Sustainability indicators in an evolving sustainability information system:
The case of Seattle

Lisa Pettibone,
PhD student at the Environmental Policy Research Centre, Freie Universität–Berlin

September 22, 2012

1 Abstract

Sustainability is a contested, normative concept that frames decisions using a holistic, long-term perspective based on environmental, social, and economic considerations. Cities have taken the lead in incorporating this framework into decision-making processes, from Local Agenda 21 processes to city-specific planning. However, as cities have begun to integrate sustainability into decision-making, they have been confronted with several concerns regarding the use of information and indicators. The contested nature of sustainability makes the collection and use of information inherently political and occasionally problematic. Indicators can serve multiple purposes in the policy process, from system monitoring to issue framing and coalition building. As problems or actors' understanding of them changes, new indicators may be required and old information used in new ways. However, the way indicators are used by different actors in the policy-making process is not well understood.

This paper will seek to answer this question by studying the evolving sustainability information system in Seattle, as well as the role of individual indicator users within the city. Seattle, which has used sustainability indicators for over two decades, is an international leader in this area. I use a case study approach that evaluates historical materials, government and organizational documents, and interviews with decision-makers. I highlight the various ways that actors in Seattle collect and use information related to sustainability in policy-making. I demonstrate that, although actors at different scales inside and outside government use information in multiple ways to influence policy, different types of actors emphasize specific uses based on their capacity, goals, and the needs of the system. This creates an evolving sustainability system in which actors work together to provide and discuss information, frame sustainability, and create effective policy to improve sustainability in the city.

2 Introduction

Leading cities are creating policies to become more sustainable and construct sustainability indicators (SDIs) in good faith to measure progress toward their goals (Saha, 2009). Indicators are also important for cities to show accountability, operationalize the contested concept of sustainability, and meet the data collection capabilities and requirements of the information age (Bell, Eason, & Frederiksen, 2011; Pastille, 2002).[1] Information can also be

---

[1] Indeed, one could expand the cause to Enlightenment thinking, which is concerned with individualism, rational thinking, and a scientific worldview that prizes "objective" information over local knowledge (see, e.g., Bowers, 2000).

used for political purposes: to win political arguments and introduce sustainability-based values into the public sphere (e.g., Rosenström, 2006). In short, sustainability indicators can help shift policy discourse toward one more favorable to the goals of local sustainability advocates (Bell & Morse, 2008; Meadows, 1998).

It is well understood that sustainability indicators serve multiple uses in the decision-making process (e.g., Bell, Eason, & Frederiksen, 2011; Heiland et al., 2003). What is less clear is how these uses differ between users—that is, how different actors use indicators to influence policy-making. In addition, the contested nature of sustainability as well as its newness as a political concept seem to require a certain amount of trial-and-error in indicator usage. This paper studies both these factors—indicator use by different actors and the evolution of that use over time—to argue that sustainability indicators should be understood as one source in a continuously evolving sustainability information system. It does this by examining specific indicator sets and their use by key actors in the city of Seattle, a city with over two decades of experience with sustainability indicators.

3   Sustainability and information

3.1   *Operationalizing sustainability*

Our understanding of how sustainability can be measured and that information used in policy-making processes has evolved over the past 20 years (see Holman, 2009, for a great review of the literature), in conjunction with work on the principles of the term itself (see Dresner, 2008). While early research focused on the need to construct universal or scientific indicators to measure sustainability (Bossel, 1999, 2001; Gehrlein, 2004; Heiland et al., 2003), numerous empirical studies, especially at the local level, soon began to show that even the most scientifically robust sustainability indicators did not seem to affect policy processes (Feller-Länzlinger, 2010; Lang, 2003; Pastille, 2002). Although researchers became frustrated by their inability to demonstrate the tangible influence of indicators on policy—something already seen with social indicators (Cobb & Rixford, 1998)—some studies pointed out that the process of creating indicators could build local capacity and political buy-in for policies linked to sustainability (Innes & Booher, 2000; Reed & Dougill, 2003; Wittek et al., 2002), an outcome perhaps more interesting than policies that could be directly linked to indicators.

This fits with a growing consensus that sustainability is a contested normative framework with roots in an ecological worldview critical of modernism's insistence on a singular rational reality (Dunlap, 2008; Ehrenfeld, 2008; Stockdale, 1989). It is clear that sustainability is an explicitly normative agenda, but what that agenda seeks to achieve remains contested both by advocates and those satisfied with the status quo. Sustainability

indicators, in operationalizing this contested term, must straddle the line between the data "objectivity" requirements of modernists and the values of sustainability advocates. Bell and Morse (2001) highlight this concern:

> "Herein we believe rests the central conundrum of [sustainability indicator]s. We are trying to use [sustainability indicator]s as a tool to gauge something that is highly subjective and ridden with human values and desires, yet we are trying to do this either by ignoring these very human aspects or by trying to reduce them to a few simple numbers" (307).

Sustainability indicators thus seek to reconcile the normative with the factual. This gives them multiple uses in policy-making, where they can frame policy problems, lend legitimacy to political views, and report on the effectiveness of a specific policy (Bell, Eason, & Frederiksen, 2011; Brugmann, 1997a; Pastille, 2002). While these multiple uses are well understood, how indicators are used by different actors has not been examined. Indeed, much indicator research to date equates indicator sets created by governments with those used by nonprofits, expecting them to fulfill the same role in the policy process and thus ignoring the different purposes various actors may have. This gives a false impression of indicators' effectiveness, as indicators created to raise awareness of sustainability among the public should not be judged as attempting to pass specific policy or comprehensively monitor city systems. However, such judgments are all too often made, such as exemplified in the famous debate between Brugmann and Pinfield in *Local Environment* (Brugmann, 1997a, b; Pinfield, 1997).

I argue that we should think about sustainability indicators as one form of information in an evolving sustainability information system. This requires acknowledging the validity of different uses of indicators in the policy-making process, as well as understanding both how different actors use indicators to advance their agenda and how these uses change over time in a dynamic system. Although this concept is fairly new, it is driven from the extensive literature on policy-making, sustainability indicators, and urban governance. These issues will be examined in turn in the next section.

3.2   *Understanding sustainability indicators as part of an evolving information system*
This section distills key literature on sustainability indicators in policy-making. It is divided into three parts: the various uses of indicators, the roles of actors, and Meadows (1998) and Innes and Booher's (2000) notion of an evolving information system, which I draw on to link the indicators and actors to decision-making.

3.2.1   HOW INDICATORS ARE USED IN POLICY-MAKING
Much has been written about the potential and actual use on indicators. This section discusses different approaches from the literature before distilling these into a typology that will be used to examine what purposes indicators serve different actors in the system.

