

GRADING THE GREEN CITY

APPLYING THE LEED FOR NEIGHBORHOOD DEVELOPMENT RATING SYSTEM TO THE EXISTING BUILT ENVIRONMENT IN SEATTLE, WASHINGTON

WHAT IS LEED-ND?

The US Green Building Council's LEED for Neighborhood Development rating system integrates the principles of smart growth, new urbanism, and green building to promote sustainable neighborhoods. Like the overarching LEED system, LEED-ND rewards environmentally sensitive construction practices, but it also extends beyond the building shell to consider neighborhood-level objectives. The aim is a rethinking of how the built environment can respond to the "challenges of our time, including global climate change, dependence on nonsustainable and expensive sources of energy, and threats to human health."¹

In practice, LEED for Neighborhood Development is geared specifically to new development, but my analysis applies the criteria retroactively to the city of Seattle. If LEED-ND is a proxy for a sustainable neighborhood, how does the existing built environment fare? Under LEED-ND, a project must meet certain prerequisites and accumulates points by fulfilling credits based on its location and design. In my analysis, rather than evaluating a proposed development, which other studies have done, I score the entirety of Seattle as though it were a collection of one-acre developments.

WHAT IS A SUSTAINABLE NEIGHBORHOOD?

Most of the credits are in three categories. **Smart Location and Linkage** ensures a project site does not threaten sensitive land or species, is well connected to transit and bicycle networks, and provides access to affordable housing and jobs. **Neighborhood Pattern and Design** rewards walkable streets, dense development, access to nearby parks and services, and diversity of housing stock. **Green Building and Infrastructure** requires that the project be efficient with energy and water, manage storm- and wastewater, and conserve materials through reuse and recycling.

LEED certification is only an option for sites that have new construction. So why go through this contrived and theoretical exercise? First, GIS is an underappreciated tool for evaluating the suitability of neighborhoods for rating systems like LEED-ND. Second, while shaping new development is crucial for promoting livable and sustainable communities in an

expanding world, there are important lessons in what we've already built. If an entire city is evaluated on the LEED-ND scorecard, we can better understand what types of spatial environments—that we already intimately know—best match the type of sustainable development that the USGBC wants to encourage and reward.

