Assessing Neighborhood Livability: Evidence from LEED® for Neighborhood Development and New Urbanist Communities

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Introduction. LEED-ND: A Sustainable Neighborhood Rating System?

1 Considered the gold standard in North America, the LEED® ND rating system is known as the premier and most widely used sustainable neighborhood rating system in North America. Recently, authors have dissected the LEED-ND rating system and have found that it is generally unbalanced with regard to the three pillars of sustainability: people, planet and profit. From a structural standpoint, the rating system emphasizes environmental pillar of sustainability (Ameen et al. 2015, Wangel et al. 2016). Essentially, the pillar of social sustainability, in particular socio-economic and socio-cultural aspects which are often more difficult to quantify or qualify, have not been given the attention they deserve. Additionally, the rating system suffers from a lack of feedback from its residents and does not offer a performance-based mechanism of evaluation.

2 Currently, a gap in the literature exists regarding post-occupancy analysis of LEED-ND neighborhoods, and how to tackle the difficult assessment of social sustainability. However, if sustainability is truly about the balance between economy, equity and environment (Campbell 1996, Wheeler 2004) and the developers of rating system are truly concerned with comfortably meeting the long-term and daily needs of its residents, then
future revisions should be made to the rating system. These should include a) a post-occupancy method for regularly assessing social sustainability and resident needs, and b) better inclusion of socio-economic and socio-cultural measures that are important for neighborhood livability.

3 Understanding the concept of livability is critical in any discussion of social sustainability. In my research I examine livability in four neighborhoods – two urban LEED-ND neighborhoods and two suburban New Urbanist neighborhoods and – in the Pacific Northwest. I conduct a mail-out mail back survey to determine what factors are most important for the residents of these neighborhoods. Although the findings are specific to the Pacific Northwest, the research is broadly applicable to the rating system itself (which is widely used), as I indicate potential gaps, areas of improvement and areas for future research. My research revealed interesting distinctions between what is important to both urban and suburban residents, and why someone chooses to live in a higher-density, sustainable neighborhood. Discovering what factors influence decision-making for choosing where to live is critical for urban planners, designers and developers in North America who want to encourage more compact, livable urban development.

Conceptualizing Livability

4 While most of us would say we want to live and work in livable places, we rarely try to dissect and understand the precise meaning of the term. Donald Appleyard was the first urban theorist to use the term ‘livability’ in the 1970s and 1980s, and he specifically referenced the term with regard to the quality of neighborhood streets. Appleyard (1980, 1982) stipulated that livable neighborhood streets should be places of sanctuary and comfort, places that were healthy and protected from noise, places that were free from pollution and traffic intrusions, and places with a defined neighborhood territory, sense of community and neighborhood identity. With this simple, universal description, Appleyard set the basic parameters for defining livable places. As an academic, I have come to understand the definition to broadly mean “the suitability of a place for comfortably meeting a resident’s daily and long-term needs and desires.” However, I argue that there is much more to creating a livable place than merely checking items off a list – satisfying a set of generalized physical criteria does not necessarily result in a successful and sustainable urban environment.

5 Livable places and neighborhoods are deeply contextualized environments – embedded within each place are unique historic, political, socio-economic and cultural factors. Often, these qualitative dimensions vary according to place and time. Most significantly, the people who ultimately live in such places have a measurable impact on their success, and the residents themselves determine how such developments are perceived more broadly by the public and by the media. Research on urban design and on the social factors of architecture can play an active role in the success of livable communities by contributing to the design of new neighborhoods and ensuring that both livability and equity are addressed. New residents ultimately contextualize and create nuanced versions of what livability means to them on individual and social levels. This article explores what livability means to residents in four distinct ‘neighborhoods in North America, and the implications for sustainability and eco-urbanism on a broader level.
Livability vs. Sustainability

In the literature, the concepts of ‘livability’ and ‘sustainability’ have often been used to situate academic research within the field of city planning and urban design. The primary difference between ‘livability’ studies and ‘sustainability’ studies is that livability studies put a much greater emphasis on human and social factors. As a concept, livability is not an independent variable; to some extent it is dependent on the ‘triple-bottom line’ sustainability model (figure 1). Put differently, livability is a very specific, nuanced, and qualitative component of the broader concept of sustainability.

Figure 1. The Triple Bottom Line or Three-Legged Stool of Sustainability. While livability is not expressly named in this simplistic model, it is a critical and integral component, as modeled in Figure 2.

Sustainability studies are limited to variables that are typically easier to measure, variables that relate directly to the measurement of the built environment and building performance. Although scholars have described sustainability as being composed of ‘three pillars’ – economy, equity and environment (Wheeler 2004, Campbell 1996, Godschalk 2004) – the environment pillar has come to dominate many sustainability-related studies (Ameen et al. 2015, Wangel et al. 2016). These primarily quantitative studies are also not necessarily place-based or concerned with qualitative aspects, as they fail to examine the presence and effects of social and cultural feedback in housing and neighborhood design. This is also the case with many branded ‘ecocities’, ‘eco-districts’ and ‘eco-neighborhoods’ today. Such is the case with Vancouver’s ‘ecodensity’ strategy, which saw extensive public outcry and debate with regards to affordability and diversity (Rosol 2013). Within these spaces, the emphasis is put on the environmental feedback.
loops – the ‘eco’ – in housing and building science, rather than holistically addressing socio-economic and socio-cultural concerns.