Reed et al. (2005) describe two major camps on indicator use: reductionists, who focus on creating objective universal indicators, and the participation camp, which emphasizes community vision and a process that improves coordination and policy success.[2] The former, who see the world as a machine that simply requires more data to remain in operation, tend to presume a more straightforward use for indicators. Decisions are made based on data, so indicators should provide complete and correct information to make objective decisions. The participatory view, by contrast, often emphasizes the process as more important than the actual indicators. Here, the world is a complex, living organism that people understand through subjective, incomplete models. When diverse actors come together to create indicators, they test ideas and forge bonds that lead to negotiated indicators meaningful and legitimate to everyone involved. Adherents of the participatory framework see indicator usage as inherently political, where an inclusive indicator design process is more important than issues of scientific validity. They seek, therefore, to create indicators with social meaning, as these have more political value. Table 1 summarizes key uses of indicators according to these two frameworks.

Table 1: Indicator uses according to reductionist and participatory frameworks

Framework	**Reductionist**	**Participatory**
Indicator uses	orientation, operationalization forecasting problem definition policy analysis communication monitoring reporting project management comparison, ranking coordination, interaction between actors/agencies evaluation	monitoring, showing system health aligning worldviews, building awareness decision-making rapid feedback to actors (to influence individual behavior) knowledge transfer community building, self-governance negotiation program and policy monitoring help systems become adaptive learning processes
Sources	Gehrlein (2004); Heiland et al. (2003); Liepach, Sixt, & Irrek (2003)	Innes & Booher (2000); Meadows (1998); Pastille (2002); Wittek et al. (2002)

I have distilled these lists into broad indicator uses as follows:

- problem definition and framing: indicators used to distill certain values, change worldviews, and influence decision-making, such as the Genuine Progress Indicator or the Ecological Footprint
- system monitoring: more objective indicators that show the state of a system's health in order to point out potential problems, such as air pollution or crime rates

---

[2] These categorizations are likely related to the debate between the modern and post-modern (and in sustainability thought, ecological) perspectives, an area ripe for more concrete linkage that begs the question: to what extent does the sustainability indicators movement simply perpetuate a modernist/reductionist worldview? Participatory indicator advocates avoid this question by emphasizing the indicator creation process as a way to construct meaning in the community.

- reporting and evaluation: indicators explicitly linked to policies or programs, such as trees or recycling rates in city agencies
- policy integration: cross-cutting indicators that bridge problems from different policy sectors, such as when transit use indicators are linked to environmental quality and public health
- coalition building: indicators used to build awareness and increase cooperation between actors, such as with a participatory design process

This list emphasizes the different points in the decision-making process where indicators can intervene, as well as the distinct ways in which they seek to influence policy (see also Weiss, 1979). I use these five broad categories to understand how indicators are used differently by different actors in urban systems.

3.2.2 ACTORS AND INDICATORS

Although sustainability indicators are a thriving field of study, less has been written on how indicators are used by different actors in the policy process. Crilly, Mannis, and Morrow (1999) compare an NGO-led approach in Ireland to a government indicator initiative in the United Kingdom and find the former approach more successful, but do not link this to these actors' roles in the policy-making process. Similarly, Bell and Morse (2001) find that sustainability indicators developed by "internal" (or local) actors find more use than those created by "external" experts, a finding corroborated by German studies of indicators created by participatory actors, local governments, or scientific experts (Gehrlein, 2004; Heiland et al., 2003). Comparative case studies such as Pastille (2002) and POINT (Bell, Eason, & Frederiksen, 2011) show how indicators created by different actors are incorporated in different ways into the policy process. But such studies tend to evaluate indicator effectiveness narrowly, based on how closely they are tied to specific policies.

Studies of urban sustainability, in addition, point to a complex multi-actor governance that includes local government, nonprofits, businesses, academia, and engaged citizens (e.g., Gehrlein, 2004). Portney and Cuttler (2010), for example, look explicitly at the number of nonprofits in "sustainable" cities and find a significant positive correlation. Although much indicator research points to uses within government, many—perhaps most—indicators are developed and used in academia, nonprofits, and business associations.

It is therefore important to determine the different uses of indicators by different actor groups. Especially if we are to understand sustainability governance as a collaborative endeavor, it is important to understand how actors outside of politics or government—such as environmental nonprofits—use sustainability indicators. Such actors may be more interested in other, less tangible, uses of indicators than government stakeholders. A clearer

understanding of how different actors use sustainability indicators can further both indicator and urban governance research.

3.2.3 THE EVOLVING INFORMATION SYSTEM

Although much has been written about the different uses of sustainability indicators as well as the role of various actors in urban sustainability governance, there have been no studies about how these uses and actors' roles have changed over time. Innes and Booher (2000) talk about the role sustainability indicators can play in making cities "adaptive learning systems" (178-179):

> "A complex system like a city is capable of improving *itself*, but such adaptation requires feedback—various kinds of information—to flow among the players (Innes & Booher, 1999). This is where indicators come into the picture—to inform those players as they go about their business and create a system of distributed intelligence so that the city can be, not just a complex system, but *a complex, adaptive learning system that can be sustainable in the face of unpredictable futures*" (179, emphasis in original).

I examine the evolution of indicator use in Seattle using this framework, by evaluating how different actors use sustainability indicators and how these uses change over time. If a city can be seen as a complex, adaptive system, these uses should change both to meet the changing policy landscape and users' needs in the policy-making process.

3.3 *Research approach and methods*

The question examined in this paper is: How is the use of sustainability indicators affected by who created and uses them? Using a case study approach, I examine how key actors use sustainability information in Seattle, a city that has sought for over 20 years to link sustainability to policy-making. These cases are part of a broader research project that seeks to understand how leading cities in the U.S. and Germany define, operationalize, and implement sustainability. Data collected include documents, press releases, and reports from city governments and related jurisdictions (e.g., county, metropolitan region, and state governments), NGOs, think tanks, and research projects; previous research literature and histories related to the case cities; interviews with local experts; local press; and websites of local actors.

I focus here on several key sustainability information systems used in Seattle, in order to highlight the range of actors, indicator sets, and information challenges faced. Numerous levels of government and nonprofit actors have created sustainability indicators for various purposes, from raising awareness on specific issues to complying with state law. I selected these cases to demonstrate the breadth of actors engaged in sustainability indicator creation and the functions such information serves. It should be noted that not all indicator sets were created for the city context, although all are relevant to Seattle. In addition, I am not examining every form of sustainability information used by the city, but a

selection that represents a broad diversity of actors and uses, as well as the largest change over time.

