Building Environmentally Sustainable Communities: A Framework for Inclusivity

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April 2010

FURMAN CENTER
FOR REAL ESTATE & URBAN POLICY
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EXECUTIVE SUMMARY

The U.S. Department of Housing and Urban Development (HUD) has decided to include two key goals in all of its programs: encouraging sustainable communities and enhancing access to opportunity for lower-income people and people of color. This paper examines the relationship between these two goals through a literature review and an original empirical analysis of how these goals interact at the neighborhood and metropolitan area levels. We also offer policy recommendations for HUD.

The literature review demonstrates that sustainability means different things to different people. To many, sustainability focuses purely on traditional environmental metrics, such as carbon emissions or water pollution. To others, sustainability must include measures of equity, such as the access of people of color and lower-income people to neighborhoods with good schools and jobs. While sustainability and access to opportunity often reinforce each other, in some cases, they are in tension with each other. To examine the potential synergies and tensions between the two goals, we focus on the narrower view of sustainability, which we call "environmental sustainability," but we take no normative position as to how one should define sustainability.

As initial test cases, we examine the New York and Seattle metropolitan areas. We focus our analysis of environmental sustainability on several measures of walkability and transit accessability, and measure opportunity by reference to such indicators as school quality, crime, air quality and job access. We find that most neighborhoods are either walkable/transit accessible or provide access to opportunity, but not both. Only 11 percent of neighborhoods in the New York area and 18 percent in the Seattle area are above metro-area medians for both measures. HUD-subsidized housing, including project-based housing and vouchers, is disproportionately located in walkable/transit-accessible neighborhoods that provide poor access to opportunity; African Americans, Latinos, and Asian Americans disproportionately live in walkable/transit-accessible neighborhoods but have poor access to opportunity, while whites disproportionately live in high-opportunity, car-dependent neighborhoods. We caution that our findings are based on only two metropolitan areas, using a limited range of indicators; we offer suggestions for how to refine and expand this analysis to other metro areas.

Our results suggest that HUD can achieve access to opportunity and environmental sustainability, but only through policies that directly address both. Policies that use walkability and transit accessibility as their primary focus may disproportionately concentrate lower-income people in high-poverty and racially isolated neighborhoods with fewer educational and job opportunities. Accordingly, HUD should, in both its Sustainable Communities Initiative and its core programs:

- focus resources on neighborhoods that provide both walkability/transit-accessibility and access to opportunity;
- invest in upgrading both walkability/transit-accesibility and inclusivity in high-opportunity communities; and

- invest in upgrading opportunity (which primarily means investments other than affordable housing, such as schools and jobs) in communities that have good walkability and transit access but low opportunity.

INTRODUCTION

Against a backdrop of the administration's concern about climate change, the U.S. Department of Housing and Urban Development (HUD) is committing significant resources to ensuring that housing and planning activities promote environmentally sustainable communities. Several recent actions demonstrate this commitment. In June 2009, HUD announced a partnership with the Department of Transportation (DOT) and the Environmental Protection Agency (EPA), and together they developed "livability principles" to guide federal transportation, environmental, and housing investments.[1] HUD's 2010 budget establishes "encouraging sustainable and inclusive communities" as one of five core objectives and proposes a $150 million Sustainable Communities Initiative.[2] In addition, the American Recovery and Reinvestment Act of 2009 (ARRA) committed billions of dollars to energy retrofitting and "green" design in federally assisted housing.[3] All of these efforts will use housing, transportation, and land-use planning tools to achieve environmental goals.

Despite this increased interest in incorporating environmental goals, there is no single, generally accepted definition of sustainable development or sustainable communities. Many observers define sustainability through a narrow lens—focusing on actions to preserve and protect the environment. For example, sustainable development might include efforts to reduce carbon emissions by designing walkable neighborhoods or investing in public transportation to reduce reliance on cars. It might also include land-use regulations that reduce sprawl by encouraging high-density housing construction in already built-up areas while limiting growth on undeveloped land.

Some definitions of sustainability apply a broader lens, incorporating principles of inclusion and opportunity as well as environmental protection. This broader vision seeks to preserve the environment *and* foster healthy, vibrant neighborhoods that offer their residents affordable housing, public transportation, good jobs, high-performing schools, healthy food choices, and open spaces. It also seeks to ensure that such neighborhoods are inclusive by offering the benefits of sustainability and environmental, social, and economic opportunity to people of all incomes, ages, races, and ethnicities.

Although HUD's 2010 budget links sustainability and inclusion rhetorically, there is growing concern from advocates and key stakeholders that communities that are sustainable in the narrower, environmental sense will not necessarily be inclusive, and that efforts to promote environmental sustainability may come at the expense of efforts to improve those households' access to better social and economic opportunities. This concern is not unfounded. U.S. metropolitan areas continue to be highly segregated by race and poverty. To

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[1] See Statement of Secretary Shaun Donovan U.S. Department of Housing and Urban Development hearing before the Committee on Banking, Housing, and Urban Affairs, United States Senate June 16, 2009.

[2] See U.S. Department of Housing and Urban Development, "FY2010 Budget Road Map for Transformation," http://www.hud.gov/budgetsummary2010.