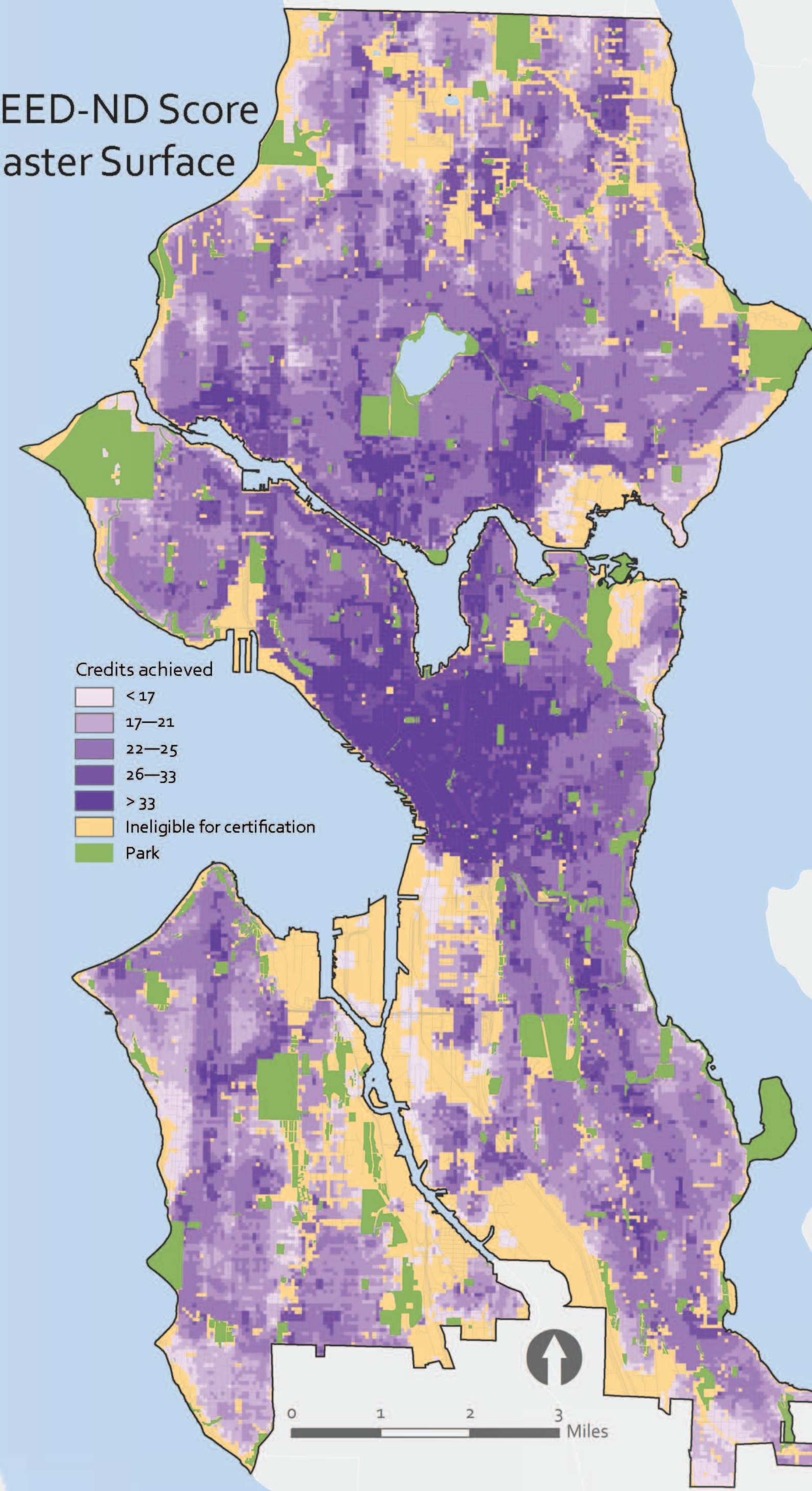
METHODOLOGY

The LEED-ND criteria are extremely specific. From a GIS perspective, this makes things challenging. Several credits were simply not feasible to evaluate, either because the data were not available (e.g., building façade details, building energy and water use, or heat island reduction) or because the credit does not apply to an existing development (e.g., habitat restoration or minimized site disturbance during construction). Most of the Green Building and Infrastructure category was not calculated as a result. To deal with these constraints, I scaled the certification criteria based on the credits I was able to evaluate. The suite of credits I did include, however, covers a broad range of sustainability metrics and effectively highlights sites across the city that would be suitable for potential LEED-ND projects.

To grid the city, I used a raster resolution of one acre. Most LEED-ND projects are bigger, but this scale provides a detailed surface gradient for the theoretical level of certification. Given the variety of credits, there was no singular methodology for translating the requirements into calculable GIS data. Many credits tabulate the number of services, amenities, and distinct uses within a specified network distance. Others restrict where a site can locate; I grouped these into a "constraints" layer. Another bunch relate to demographics like income, housing size, or rent, which I adapted from Census data. Finally, a handful had to be adapted to fit the limits of GIS analysis. I used Census commute-time data, for example, in place of vehicles miles traveled, and I adjusted the affordability cutoffs for rental housing based on the Census data brackets.

Each credit eventually became a raster layer classified by the number of points awarded. Using the Raster Calculator, I summed these layers to produce each cell's final LEED-ND score.