The cases are:
- King County's greenhouse gas emissions inventory, developed with the Stockholm Environment Institute
- the work of the Sightline Institute, a think tank dedicated to promoting sustainability in the Cascadia bioregion
- the indicator reports released by the volunteer association Sustainable Seattle
- WalkScore, a walkability rating by address developed by a Seattle-based company of the same name
- STAR, a national sustainability indicator tool developed by ICLEI USA, the National League of Cities, and the U.S. Green Building Council, for which King County is one of 10 beta communities

Table 2: Cases studied

Actors	Indicator set/information	Actor type	Scale
Seattle Department of Planning and Development; Office of Sustainability & Environment	comprehensive plan	city agency	City
King County, Stockholm Environment Institute	2012 greenhouse gas inventory	county government, research institute	county
Sightline	Cascadia Scorecard, research reports	think tank	bioregion (Cascadia)
Sustainable Seattle	Indicators of Sustainable Community, Happiness Index	volunteer/nonprofit group	City
WalkScore	WalkScore	business	international
ICLEI, National League of Cities, U.S. Green Building Council	STAR	*locally:* county government; *nationally:* nonprofits, think tank	National

As it is understood that these cases can use sustainability indicators in multiple ways, I will evaluate the differences between them by ranking the importance of the five different indicator uses defined above in terms of "high," "moderate," or "low," each of which is used once or twice for each case, to preserve a balance of uses. I should emphasize that this is a preliminary analysis, but one with results worthy of further investigation.

4 Seattle's evolving network of sustainability information

4.1 Background

Seattle is a mid-sized city in the Pacific Northwest with about 600,000 residents in a metropolitan area of 3.3 million.[3] The city has a long history of interjurisdictional cooperation—both at higher regional and state levels and in neighborhoods—and civic engagement (Brambilla & Longo, 1980; Sanders, 2010). The city's decentralized, shared, and inclusive power structures, coupled with the strong grassroots related to environmental issues, reveals a city institutionally and dispositionally receptive to sustainability, which makes the city's 20-year experience with sustainability indicators unsurprising.

Seattle is proud of its reputation as a "livable" city, born out of forced economic diversification after massive layoffs from Boeing, an airplane manufacturer, in the 1960s (Brambilla & Longo, 1980). Since then, Seattle has placed a high value on long-term, holistic planning that preserves the region's natural beauty and restrains the rate of growth while improving its high quality of life. This creates tension at times, however, especially when car-loving residents of suburban-style neighborhoods resist efforts to increase density.

The city began to use sustainability as a principle for its planning in the early 1990s in creating its state-mandated comprehensive plan, titled *Toward a sustainable Seattle* (City of Seattle, 1994; 2005). Around the same time, a group of engaged volunteers formed Sustainable Seattle, which used a consensus-based process with a broad spectrum of Seattle residents to create a set of sustainability indicators (Holden, 2006; see also Holden, 2007). Many principles of sustainability—especially those, such as communitarianism and ecocentrism, at odds with some American political values—have deep roots in Seattle. The centrality of such values to the public leads to an easier acceptance of—and even demand for—political decisions explicitly tied to sustainability.

Perhaps due in part to its comprehensive plan, much of the city's political debate surrounding sustainability is related to land-use planning (Miller, 2004; Williams-Derry interview, Mar. 30, 2012).[4] Before the 1960s, Seattle planners prioritized automobile transportation and single-use residential developments (this is typical of U.S. cities; see Beauregard, 2006 and Rybczynski, 2007), creating a city with relatively low density and few

---

[3] All historical information from Brambilla & Longo (1980), City of Seattle (1994), and Center for Sustainable Communities (CSC) et al. (1995) unless otherwise noted.

[4] I suspect based on anecdotal evidence that strength of land use policy in the Pacific Northwest's definition of sustainability is at least partly based on the region's strong planning tradition. Urban planning seems to have a better reputation and closer ties to political decision-making. The direct interventions into urban form in Seattle and Portland stand in contrast to the more laissez-faire approach to urban development in most California cities around the same time. This suspicion is worthy of investigation.

forms of alternative transportation. Most Seattle residents own and use cars as a primary mode of transportation (Williams-Derry, 2012a); in addition, many neighborhood plans restrict new housing and upzoning in existing residential neighborhoods (City of Seattle, 1994; 2005). This is due in part to protect residents' views of the Cascade and Olympic mountain ranges, but is also based on fears that any population increase will reduce residents' prized quality of life. Seattle could thus be described as a city of environmentalists built to minimize environmental benefits even as its residents clamor for sustainable public and private solutions.

4.2 *Major indicator users*

4.2.1   CITY GOVERNMENT: DEPARTMENT OF PLANNING AND DEVELOPMENT

Although several city agencies are working on sectoral policies related to sustainability—such as transportation and recycling—this section deals with the Department of Planning and Development's (DPD) implementation of the city's state-mandated comprehensive plan. Indicators in this plan are dictated to some extent by the state or county and passed down to neighborhoods. Many of these deal with land-use, such as new population and jobs targets, and transportation goals. These indicators thus frame sustainability as related to urban planning concepts such as smart growth, mixed-use or transit-oriented development, and such. The indicators are specific targets used to frame policy and link policy sectors, such as land development and transportation.

In 1994, Seattle's city planning department released its comprehensive plan, *Toward a sustainable Seattle*, in accordance with state law. The Washington state Growth Management Act (GMA) that required all major or fast-growing cities and counties to develop comprehensive plans that concentrated growth into transit-accessible urban areas and protected sensitive environmental and rural resource land (Laschever, 1998; Lloyd, 2000). The Act seeks to protect "the environment, sustainable economic development, and the health, safety, and high quality of life enjoyed by residents of this state," which it sees as threatened by "uncoordinated and unplanned growth" (Lloyd, 2000, 83-84).

The city's plan centers around creating policy for the population and job growth targets set by the state. This includes zoning changes, infrastructure projects, and environmental policies that preserve the city's character while increasing density. In the face of criticism to the city's "Urban Villages" approach by powerful neighborhood groups, the planning department devolved key decisions about how to grow to the neighborhoods. Each has created a Neighborhood Plan that ties into the city plan, including by using city growth targets for the neighborhoods, developed by a resident-driven process that includes a neighborhood planner and resource support from the city's Department of Neighborhoods

(CSC et al., 1995). Thus, an important way that DPD uses indicators to promote sustainability is by using population growth figures provided by the start to guide planning policies that promote and accommodate expected growth in key neighborhoods in a way accepted by the neighborhoods themselves.

