines the EcoDistricts framework with earlier City-directed plans, such as the 2013 *Decatur-Federal Station Area Plan* and the 2014 *Decatur-Federal General Development Plan*. Paul Schmiechen did not indicate, however, that the inclusion of the EcoDistricts Protocol as part of the planning process was particularly burdensome.

The EcoDistricts' Principles all fit pretty nicely into what [the master planning process is] talking about because there are energy components, there are water components, there is walkability, there is healthy community, there is governance issues (Schmiechen 2016).

Our conversation made it clear that Schmiechen sees the EcoDistrict as a key component of broader City efforts. Schmiechen often answered questions about neighborhood-scale sustainability from a citywide perspective. For example, when I asked Schmiechen why he implemented a neighborhood level initiative, he responded, “Denver tends to focus more on project scale innovation. They don’t automatically leap to ‘Let’s create citywide policy’.” He also understood the NSA standard as a potential midpoint on the way to broader formalization: “There’s a hope that you can learn from these different projects and then codify some of the lessons into building codes, or zoning, or incentives” (Schmiechen 2016).

Like the Sun Valley EcoDistrict, the LEED ND Mariposa District is run by the Denver Housing Authority. This project is not linked as closely to the City of Denver as the Sun Valley EcoDistrict because the Housing Authority, a quasi-municipal agency, is the only entity involved. This said, the Mariposa District, like Sun Valley, is connected with the City’s planning efforts: the Mariposa District was initiated in 2006 after the City began planning for the area around the new 10th Avenue and Osage Street light rail station.

Adam Knoff’s 2030 District is the only project in this study explicitly driven by the private sector. Even here, the City of Denver is still very involved. Knoff describes:

The City has been a great partner. They signed up both as a property owner and a community stakeholder the second day. Mayor Hancock signed the letter himself... We have City staff serving in a number of committee positions and one might join our Board soon. They’ve been great (Knoff 2016a).

In addition to this operational support, the municipality assists in program outreach by referring potential participants to Knoff. Knoff credits Denver’s willingness to help to the fact that 2030 Districts is willing to collaborate rather than seeking to be the only player.

These four NSA standards show multiple relationships possible between neighborhood-scale initiatives and the City. Most obviously, Schmiechen and Moellers are City employees. In addition, Sustainable Neighborhoods interacts with existing City programs, EcoDistricts and LEED ND are a part of City planning processes, and the City participates as a property owner in the Denver 2030 Districts. Regardless of the nature of the relationship, all four NSA standards were heavily intertwined with the City.

Office of Sustainability

One would expect this degree of City involvement to be met with equivalent, if not greater, support from the Office of Sustainability. This is not the case. Chief Sustainability Officer Jerry Tinianow was aware of all four programs and had varying assessments of each, but explained that the Office was not directly involved in supporting any of them because none of the NSA projects were large enough to warrant their involvement (Tinianow 2016).

Tinianow did say that 2030 Districts “definitely has the potential to operate at scale”, suggesting that this program might eventually contribute to Denver’s *2020 Sustainability Goals*, enough to earn the interest of the Office of Sustainability. This said, Tinianow also mentioned that 2030 Districts was “by design a non-governmental program” and thus not in his control. He shared a similar assessment of the programs managed by the Denver Housing Authority, which he described as “an entity that is completely separate from City government.” While the Office of Sustainability is not actively supporting the four NSA projects, it is not blocking them either. “I don’t see any danger. It’s not that we’re going to say this is a bad thing. But we need to be focused on the Mayor’s directions” (Tinianow 2016).

The four project initiators shared Tinianow’s understanding of the role of the Office of Sustainability. Moellers described the Office’s function as “city scale and policy” and Schmiechen understood the Office of Sustainability’s work to involve “high level planning and communications”. Even Knoff, working from outside City government, understood that the Office of Sustainability deals with policy rather than programs (Knoff 2016b). Not one of the initiators expressed frustration about the Office’s lack of involvement, but this may be due to the fact that they had found governmental support elsewhere.