[3] See U.S. Department of Housing and Urban Development, "Going Green: Economic Recovery and Beyond," June 11, 2009.

date, many sustainable development efforts have emphasized environmental goals and paid little attention to inclusion. Some actions to advance environmental goals have the potential to make it even harder to develop and preserve affordable housing, particularly in neighborhoods of opportunity. But environmental sustainability and inclusion can also be complementary, and an argument can be made that to fully achieve their environmental goals, sustainable communities *must* be inclusive.

Because definitions of sustainable development and sustainable communities are still taking shape at the local level, HUD's actions over the next decade, including how the agency defines environmentally sustainable communities, how it measures the success of such communities, and how HUD fosters inclusion in these communities, will play a critical role. Its statutory responsibility for expanding affordable housing and the obligation to affirmatively further fair housing can and should be integrated with the commitment to environmental goals. As policymakers at HUD define, promote, and develop environmentally sustainable *and* inclusive communities, they will need to consider the following questions:

- ❖ What characteristics make communities environmentally sustainable and inclusive?
- ❖ Are there points of tension between the two goals and how can HUD resolve or balance such tensions?
- ❖ How do environmental sustainability and inclusivity complement one another?
- ❖ How should HUD advance these goals through new initiatives?
- ❖ What changes does HUD need to make to its current programs to encourage environmental sustainability and inclusion?

This paper provides a framework for exploring these questions and makes recommendations for policy development. It begins with a look back at the patterns of environmentally unsustainable and inequitable development that have characterized most of metropolitan America. We then look forward, discussing the interconnected goals of environmental sustainability, access to opportunity, and community inclusion. The third section presents measures of environmental sustainability, opportunity, and inclusion that HUD can use to decide where it should invest its resources, and to assess progress toward meeting its goals at the neighborhood and metropolitan levels. Finally, section four makes specific recommendations for federal housing policy and programs.

1. Looking Back—Environmentally Unsustainable and Inequitable Urban Development

Racially and Economically Segregated and Environmentally Unsustainable Metro Areas

Since World War II, housing, land-use, and transportation policies have all contributed to environmentally unsustainable growth patterns (Squires 2002). The rise of the automobile, interstate highway construction, Federal Housing Administration (FHA) redlining, and subsidies for mortgages all encouraged the suburbanization of America, with first households

and then jobs moving further and further from the city (Squires 2002). The cost of these growth patterns is staggering: in 2007, traffic congestion costs reached $87.2 billion, and Americans wasted 2.8 billion gallons of fuel and spent 4.2 billion hours stuck in traffic (2009 Urban Mobility Report). Uneven metropolitan growth patterns are also taking a toll on the environment. The share of CO_2 emissions from residential buildings and transportation has increased significantly: today, they collectively account for approximately 55 percent of energy-related carbon dioxide emissions (U.S. Energy Information Administration 2009).

The rise of the suburbs and sprawling development coincided with considerable racial segregation. Middle- and high-income white households moved to newly incorporated suburban jurisdictions that adopted zoning regulations that effectively priced out lower-income households and kept out minority households through racial covenants, discriminatory lending practices, and regulations requiring high-cost housing. Thus, many suburban communities became both economically and racially exclusive. Efforts to site affordable rental housing in these communities often met strong opposition and cries of "not in my back yard," or "NIMBY." Suburban jurisdictions often advanced these exclusionary zoning policies under the guise that they protected property values, neighborhood amenities, or environmental assets. But as Pendall et al. (2002, 230) note, "there is strong support from case law, popular accounts, and the academic literature that local governments adopt large-lot zoning, minimum house size requirements, and bans on secondary units precisely to make their housing more expensive and thereby exclude lower-income racial and ethnic minorities."

As middle-income households moved to find the American dream in the suburbs, they left behind increasingly isolated and distressed neighborhoods in cities and older, first-ring suburbs. Jargowsky (2002) notes the connection between sprawl and rising inequality, describing it as a push and pull cycle: the "pull of the suburbs" attracting middle and high-income households, moving for more space, better schools, and the push of these households from inner-city neighborhoods, leaving to escape crime and low-performing schools. As middle-income households left the city, the tax base weakened, making paying for city services—schools, policing, roads—more difficult, exacerbating disinvestment, and creating a vicious cycle of decline (Orfield 1997; powell 2002).

Federal policies played a significant role in establishing and perpetuating patterns of racial segregation. Most publically assisted housing was sited in predominantly minority neighborhoods (Turner, Popkin, Rawlings 2008) and, for many years, explicitly assigned residents to projects based on race. And the original mortgage underwriting standards issued by the FHA explicitly discouraged lending in minority and racially mixed neighborhoods, while encouraging whites to buy homes in new, exclusively white communities (Hirsch 1998).

Racial discrimination in the private housing market also excluded minority homeseekers from predominantly white suburban communities. The most recent evidence indicates that although discrimination has become less blatant over time, it still limits the information and options available to minority homeseekers, raises their costs of search, and steers them

away from predominantly white neighborhoods (HDS 2000;Turner and Ross 2003; Turner, Ross, et al. 2002; Turner, Freiberg, et al. 2002).