Livability studies are unique in that they recognize that social factors are equally important as economic and environmental factors in terms of informing planning policy and the design of the built environment. In my research, I conceptualize livability as a critical component of sustainability – a specific piece of the ‘triple-bottom line’ model that prioritizes human and social factors over the economy pillar and the equity pillar (figure 2).

Figure 2. Livability as a critical component of sustainability.

People, Place and Social Equity

‘Livability’ studies are inherently tied to people, place, and social equity. Livability studies attempt to simultaneously measure built form, observe and record community behavior, and determine user satisfaction with a specific urban environment. There exists a large body of research on ‘livability’ studies, mostly regarding the design of streets and public interaction in plazas. Livability studies were originally inspired by the writings of Kevin Lynch (1960), who theorized that resident perceptions of the city should inform future design processes. Appleyard, Lynch and Meyer (1965) and Appleyard and Lintell (1972) also pioneered methods for early livability studies. Although the definition of livability varies widely in the literature, the definition used here is based on the one created by Appleyard and Lintell (1972) for neighborhood streets, as mentioned above.
Figure 3. The inclusion of front porches—shown here in suburban Fairview Village, OR—is a key principle in the design of New Urbanist neighborhoods. This helps to keep “eyes on the street” and follows the thinking of urbanist Jane Jacobs, who believed this would aid in maintaining the vitality and safety of neighborhoods.

According to Appleyard and Lintell (1972), a livable place (or in their case, a livable street) has a balance of renters and owners, and accommodates a variety of household sizes. They believed that people know their neighbors because of time spent outdoors on their front porches, stoops, or yards. With regards to this outdoor realm, Jacobs’ “eyes on the street” surveillance theory (1961) is important to understanding livability. As Macdonald (2005) notes, Jacobs’s neighborhood was comprised of medium-density traditional building types: low-scale, apartment buildings, and one- and two-family row houses. What one learns from Jacob’s study is that housing density and mix influences social interaction. Macdonald’s research work also demonstrates that a livable place is where residents not only know each other, but where they also act as stewards and identify with the physical territory of the community. So while the physical design of housing has an effect on livability, so too does the relationships between residents and their feelings about where they live and who they are sharing their neighborhood with.

Livability & the Berkeley School of Planning, Landscape Architecture and Urban Design

Drawing on the long-established tradition of good urban design and livability in Europe, the Berkeley School of Planning, Landscape Architecture and Urban Design has been a strong proponent of livability studies since Donald Appleyard’s initial work. Continuing in Appleyard’s (1980, 1982) tradition, Allan Jacobs (1995), Bosselmann (2008) and Bosselmann, Macdonald and Kronemeyer (1999) further examined street and public
realm studies with respect to user experience. Bosselmann (2008: 142) has highlighted that "the original meaning of livability described conditions in neighborhoods where residents live relatively free from intrusions", but that the term has been progressively broadened to include safety, sustainability, comfort, available services, walkability, and transit. He explicitly differentiates the term from vitality (the presence of other people within close proximity and how this influences the functionality and desirability of public places) and sense of belonging (the psychological or emotional dimensions obtained from living in a particular place such as a neighborhood, on a street or in a building).

With regard to livable housing in North America, Marcus and Sarkissian (1988) were the first to survey tenants in San Francisco and develop guidelines in order to improve livability in high-density buildings. Clare Cooper Marcus is also widely known for her work on livability and its impact on the form that affordable housing takes. In her work, Marcus (1986) posits that post-occupancy research on people-housing relations is key to understanding livability and generating successful future design guidelines and recommendations. Marcus (1974) also emphasizes the need to a return to community-oriented housing multi-unit housing design that functions well for families.

Macdonald’s (2005) research in Vancouver, British Columbia examines the effects of high-density residential development on social interaction and street life is an important recent contribution that extends its scope beyond the limited realm of street design to include the semi-private spaces between building facade and street. She concludes that half-grade raised entries for units are critical for increasing residential privacy, and strong ground-floor unit articulation adds to visual interest and ‘eyes on the street.’ A strong component of livability and resident satisfaction in urban environments in North America is preserving or enhancing the underlying element of privacy, as also confirmed by Day (2000).

**Operationalizing Sustainability through LEED®ND**

One of the recent urban planning tools for analyzing and promoting higher density and mixed-use development is the LEED®ND rating system. LEED®ND is a sustainable neighborhood rating system developed by the US Green Building Council® (USGBC®) in 2007, in concert with the Congress for New Urbanism and the Natural Resources Defense Council. While the LEED® for New Construction (NC) rating system is widely known, the LEED®ND neighborhood-scale rating system is only now starting to gain recognition (cf. figure 4). It is a rating system that integrates the principles of smart growth, new urbanism, and green building into a comprehensive evaluation framework for neighborhood design. Its aim is to use design standards to promote sustainable urban design in the construction and building industry. Today, LEED®ND is known as the ‘gold standard’ in sustainable neighborhood development in North America, and has gained significant popularity among planning professionals, developers and sustainability consultants. The rapid adoption of this rating system has promoted the implementation of sustainable neighborhood design around the world (Sharifi and Murayama 2015).
The formal LEED® ND standard was released in 2009, in the context of a pilot rating system. Projects seeking LEED® ND certification must be evaluated by a LEED-ND Accredited Professional (AP), who assesses three major development categories: Smart Location and Linkage (SLL), Neighborhood Pattern and Design (NPD), and Green Infrastructure and Buildings (GIB). There are two additional optional categories for innovation and regional priority credits. Each major category has several prerequisites that must be achieved, in addition to a menu of possible ‘credits.’ There are defined certification thresholds based on the total points earned: certified (40-49), silver (50-59), gold (60-79) and platinum (80+). As of 2014, 216 projects have been registered for LEED® ND evaluation, but only approximately 18% (38) of those projects are fully certified (LEED-ND interview with C. Studhalter, USGBC Project Manager for Neighborhood Development, November 3, 2014).