4.2.2   COUNTY GOVERNMENT: KING COUNTY

In spring 2012, King County, which includes the city of Seattle, worked with the Stockholm Environment Institute to develop its latest greenhouse gas inventory (King County & SEI, 2012).[5] The report demonstrates the city's ability to embrace the complexity inherent in sustainability and the importance of methodology to indicator development. In addition to reporting on recent changes in county-level emissions used the standard geographic methodology, the report tests a consumption-based accounting method. The newer approach counts emissions based on products and services used within the county, regardless of where they originate, a revolutionary change from standard accounting. (This would include emissions from goods shipped to the county from abroad, for example, but not those of goods manufactured in Seattle for sale outside the region.) Although per capita emissions amounted to about 12 metric tons CO_2e in 2008 (below the state average and about half of the U.S. average of 23.4), the consumption-based figure was an astounding 29 metric tons CO_2e (King County & SEI, 2012).

Such figures redefine the sorts of policies cities can use to address climate change (see Rutland & Aylett, 2008, for an excellent discussion of this). In this case, consumption takes center stage, forcing the county to address the behavior of local residents, an area that has been off-limits. It is amazing that a county agency developed and tested a new methodology that increased the scale and seriousness of the problem at the same time it moved its scope into controversial policy territory. Currently, King County is continuing to use the geographic figure as its official emissions number, so it is not clear whether or how the consumption-based inventory will be used in the future (Pinto de Bader & Wysocki interview, Apr. 6, 2012). Still, having this new information may change the terms of debate in the Seattle region.

4.2.3   THINK TANK: SIGHTLINE INSTITUTE

Sightline Institute is a think tank focused on making the Cascadia bioregion (an area that includes much of Washington, Oregon, and Idaho, as well as British Columbia) a model of sustainability. Sightline's mission is to provide research and information on policy relevant

---

[5] This inventory is an example of the collaboration between city, county, and regional governments in Seattle. The county government has taken the lead in greenhouse gas inventories, but is supported by Seattle's Office of Sustainability and Environment (Pinto de Bader & Wysocki interview, Apr. 6, 2012).

to sustainability. The organization serves two major roles in policy-making: evaluating potential and current policies using a sustainability framework and selling the story of sustainability more broadly.

First, Sightline questions major policy assumptions—even those of sustainability advocates—in evaluating current and proposed policies in the region, positioning itself as a watchdog in order to advocate for effective policies (i.e., in terms of sustainability). In addition, Sightline frames policy discussions using a sustainability framework by bringing up environmental and social concerns.

For example, Sightline recently wrote a report on gasoline consumption in Washington and Oregon, arguing that demographic trends have reduced driving and gasoline consumption in these to states (Williams-Derry, Broner, & Howard, 2012); young people are also beginning to choose alternate forms of transportation, such as public transit and cycling (Williams-Derry, 2012b). This research serves as the empirical basis for their argument that transportation policy should thus shift resources away from roads and highway projects. As part of this initiative, Sightline has a blog series entitled *Dude, where are my cars?* that examines driving and transportation funding trends in Washington and Oregon (*Dude, where are my cars?*, 2012). This includes several posts critical of state traffic forecasting methods, which over-project increases in car traffic (e.g., Williams-Derry, 2012c; Broner & Williams-Derry, 2012). In addition to its research projects, Sightline has used the Cascadia Scorecard since 2004 to track sustainability in the region in order to raise awareness about sustainability issues more broadly.

Sightline's approach has evolved over the years, perhaps mirroring a changing understanding of the value of indicators and information regarding sustainability: it seems to put less emphasis on the indicators per se and more on getting information that could aid decision-making into the hands of the right people. To Williams-Derry, the important work is not necessarily collecting data, but using available data to tell a story about sustainability:

> "[S]ometimes the data is messy and inconclusive. Even if people agree on the facts, they disagree on what they mean. So there's always a layer of storytelling or interpretation that has to happen, in order to make sense of the numbers you're seeing" (Williams-Derry interview, Mar. 30, 2012).

Sightline uses sustainability information in numerous ways, it focuses on framing issues of important and evaluating current and proposed policies according to a sustainability framework. Also important are integrating policy, understood as linking policy measures to each other and to sustainability, and coalition-building by informing

key actors in policy-making as well as engaged citizens of important local issues and their connection to sustainability.

4.2.4   VOLUNTEER ASSOCIATION: SUSTAINABLE SEATTLE

The first iteration of indicators in Seattle has been referred to as the first set of sustainability indicators in the world (Holden, 2007). Released by the volunteer group Sustainable Seattle in 1993, indicators were developed by a participatory process that included over 150 participants—elected officials, nonprofit and institutional leaders, and engaged citizens— who created measures that generated enthusiasm for sustainability from residents (Holden, 2006) but were seen by some as lacking methodological rigor (Brugmann, 1997a). Indeed, because the indicators were created by a diverse group of volunteers, the emphasis was on values important to the community, such as "children living in poverty" and "public participation in the arts," rather than issues that most easily influenced by city government (Sustainable Seattle, 1998). The group released four indicator reports in the 1990s and began a Happiness Project more recently that has spun off into its own group (Butler interview, Apr. 10, 2012), indicating the group's struggle with data availability and an unclear audience. Although the group's indicators have been the source of much scientific study, Sustainable Seattle has gotten out of the indicator business. Perhaps its commitment to values-based measures that were nonetheless difficult to collect data on was a partial cause.

The work of Sustainable Seattle created several additional important outcomes, however. The project became a leading example for indicator projects internationally (members of Sustainable Seattle were invited to at least 22 conferences around the world in the 1990s; Holden, 2006, 189). Project leaders have gone into city government, founded think tanks, and risen to positions of power in Seattle and beyond; and the work helped start a discussion about sustainability that undoubtedly aids its continued prominence in public debate. Although Sustainable Seattle's mission has changed several times since their initial indicator report (Holden, 2006; Butler interview, Apr. 10, 2012; Holden interview, Mar. 27, 2012), this could be seen as a testament to the quick acceptance of its projects by city government. Indeed, when the group's limited finances threw into doubt their ability to print their first indicator report, the city offered to buy the first 2,000 copies, to be distributed at planning meetings for its first comprehensive plan, which was being developed at this time (G. Lawrence interview, Feb. 20, 2012).

In addition to the short-term impact of its first indicator report, Sustainable Seattle's indicator project influenced at least nine other sustainability indicator sets within the region over the next decade, ranging from indicators related to government plans at the state, county, and state level to the Sightline Institute's Cascadia Scorecard, which measures the

entire Pacific Northwest region (Holden, 2007). Although it is unclear whether this leadership has led the region to become more sustainable or the liberal attitudes of its residents caused the indicators to be developed in the first place, Sustainable Seattle raised awareness of sustainability as a framework for local policy and provided a springboard for sustainability advocates to become city leaders.