The exodus of middle- and upper-income whites to the suburbs and the segregation of neighborhoods along racial lines fueled the geographic concentration of poverty and the severe distress of poor, minority neighborhoods. Massey and Denton (1993) convincingly show that policies and practices confining urban blacks—among whom the incidence of poverty was markedly higher than for whites—to a limited selection of city neighborhoods produced much higher poverty rates than in white neighborhoods. Subsequent job losses and rising unemployment pushed poverty and isolation in many central-city black neighborhoods even higher. In high-poverty communities, the most destructive consequences of neighborhood segregation and social exclusion are evident (Massey and Denton 1993; Wilson 1987).

Modest declines in racial segregation mean that America's neighborhoods are more inclusive and diverse today than in previous decades. Nonetheless, most black and Latino households still live in predominantly minority neighborhoods, which often lack the amenities and opportunities that white neighborhoods take for granted (Turner and Rawlings 2009). Moreover, almost all high-poverty neighborhoods are majority minority (Jargowsky 1998, 2003; Pettit and Kingsley 2003) and living in these profoundly poor, racially isolated neighborhoods severely undermines the well-being and long-term life chances of minority households (Cutler and Glaeser 1997). Put simply: where you live matters (Ellen and Turner 1997).

A recent *New York Times* article focused on health as one outcome related to place, coining the term "ghetto miasma" and asking if some neighborhoods were "enough to make you sick." It is widely documented that African Americans have high rates of chronic illnesses, such as Type 2 diabetes, heart disease, kidney failure, and some types of cancer, and evidence from HOPE VI shows that physical health problems are widespread among residents living in distressed public housing (Harris and Kaye 2004). Many researchers argue that these health outcomes are connected to residents' neighborhoods. While the "what" and the "how" evidence is still unfolding, it is clear that place matters—not only for access to jobs and high-performing schools, but for access to parks, outdoor space, supermarkets, health care facilities, and, more broadly, clean water and air.

Residential segregation also plays a role in environmental justice. Hazardous waste dumps, chemical plants, and freeways are all often located in poor neighborhoods. Research highlights staggering rates of environmental inequality for racial and ethnic minorities (Downey 2006). Orfield (2005) argues that to put a stop to such environmental injustices, policymakers must end residential segregation.

Prior Efforts to Reverse Patterns of Segregation

Overcoming long-standing patterns of economic and racial segregation has proven to be extremely difficult. Many suburban jurisdictions are successful at preventing the

development of affordable housing through land use regulations and community opposition. And while some cities experienced growth during the 1990s, many middle-income white households remain reluctant to move into urban neighborhoods that are racially diverse or have lower average incomes. Moreover, the recent revitalization of some inner-city neighborhoods has led to gentrification and worsening affordability problems in regions with strong housing markets. On the other hand, weaker markets—like Cleveland or Detroit—pose challenges both for attracting middle-income households to distressed neighborhoods and for opening up the suburbs with more affordable housing placement.

To date, federal efforts to reverse racial segregation and concentrated poverty have been limited to small initiatives and demonstration programs. Some initiatives focus on revitalizing distressed neighborhoods, while others help families move from distressed neighborhoods to better ones. With the exception of targeted settlement agreements stemming from desegregation lawsuits, these programs have been race-neutral, meaning that they do not explicitly use race in program policies. HOPE VI, for example, a place-based neighborhood revitalization strategy, demolished severely distressed public housing projects and replaced them with mixed-income communities. And the Moving to Opportunity (MTO) demonstration enabled families living in high-poverty public and assisted housing projects to move to low-poverty neighborhoods by providing special-purpose housing vouchers, search assistance, and landlord outreach. Although many families have benefited from these programs and some HOPE VI neighborhoods have experienced dramatic turnarounds, particularly improvements in mental health and safety, the impact on broader patterns of segregation and poverty concentration has been small (Popkin 2004; Turner and Briggs 2008).

Looking beyond these initiatives, the primary federal housing programs—public and assisted housing, the Low Income Housing Tax Credit, and the Housing Choice Voucher program—continue to concentrate affordable housing in low-income communities and to perpetuate racial segregation (Devine et al. 2003; Turner, Popkin, and Rawlings 2008). The siting of assisted housing in middle-income communities remains controversial and politically risky, making NIMBY a strong force to overcome. And although the Housing Choice Voucher Program theoretically offers recipients the choice about where to live, the payment standards are often above market rates in high-poverty neighborhoods and below market rates in higher-opportunity communities. Research shows that extra help in the form of housing search and mobility counseling assistance is often required to get people to better neighborhoods (Turner and Briggs 2008; Cunningham and Sawyer 2005).

2. Looking Forward—Visions for Environmental Sustainability, Opportunity, and Inclusion

HUD's 2010 budget explicitly links sustainability and inclusion by noting support for "fair housing programs to combat discrimination in the housing market and enable growth patterns that are not only sustainable but inclusive."[4] In addition, HUD's partnership with

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[4] See U.S. Department of Housing and Urban Development, "FY2010 Budget Road Map for Transformation," www.hud.gov/budgetsummary2010.

DOT and EPA outlines livability principles to "promote equitable, affordable housing" by expanding "location and energy efficient housing choices for people of all ages, incomes, races, and ethnicity."[5] How are the goals of inclusion and environmental sustainability defined and how are they interconnected?

Opportunity and Inclusion

The federal Fair Housing Act prohibits discrimination in the sale, rental, and financing of housing based on race, color, national origin, religion, sex, familial status, and disability. All of these protected groups should—for both moral and legal reasons—have an equal opportunity to live in communities that are both environmentally sustainable and rich in opportunities. In this paper, we focus primarily on issues of race, ethnicity, and income because they have played such a central role in shaping current patterns of development.