LEED-ND Score Raster Surface



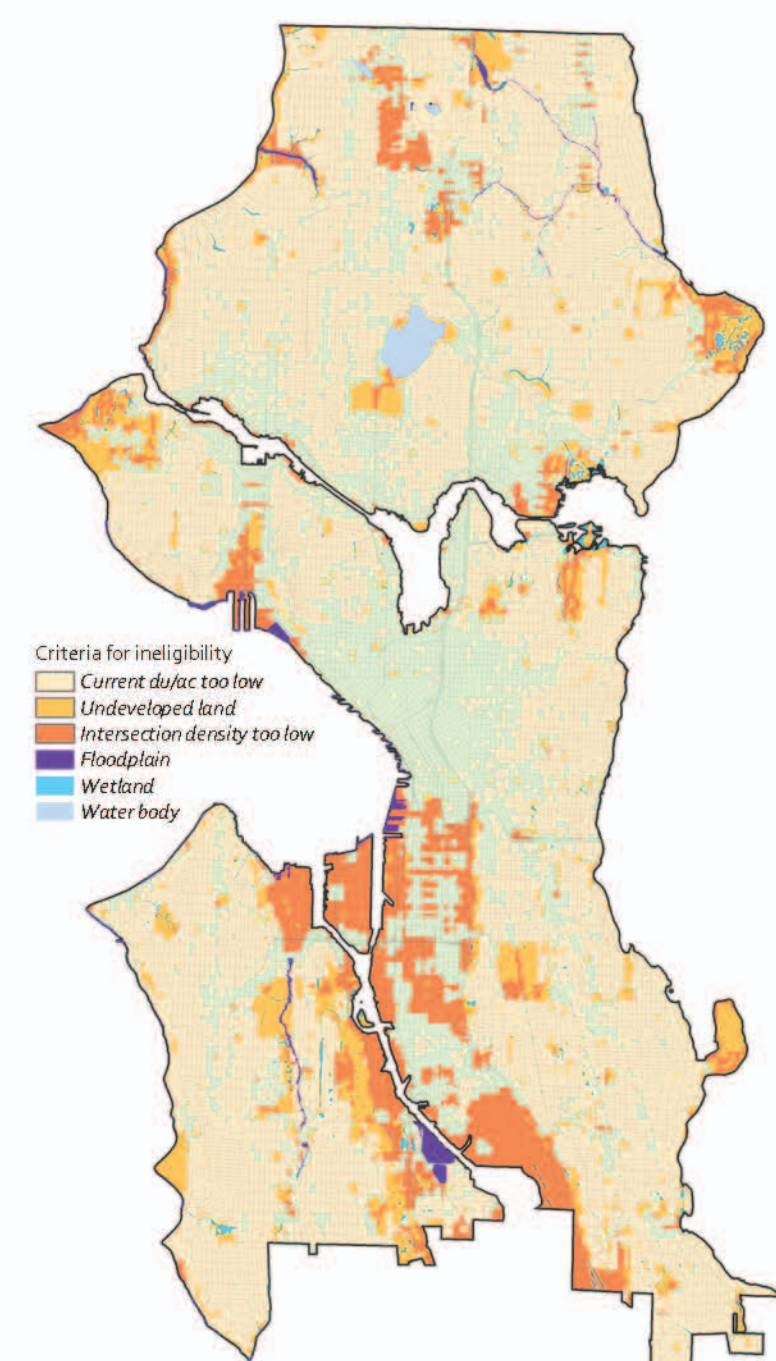
CREDITS

In total, my analysis assessed 47 of the 110 possible points on the LEED-ND scorecard. While this city-wide survey omitted the Green Building and Infrastructure category and several urban design credits, GIS could be an even more powerful tool for a more localized analysis where utility data, façade treatments, and water management details could be gathered. Future research could compare these LEED-ND scores to other measures of healthy, livable communities, such as local air quality or crime statistics, or incorporate them into the city's aggressive Climate Action Plan to become carbon neutral by 2050.