Conclusions

Chapter Five sought to answer my final research question: What is the relationship between city-led, city-scale planning and NSA standards? I found that in Denver, the certified-projects were well connected to City government in a wide variety of ways. The strength of this relationship, however, did not extend to the Office of Sustainability, which Project Initiators identified as having a focus on policy, rather than programs.

The quantity and diversity of NSA standards in Denver sparks another question: What is Denver doing to attract so many neighborhood-scale sustainability projects? The four cases I examine

represent just a subset of the projects in Denver seeking NSA certification. In addition, the City has a number of neighborhood-scale sustainability initiatives that are not seeking certification, such as the 865 million dollar redevelopment of Denver's National Western Center (City and County of Denver 2014; Schmiechen 2016) and Panasonic Enterprise Solution's new technology and business solutions hub (Schmiechen 2016; Svaldi and Keeney 2014).

I see two possible explanations for this large number of neighborhood-scale sustainability projects. One explanation perceives the quantity of projects in Denver as compensation for a failure on the part of the City to meaningfully advance sustainability. In this interpretation, each standard can be used to diagnose the City's shortcomings: 2030 Districts, for example, shows that Denver fails to show property owners exactly how to reduce water and energy consumption in their properties, while the implementation of EcoDistricts demonstrates a desire to focus more on the social dimensions of sustainability. This explanation, however, is weakened by the fact that Denver is nationally acclaimed for its sustainability initiatives.

A second view is that the large number of neighborhood-scale sustainability initiatives in Denver results from a culture that the City facilitates through its directive that every City department, not just the Office of Sustainability, prioritize sustainability. This directive does two things: it dramatically increases the number of people working on sustainability projects, and creates the potential for a greater diversity of approaches, as each City department operates in different contexts and focuses on different areas of the city.

Chapter Six: Conclusions

In Chapter Six, I summarize my findings from Chapters 3, 4, and 5 and suggest future research. I also reflect on how NSA standards can contribute to overall city sustainability.

Since the first Neighborhood Sustainability Assessment (NSA) standard was published in 2001 (Sharifi 2016), the number of standards in use around the world has climbed to 32 (Criterion Planners 2016). Yet, because these standards are no more than fifteen years old, there is relatively little written on them individually, and even less written on how they compare to one another. The existing literature also has yet to examine the application of multiple NSA standards in a single city, or the relationship between standards and a city's efforts to advance sustainability (Haapio 2012; Sharifi and Murayama 2013; Berardi 2013; Reith and Orova 2015; Komeily and Srinivasan 2015).

This study addressed these gaps in the literature by studying four NSA standards in use in Denver, Colorado: LEED ND, 2030 Districts, EcoDistricts, and Sustainable Neighborhoods. This is the first study to examine the use of multiple NSA standards in the same city and the first to analyze the relationship between NSA standards and citywide sustainability efforts.

Summary of Findings

I posed three research questions for this study:

- What are the similarities and differences between the intent, certification approach, and applicability of different NSA standards?
- Why are individuals, institutions, and cities adopting NSA standards and how satisfied are they with their choice?
- What is the relationship between city-led, city-scale planning and NSA standards?

I summarize my findings below.

What are the similarities and differences between the intent, certification approach, and applicability of different NSA standards?

In Chapter Three, I conducted a Development Phase Comparison of LEED ND, 2030 Districts, EcoDistricts, and Sustainable Neighborhoods, the four standards in use in Denver. I drew on the frameworks developed by Sharifi and Murayama (2013), Berardi (2013) Reith and Orova (2015), and Komeily and Srinivasan (2016) for my work. My study identified two approaches to certification that had not yet been studied: procedure certification, in which a standard puts forth a series of steps project

teams must complete in order for their neighborhood-scale sustainability project to become certified, and commitment certification, in which a project becomes certified once a certain number of individuals have pledged to complete a series of actions. I also developed a technique to determine the context in which each standard can feasibly be applied. This method considers three dimensions: the type of intervention a standard directs (new construction or work in an existing neighborhood), the ownership structure (a single or multiple owners), and finally, the zone (commercial or residential) where the project is supposed to occur.