4.2.5 BUSINESS: WALKSCORE

WalkScore is an online tool that evaluates the walkability of any address in the United States and many other countries. It was created by a start-up company of the same name, based in Seattle, to promote walkable neighborhoods. The indicator's main audience is renters and home-buyers, who can compare the WalkScore—a number from 0 to 100 calculated based on the proximity and accessibility of local shops and services, amenities, and public transportation options—between different potential apartments. Users can also plug in their place of work and calculate commute times by various transportation modes. In addition, the company admits to the number of judgment calls it makes in calculating amenity values, so is examining the most recent literature on walkability to improve the scientific robustness of its tool. WalkScore has become valuable for real estate developers and agents in marketing properties located in the urban core. A study by CEOs for Cities found that each additional WalkScore point corresponded to about $1,413 in value to Seattle homes (Cortright, 2009).

WalkScore is of course an indicator creator, but its mission indicates that it expects this indicator to be used to further its goal of walkable neighborhoods, a more politically palatable way of talking about density. According to co-founder Matt Lerner, "Walkable neighborhoods aren't just a nice thing to have, but are at the core of a sustainable future" (personal communication, Mar. 16, 2012). WalkScore's website provides 6 million scores per day; the company also helps major real estate websites, such as Zillow.com, conduct research on housing values. The group's main goal is to provide information that can influence individual decision-making toward sustainability, by giving home-buyers for example the tools to choose walkable neighborhoods. It is also clear that WalkScore hopes their indicator will link walkability—which they see as linked to sustainability—to housing prices, which could remake the real estate industry.

WalkScore has latched onto a similar aspect of sustainability to Seattle's comp plan—increasing housing density—by using a completely different tool. WalkScore does so in a more subversive way, however, by giving a tool for apartment-hunters to use in individual decision-making that increases the desirability of homes in denser (i.e., more walkable) neighborhoods. In this way, WalkScore can be seen as an innovative element in a

sustainability information system, one that focuses more on getting individuals interested in living in the sorts of neighborhoods advocated in the comprehensive plan than determining policy to improve those neighborhoods.

4.2.6   NATIONAL NON-PROFITS: STAR COMMUNITY INDEX

The STAR Community Index is a national sustainability indicator initiative started in 2007 by a group of non-profits (ICLEI USA, the National League of Cities, and the U.S. Green Building Council), and a center-left think tank (Center for American Progress). STAR is an online toolkit that hopes to provide communities a platform to track their sustainability according to three dimensions, compare themselves to others, and disseminate best practices. The system is currently being tested in 10 beta communities, including cities, towns, and one county: King County.

STAR is a tool for sustainability management that will also include certification of different levels of sustainability according to a rating system. Unlike most other indicator systems, STAR hopes to be functional in multiple contexts and used by communities across the United States. The data will be aggregated within the system. According to a two-page overview released by ICLEI et al. (n.d.), STAR plans to combine:

> "A framework for sustainability encompassing the environment, economy, and social equity;
>
> An online performance management system that gathers, organizes, analyzes, and presents information required to meet community and local government sustainability goals; and
>
> A rating system that drives continuous improvement and fosters competition in advancing community health, prosperity and inclusion" (1).

Indeed, the system seems to aim to replace the sort of work performed by national governments in other countries, for example through Agenda 21 initiatives. Tammy Zborel, who works on sustainability at the National League of Cities, told me that the project managers may seek to sell the tool to federal agencies once it is up and running, but their focus for now is to finish development in order to get a set of indicators that are meaningful for a wide variety of cities, towns, and counties (interview, Jun. 12, 2012).

STAR has not yet released its indicators or begun full operation, so it is difficult to report on in more detail. However, it is clear that the project's mission is to replace a missing national regulatory framework for sustainability, such as might be provided by Agenda 21, with a voluntary initiative. It thus focuses on indicator uses similar to those important to city and county government actors: monitoring and reporting. In addition, STAR aims to connect policy sectors with cross-cutting indicators, making policy integration a major focus.

4.3   *Sustainability information in Seattle: A recap*

In general, there is a strong culture of collaboration between agencies, as well as public agencies, nonprofits, advocacy groups, and business. This highlights the difficulty of

demonstrating the effect a particular group's efforts have had on the city's sustainability. In addition, all of the groups studied used indicators in multiple ways to influence policy-making. Still, it is clear that the emphasis differs between different groups, and has changed within many groups as well.

As can be seen in Table 3, city agencies seem to play a larger role in providing information—by monitoring the system—and reporting on specific policies. Outside actors such as nonprofits seem more interested, by contrast, in using indicators to frame policy discussions using sustainability and to build political coalitions. This contrast in emphasis can be seen as well in the changing mission of Sustainable Seattle, for example, which has stopped issuing indicator reports and is now focusing on building awareness and buy-in in the business community. These trends, and their implications, will be discussed in the next section.

Table 3: Information use by actor

Indicator use	City agencies	County govt.	Sightline	Sustainable Seattle	WalkScore	ICLEI, NLC, USGBC
problem definition, issue framing	low	moderate	high	moderate	high	low
system monitoring	high	high	low	low	high	moderate
reporting, evaluation	high	high	high	low	low	high
policy integration	moderate	moderate	moderate	high	low	high
coalition building	low	low	moderate	high	moderate	moderate

5 Discussion

Research on sustainability indicators has generally focused on indicator sets generated by government actors, or looked at diverse indicator projects independent of who created them. Here I take a broad approach, informed particularly by Meadows (1998) and Innes and Booher (2000), to better understand how indicator uses differ between actors as well as whether indicator use can be conceptualized as part of an evolving information system.

In the cases examined in Seattle, it is clear that indicators' purpose differs based on who created and uses them. Indeed, the term "sustainability indicator" limits our understanding of the type of information cities use to incorporate sustainability into decision-making. Indeed, Meadows's (1998) and Innes and Booher's (2000) preference for

discussing indicator use in terms of a sustainability information system seems more meaningful.

In Seattle, which has over 20 years of experience with sustainability indicators, one can see an evolution in the types of indicators that are being developed and how they are used, confirming Meadows (1998). In addition, actors have begun to place less emphasis on sustainability indicators *per se*. Instead, they seek to use a wide variety of existing information to understand and advocate for sustainability, as well as create targeted indicators at different scales and for concrete purposes. Understanding how different actors use sustainability indicators as well as the evolution of sustainability indicators into a sustainability information system can provide a better understanding of how information is used in local decision-making processes. This section will discuss these two issues in turn.