Smart Location and Linkage		21 points
Prereq 1	Smart Location	Required
Prereq 3	Wetland and Water Body Conservation	Required
Prereq 4	Agricultural Land Conservation	Required
Prereq 5	Floodplain Avoidance	Required
Credit 1	Preferred Locations	10
Credit 3	Locations with Reduced Automobile Dependence	7
Credit 4	Bicycle Network Storage	1
Credit 5	Housing and Jobs Proximity	3
Neighborhood Pattern and Design		26 points
Prereq 1	Walkable Streets	Required
Prereq 2	Compact Development	Required
Prereq 3	Connected and Open Community	Required
Credit 1	Walkable Streets	1
Credit 2	Compact Development	6
Credit 3	Mixed-Use Neighborhood Centers	4
Credit 4	Mixed-Income Diverse Communities	7
Credit 6	Street Network	2
Credit 8	Transportation Demand Management	2
Credit 9	Access to Civic and Public Spaces	1
Credit 10	Access to Recreation Facilities	1
Credit 13	Local Food Production	1
Credit 15	Neighborhood Schools	1

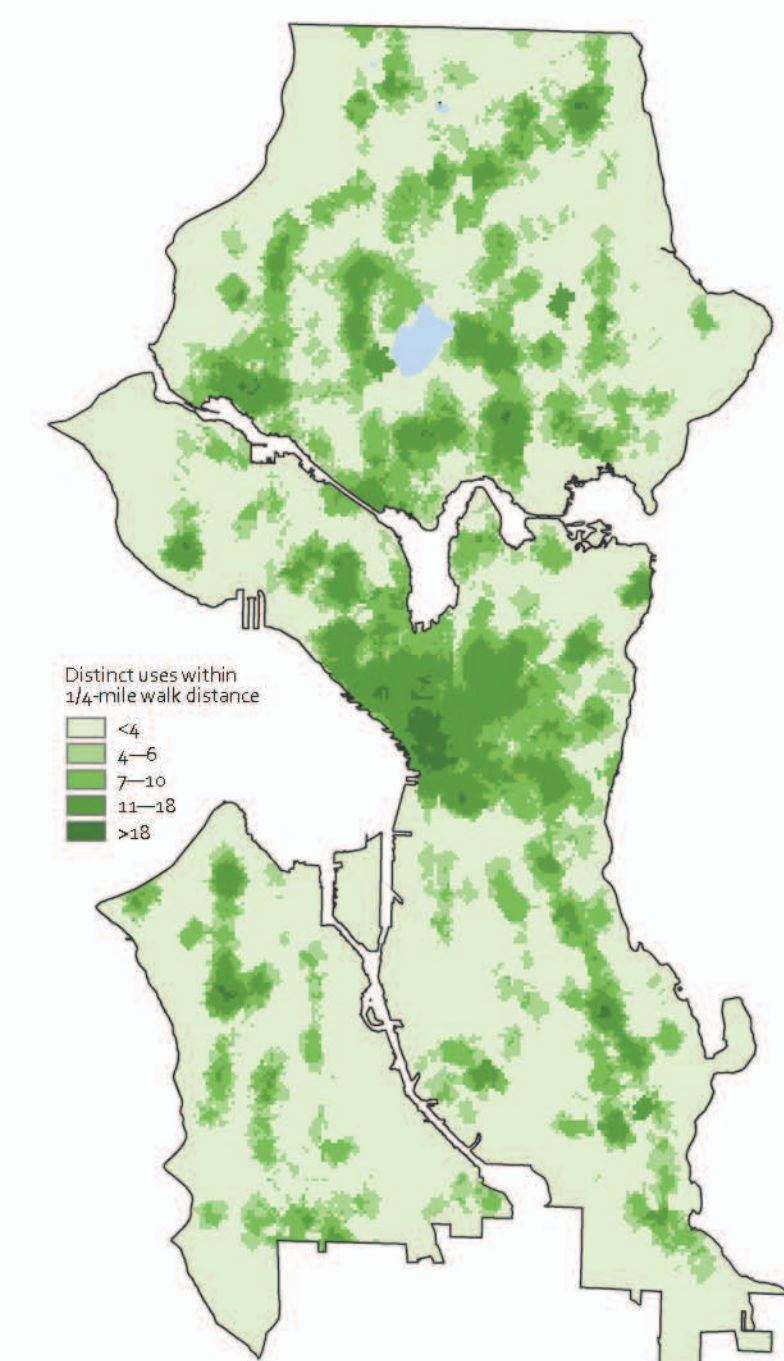
CONSTRAINTS

Sites must be infill, meet certain densities, and locate away from wetlands, water bodies, and floodplains.



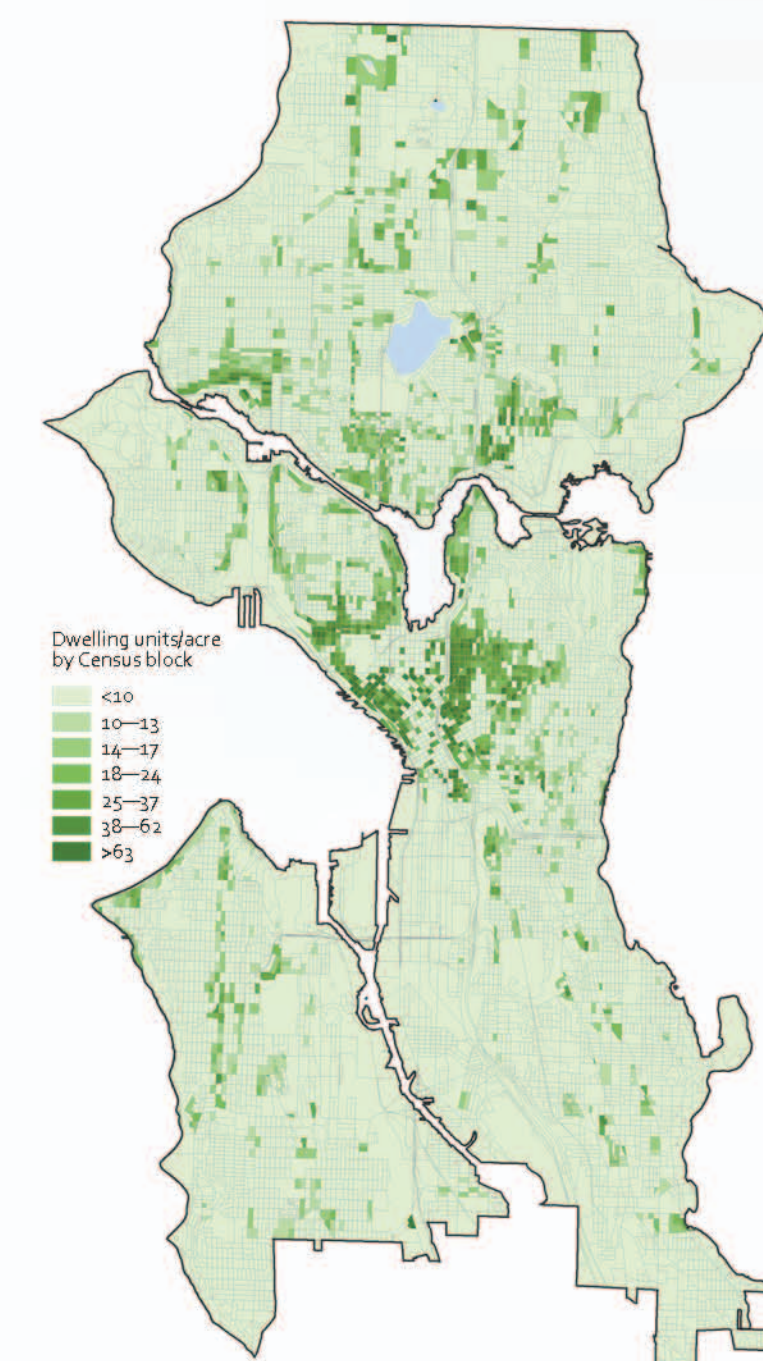
WALKABILITY

I analyzed proximity along a network to a mix of 27 neighborhood services, amenities, and uses.