Through this process, I constructed the following profiles:

- LEED ND is a specification-type standard, meaning that it quantifies the sustainability of a product. Relatedly, this standard is the most restrictive tool I looked at, supplying minimum requirements for a project site and mandatory measures for certification. LEED ND offered the best sustainability coverage of the four standards I examined, but did fail to address the social and economic dimensions of sustainability in an adequate way.
- 2030 Districts has an explicit focus on climate change, which sets it apart from the other tools I considered. It also varies in approach: the 2030 District title is earned only when a certain number of property owners commit to working towards the 2030 Challenge.
- EcoDistricts is a procedure-based standard. In contrast with LEED ND, EcoDistricts emphasized the social dimensions of sustainability.
- Sustainable Neighborhoods is a city-sponsored program designed to help residents implement sustainability-themed projects. To participate, a community must first apply to the program. Once accepted, certification is attained through measures like hosting workshops and sponsoring community events. These initiatives should advance one of five Goal Areas the standard defines (air, water, land, people, energy) but no distribution requirement exists.

Why are individuals, institutions, and cities adopting NSA standards and how satisfied are they with their choice?

In Chapter Four, I used data collected through six semi-structured interviews to understand why neighborhood sustainability assessment standards are valued. I broke this analysis down into three sections, first looking at why an initiator chose to work at the neighborhood scale, then looking at why they

chose to use a standard, and finally, looking at their reasons for selecting a particular standard.

The benefits reported during my interviews fell into two groups, functional explanations, such as parcel size or funding, and strategic explanations, which see the neighborhood as a tactical point of intervention. These strategic explanations varied by the scale to which the individual was most accustomed; City employees, for instance, saw the neighborhood as the best place to interact with residents while Adam Knoff, a private sector real estate professional, saw the neighborhood as increasing the impact of his initiative.

The individuals I interviewed all expressed that they valued their selected standard for providing a framework for their work. They also referenced the notion that a standard could brand the resulting project, but held differing views about whether this was important. In general, their opinions seemed to be linked to the reputation of the standard used; individuals that worked with well-known standards—such as LEED ND—valued the standard’s reputation, while others, who worked with lesser known standards—like EcoDistricts—did not see this branding to be important. In any case, the standard’s name alone was not enough to motivate use.

I also asked each initiator why they selected a particular standard. While their responses communicated that they saw unique value in the standard they adopted, their high opinions of, and occasional participation in, the other four projects in Denver suggested that they did not see their standard as inherently better. Rather, they understood it as the best fit for a specific problem they were trying to solve in a particular location. I found that individuals adopted specific NSA standards as a result of a tangle of iterative decisions that draw upon the initiator’s personal and professional networks, their knowledge of the variety of standards available, and the authority they possess.

What is the relationship between city-led, city-scale planning and NSA standards?

In Chapter Five, I explored the relationship between the standards and the city. I found that in Denver, the certified-projects intersect with multiple City agencies. The strength of this relationship, however, did not extend to the Office of Sustainability, which project initiators identified as having a focus on policy, rather than programs.

I also reflected on why Denver has such a quantity and diversity of NSA standards. I proposed that the large number of neighborhood-scale sustainability initiatives in Denver results from a culture that the City facilitates through its directive that every City department, not just the Office of Sustainability,

prioritize sustainability. This directive does two things: first, it dramatically increases the number of people working on sustainability projects and second, creates the potential for a greater diversity of approaches, as each City department, operates in different contexts and focuses on different areas of the city. So while to an outsider, the number of NSA standards in Denver and number of City departments and agencies involved in sustainability work may appear chaotic and redundant, this approach has proven effective in advancing neighborhood-level sustainability.