Around the world, other rating systems have been developed to assess sustainable communities, but LEED® ND is by far the most well-known rating system in North America (Sharifi and Murayama 2013a).

Several critiques (Newsham et al. 2009, Zimmerman and Kibert 2007, Retzlaff 2008) and valuation studies (Dermisi 2009) have been conducted to date on LEED for New Construction (NC) – a rating system for individual commercial buildings, considered a precursor to LEED-ND. Studies have also been done that assess LEED® for Homes (residential buildings) (Reposa 2009) and LEED for Existing Buildings (Hodapp 2012). More recently, Garde (2009), Ewing et al. (2013), and Sharifi and Murayama (2013b) completed the first comprehensive studies on LEED-ND. Talen et al. (2013) have also examined how the LEED® ND rating system could potentially be used as a suitability analysis tool within urban planning.
city governments to direct development. Others, such as Smith (2015), have analyzed the United States geography of LEED®ND projects, and have determined that a bi-coastal pattern exists in terms of their registration locations. Wangel et al. (2016) have deconstructed the rating system and examined if it truly measures what it purports to measure in terms of sustainability categories, and have questioned its internal validity as performance-based rating tool. However, none of these studies have surveyed residents in situ or completed post-occupancy evaluations of LEED-ND neighborhoods; rather they have analyzed and compared secondary LEED®ND scorecard data.

**Current Issues with LEED-ND**

Unlike any of the Smart Growth, New Urbanism, or Traditional Neighborhood Design (TND) frameworks, LEED®ND incorporates both green building principles and sustainability planning concerns. The rating system thus attempts to curb climate change at the neighborhood scale but also at the building scale, by promoting energy reduction strategies, by rewarding the provision of renewable energy, and encouraging solutions to the Urban Heat Island (UHI) effect through green roofs and green infrastructure. Freilich et al. (2010) note how LEED®ND addressed the concern that the principles of new urbanism are divorced from sustainability and growth management issues, as the rating system integrates smart growth and New Urbanist principles with green building techniques. LEED®ND is a voluntary and market-driven approach that seeks to push developers to go beyond satisfying the bare minimum of development regulatory requirements, and thus it is quite flexible since it allows for choosing amongst different credits or approaches to accrue points.

However, since LEED®ND is a market-based rating system, developers who attempt to certify under the program are most concerned about the bottom line and do not necessarily attend to all three domains of the ‘triple-bottom line’ equally. Although little research has been done on the socio-economic and socio-cultural diversity present in LEED®ND neighborhoods, a significant amount of research has been done on the lack of diversity of its pre-cursor—New Urbanism. Smart growth proponents and New Urbanists have long ignored diversity, social equity and affordability (Talen 2010, Talen 2012, Talen and Koschinsky 2011) and it is likely that LEED-ND neighborhoods will follow suit. Several comprehensive studies of New Urbanist developments concluded that only a small percentage of their dwelling units are affordable to households earning the area median income (AMI) for the surrounding metro area, and that developers charge a premium for these homes (Talen 2010, Tu and Eppli 2001). Further research is needed on the demographic composition and income mixing within new sustainable neighborhoods.

Another issue with the rating system is that it is missing any explicit links to Crime Prevention Through Environmental Design (CPTED) principles. CPTED principles based on the ideas of urban theorist Oscar Newman (1972), who believed spaces should be ‘defensible’ against potential criminal and illicit activities. Newman (1972) argued that much of the vandalism, petty crime, mugging and burglary in Modernist public housing projects in the United States was caused by the inability of residents to identify with or exert territorial control over liminal spaces beyond their own front door. The problematic zones were primarily public and semi-public spaces that lacked color, variety and ornamentation and were often ill-defined or designed and bereft of identity and meaning. Urban design elements such as the presence of lighting, articulate landscaping
can positively affect pedestrian comfort levels. Importantly, Wangel et al. (2016) in their analysis of the LEED-ND criteria note that issues related to perception of safety and security are clearly missing from the rating system.

Fraker (2013) tested the LEED®ND rating system criteria using performance data from four neighborhoods in Germany (Vauban in Freiburg and Kronsberg) and Sweden (B001 in Malmö and Hammarby Sjöstad in Stockholm). Fraker found that the majority of the points in the rating system were awarded to items that do not reduce CO₂ emissions in a significant way, such as having the neighborhood evaluated by a LEED®ND AP. Buildings studied in all four European neighborhoods performed more efficiently than most LEED® certified ‘green’ buildings in North America, yet because they did not complete the official LEED® certification process, they lost quite a few points. In addition, he also found that the percentage of points awarded to meaningful categories such as renewable energy sources and energy efficiency was relatively low. Fraker concludes that the focus on possessing a trademarked ‘LEED®’ certification is ultimately self-serving, and it could be argued that to some extent a market-based rating system becomes a self-fulfilling prophecy, since the priorities lie with perpetuating the brand and checking off boxes on a list rather than creating quality neighborhoods that are continually re-evaluated through performance measures.