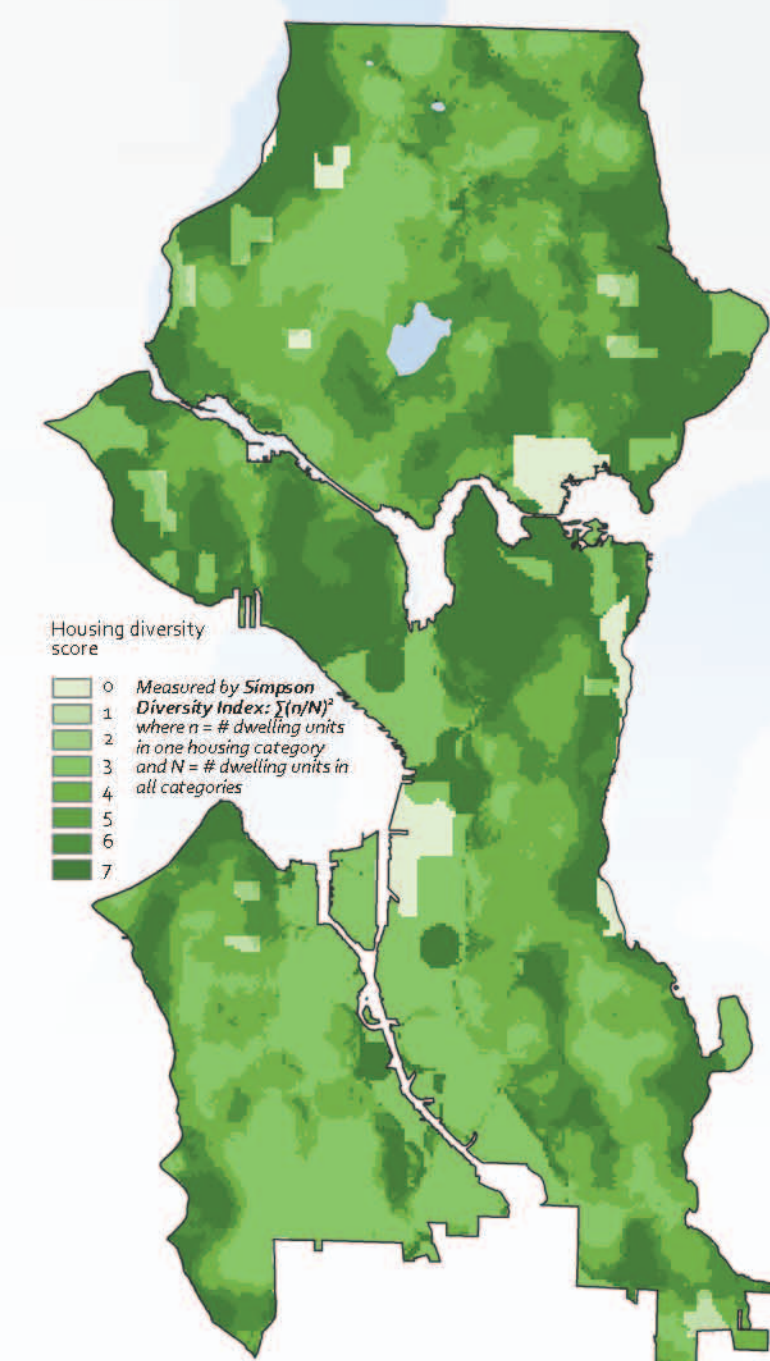
COMPACT DEVELOPMENT

Projects can achieve 1-6 points for building at densities of up to 63 dwelling units per acre.