At the most basic level, an inclusive community could be defined as one that is not actively *exclusionary*—one that is not engaged (intentionally or unintentionally) in zoning or land use regulations that exclude lower-income and minority residents. Because so many aspects of zoning and land use regulation can have exclusionary effects, even this definition requires state and local governments to make affirmative efforts to identify and remove or mitigate exclusionary effects of land use regulations.

But to many, genuine inclusiveness means more: it requires efforts to provide opportunities for people of all races, ethnicities, and income levels to live within a community and to reduce racial, ethnic, and economic segregation across a metropolitan area. Such efforts may involve such regulatory tools as inclusionary zoning, minimum density requirements, direct subsidies for affordable housing development, and affirmative marketing campaigns and community building. They also may involve prohibitions on building subsidized housing in segregated or poor neighborhoods, or incentives to put developments in less segregated neighborhoods.

In another, perhaps deeper sense, the term "inclusive" refers to equality of access to social and economic opportunities. This definition of inclusion asks if our society's benefits and burdens are fairly distributed. In its 2008 report, the National Commission on Fair Housing and Equal Opportunity reflected this tradition: "a diverse community is one where all residents are included, where no group is privileged above any other group, and where everyone has equal access to opportunity."

To examine the synergies and potential tensions between the goals of environmental sustainability and inclusion, this paper adopts a distributive justice perspective on inclusion. Specifically, we explore three questions: (1) how might federal policies to encourage environmental sustainability in siting new subsidized housing, preserving existing affordable housing, or targeting investments help or hurt efforts to expand choices for the poor and

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[5] See Statement of Secretary Shaun Donovan, U.S. Department of Housing and Urban Development hearing before the Committee on Banking, Housing, and Urban Affairs, United States Senate, June 16, 2009.

minorities to live in neighborhoods that provide superior educational, job, health, and safety opportunities? (2) To what extent are high-opportunity and environmentally sustainable neighborhoods currently accessible to low-income, minority, and HUD-assisted households? (3) To the extent that policies promoting environmental sustainability may be at cross-purposes in allowing low-income and minority families access to high-opportunity neighborhoods, what policies could the federal government adopt to promote both opportunity and environmental sustainability?

Defining Sustainability

When someone uses the term "sustainable community," usually the question that follows is "What do you mean by that?" Sustainable means different things to different people, and no single definition for sustainable communities or sustainable development has been widely accepted. Usually the terms refer to how the development of a community over time protects the environment for future generations. The United Nation's 1987 "Our Common Future, a Report of the World Commission on Environment and Development" (commonly called the Brundtland Report) coined the most widely cited definition of sustainable development: "[development] which is meeting the needs of the present without compromising the ability of future generations to meet their own needs."[6]

For many, the term focuses *solely* on protecting the environment. Environmental groups typically advocate environmental policies that promote clean air and water and protect natural resources and habitats. Some, recognizing the impact transportation and residential buildings have on carbon emissions—a significant driver of greenhouse gases and climate change—promote public transit and green building. The Sierra Club, for example, outlines several goals to halt climate change, including promoting clean energy and green transportation.[7]

For others, the definition of sustainable community is broader—encompassing the social and economic factors that may, as the Brundtland Commission wrote, "compromise the ability of future generations to meet their own needs."[8] These broader definitions consider issues of economic sustainability and equitable development, including but not limited to environmental justice. For example, economic sustainability addresses business or industry development and the availability of decent-paying jobs. Equitable development addresses where affordable housing and transportation are located and whether they provide access to jobs, quality schools, retail amenities, and parks and recreation. Including economic and equity values in the definition of sustainable communities has led to the articulation of "three E's:"

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[6] http://www.iisd.org/sd/principle.asp.

[7] See http://www.sierraclub.com for more on the organization's goals and priorities.

[8] See http://unece.org/oes/nutshell/2004-2005/focus_sustainable_development.htm

❖ **Environmental**—Efforts to protect the natural environment and ensure benefits for future generations.

❖ **Economic**—Access to economic opportunity so people can meet their basic needs and flourish.

❖ **Equity**—That all people, no matter what their race, age, disability status, or income, benefit from economic opportunity and the shared environment.

One of the first places the three E's were used was in the final report "Towards a Sustainable America: Advancing Prosperity, Opportunity, and a Healthy Environment for the 21st Century" to President Clinton by the President's Council on Sustainable Development in May 1999: "For nations to achieve sustainable development, multilateral agreements or processes that affect the economy, the environment, or social equity should be undertaken from a perspective of sustainability and reflect all three areas of concern." The definition included in the report authored by the President's Council reads:

> Encourage people to work together to create healthy communities where natural and historic resources are preserved, jobs are available, sprawl is contained, neighborhoods are secure, education is lifelong, transportation and health care are accessible, and all citizens have opportunities to improve the quality of their lives. (President's Council on Sustainable Development 1996).[9]

Despite the recognition by some that sustainable development efforts should include equity components (both economic and racial), the second and third E's are often overlooked or neglected by sustainability initiatives. In our analysis of indicators in part three below, we generally use a narrower definition of sustainability that does not focus on the economy or equity. We do so because these narrower definitions are more prevalent in policy discussions and thus more likely to shape federal sustainability efforts, not because of any normative judgment that a narrower view of sustainability is the correct one. To make clear that we are using a narrow definition, we use the term "environmental sustainability."