In addition to Fraker’s recent work, several other studies have tested the rating system criteria on older, well-designed neighborhoods throughout the Bay Area that would be considered ‘livable,’ but are not LEED®ND certified (Clark et al. 2013, Boeing et al. 2014), including the Duboce Triangle neighborhood of San Francisco, Hercules Bayfront in the East Bay, and Temescal in Oakland. Measurement results indicated that none of the tested neighborhoods would qualify as certified LEED®ND neighborhoods, because they did not meet the technical criteria (e.g. minimum density, connectivity as measured by intersections per square mile); however, residents rated these neighborhoods as highly livable places. These studies illustrate that LEED®ND in its current form and how it is operationalized may not be able to adequately reflect and measure the wide variety of desired amenities and values of many communities.

Other recent studies of LEED®ND have looked at its potential impact on mode share and vehicle miles traveled (VMT). Ewing et al. (2013) predicted that VMT per person in LEED®ND developments would be reduced by 24 to 60 percent from their respective regional average. However, this study is merely a projection, using comparative data from LEED®ND scorecards/project data and the 2009 National Household Travel Survey (NHTS). Further research and statistical analysis is needed to confirm these predictions.

Garde (2009) critically evaluated the rating system early on and found that participation in the LEED®ND rating system does not necessarily guarantee sustainable neighborhoods. He surveyed a variety of LEED®ND developments, assessed their point achievements, and interviewed developers and LEED®ND consultants regarding the process. One main problem Garde (2009: 428) notes is that the LEED®ND rating system provides very little credit for the sufficient provision of affordable housing. Indeed, equity is largely ignored in LEED®ND. Garde (2009) also found that almost all projects seeking LEED®ND Gold or higher included affordable rental housing in the project, but those that sought silver and basic certification did not. He found that higher scoring projects also scored much better in the Green Infrastructure and Buildings (GIB) category.
LEED®ND, although it has been revised since its inception in 2007, has never incorporated post-occupancy evaluation (POE) as part of its criteria. Although Mapes and Wolch (2010: 115) argue that LEED®ND is a constructive step forward in that it pressures developers to move beyond ‘greenwashing’ to incorporate features that have a greater impact on long-term sustainability, LEED®ND clearly falls short in terms of social sustainability and livability – particularly in its failure to require post-occupancy evaluation and assessment of resident perceptions of the built environment, and lack of attention to affordable housing.

In 2013, LEED-ND was updated to LEED-ND v.4 (USGBC 2013), which aligns with the reference standards for current industry norms as well as with the LEED® Building Design and Construction (LEED® BD&C) rating systems. A variety of credits have undergone name changes, in order to better reflect their intent in the BD&C rating systems. In addition, a few credits now more closely reflect the requirements and underlying standards in LEED for New Construction and other BD&C rating systems.

Post Occupancy Evaluation (POE), LEED-ND and Livability

One of the shortcomings of the LEED®ND rating system is the absence of long-term performance-based indicators, whereby a development is constantly evaluated on what it claims to have achieved with regard to sustainability, especially social sustainability. Although the other LEED® USGBC® programs have moved toward post-occupancy evaluation, this criterion has never been specifically incorporated into LEED ND. Wangel et al. (2016) point this out in their research, emphasizing that performance measures are not well incorporated into the rating system. Unfortunately, the focus in the current rating system remains on the presence of specific features of built form or the inclusion of procedures, and does not address how well those features or procedures are efficiently or effectively functioning. Sharifi (2016) agrees and notes that LEED-ND needs a better mechanism for evaluation in order to certify on-going compliance with the initial targets established for the development.

Within the field of architecture, post-occupancy evaluations (POEs) or post-occupancy analyses (POA) serve as a useful tool for evaluating the performance of both single and multi-residential buildings (Garde 2009). Post-occupancy evaluations involve a survey of building performance and/or resident satisfaction after residents have moved into a development or neighborhood. POEs attempt to assess whether the building has been successful in meeting its projected environmental benchmarks (in terms of energy, water, materials, indoor air quality, etc). Private consulting firms or academic institutes normally carry out POEs, as they are interested in quantifying building performance for either marketing purposes or scholastic studies (Rabinowitz 1989).

More recently, POEs have received a great deal of attention as a popular tool for evaluating ‘green buildings’, since the combined set of survey data can validate the attainment of sustainability goals. However, while energy use and sustainability issues have been thoroughly examined, the social experience of residents has largely been ignored or marginalized, and this presents serious limitations within the discipline. More often than not, the measurement of end-use energy becomes the sole end goal (Newsham et al. 2009), with the possible inclusion of occupant comfort and/or productivity (von Paumgartten 2003, Paul and Taylor 2008). Occupant comfort studies are usually conducted for commercial buildings, with the goal of increasing ‘worker productivity’—
rather than worker quality of life or livability—and are often financed by large corporations. There are scarce financial incentives and support to study residential buildings, and resident satisfaction is often overlooked unless it is a high-profile pilot project. Some recent examples of neighborhood-scale POEs include the Mustel group’s (2010) analysis of SFU UniverCity in Burnaby, Metro Vancouver, and Lancaster’s (2008) POE of False Creek North, in Vancouver, BC. It is recommended that post-occupancy evaluations be conducted both at 3 to 6 months (an immediate operational review) and 9 to 18 months, after the residents are familiar with the development.

The above literature indicates that there has been some initial research completed on the LEED-ND rating system. However, the primary focus thus far has been to 1) assess the validity of the internal rating system structure and how well it is calibrated, 2) compare its structure to other sustainable neighborhood rating systems and/or, 3) contrast the performance of other LEED-ND certified or non-certified neighborhoods. These approaches all lack an examination of the quality of the neighborhood itself and its 'livability' from the residents' point of view. This paper attempts to address this so-called “fuzzy chasm” of livability through the surveying of residents in these neighborhoods.