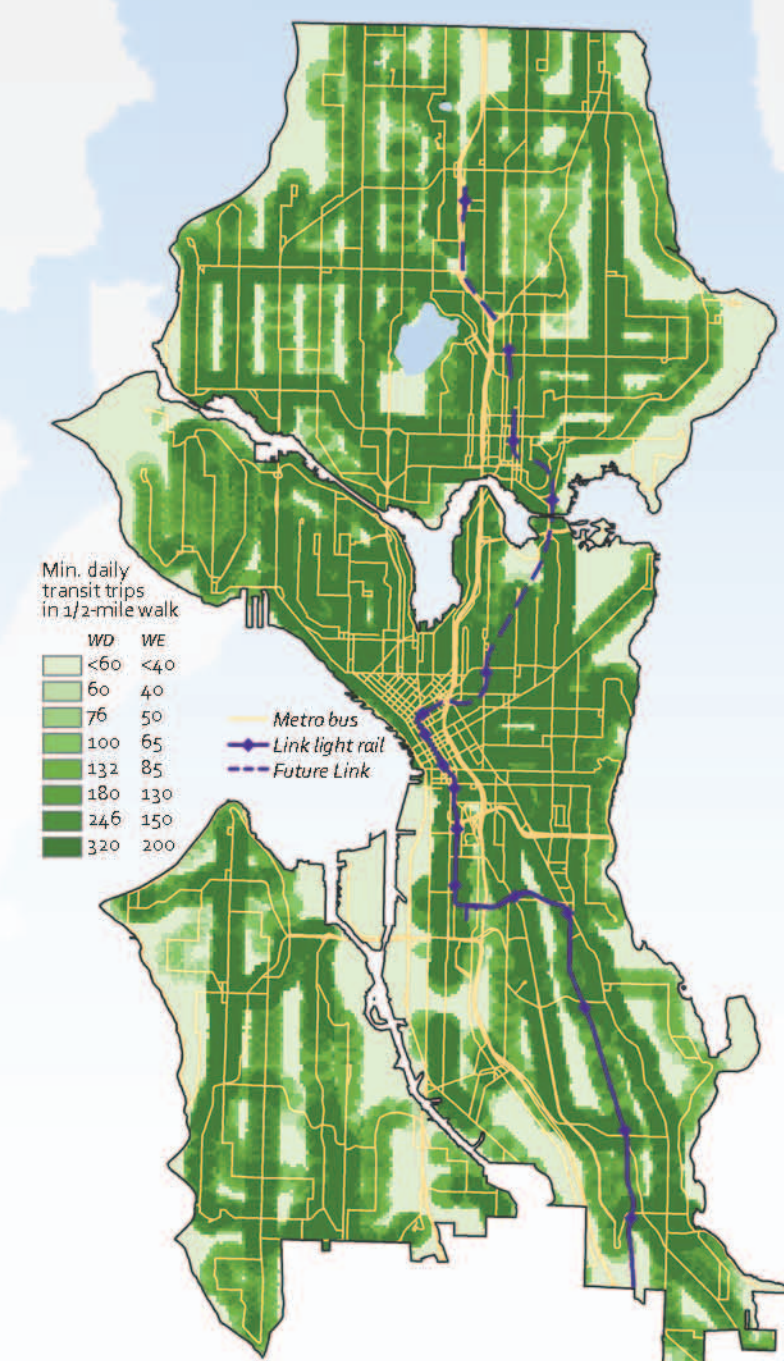
INCOME DIVERSITY

Variety in housing stock supports a range of economic levels, household sizes, and ages in the community.