Scale of Environmental Sustainability Initiatives

A tremendous variety of policies, programs, and activities are advanced as tools for environmentally sustainable development (see Figure 1 for examples). The scale of these activities range from individual buildings (homes and businesses) to metropolitan regions, and their expected impacts vary widely as well. For example, environmentally sustainable development may include investing in "green elements," such as energy efficiency, recycled building materials, low-flow water, and limited landscaping in housing design. Environmentally sustainable development can also include the development of whole communities, built around walkable neighborhoods, rich with transit options that reduce the communities' dependence on cars. A citywide climate change plan could advance the

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[9] See http://clinton4.nara.gov/PCSD/Publications/TF_Reports/amer-top.html

development of environmentally sustainable communities. Since the actions of cities and suburbs are often linked, environmental sustainability efforts may require regional planning around the siting of affordable housing and transportation planning. Finally, environmentally sustainable development around shared resources, such as waterways, or transportation investments, may also require planning at the regional or statewide level.

Figure 1. Different Types of Sustainability Efforts

❖ Green building and energy efficiency retrofitting
❖ Walkable neighborhood design
❖ Bike paths and outdoor recreation space planning
❖ Green infrastructure (parks, trails, etc.) planning and preservation
❖ Mixed-income housing development, multiuse development
❖ Adoption of land-use controls and growth management
❖ Transit-oriented development
❖ Regional cooperation or governance
❖ Regional tax sharing
❖ Implementation of climate change plans
❖ Energy-consumption reduction campaigns

Potential Synergies and Conflicts between Inclusivity and Environmental Sustainability

Efforts to promote environmentally sustainable development sometimes may compete with efforts to promote inclusivity (e.g., by ensuring that all groups have access to neighborhoods offering sound educational and employment opportunities, safety and neighborhood quality). Although the potential for conflict between environmental sustainability and inclusion is serious, these goals can also be compatible (see table 1). In fact, one can argue that neither environmental sustainability nor inclusion can be fully achieved in the absence of the other. The challenge lies in finding strategies that respect and advance both goals rather than myopically pursue one at the expense of the other. Below are some examples of how specific policies might present synergies or conflicts between inclusivity and environmental sustainability.

❖ Developers are increasingly adopting **green building** techniques, such as energy efficient cooling/heating systems and appliances, green roofs, and the use of less toxic materials. Although the construction of greener residences may be cost-effective over the long run, including such design elements may increase short-term development costs. Developers of affordable housing may see adding or retrofitting "green elements" in affordable buildings as a financial deal breaker. Instead, affordable housing developers focus on keeping development and debt service costs down, to increase financial sustainability over the long term (Enterprise 2008). Further, many of these features are attractive to high-end buyers and unaffordable to lower-income households. As such, housing developers tend to develop green buildings for a higher-end market and market green features to these households (Poticha 2008). In some instances, developers may use green building as a "gold plating," which has an exclusionary effect, similar to the way that adopting policies that promote large lot sizes and single family residences excludes

lower-income families. While residential green building helps forward environmental sustainability goals, extra efforts to ensure that it forwards goals of inclusivity are critical.

❖ To the extent that energy retrofitting or other **green building creates jobs**, and those jobs provide opportunities for low-income and minority workers, sustainability efforts may increase opportunity. Taking steps to ensure that lower-income and disconnected workers access training for these "green-collar" jobs could help increase their income so that they can afford housing. If jobs are neighborhood based, adopting preferences for hiring local workers could also be compatible with environmental sustainability because it could mean that workers are commuting less to jobs outside their neighborhood. There is, however, no guarantee that these jobs will go to low-income workers or that they will result in less commuting.

❖ **Engaging residents** in goal setting, designing, and developing environmentally sustainable communities can increase inclusivity, particularly in neighborhoods undergoing neighborhood revitalization and regional planning efforts. Since environmental sustainability is about stewardship, it makes sense to include residents in the process. For example, resident engagement can help ensure residents are adopting habits and strategies that reduce energy consumption, such as completing energy retrofits on their home. It can also make it more likely that land-use, transportation, and housing planning will include key affordable housing provisions to ensure that a diverse set of residents can share in the benefits of the revitalized community. Civic engagement comes in many forms and not all are positive. Resident engagement also risks being exclusionary and can lead to NIMBYism and the adoption of zoning policies that thwart the development of affordable housing. Indeed, pushes for environmental protections are sometimes thinly veiled disguises for NIMBYism.

❖ Developing **mixed-use and mixed-income housing** can reduce sprawl by creating places where residents can live, work, and enjoy leisure activities, thus reducing automobile use. They can also achieve inclusivity goals by providing a range of housing types that are affordable to low-, moderate-, and higher-income residents and that can overcome jobs and housing mismatches. To be inclusive, mixed-income developments will need to ensure that multifamily units, and, where needed, units for large families, are created.

❖ Inclusion is not only about revitalizing distressed neighborhoods, it also means opening up suburban neighborhoods that were not accessible in the past. A common criticism of **mobility assistance programs** is that they help participants move to suburban locations and thereby increase car use. While moving residents away from the city might increase their reliance on cars, it could also move residents closer to jobs. And by reversing long-standing patterns of poverty concentration and reducing transportation associated with job-housing mismatches, these programs can promote more environmentally sustainable development patterns in the region as a whole.