Research Approach and Questions

Key questions for my research dealt with whether LEED® ND neighborhoods are perceived as truly livable places through the eyes of its residents. These included:

How do residents of LEED® ND neighborhoods and suburban New Urbanist neighborhoods rank and weight LEED® ND criteria?

Do rankings and weightings differ from those established by LEED® ND? Are there any criteria missing from LEED® ND that residents believe contribute to neighborhood livability?

Despite its popularity among the development community in North America, I hypothesized that the LEED® ND rating system is still overly reliant on physical design criteria (measures of compact urban form, transit accessibility, walkability, etc.), and lacks a comprehensive evaluation of how qualitative and social factors impact the resident experience in these newly built sustainable neighborhoods. To test my hypothesis, I examined livability in four neighborhoods – two LEED® ND certified and two New Urbanist neighborhoods – in metropolitan Portland, Oregon and metropolitan Vancouver, British Columbia.

Sustainable Neighborhoods in Canada and the United States: Four Case Studies

Case Selection

For this research effort, I wanted to discover what residents in LEED® ND and New Urbanist neighborhoods prioritize in terms of livability (as defined by generally agreed-upon elements). I was also interested in whether livability priorities differed in LEED® ND urban neighborhoods versus New Urbanist neighborhoods located in fringe suburban locations. The urban-suburban cross comparison is important since future urban metropolitan growth in North America will inevitably trend towards denser development as infill and brownfield projects come on-line. In order to attract potential suburban homebuyers to more compact developments, planners and designers need to understand what qualities
and characteristics inherent in urban form and design will entice these residents into these environments.

In the spring and summer of 2012, scoping of potential case study sites was conducted. Due to the North American birthplace of the USGBC® and LEED’ND as a rating system, cases were limited to the United States and Canada. Both the City and region of Greater Vancouver (Berelowitz 2005, Beasley 2000, Holden 2012, MacDonald 2008, Punter 2003, Fernandez 2011, Harcourt 2007, Macdonald 2005) and the City of Portland (Abbott 2011, Podobnik 2011, Ozawa 2004) are world renowned for their sustainability and neighborhood planning. Given the aggressiveness of both cities to develop as ‘green cities’, a comparison between both metropolitan areas has generalizability for the Pacific Northwest region. I eventually narrowed down a long list of LEED’ND candidate sites based on a variety of factors, and settled on four cases in the Pacific Northwest: two in metropolitan Portland, Oregon (Hoyt Yards and Fairview Village), and two in Vancouver, Canada (the Olympic Village, part of the Southeast False Creek development, in Vancouver and East Clayton in Surrey, cf. figure 5).

Figure 5. Case study comparison.

<table>
<thead>
<tr>
<th>URBAN</th>
<th>Southeast False Creek</th>
<th>Hoyt Yards</th>
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<table>
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<tr>
<th>SUBURBAN</th>
<th>East Clayton</th>
<th>Fairview Village</th>
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<td>Surrey, BC</td>
<td>Fairview, OR</td>
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Source: Author.

The scoping included neighborhood site visits to five potential sites in both British Columbia and Oregon (figure 6). All of the neighborhoods were photo-documented, and notes about the neighborhoods were taken in the field. Only LEED’ND Platinum rated sites were considered, in addition to those in Stage II development (necessary approvals and entitlements to be built to plan) or those developments attempting Stage III.
I strategically chose two LEED®ND Platinum sites (the highest possible LEED®ND rating) so that I could test ‘the best of the best.’ I conducted a mail-out mail-back survey in the Spring of 2013 and asked the residents in each community to rank 19 different livability factors that are commonly agreed upon in the planning literature. In Fall 2013 and Spring 2014, I analyzed the survey results and produced several key findings and lessons learned from this case study research.

The mail-out, mail-back survey included a cover letter, explaining the purpose of the study. A broad definition of livability was given and defined as “the suitability of a place for comfortably meeting all your daily and long-term needs and desires.” The objectives stated in the cover letter were “to learn what environmental design qualities you feel are most important to the character and quality of your neighborhood.” It was explained to respondents that as a researcher I wanted to understand how to improve new neighborhood developments and rating systems such as LEED®ND.

I asked the person in the household, over the age of 18, whose birthday month was closest to May or June 2013, to complete the enclosed questionnaire. A return envelope was enclosed with pre-paid postage. The survey itself was comprised of six pages (3 pages double-sided). The majority of the questions were multiple-choice tri-level Likert-scale questions. The survey was implicitly divided into five main categories: dwelling type
information, livability, housing, travel, and demographics. A basic series of questions on building and unit type were asked, in addition to length of residence. The subsequent livability section comprised the majority of the survey, and led respondents through a series of 19 tri-level Likert scale questions regarding factors and characteristics both in LEED ND and not included in LEED ND. These questions were developed from a proxy sheet that related LEED-ND credits to survey questions. The LEED ND proxy factors and non-LEED ND factors were mixed randomly together, creating a “mixed-bag” blind survey design.

After introducing respondents to these 19 factors separate Likert scale questions, respondents were then asked to rank the top three characteristics related to livability (in order of importance). Following this, residents were then asked to rank the three neighborhood characteristics that were the least important to them, in terms of livability. This method is based upon the Q-sort methodology more commonly used in psychology, whereby the participants are initially introduced to a range of factors, and afterward are asked to rank the factors relative to one another. Questions regarding housing precluded the livability questions. Travel questions regarding vehicle ownership and travel mode choice followed the housing questions, in order to get a sense of the impact LEED ND development has on mode share. Demographic information was collected last as this often the most sensitive information, and categories were used from both the US and Canadian census.