Suggestions for Further Research

The first suggestion I have for future research is to repeat this study in a different city. An analysis of this kind would help verify which of my findings are applicable beyond Denver and which are limited to this particular case. There are two types of cities that would be particularly beneficial to investigate: cities like Denver that are nationally recognized for their sustainability work, and cities, in contrast with Denver, that continually receive poor sustainability rankings. For this first category, I recommend looking at San Francisco, which has a 2030 District, a number of EcoDistricts, and a Living Community Challenge project (International Living Future Institute 2015). For a city with poor sustainability rankings, I would recommend a study of Cleveland, which has both a 2030 District and an EcoDistrict, and which was recently placed 82nd of 100 in a 2015 Ranking of Greenest U.S. Cities (Bernardo 2015). An alternate approach would be to look at the use of NSA standards in areas that are less developed than major U.S. cities, such as the Old Town EcoDistrict in Bellingham, WA.

A second suggestion is to study NSA standards different than the ones I considered here. I selected LEED ND, 2030 Districts, EcoDistricts and Sustainable Neighborhoods because they were used in Denver, but there are many other NSA standards directing projects in the United States, and even more across the globe. Possibilities include: the International Living Future Institute's Living Community Challenge, Audubon International's Sustainable Communities standard, and C40's Climate Positive Development standard (Criterion Planners 2016).

It would also be interesting to analyze the larger trend of NSA standards. Here, I believe it would be particularly informative to interview authors of NSA standards to understand precisely why they developed their standard, the relationship they would like to have with the city governments and finally what they hope to accomplish in the future. It would also be useful to take a broader look at where neighborhood-scale projects as a group are being implemented.

Finally, as these neighborhood-scale projects mature, it will be critical to conduct an Application Phase Analysis to determine whether the development products are sustainable, and to compare the impact of NSA approaches to citywide sustainability initiatives. I hypothesize that an analysis of this kind would find that, in contrast with citywide approaches, neighborhood-scale projects are more faithful to principles for sustainable development because the standard forces the project initiator to consider all dimensions of sustainability.

Concluding Thoughts

This thesis catches NSA standards at what I expect is the beginning of a much larger trend. The addition of 32 NSA standards in the past fifteen years is remarkable in itself (Sharifi and Murayama 2013; Criterion Planners 2016). In addition, I witnessed lots of movement in just the few months I spent researching and writing this study: EcoDistricts launched its Protocol; 2030 Districts declared two new Emerging Districts; and a New York City project team announced plans for a combined 2030-EcoDistrict-Living City Block project in Brooklyn. The relationship between these standards and cities is also changing. For example, the San Francisco Planning Department has recently incorporated EcoDistricts into its approach to sustainability, and the City of Denver just hired someone to begin to think through the project of translating some of the lessons learned during these neighborhood-scale initiatives into citywide policy (Schmiechen 2016).

This high level of activity prompts the question: Are neighborhood sustainability assessment standards a good thing? Should planners be taking steps to make the implementation of NSA-certified projects easier? Can sustainability be local? My answer to all three is an unequivocal yes.

I believe the neighborhood scale is an ideal, if not the only, place to produce development that abides by all three pillars of sustainability: environmental, economic, and social. Building-scale is too small to address economic and social dimensions; and a project that would achieve all three pillars of sustainability would be far too complex to be able to achieve through one citywide initiative. Neighborhoods present a “sweet spot”—big enough to respond to environmental, economic, and social dimensions of sustainability but small enough to concentrate resources for a thorough response.

My advocacy of neighborhood-scale sustainability initiatives is strengthened by the fact that the neighborhood-scale standards I investigated in this thesis emerged only after building-level or city-scale approaches had been developed: LEED ND follows the building-level LEED standard, 2030 Districts

follows the 2030 Challenge, which addressed individual buildings, while EcoDistricts and Sustainable Neighborhoods were both established by Cities seeking to work at a smaller scale. This suggests that each of the standard authors felt that the platform on which they were working needed to be enhanced. The projects I studied in Denver also showed this trend: Knoff, a private developer, scaled up to the neighborhood level, while City employees Schmiechen and Moellers, scaled down.

I began this study mystified by the trend of neighborhood-scale sustainability assessment; I end enthusiastic about these projects and hopeful about where these projects may lead. I am excited to observe their development over the next few years.

Appendix

A. Interview Questions

Development

When did you begin this project? Why did you begin this project?
How did you select the project site? How did you define project boundaries?