❖ **Transit-oriented development** that creates neighborhoods close to public transportation, restaurants, supermarkets, shopping, parks, recreation areas, and jobs is in high demand, and can create opportunities for revitalization. However, neighborhood

revitalization can also come with dangerous side effects: driving up property values and increasing pressures on housing affordability may displace residents. Siting subsidized housing near transit may be environmentally sustainable because it provides residents with more transportation options, but it could lead to concentrations of poverty and perpetuate racial segregation, or place residents in areas with low-performing schools, high crime, or other problems.

❖ **Land use controls** adopted in the name of environmental protection risk being highly exclusionary. For example, efforts to convert a vacant lot to a park may come at the cost of the development of affordable housing. In this case, a city may have to choose between preserving a lot of land for a new green space and developing an affordable housing building. The jurisdiction may choose conservation for nondiscriminatory reasons, but as a result, prevent low-income households who are "priced out" from living in the community. On the other hand, land-use controls can be both environmentally friendly and inclusive. Inclusionary zoning, for example, can encourage developers to include higher-density, affordable multifamily housing in their projects.

❖ **Growth management boundaries** that limit the development of housing to prevent sprawl and protect undeveloped land, such as farmland or wetlands, can increase the cost of housing within the growth boundary (Segal and Srinivasan 1985; Landis 1986). On the other hand, growth management boundaries that include density bonuses, minimum density requirements, and inclusionary zoning can theoretically increase the availability of affordable housing (Abbot 2002).

❖ Strengthening **regional, planning, cooperation, and governance** capacities can promote region-wide land use and transportation policies that reduce sprawl and traffic congestion, as well as protect shared waterways and other natural resources. These efforts can also result in the development of fair-share housing strategies across a region, which have the potential to reduce economic and racial segregation. However, regional coalitions frequently have limited capacity and lack broad representation. Consequently, they may present a suburban bias that runs counter to inclusivity.

TABLE 1. Potential Synergies and Conflicts between Inclusivity and Environmental Sustainability

Scale	Environmentally sustainable development	Compatible with inclusion	Competes with inclusion
Individual property	Green building and energy retrofitting	Low-income residents could benefit from savings achieved by energy-efficient design and retrofits create local green jobs.	Higher front-end costs could reduce the number of affordable units.
	Mixed-use and mixed-income / workforce housing	Affordable housing could be integrated into healthy communities with proximity to jobs.	Number of units affordable to low-income families might be scaled back.
	Resident engagement in housing and neighborhood planning	Low-income and minority residents could have a voice in development decisions.	Community opposition to inclusion might be encouraged.
	Transit-oriented development	High-density development could incorporate affordable units near transit.	Property values rise and might cause gentrification and displacement. Areas in proximity to transit may not be high opportunity.
	Mobility assistance	Helps participants move to suburban locations and thereby may help them move close to jobs and schools, allowing a decrease in vehicle miles traveled.	Helps participants move to what may be less walkable and transit accessible suburban locations and thereby may increase vehicle miles traveled.

TABLE 1. Potential Synergies and Conflicts between Inclusivity and Environmental Sustainability

Metropolitan region	Green jobs	Low-wage workers might gain access to high-skilled, high-wage jobs.	Low-income and minority workers might lack the skills and knowledge needed for these jobs or the jobs may not be created locally.
	Land use controls	Inclusionary zoning regulations could expand affordable housing options.	Exclusionary zoning could limit affordable housing production.
	Growth management boundaries	Higher densities might expand modestly priced housing options.	Limits on development could drive up housing prices.
	Regional planning and governance	Jurisdictions could agree to develop affordable housing throughout the region.	Regional institutions might neglect affordability and inclusion goals because many regional organizations favor suburban interests.

Is Inclusion Necessary for Environmental Sustainability?

The previous section highlights where environmental sustainability and inclusivity might compete and where they might be compatible. As HUD develops programs and targets investments, it will need to pay attention to the goals of environmental sustainability and furthering fair housing. The question that remains is whether inclusion is *necessary* for achieving environmental sustainability.

At the very least, efforts to promote environmental sustainability need to be widespread. "Pockets of sustainability" may not be enough to achieve environmental goals. Reaching environmental goals will mean that some residential properties will need to be retrofitted with energy efficient features. Homeowners, who have a stake in the resale value of their property and equity, have a financial incentive to make these changes. Renters, however, have less of an incentive, and how much landlords would invest in energy retrofits is unclear, particularly if their tenants are paying energy and heating bills. Assisted housing residents have less of an incentive and fewer means to accomplish such retrofits. Achieving retrofitting at a meaningful scale, therefore, must *include* rental developments.

Social and economic inclusion at the neighborhood level may also be important for environmental sustainability. For example, if large lot development in single-use neighborhoods persists in suburban and rural areas, it could erase the potential positive impacts of other neighborhoods that are incorporating mixed-income, mixed-use, and transit-oriented development. Encouraging inclusion, through the development of higher density and more affordable housing, could help make these communities more sustainable, for example by reducing commute times if many low-income people currently commute long distances by car to jobs in those communities.