Survey Mailing & Returns

A survey pre-test was mailed to all four sites in February and March 2013. Twenty addresses were randomly selected at each site for the pre-test, using the RAND feature in Microsoft Excel. The survey pre-tests were returned with an overall 29% survey return response rate. Only one returned survey was not completed fully, demonstrating that survey fatigue was not an issue. The results from all four neighborhoods were analyzed collectively, given that splitting and analyzing the four neighborhoods individually using a relatively small pre-test sample size would be statistically insignificant. Based on the limited pre-test results, I was encouraged by that my hypothesis – that there are other factors equally important to neighborhood livability as LEED ND factors – would be supported by the final survey results. Indeed, residents on the survey pre-test indicated that these “other” livability factors were important to them. For example, safety/security and privacy, both of which are not currently included in LEED ND, were shown in the pre-test results to be particularly important to residents.

The decision was made to mail out 500 surveys to each of the study sites, with 2,000 surveys mailed out in total. 500 surveys were deemed as the absolute survey minimum, given that there were only 550 units in Fairview Village at the time with known addresses. Therefore, the lowest common denominator was the determining number. There was no incentive offered to respondents. A number of surveys were unclaimed or returned. Hoyt Yards, in the Pearl District in Portland, OR, had the overall best survey return rate, at 24.8%, which included discounting invalid addresses. Both suburban, non-LEED ND sites (East Clayton and Fairview Village) had the lowest survey return rates. Fairview Village also had the overall most unclaimed and unreturned surveys, which could be explained through a naming or address error. One of the limitations of a mail-out mail-back survey study such as this one is that survey results are often lower than email surveys, which on average have a return rate of about 30%.
Livability Findings in Four Neighborhoods

The post-occupancy evaluation I conducted produced several interesting and unexpected findings in the four case study neighborhoods. These findings are presented below. One caveat is that these findings are specific to the Pacific Northwest, and although they are a reflection of the neighborhoods in this particular area, this research acts a starting point for further investigation on this topic. A more comprehensive description of the case studies, case selection, methods and findings can be viewed in Szibbo (2015).

A Socio-Demographic Lack of Diversity

Residents in all four neighborhoods self-identified overwhelmingly as Caucasian. 75.4% of respondents in Southeast False Creek identified themselves as Caucasian, as do 88.2% of residents in Hoyt Yards, 89.7% in East Clayton, and 85.2% in Fairview Village. Out of all of the neighborhoods, Southeast False Creek displays the highest level of racial diversity, with 8.4% respondents identifying as two or more races, 7.2% identifying as Asian or Pacific Islander. There is the limitation and possibility that some groups were more willing than others to fill in the survey.

The majority of respondents in each of the four neighborhoods had obtained a bachelor's degree level of education or higher. Hoyt Yards contained the highest percentage of respondents with a graduate degree or higher (58.9%). In contrast, the suburban sites showed lower overall levels of education; Fairview Village had the highest percentage of respondents with only a high school degree (13%), and East Clayton had the highest percentage of respondents who have only obtained some college (30%). For Southeast False Creek (43.5%) and East Clayton (58.6%), income peaked at 80K CDN-150K CDN, and in the Pearl District (38%) income peaked higher at 150K+ USD.

The above data suggests that all four neighborhoods are not particularly diverse in terms of race and socio-economic status. This evidence suggests that LEED® neighborhoods could be in danger of following a similar trajectory to New Urbanist neighborhoods, which have been proven in many cases to exemplify socio-demographic homogeneity.

Residents in Sustainable Neighborhoods like their Automobiles

Despite the fact that LEED® neighborhoods attempt to promote sustainable modes of transit, findings from my research revealed that the majority of respondents in both the LEED®ND and the New Urbanist case studies believe that owning a vehicle is important, and the majority of respondents in all four neighborhoods owned one or more vehicles. Respondents in East Clayton and Fairview Village felt the strongest about ownership, with 82.8% of respondents in East Clayton stating that owning/leasing a vehicle was ‘very important’, and 78.8% of respondents in Fairview Village agreeing that it was ‘very important.’ Comparatively, respondents in the urban communities did demonstrate a reduced reliance on cars – only 36.8% of respondents in Southeast False Creek felt owning or leasing a vehicle was ‘very important’, as did 37.3% of respondents in Hoyt Yards. However, ‘very important’ was still the top response. Approximately 30% of respondents in Southeast False Creek thought it was ‘not important’, the highest percentage among
surveyed neighborhoods, with 13% of respondents in Hoyt Yards stating that owning a vehicle was also ‘not important’ to them.

Figure 7. #1 Most Frequent Mode of Travel in A Typical Week in each of the four neighborhoods. Notably walking is the most popular mode choice in Hoyt Yards, Pearl District, Portland.

The number one most frequent mode of travel for all neighborhood respondents is still the personal car, with the exception of the Hoyt Yards in the Pearl District in Portland, OR, where walking is the most popular travel mode. In Southeast False Creek, 65.2% of respondents owned 1 vehicle, as did 71.7% in Hoyt Yards, 13.8% in East Clayton, and 33.3% in Fairview Village. Those respondents living in suburban neighborhoods were more likely to own two or more vehicles. 86% of respondents in East Clayton possess two or more vehicles, and 66.7% in Fairview Village. Only 20.3% of respondents in Southeast False Creek possess two or more vehicles, as do only 24.6% of respondents in Hoyt Yards. Southeast False Creek contained the highest percentage of respondents who own or lease zero vehicles, at 14.5%.