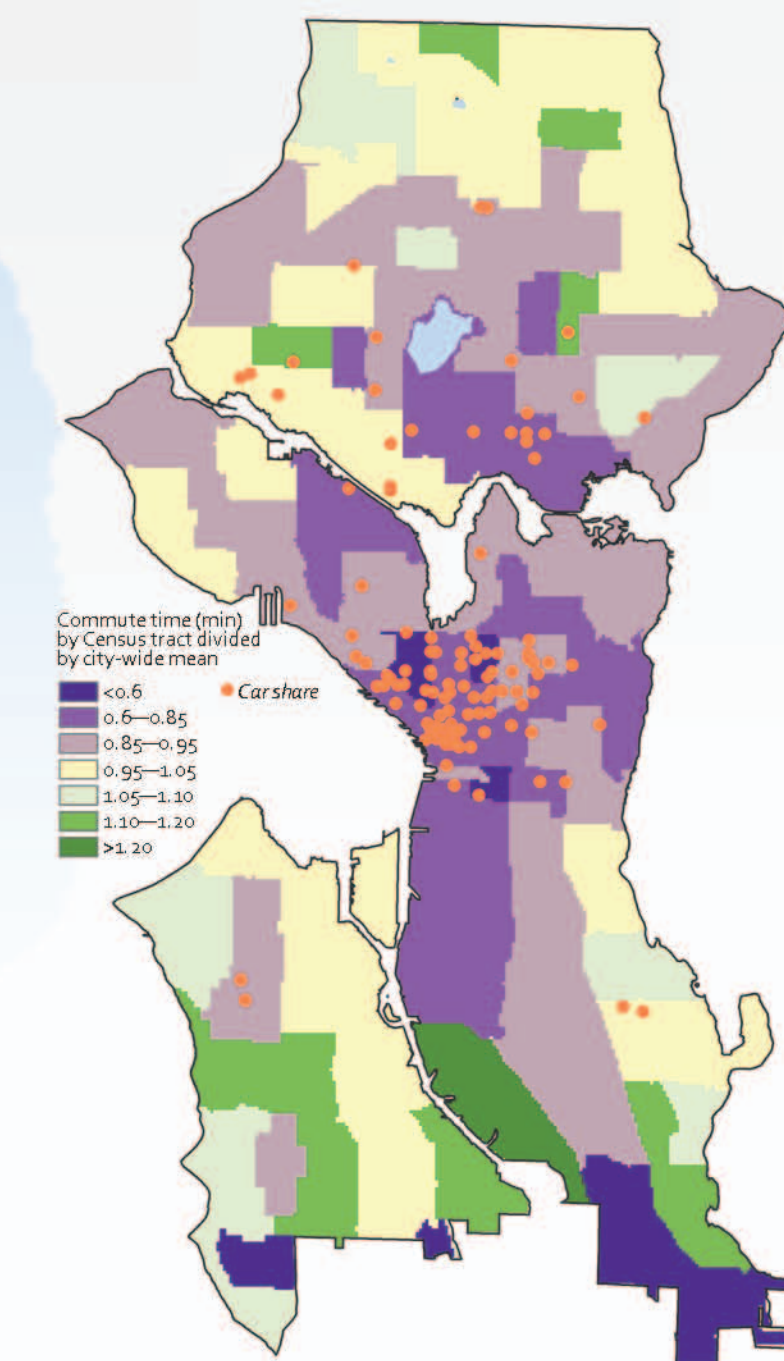
TRANSIT ACCESS

To reduce automobile dependence, sites have a certain number of transit trips within a 1/2-mile walk.



VMT REDUCTION

Projects can earn up to 2 points for using TDM programs, transit passes, or car sharing to reduce VMT.



Nick Welch | 16 December 2011 | UEP 232
 Urban + Environment Policy + Planning | Tufts University
 Projection: NAD 1983 Washington State Plane North
 Data Sources: City of Seattle GIS; King County GIS; City of Seattle Department of Parks and Recreation; City of Seattle Office of Housing; King County Department of Transportation—Metro Transit Division; King County Assessor's Office; Washington State Department of Ecology; US Census Bureau; Reference USA; Zipcar.com
 (1) U.S. Green Building Council, "LEED-ND Rating System."