Finally, inclusion at the metropolitan scale, ensuring that low-income residents have access to housing, transportation, and jobs across the region is important for environmental sustainability. For example, the spatial mismatch between jobs and affordable housing in many metropolitan areas means that many low-income households living in the city are commuting by car to suburban jurisdictions for work. Efforts to include low-income residents, through the development of affordable housing in suburban communities with jobs, may not only be compatible with environmental goals but may be necessary to reduce automobile pollution.

While inclusion seems necessary to achieve environmental sustainability, empirical research on this question is limited. Further, as the next section reveals, there are many ways that policies and programs could make metropolitan areas more environmentally sustainable without improving, or even reducing, the opportunities available to poor and ethnic minorities.

3. Measuring Environmental Sustainability and Access to Opportunity: An Exploratory Analysis

To ensure that policies to further environmental sustainability are not achieved at the expense of the goal (and legal obligation) to promote inclusivity, HUD and other federal agencies need a practical method of assessing whether their policies and investments (made in the form of competitive programs, formula programs, vouchers, tax credits, and other subsidies) will further inclusivity, environmental sustainability, both, or neither. HUD may wish to evaluate, for example, whether prioritizing the development of new subsidized housing in locations that will further environmental sustainability would expose the residents of that housing to better opportunities for education, jobs, or neighborhood quality, or would place the residents in neighborhoods that are struggling.

This section of the paper suggests one such method. It begins by proposing metrics to measure three outcomes: *walkability and transit accessibility*, two of the key concerns of environmental sustainability; *opportunity*, or the richness of educational, employment, and quality of life opportunities that neighborhoods offer their residents; and *inclusivity,* or whether high-opportunity neighborhoods are open to lower-income households and people of color. It then uses two metropolitan areas, New York and Seattle, as test cases, applying the proposed metrics to those areas to assess whether the goal of environmental sustainability may sometimes be in tension with the goal of encouraging inclusivity.

Developing environmental sustainability metrics is challenging because, as discussed above, for some people, sustainability encompasses not only environmental concerns but also opportunity and inclusivity. To others, it is limited to environmental concerns. We use the narrower definition because defining sustainability more broadly risks concealing the underlying tradeoffs between, for example, reducing auto emissions and encouraging greater access to high-performing schools. Further, defining sustainability more broadly risks providing cover for those who pay lip service to inclusivity while ignoring its demands. In addition, creating a single, broad metric incorporating all factors requires difficult decisions about how to weigh different criteria. Separating the components of sustainability offers more transparency and affords more flexibility to policymakers.

To keep this project manageable, we focused walkability and transit accessibility of the neighborhood because this is widely considered to be key elements of the definition of environmental sustainability. As explained further in part (a), those concerns figure prominently in all the efforts to define and measure environmental sustainability that we studied, and are the major focus of the DOT, HUD, and DOE joint task force.

To measure inclusivity, we first assessed the opportunities, such as educational and employment offerings, each neighborhood provides within the metropolitan area. As described further in part (a), we looked at a range of opportunity factors and chose those most commonly employed across different types of indices in the literature. We then measured the extent to which neighborhoods offering different levels of opportunity and walkability/transit accessibility are occupied by racial and ethnic minorities, low-income households, and HUD-assisted households. In other words, we measured how much access

all residents of a metropolitan area have to neighborhoods that provide opportunities for advancement and that are more pedestrian and transit friendly.

We applied the metrics to two metropolitan areas, using the analysis as a test case to assess how much the goals of walkability/transit accessibility, on one hand, and opportunity and inclusivity, on the other, might be in tension or might be complementary. We chose a newer metropolitan area on the West Coast, Seattle, and part of an older metropolitan area on the East Coast, New York City. Both areas provide a mix of densities within the urban areas, inner suburbs, and outer suburbs. We used census tracts to approximate neighborhoods within the metropolitan areas.

In both Seattle and New York, we found that areas of high opportunity and high walkability/transit accessibility largely do not overlap, and that significant tensions exist between opportunity and walkability/transit accessibility at the neighborhood level. Thus, policies designed to place federally assisted housing in neighborhoods with better access to transit, or to encourage voucher recipients to move to those neighborhoods, may undermine efforts to improve social and economic opportunities for lower-income or minority residents, and vice versa. Similarly, the access lower-income people, people of color, and residents of HUD-assisted housing or voucher recipients now have to neighborhoods of high opportunity differs significantly from the access they have to walkable and transit-friendly neighborhoods. Policies designed to encourage metropolitan areas to be more transit oriented accordingly may be in tension with policies designed to encourage metropolitan areas to become more inclusive of lower-income people and people of color.

However, our analysis also suggests ways in which HUD can promote both opportunity and walkability/transit accessibility. Some neighborhoods rank highly in both dimensions. Moreover, as discussed further in Section 4, HUD and federal agencies have tools that they can use to help create more of these win-win neighborhoods.

This section proceeds as follows. Part (a) explains how we chose the metrics for walkability/transit accessibility, opportunity, and inclusivity. Part (b) applies the walkability/transit accessibility and opportunity metrics to neighborhoods in Seattle and New York, and discusses tensions and convergences between those metrics. Part (c) applies the inclusivity metrics to the Seattle and New York metropolitan areas as a whole, and discusses the potential conflicts and synergies of walkability/transit accessibility and inclusivity. Part (d) suggests further research to help design federal policies that promote both environmental sustainability and more equally accessible opportunity.