These findings have serious implications for the hypothesis put forward by Ewing (2013) that LEED®-ND developments have the potential to drastically reduce vehicle miles traveled (VMT). It may be the case that unless a neighborhood is highly connected to existing services and employment and consists of high-density development with a robust transit system in place (such as Portland’s MAX light rail), residents will continue to own a car and drive frequently. Such neighborhoods will likely see little to no reduction in VMT or continue to be designed and built for cars.

Affordability: A Major Concern in New Sustainable Neighborhoods

I also found that affordability is a major concern for current residents in both the LEED® ND neighborhoods and the New Urbanist neighborhoods. The survey results illustrated that the majority of respondents in all case study neighborhoods believe that the cost of housing in their neighborhoods impacts the livability of their neighborhood. Southeast False Creek residents believed this most strongly, with 79.7% agreeing that the cost of housing impacts livability. 60.2% of residents in Hoyt Yards believed this, as did 64.3% of residents in East Clayton, and 63.6% of residents in Fairview Village. Importantly, affordability was also the number one answer to the survey question “what one element or
characteristic would make your neighborhood more livable?” in Vancouver’s Olympic Village in Southeast False Creek. This is an interesting and surprising finding – why should current residents be worried about affordability when they can already afford to live in the neighborhood? Perhaps they believe they are vulnerable to future housing price increases, or fear accelerating gentrification, or see a relationship between lack of diversity and high housing costs. A surprising finding, clearly the topic of housing vulnerability and affordability for all income groups merits further research.

Additional findings about LEED®-ND, social equity and the lack of incentives within the rating system for providing affordable housing are examined in Szibbo (2016). In this article, I provide specific recommendations for how affordable housing may be better incentivized for developers within the rating system, with the intention of increasing the affordable housing supply.

Figure 8. Co-operative housing in Olympic Village in Vancouver’s Southeast False Creek. The affordability of new neighborhoods is a concern for the majority of residents in all of the neighborhoods surveyed.

Incorporating Crime Prevention Through Environmental Design (CPTED)

With regard to livability, I argue that there are important social aspects that have been omitted from the current LEED®-ND rating system. While all respondents were generally either very satisfied or extremely satisfied with the livability of their neighborhoods, there were outstanding elements that LEED-ND in its present format does not address. With regard to the #1 most important livability factor out of 19 factors, the majority of respondents in three of the four neighborhoods ranked ‘safety from crime’ as their first...
choice. 20% of respondents in Southeast False Creek ranked it as the number one factor, as did East Clayton residents (51.7%) and Fairview Village residents (43.8%). It is interesting to note that safety from crime was most important to a much larger percentage of suburban survey respondents. If future sustainable development intends to attract residents to existing communities in urban areas, then it is crucial to think about what neighborhood elements are critical to potential suburbanites.

Currently, LEED® ND currently does not include or integrate any credits or prerequisites directly related to CPTED (Crime Prevention Through Environmental Design) principles into its rating system. Although it indirectly discourages crime through limiting setbacks, requiring frequent entrances, and promoting ground floor transparency, the rating system could do better by awarding points for elements like defensible space, strategic use of vegetation, controlled entries to buildings, fence design, eliminating lighting blind spots, and others. These latter elements have the potential to reduce crime by limiting and directing pedestrian access in semi-public and public spaces. However, there are inherent trade-offs since these same interventions can also create formal barriers and in some cases reduce access for pedestrians.

**Figure 9.** Residents in suburban New Urbanist Fairview Village in Fairview, OR have access to open space views.

**Source:** Author.

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**Nature and Community**

The survey results also illustrated that suburban respondents highly ranked other factors not currently present in the LEED-ND rating system, such as ‘privacy within the interior of the unit,’ ‘a view to trees and natural landscapes,’ and ‘a sense of community with neighbors.’ The latter two, a view of nature and sense of community with neighbors, are particular to the
suburban sites, and may thus potentially indicate what features, both social and environmental, could be improved upon to entice people to live in higher density development in more urban environments. The findings from this post-occupancy evaluation indicate that the incorporation of green infrastructure and design elements in high-density developments has the potential to fulfill both aesthetic and health needs for residents. In addition, architecture that leverages courtyards, rooftops, balconies, and other semi-private open space may be critical for the success of high-density urban neighborhoods.

Figure 10. Hoyt Yards in Portland, Oregon illustrates how to incorporate natural settings into urban environment.

Recommendations for Improving Livability within New Sustainable Neighborhoods

My research and survey analysis generated a snapshot of livability in four neighborhoods, specifically looking at how the LEED® ND rating system functions. My key interest was discovering the difference between the type of metrics addressed in the sustainable neighborhood rating system and the primary factors that comprise residents' perceptions and evaluations of their own neighborhoods. I found that there is much room for improvement within the LEED ND rating system, as it needs to put a greater emphasis on several critical items. My recommendations are as follows:

1) LEED-ND should include post-occupancy analysis as part of its evaluation and rating method. Currently, little to no post-occupancy evaluation is conducted for LEED ND projects.
LEED-ND has received a lot of attention recently as it is a well-marketed product, but few studies have tested the success of such neighborhoods by measuring resident satisfaction and livability. Urban planners and designers need to be aware of the potential shortcomings of the rating system, given that it lacks tools for evaluating certain aspects of sustainable neighborhoods, namely the resident/user experience and issues of social equity. It is recommended that LEED-ND incorporate a post-occupancy analysis, so that the rating system can evaluate resident satisfaction and evolve from a prescriptive-based system into a performance-based system. This should be done at least a year out from build-out, and then every three to five years (University of Westminster 2006).