5.1   Indicator users and their role in the system

Seattle has a uniquely collaborative approach to governance, but one that could be seen as in line with how sustainability advocates imagine governance should look. This means that actors from different sectors work together on major projects, sharing their strengths and collaborating with each other.

Although the results are preliminary and based on my analysis of the cases, I have found results interesting enough to warrant further study. All actors use sustainability indicators for each of the five purposes examined. However, the importance of these indicators uses varied dramatically and has evolved significantly. This indicates that use does in fact differ between user type.

For example, one of Sustainable Seattle's first projects was to develop a set of sustainability indicators. The purpose of this exercise was to frame sustainability as an issue of concern to residents, as well as to monitor the health of the system. For this reason, the group selected indicators that had both high political salience and scientific importance (such as salmon in the city's rivers). However, although these indicators did have some policy effect, the reports' most important outcome was to build the expertise and political visibility of core members, who gained positions of power in the city's political system. Indeed, one early member of Sustainable Seattle founded a think tank that provides decision-makers with information on sustainability in the region, with the goal of framing major issues and evaluating policy options. This development points to an evolution in the information system, where nonprofit actors found that they could be more effective at issue framing, advocacy, and coalition building.

Another coalition of nonprofits, led by ICLEI USA and the National League of Cities, is working to replace the monitoring and aggregation functions absent from the federal government, with STAR.

5.2 *The evolution of information systems*

As discussed above, the way Seattle uses sustainability indicators has evolved dramatically in the past 20 years. Every aspect of the system has seen dramatic change: the landscape of uses, the types of indicators, and the ways they are used to make decisions. I expect this evolution to continue as stakeholders find new problems or try new ways to effect change. So far, though, there are some key trends that can be seen.

5.2.1 ACTORS USE INDICATORS IN WAYS THAT THAT FIT THEIR RESOURCES AND GOALS

This is seen with WalkScore, which created a tool to provide that would better incorporate sustainability concerns into home-buying and renting decisions. More broadly, actor groups tend to focus on indicator use that best fits their strategic goals. Sightline, which is interested in injecting sustainability considerations into political debate in Seattle, conducts research evaluating specific policies in order to provide relevant information and arguments. Sustainable Seattle has seen its core mission as building a coalition for sustainability, which, along with its limited financial resources, has caused it to place less emphasis on indicators.

5.2.2 INDICATOR SETS HAVE BEEN REPLACED BY INFORMATION COLLECTED AS NEEDED TO MAKE DECISIONS

In general, "dashboard"-style indicator sets have seen decreased in importance over time. Sustainable Seattle focuses on other work; it even spun off its Happiness Initiative to an independent nonprofit. Sightline retains its Cascadia Scorecard, but has shifted its emphasize here to analyzing trends rather than simply providing information.

Government actors seem to see the greatest value in maintaining more comprehensive indicator sets. This may be due in part to resource availability: statistical offices collect information on all sorts of issues, making sustainability indicators a relatively small burden. In addition, government agencies' more global responsibilities can make system monitoring a higher priority.

5.2.3 ACTORS WORK TOGETHER TO FILL IN GAPS IN THE SYSTEM

Here the non-profit coalition behind STAR is an interesting case. This national sustainability index serves a similar purpose to government indicators. It appears that a strong motivator for ICLEI, NLC, and the U.S. Green Building Council is the lack of work done by federal agencies to create comparable information for cities and communities. Therefore, they are creating STAR to fill an important information gap. Coalition partners seem interested in

eventually getting more federal cooperation; one expressed the possibility of selling it to federal agencies once it was tested and shown valuable (T. Zborel interview, Jun. 12, 2012).

5.2.4 INFORMATION OF ALL KINDS — NOT JUST SUSTAINABILITY INDICATORS — IS USED TO DEFINE SUSTAINABILITY AND ADVOCATE FOR POLICY

Sightline especially does not stick to sustainability indicators, per se, to tell its story. Instead, researchers look to the arguments made in local policy debates and use information from a variety of sources to evaluate those claims. In a recent debate over the extension of parking fees from 6pm to 8pm in Seattle's downtown, local businesses expressed fears that this would cut into their revenue. Sightline analyzed business revenue in the months before and after the policy went into effect and found that revenues actually went up, supporting their suspicion that the new policy would actually encourage business activity, as people couldn't simply park their cars for the night at 6pm. Such information increases the quality of debate and allows sustainability concerns to permeate policy issues further afield from those under a more traditional definition.

5.2.5 INFORMATION IS POLITICAL AND IS REFRAMED TO IMPROVE ACCEPTANCE

In developing its comprehensive, city planners came across resistance from neighborhood groups to an indicator critical to smart growth advocates: density. When faced with pushback, the Department of Planning and Development began to emphasize other aspects of the plan, or to frame archaic zoning changes in a way that residents understood (such as including a graphic of a house with a human for scale in discussions of building height requirements; G. Lawrence interview, Feb. 20, 2012). At the same time, other actors in the city have stepped into the debate in innovative ways: WalkScore has introduced walkability ratings to individuals' home-buying decisions and Sightline has provided analyses of transportation and planning policies that address critics' concerns. All of this activity points to a living, evolving information system where advocates constantly plug gaps in a collaborative way.

5.3 Seattle as exemplar

Seattle is an exemplary case in its use of sustainability indicators. Its information system is includes a wider diversity of actors and different indicator sets than in New York and Portland, the two other U.S. sustainability leaders studied for my dissertation. (This does not mean that those cities are "less sustainable" or interested in sustainability, but simply that they use sustainability-related information differently in policy-making.) This means that Seattle's experience should not be seen as generalizable to other U.S. cities, but as an example of a best case: a highly evolved sustainability information system. Although such a system should look different in other cities, the main message to draw from this case is that

the use of sustainability information in urban decision-making evolves, drawing in more actors over time as new problems and opportunities are seen. Hopefully the themes seen in Seattle can help sustainability advocates in other cities understand how information is used, so that they may use indicators more successfully in their community.

5.4 *Moving forward: Constructing better tools to measure sustainability systems*

This research has indeed demonstrated an evolution in indicator use to incorporate sustainability into decision-making. However, at times it has been different to fit the results seen in the cases to existing models of indicator use and actor engagement. In moving forward with my own research, I hope to develop a more inclusive model that can incorporate a more collaborative, organic, decentralized understanding of urban decision-making. This model would also better explain how indicator producers and users can put the same indicator to different uses, as well as deal with the differences between concrete indicators and information use more generally. A key finding of this paper is that our current understanding of sustainability indicator used in urban decision-making is outdated and misses much of the important work local actors are doing to frame debate and advance their goals. A better model would certainly advance this understanding.