Selection

Why the intermediate scale? In your mind, what are the benefits of this approach over city scale initiatives? Over other smaller initiative?
Why did you decide to use a Neighborhood Scale Assessment (NSA) tool?
Why did you select this standard?
Did you look at similar programs before deciding on [NSA]? Which ones? How did you make your selection?

Evaluation

What was the greatest challenge in creating this district?
How much is left to do before you would consider the project largely complete?
What does success look like?
Have you been pleased with this approach?
If you were to complete a similar project elsewhere in Denver, would you continue to use a NSA tool?
Would you use the same one?

Relationships

Are you familiar with the other neighborhood scale approaches in Denver? Do you interact with these groups?
Did the City of Denver support your efforts? How?
How do you see your project relating to the city's sustainability planning efforts?

B. List of Tables and Figures

Table List

No.	Title	Page
1.1	Standards Evaluated in Development Phase Comparisons	10
1.2	Measures Compared in Analytical Development Phase Comparisons	12
2.1	LEED Neighborhood Development Certification Prerequisites	23
2.2	EcoDistricts Phases and Steps and Corresponding Certification Requirements	32
3.1	Re-categorization of Objectives Defined by LEED ND, 2030 Districts, EcoDistricts, and Sustainable Neighborhoods	44
3.2	Similarities and Differences between LEED ND, 2030 Districts, EcoDistricts and Sustainable neighborhoods	53

Figure List

Figure	Title	Page
1.1	The Three Pillars of Sustainability	8
1.2	The Planner's Triangle	9
1.3	Map of Denver NSA Projects	15
2.1	Denver 2020 Sustainability Goals	19-20
2.2	Map of Certified Projects Considered in this Study	22
2.3	Rendering of the Mariposa District	25
2.4	Project Site in 2006 and 2016	26
2.5	Reduction Schedule for 2030 Challenge for Planning	28
2.6	Buildings Participating in Denver's 2030 District	29
2.7	Denver 2030 District Goals and Progress to Date	30
2.8	Sun Valley Master Plan (Draft)	34
2.9	Denver Neighborhoods Enrolled in the Sustainable Neighborhoods Program	36
2.10	Time line for Denver Citywide Initiatives, NSA Standards, and Certified Projects	38 - 41
3.1	Intervention	51
3.2	Ownership	52
3.3	Zone	52