2) LEED-ND needs to better incentivize affordable housing for certain income levels and ensure a variety of building types so that the neighborhoods are diverse and inclusive. Demographic analysis from this study suggests that new sustainable neighborhoods in the Pacific Northwest are not very diverse in terms of race, educational attainment and income. Current means of encouraging the development of sustainable neighborhoods may not result in diverse communities that include people of color, lower income people, or less educated people. New mechanisms need to be created to address this problem of inequality. There is no easy solution to this dilemma – further future research is needed in this area. However, one step in ensuring a diverse mix of residents in new developments is by encouraging or requiring the provision of affordable housing within the neighborhood and supporting a diverse mix of housing types (Szibbo 2016).

3) LEED-ND should add a credit related to reducing parking requirements or setting low parking maximums to incentivize car-free development. The majority of respondents in both certified and control neighborhoods believe that owning a vehicle is important, and the majority own at least one vehicle. The majority of residents in each neighborhood (except Hoyt Yards, in the Pearl District in Portland, OR), drive alone as their primary mode of transportation. VMT (and by correlation GHG emissions) in developments marketed as sustainable neighborhoods may not decrease unless vehicle ownership is discouraged or other forms of sustainable transportation are encouraged and/or incentivized. Although strengthening transit service/facilities and designing shorter blocks is already part of the rating system, it would be wise to create a credit related to parking ratios and the overall number of vehicle parking spaces in new development. For example, a new credit could reward setting a low parking maximum (e.g. 0.5 spaces per unit) in LEED®-ND neighborhoods, ensuring that the neighborhood is virtually car-free. Cities in Europe have been known to do this (such as Vauban in Freiberg, Germany). The Hoyt Yards development was the only case study where walking is the primary mode choice.

4) LEED-ND should better integrate the principles of defensible space and CPTED into the rating system through the inclusion of safety and security urban design elements.

The majority of respondents in all neighborhoods stated that safety from crime was their most important livability concern. People clearly want to live in neighborhoods that feel safe and secure, and they will be reluctant to live in new developments if they don’t have the perception that the neighborhood is safe. This issue also ties back to walkability; feeling safe using the neighborhood’s sidewalks and parks would undeniably increase the likelihood of doing so. One major recommendation is to extensively incorporate more Crime Prevention Through Environmental Design (CPTED) principles into the Walkable Streets credit. Additionally, cities should encourage LEED consultants and architects to provide relevant urban design guidelines for new sustainable development, especially in urban areas.
5) Credits should be included for views to nature and natural landscapes. The credit for ground floor privacy should be modified to reflect research on semi-private and private spaces. LEED-ND could also reward developments by introducing a credit for high-quality community benefits. Respondents living in suburban neighborhoods placed a high value on interior privacy within their units, views of trees and natural landscapes, and a sense of community.

In order to prevent endless urban sprawl, developers, planners and designers need to attract suburban residents back into core urban areas and corridors. Creating a credit relating to design for nature has the potential to lure would-be suburbanites back to the city by promoting greater privacy, internal open areas, and other common spaces. A credit could be added to the Walkable Streets section for “views to nature.” For example, this credit could stipulate that ‘for 75% of units, provide direct views from windows to trees and other natural landscapes, and orient buildings towards key vistas and natural landscapes.’ The credit relating to ground-floor privacy could be modified from a minimum of 36 inches to 48 or even 60 inches above street level. A new credit related to the provision of private and semi-private space could be introduced, such as providing a minimum of 75 square feet of private outdoor open space per unit or a similar mechanism, to give credit to developments that include balconies and rooftop patios. LEED-ND could also reward developments that provide community amenities through mandatory Community Benefit Agreements (CBAs), also known as Community Amenity Contributions (CACs) in Canada.

One of the major findings of my research is to recommend that LEED’ND and other sustainable neighborhood rating systems incorporate a credit for post-occupancy evaluation that assesses not only physical comfort, but also a broader variety of livability factors. Post-occupancy research on newly constructed sustainable neighborhoods is important for ensuring that communities and neighborhoods stay strong, healthy and functional. The architecture and urban design of new residential development can be interesting and “green”, but is it “livable”? Is it resilient? Does it function for its residents how it was originally intended? As planners and designers, it behooves us to continually re-consider and re-evaluate the spaces our clients inhabit and dwell in. A wide variety of factors need to be assessed over the lifecycle of new sustainable neighborhoods in order for a built space to become a livable place with meaning, comfort and function for its residents. On the whole, LEED’ND clearly has an important role to play in the design of sustainable neighborhood developments, but it does not yet incorporate all the qualities and components that make a place ‘livable’.

BIBLIOGRAPHY


LEED® for Neighborhood Development has been rapidly adopted as the de-facto green neighborhood standard and is now used to measure the sustainability of neighborhood design in North America and around the world. Similar to previous LEED® green building rating systems, LEED®ND is heavily reliant on physical & environmental design criteria (such as compact urban form and transit accessibility), and is based on an expert-generated point system. LEED®ND excels at measuring ‘environmental sustainability’ through its stringent criteria; however, it fails to critically address important livability factors, namely socio-cultural and socio-economic factors. Furthermore, no study has critically examined how LEED®ND could better incorporate these missing factors through post-occupancy analysis. In fact, very little research at all has been done that examines the role of livability and social sustainability in LEED-ND neighborhoods. This paper assesses livability in four North American neighborhoods: two LEED®ND and two control suburban New Urbanist cases. This article also provides a series of recommendations for the rating system based on key survey findings.

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