6 Areas for further research

This research has highlighted the various ways that city actors use sustainability indicators to inform their policy-making. After conducting the case studies, I would like to suggest three avenues for future research. First, the conclusions made here are only preliminary. I would like to conduct additional research on the initial findings, for example by surveying the different actors in Seattle to see what uses of information they see as most central to their operations. Second, although there is some agreement that cities should define sustainability and create indicators to fit their local context, it is not clear whether the way cities construct sustainability—often in terms of quality of life or eco-efficiency—will lead them to become sustainable in the ways defined by the scientific literature, or whether this is even possible. This is a fascinating question that this paper did not even attempt to address. Third and finally, more work should be done examining how indicators and policies imposed from higher levels of government affect policy-making regarding sustainability at the city level. Political scientists often argue for a national framework for sustainability: to what extent is such a thing necessary, possible (considering the difficulties of dealing with differing contextual factors and goals), or useful? Sustainability indicators have been a popular field of research, but the questions that remain show that there is still much to discover.

7 References

1. Beauregard, R. A. (2006). *When America became suburban.* Minneapolis, MN: University of Minnesota Press.
2. Bell, S., Eason, K., & Frederiksen, P. (eds). (2011). *A synthesis of the findings of the POINT project.* Retrieved July 12, 2011, from http://www.point-eufp7.info/storage/POINT_synthesis_deliverable 15.pdf.
3. Bell, S., & Morse, S. (2001). Breaking through the glass ceiling: who really cares about sustainability indicators? *Local Environment*, *6*(3), 291-309. doi:10.1080/1354983012007328.
4. Bell, S., & Morse, S. (2008). *Sustainability indicators: Measuring the immeasurable?* Second edition. London: Earthscan.
5. Bossel, H. (1999). *Indicators for sustainable development: Theory, method, applications.* Winnipeg, Canada: International Institute for Sustainable Development. Retrieved May 3, 2010, from http://www.iisd.org/pdf/balatonreport.pdf.
6. Bossel, H. (2001). Assessing viability and sustainability: A systems-based approach for deriving comprehensive indicator sets. *Conservation Ecology*, *5*(1), 12. Retrieved May 10, 2010, from http://www.consecol.org/vol5/iss2/art12/.
7. Bowers, C. A. (2000). *Let them eat data: How computers affect education, cultural diversity, and the prospects of ecological sustainability.* Athens, GA: University of Georgia Press.
8. Brambilla, R. & Longo, G. (1980). *What makes a city livable? Learning from Seattle.* Institute for Environmental Action.
9. Broner, A., & Williams-Derry, C. (2012, 28 Jun). Traffic forecasting: A blast from the present. *Sightline* blog, post 27 in *Dude, where are my cars?* series. Retrieved September 22, 2012, from http://daily.sightline.org/2012/06/28/traffic-forecasting-a-blast-from-the-present/.
10. Brugmann, J. (1997a). Is there a method in our measurement? The use of indicators in local sustainable development planning. *Local Environment*, *2*(1), 59–72. doi:10.1080/13549839708725512.
11. Brugmann, J. (1997b). Sustainability indicators revisited: Getting from political objectives to performance outcomes — a response to Graham Pinfield. *Local Environment*, *2*(3), 299–302.
12. Center for Sustainable Communities [CSC], Sustainable Seattle, & AtKisson & Associates, Inc. (1995). *Sustainability in Seattle 1995: A report to the President's Council on Sustainable Development and the citizens of Seattle.* Seattle, WA.
13. City of Seattle. (1994). *Seattle's comprehensive plan: Toward a sustainable Seattle. A plan for managing growth 1994-2014.* Seattle, WA: Office of Management and Planning.
14. City of Seattle. (2005). *Seattle's comprehensive plan: Toward a sustainable Seattle. A plan for managing growth 2004-2024.* Seattle, WA: Department of Planning and Development.
15. Cobb, C. W., & Rixford, C. (1998). *Lessons to be learned from the history of social indicators.* San Francisco, CA: Redefining Progress. doi:10.2307/492843.
16. Cortright, J. (2009). *Walking the walk: How walkability raises home values in U.S. cities.* CEOs for Cities. Retrieved September 21, 2012, from http://blog.walkscore.com/wp-content/uploads/2009/08/ WalkingTheWalk_CEOsforCities.pdf.
17. Crilly, M., Mannis, A., & Morrow, K. (1999). Indicators for change: Taking a lead. *Local Environment*, *4*(2), 151-168. doi: 10.1080/13549839908725590.
18. Dresner, S. (2008). *The principles of sustainability.* Second edition. London: Earthscan.
19. *Dude, where are my cars?* (2011-2012). Sightline blog series. Retrieved September 21, 2012, from http://daily.sightline.org/blog_series/dude-where-are-my-cars/.
20. Dunlap, R. E. (2008). The New Environmental Paradigm scale: From marginality to worldwide use. *The Journal of Environmental Education*, *40*(1), 3-18. doi:10.3200/JOEE.40.1.3-18.
21. Ehrenfeld, J. R. (2008). *Sustainability by design: A subversive strategy for transforming our consumer culture.* New Haven, CT: Yale University Press.
22. Feller-Länzlinger, R., Haefeli, U., Rieder, S., Biebricher, M., & Weber, K. (2010). *Messen, werten, steuern: Indikatoren — Entstehung und Nutzung in der Politik.* TA-SWISS-Studie TA-54/2010. Bern: Zentrum für Technologiefolgen-Abschätzung (TA-SWISS). Retrieved August 19, 2011, from www.ta-swiss.ch. [An English-language summary entitled *All sized up: Counting, calculating and contolling in the knowledge-based society* is also available online.]
23. Gehrlein, U. (2004). *Nachhaltigkeitsindikatoren zur Steuerung kommunaler Entwicklung.* Wiesbaden: Verlag zur Sozialwissenschaften.
24. Heiland, S., Tischer, M., Döring, T., Pahl, T., & Jessel, B. (2003). *Indikatoren zur Zielkonkretisierung und Erfolgskontrolle im Rahmen der Lokalen Agenda 21.* Umweltbundesamt No. UBA-FB 000513. Berlin. Retrieved September 10, 2010, from www.umweltdaten.de/publikationen/fpdf-l/2400.pdf.
25. Holden, M. (2006). Sustainable Seattle: The case of the prototype sustainability indicators project. In M. J. Sirgy, D. Rahtz, & D. Swain (Eds.), *Community quality-of-life indicators: Best cases II* (pp. 177-202). Amsterdam: Springer.