C. Bibliography

- 2030 Districts. 2015a. "2030 Districts Introduction."
- . 2015b. "2030 Districts & Other District Approaches."
- . 2015c. "Establishing 2030 Districts & Organizational Structures."
- . 2015d. "The Value of 2030 Districts."
- Alliance for Sustainable Colorado. 2011. "Denver Ranks Fifth in US and Canada Green City Index | The Alliance for Sustainable Colorado." Alliance for Sustainable Colorado. June 30. <http://www.sustainablecolorado.org/denver-ranks-fifth-in-us-and-canada-green-city-index/>.
- Architecture 2030. 2014. "Roadmap to Zero Emmissions." http://architecture2030.org/files/roadmap_web.pdf.
- . 2016a. "About Us." <http://architecture2030.org/about/>.
- . 2016b. "The 2030 Challenge." http://architecture2030.org/2030_challenges/2030-challenge/.
- . 2016c. "Timeline." <http://architecture2030.org/about/timeline/>.
- Bell, Simon, and Stephen Morse. 2008. *Sustainability Indicators: Measuring the Immeasurable?* Earthscan.
- Berardi, Umberto. 2013. "Sustainability Assessment of Urban Communities through Rating Systems." *Environment, Development and Sustainability* 15 (6): 1573–91.
- Bernardo, Richie. 2015. "2015's Greenest Cities in America." *WalletHub*. <https://wallethub.com/edu/most-least-green-cities/16246/>.
- Bond, Alan, Angus Morrison-Saunders, and Jenny Pope. 2012. "Sustainability Assessment: The State of the Art." *Impact Assessment and Project Appraisal* 30 (1): 53–62.
- Boyko, Christopher T, Rachel Cooper, Caroline L Davey, and Andrew B Wootton. 2006. "Addressing Sustainability Early in the Urban Design Process." *Management of Environmental Quality: An International Journal* 17 (6): 689–706.
- Brundtland, Gro, Mansour Khalid, Susanna Agnelli, Sali Al-Athel, Bernard Chidzero, Lamina Fadika, Volker Hauff, et al. 1987. "Our Common Future."
- Casey, Jerry. 2015. "Sam Adams, Former Portland Mayor, Leaving City for Job in Washington, D.C., with Environmental Group." *OregonLive.com*. January 14. http://www.oregonlive.com/portland/index.ssf/2015/01/sam_adams_former_portland_mayo.html.
- Chaskin, Robert J. 1998. "Neighborhood as a Unit of Planning and Action: A Heuristic Approach." *Journal of Planning Literature* 13 (1): 11–30.
- City and County of Denver. 2002. "Blueprint Denver."
- . 2014. "National Western Center Master Plan – Draft for Public Review."
- . 2015a. "Climate Action Plan 2015."
- . 2015b. "Climate Adaptation Plan."
- . 2016. "Department of Environmental Health." City of Denver. <https://www.denvergov.org/content/denvergov/en/environmental-health.html>.
- "Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 2007." 2007. 2.1.3 The Dual Relationship between Climate Change and Sustainable Development.
- Criterion Planners. 2016. "Transformative Tools." Accessed May 2. <http://www.transformativetools.org/>.
- Denver 2030. 2015. "Denver 2030 District 2014 Annual Report."
- . 2016. "Denver 2030 District Q1 2016 Newsletter." March 7. <http://www.2030districts.org/denver/news/denver-2030-district-q1-2016-newsletter>.
- Denver Housing Authority. 2014. "Denver Housing Authority Initiative Joins 'Target Cities' in New Era of Urban Leadership." June 24. <http://www.denverhousing.org/aboutus/newsrelease/Documents/2014%20DHA%20Sun%20Valley%20Named%20EcoDistrict%2062414.pdf>.
- Denver Office of Sustainability. 2015. "Where Are We Now?" Office of Sustainability – About – What
-

We Do. November. <https://www.denvergov.org/content/denvergov/en/office-of-sustainability/2020-sustainability-goals/where-are-we-now-.html>.

———. 2016. “Denver Ranks 9th in EPA’s List of 2016 Top Cities with the Most ENERGY STAR Certified Buildings.” Office of Sustainability – News & Events – 2016. March 31. <https://www.denvergov.org/content/denvergov/en/office-of-sustainability/news-events/2016/denver-ranks-9th-in-epas-list-of-2016-top-cities-with-the-most-e.html>.

EcoDistricts. 2014. “Launched: Target Cities. The Pilot Program Redefined.” EcoDistricts – Posts – Blog. June 24. <https://ecodistricts.org>.

———. 2015a. “Portland EcoDistrict Pilot Program Evaluation.” <https://ecodistricts.org/wp-content/uploads/2013/05/Portland-Pilot-Program-Evaluation.pdf>.

———. 2015b. “About the Incubator.” EcoDistricts. December. <https://ecodistricts.org>.

———. 2016a. “2015 Incubator Report.” <https://ecodistricts.org/wp-content/uploads/2015/12/2015-Incubator-Report-FINAL.pdf>.

———. 2016b. “EcoDistricts Incubator – 2013 Highlights.” https://ecodistricts.org/wp-content/uploads/2013/03/Incubator_Report_Final.pdf.

———. 2016c. “Target Cities.” EcoDistricts. <https://ecodistricts.org>.

———. 2016d. “EcoDistricts Protocol – Draft.”

Edwards, Andres R. 2005. *The Sustainability Revolution: Portrait of a Paradigm Shift*. New Society Publishers.

Elsby, Catherine. 2015. “Lakewood Making Green Strides.” *The Denver Post*, December 17, sec. YourHub Lakewood. http://www.denverpost.com/lakewood/ci_29257001/lakewood-making-green-strides.