26. Holden, M. (2007). Revisiting the local impact of community indicators projects: Sustainable Seattle as prophet in its own land. *Applied Research in Quality of Life*, *1*, 253-277. doi: 10.1007/s11482-007-9020-8.

27. Holman, N. (2009). Incorporating local sustainability indicators into structures of local governance: a review of the literature. *Local Environment*, *14*(4), 365-375. doi: 10.1080/13549830902783043.

28. Innes, J. E., & Booher, D. E. (1999). Metropolitan development as a complex system: A new approach to sustainability. *Economic Development Quarterly*, *13*(2), 141-156. doi:10.1177/089124249901300204.

29. E. Innes, J., & Booher, D. E. (2000). Indicators for sustainable communities: A strategy building on complexity theory and distributed intelligence. *Planning Theory & Practice*, *1*(2), 173–186. doi:10.1080/14649350020008378.

30. King County & Stockholm Environment Institute. (2012). *Greenhouse gas emissions in King County*. Retrieved February 24, 2012, from http://sei-us.org/Publications_PDF/SEI-KingCounty-GHG-2008-full.pdf.

31. Lang, A. (2003). *Ist Nachhaltigkeit messbar? Eine Gegenüberstellung von Indikatoren und Kriterien zur Bewertung nachhaltiger Entwicklung unter Berücksichtigung der Rahmenbedingungen in Deutschland und Frankreich. Überlegungen auf der Basis der Ergebnisse eines Forschungsvorhabens*. Doctoral dissertation. Fachbereich Landschaftsarchitektur und Umweltentwicklung der Universität Hannover. Stuttgart: ibidem-Verlag.

32. Laschever, E. S. (1998). An overview of Washington's Growth Management Act. *Pacific Rim Law & Policy Journal*, *7*(3), 657-677.

33. Liepach, K., Sixt, J., & Irrek, W. (2003). *Kommunale Nachhaltigkeitsindikatoren: Vom Datenfriedhof zur zentralen Steuerungsinformation*. Wuppertal Paper. Wuppertal, Germany. Retrieved September 10, 2010, from www.wupperinst.org/uploads/tx_wibeitrag/WP138.pdf.

34. Lloyd, B. D. (2000). Accommodating growth or enabling sprawl? The role of population growth projections in comprehensive planning under the Washington state Growth Management Act. *Gonzaga Law Review*, *36*(1), 73-151.

35. Meadows, D. (1998). *Indicators and information systems for sustainable development*. A report to the Balaton Group. Hartland, VT: The Sustainability Institute.

36. Miller, D. (2004). Decentralized planning for sustainable urban development: The Washington State Growth Management Act and its application in the Seattle metropolitan area. In: Feitelson, E., ed. *Advancing sustainability at the sub-national level: The potential and limitations of planning*. Aldershot, UK: Ashgate. 45-56.

37. The PASTILLE Consortium. (2002). *Indicators into action: Local sustainability indicator sets in their context*. Retrieved May 10, 2010, from http://www.lse.ac.uk/collections/PASTILLE/images/FinalReportWeb.pdf.

38. Pinfield, G. (1997). The use of indicators in local sustainable development planning: A response to Jeb Brugmann. *Local Environment*, *2*(2), 185–187.

39. Portney, K. E., & Cuttler, Z. (2010). The local nonprofit sector and the pursuit of sustainability in American cities: a preliminary exploration. *Local Environment*, *15*(4), 323-339. doi:10.1080/13549831003677704

40. Reed, M. S., & Dougill, A. J. (2003). Facilitating grass-roots sustainable development through sustainability indicators: A Kalahari case study. Valletta, Malta. Retrieved May 13, 2010, from http://www.env.leeds.ac.uk/~mreed/Reed 2003b.doc.

41. Reed, M. S., Fraser, E. D. G., Morse, S., & Dougill, A. J. (2005). Integrating methods for developing sustainability indicators to facilitate learning and action. *Ecology and Society*, *10*(1), r3. Retrieved May 10, 2010, from http://www.ecologyandsociety.org/vol10/iss1/resp3/.

42. Rosenström, U. (2006). Exploring the policy use of sustainable development indicators: Interviews with Finnish politicians. *The Journal of Transdisciplinary Environmental Studies*, *5*(1-2), 1-13.

43. Rutland, T., & Aylett, A. (2008). The work of policy: actor networks, governmentality, and local action on climate change in Portland, Oregon. *Environment and Planning D: Society and Space*, *26*(4), 627-646. doi:10.1068/d6907

44. Rybczynski, W. (2007). *Last harvest. How a cornfield became New Daleville: Real estate development in America from George Washington to the builders of the twenty-first century, and why we live in houses anyway*. New York: Scribner.

45. Saha, D. (2009). Factors influencing local government sustainability efforts. *State & Local Government Review*, *41*(1), 39-48.

46. Sanders, J. C. (2010). *Seattle and the roots of urban sustainability: Inventing ecotopia*. Pittsburgh, PA: University of Pittsburgh Press.

47. Stockdale, J. (1989). Pro-growth, limits to growth, and a sustainable development synthesis. *Society & Natural Resources*, *2*, 163-176.

48. Sustainable Seattle. (1998). *Indicators of Sustainable Community*. Seattle, WA. Retrieved April 30, 2010, from http://sustainableseattle.org/Programs/RegionalIndicators/1998IndicatorsRpt.pdf.

49. Weiss, C. H. (1979). The many meanings of research utilization. *Public Administration Review*, 426-431.

50. Williams-Derry, C. (2012a, 28 Feb). Commuting in Seattle and Portland. *Sightline Daily* blog. Retrieved March 3, 2012, from http://daily.sightline.org/2012/02/28/commuting-in-seattle-and-portland/.

51. Williams-Derry, C. (2012b, 5 Apr). Young people are driving less. *Sightline* blog, post 22 in *Dude, where are my cars?* series. Retrieved September 22, 2012, from http://daily.sightline.org/2012/04/05/young-people-are-driving-less/

52. Williams-Derry, C. (2012c, 9 Apr). How not to forecast traffic: How a Washington State transportation council misuses statistics. *Sightline* blog, post 23 in *Dude, where are my cars?* series. Retrieved September 21, 2012, from http://daily.sightline.org/2012/04/09/how-not-to-forecast-traffic/.

53. Wittek, S., Feindt, P. H., Gessenharter, W., Hoppe, J., & Seifert, E. K. (Eds.). (2002). *Nachhaltigkeitsindikatoren und Partizipation*. Hamburg University Press. Retrieved October, 23, 2010, from http://hup.sub.uni-hamburg.de/opus/volltexte/2008/45/pdf/HamburgUP_Wittek_Nachhaltigkeit.pdf.