Engle, Jayne, and Nik Luka. 2014. “Neighborhood Planning for Resilient and Livable Cities, Part 1 of 3: Why Do Neighborhoods Matter and Where Are We Going Wrong? | The Nature of Cities.” *The Nature of Cities*. September 28. <http://www.thenatureofcities.com/2014/09/28/neighborhood-planning-for-resilient-and-livable-cities-part-1-of-3-why-do-neighborhoods-matter-and-where-are-we-going-wrong/>.

Geller, Brian. 2013. Q&A: Brian Geller Interview by Martin Pedersen. <http://www.metropolismag.com/Point-of-View/January-2013/Q-A-Brian-Geller/>.

Greenprint Denver. 2006. “Greenprint Denver Plan.”

———. 2010. “Awards & Accomplishments.” Greenprint Denver. July 26. <https://web.archive.org/web/20100726172420/http://www.greenprintdenver.org/about/awards-accomplishments>.

Haapio, Appu. 2012. “Towards Sustainable Urban Communities.” *Environmental Impact Assessment Review* 32 (1): 165–69.

Hanscom, Greg. 2011. “Green Giants: Seattle Gets Even Greener, Starting with Its Biggest Buildings.” *Grist*. December 7. <http://grist.org/smart-cities/2011-12-06-green-giants-seattle-gets-even-greener-starting-with-its-biggest/>.

Hopwood, Bill, Mary Mellor, and Geoff O’Brien. 2005. “Sustainable Development: Mapping Different Approaches.” *Sustainable Development* 13 (1): 38–52.

International Living Future Institute. 2015. “Pilot Projects + Registered Communities.” *Living Future*. <https://living-future.org/lcc/pilot-registered-communities>.

Jones, Katherine. 2013. “CNU Charter Award Latest Accolade for LEED-ND Project.” USGBC. September 5. <http://www.usgbc.org/articles/cnu-charter-award-latest-accolade-leed-nd-project>.

Knoff, Adam. 2016a. Denver 2030 District Interview by Author. In Person.

———. 2016b. Denver 2030 District – Follow Up Interview by Author. Phone.

Komeily, Ali, and Ravi S Srinivasan. 2015. “A Need for Balanced Approach to Neighborhood Sustainability Assessments: A Critical Review and Analysis.” *Sustainable Cities and Society* 18: 32–43.

-
- “LEED Mariposa.” Letter to Author. 2016, April 29.
- Luederitz, Christopher, Daniel J Lang, and Henrik Von Wehrden. 2013. “A Systematic Review of Guiding Principles for Sustainable Urban Neighborhood Development.” *Landscape and Urban Planning* 118: 40–52.
- Moellers, Taylor. 2016a. Sustainable Neighborhoods Denver Interview by Author. In Person.
- . Letter to Author. 2016b. “Sustainable Neighborhoods Denver – Follow Up,” April 29.
- Naji, Sally, and Julie Gwilliam. 2016. “Neighborhood Sustainability Assessment Tools: A Conceptual Framework for Their Use in Building Adaptive Capacity to Climate Change.” *World Academy of Science, Engineering and Technology, International Journal of Civil, Environmental, Structural, Construction and Architectural Engineering* 10 (2): 180–89.
- NYC Districts. 2015. “NYC Districts Program.” NYC EcoDistricts. <http://www.nycdistricts.com/>.
- Ottawa Centre EcoDistrict. 2014. “EcoDistrict Roadmap – Ottawa Centre EcoDistrict.” http://ottawaecodistrict.org/wp-content/uploads/2015/09/SNAP_Appendix_B-EcoDistricts-Roadmap-September-2015.pdf.
- PD&R Edge. 2014. “Denver’s Mariposa District: Supporting Healthy, Mixed-Income Living.” In Practice – HUD User – PD&R Home. https://www.huduser.gov/portal/pdredge/pdr_edge_inpractice_022414.html.
- Reith, András, and Melinda Orova. 2015. “Do Green Neighbourhood Ratings Cover Sustainability?” *Ecological Indicators* 48: 660–72.
- Robinson, John. 2004. “Squaring the Circle? Some Thoughts on the Idea of Sustainable Development.” *Ecological Economics* 48 (4): 369–84.
- Schmiechen, Paul. 2016. Sun Valley EcoDistrict Interview by Author. In Person.
- Seattle 2030. 2016. “Seattle District Goals.” <http://www.2030districts.org/seattle>.
- Selzter, Ethan, Tim Smith, Joe Cortright, Ellen Basset, and Vivek Shandas. 2010. “Making EcoDistricts.” https://ecodistricts.org/wp-content/uploads/2013/03/making_ecodistricts_concepts_and_methods_for_advancing_sustainability_in_neighborhoods.pdf.
- Sharifi, Ayyoob. 2016. “From Garden City to Eco-Urbanism: The Quest for Sustainable Neighborhood Development.” *Sustainable Cities and Society* 20: 1–16.
- Sharifi, Ayyoob, and Akito Murayama. 2013. “A Critical Review of Seven Selected Neighborhood Sustainability Assessment Tools.” *Environmental Impact Assessment Review* 38: 73–87.
- . 2014. “Neighborhood Sustainability Assessment in Action: Cross-Evaluation of Three Assessment Systems and Their Cases from the US, the UK, and Japan.” *Building and Environment* 72: 243–58.
- . 2015. “Viability of Using Global Standards for Neighbourhood Sustainability Assessment: Insights from a Comparative Case Study.” *Journal of Environmental Planning and Management* 58 (1): 1–23.
- Sustainable Neighborhoods Program. 2013. “Certification Requirements.”
- . 2016a. “Denver Goal and Target Areas Brochure.”
- . 2016b. “Program Background.” <https://www.sustainableneighborhoodnetwork.org/information/program-background>.
- . 2016c. “Sustainable Neighborhoods Denver.” <https://www.sustainableneighborhoodnetwork.org/sustainable-neighborhoods-denver>.
- Svaldi, Aldo, and Laura Keeney. 2014. “Panasonic Enterprise Solutions a ‘First Win’ for Denver Aerotropolis.” December 18. http://www.denverpost.com/business/ci_27163471/denver-lands-panasonic-enterprise-solutions-near-airport.
- Tanguay, Georges A, Juste Rajaonson, Jean-François Lefebvre, and Paul Lanoie. 2009. “Measuring the
-

Sustainability of Cities: A Survey-Based Analysis of the Use of Local Indicators.” CIRANO-Scientific Publications, no. 2009s-02.

Tinianow, Jerry. 2016. Office of Sustainability Interview by Author. In Person.

Turcu, Catalina. 2013. “Re-Thinking Sustainability Indicators: Local Perspectives of Urban Sustainability.” *Journal of Environmental Planning and Management* 56 (5): 695-719.

USGBC. 2009. “LEED 2009 for Neighborhood Development.”

———. 2014a. “Imperiled Species and Ecological Communities | U.S. Green Building Council.” <http://www.usgbc.org/node/2615295?return=/credits/neighborhood-development-plan/v4/smart-location-and-linkage>.

———. 2014b. “Reference Guide for Neighborhood Development.”

———. 2015a. “Scorecard – DHA Mariposa Mixed-Use Development.” January. <http://www.usgbc.org/projects/dha-mariposa-mixed-use-development>.

———. 2015b. “DHA Senior Housing – 1099 Osage.” US GBC – Directory – Projects. March. <http://www.usgbc.org/projects/dha-senior-housing-1099-osage>.

———. 2016a. “Directory – Projects.” <http://www.usgbc.org/projects>.

———. 2016b. “LEED.” <http://www.usgbc.org/LEED>.

———. 2016c. “LEED Certification Fees.” USGBC. <http://www.usgbc.org/cert-guide/fees>.

Valentin, Anke, and Joachim H Spangenberg. 2000. “A Guide to Community Sustainability Indicators.” *Environmental Impact Assessment Review* 20 (3): 381-92.

Wolfe, Isabelle. 2016. LEED Mariposa and Sun Valley EcoDistrict Interview by Author. Phone.