(a) The proposed metrics

We identified indicators for neighborhood opportunity and walkability/transit accessibility by reviewing indices used by various groups, reviewing related literature, and interviewing

experts in the fields to identify commonly used indicators.[10] We included only indicators for which data were available nationwide at smaller levels of geography (generally geocoded location, census tract, zip code, or political jurisdiction).

Our processes were not meant to be exhaustive. Our intent was to gather a representative list of neighborhood opportunity and walkability/transit accessibility indicators. As summarized in the tables below, the opportunity indicators fall into four policy arenas: educational opportunity, economic opportunity, neighborhood safety, and air quality. The walkability/transit accessibility indicators fall into two arenas: auto dependency and density. We present a table of the indicators below and a more detailed discussion of the indicators surveyed and why we chose the ones that we did in appendices A and B.

Even though we limited our environmental sustainability focus to walkability/transit accessibility measures, and limited our opportunity indicators to a few areas, some indicators we considered could be categorized as measuring both environmental sustainability and opportunity. For example, a measure of the proximity of a particular neighborhood to job centers might indicate not only economic opportunity but reduced auto dependency. Further, air quality, which we consider an aspect of neighborhood opportunity, could be seen as an environmental outcome.[11] The difficulty of drawing lines between the categories illustrates again that sustainability (even narrowed to "environmental sustainability" and within that subset, narrowed even further to walkability/transit accessiblity) can encompass many aspects of a neighborhood's quality of life. Our framework admittedly draws lines about which reasonable people can disagree, but defines walkability/transit accessibility by focusing on how the neighborhood infrastructure allows households to avoid driving, and defines opportunity by reference to chances to improve one's education, employment, and neighborhood quality of life. Our framework distinguishes between walkability/transit accessibility and opportunity instead of folding them into an all-inclusive sustainability index, because only by looking at each separately can we ensure that we have not defined away tensions that should be confronted. There may be other valid approaches that, for example, disaggregate the indicators into more indices (such as a separate index for air quality).

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[10] For example, we reviewed the metrics several nonprofits used in opportunity mapping, most notably the work by john powell and the Kirwan Institute at Ohio State University. We also examined metrics local governments have used to target their resources to higher opportunity areas, such as the comprehensive mapping initiative in King County, Washington, and the competitions state housing finance agencies have conducted to decide between proposals for Low Income Housing Tax Credit developments. Finally, we examined opportunity metrics used by businesses that help people of all incomes determine where they should move. Such sites as realtor.com and neighborhoodscout.com that provide information on opportunities helped us think about what information market actors consider valuable. We studied the one certification system addressed to a neighborhood scale, the U.S. Green Building Council's LEED for Neighborhood Development. We also examined several initiatives that compare and rank metropolitan areas in terms of their environmental sustainability. Finally, we reviewed several programs that major U.S. cities, as well as international initiatives, have implemented.

[11] To test whether our decision to include air quality as an opportunity indicator rather than as a walkability/transit accessibility indicator affected our analysis, we compiled the matrix described in subpart (b) with and without the air quality indicator as a measure of opportunity. Including air quality in the opportunity index affected the classification of only 7 to 9 percent of the tracts.

Similarly, our framework chooses one way of measuring inclusivity among several different potential approaches. We define as "inclusive" metropolitan areas in which neighborhoods that are rich in opportunity or that are walkable and transit friendly are distributed in roughly equal shares across residents of different race or ethnicity, income level, and status as HUD-assisted tenants or voucher recipients. We do not focus on how well integrated the high-opportunity neighborhoods are (a measure that also could be seen as an element of opportunity itself) or on the stability of the neighborhoods' demographics, although those might be considered critical elements of inclusivity. Again, there are undoubtedly other valid approaches to measuring inclusivity, and both HUD's legal obligations and its policy choices regarding fair housing are critical considerations for any inclusivity measure.

We discuss further in part (d) data gaps that, if filled by federal, state, or local government, could allow a stronger analysis. For example, if there were more detailed crime statistics available on a neighborhood level, the opportunity metric for crime would provide a more accurate indicator of neighborhood safety than our current data do. For walkability/transit accessibility, we were not able to obtain consistent data on access to or quality of transit. Part (d) also highlights potential next steps for more detailed research using currently available data.

Table 2. Summary of Opportunity Indicators

Opportunity Arena	Indicator	Data Source
Education	Percent of elementary school students proficient in state reading and math tests	School Data Direct
	Percent of elementary school students on free and reduced-price lunch	School Data Direct
Crime	Number of violent crimes per thousand people	FBI Uniform Crime Report (2008)
	Number of property crimes per thousand people	FBI Uniform Crime Report (2008)
Economic Opportunity	Number of jobs at associate's degree level within five-mile radius of tract	Census Zip Business Patterns (2006), BLS Occupational Training Data
	Number of jobs at associate's degree level within five-mile radius divided by number of people at or below 60 percent AMI within five-mile radius	Census Zip Business Patterns (2006), BLS Occupational Training Data
	Growth rate for jobs at "associates degree" level between 1998 and 2006 within 5-mile radius	Zip Business Patterns Data (2006 and 1998), BLS Occupational Training Data
Environmental Quality[a]	Sum of common chemical releases (lead, nitric acid, mercury, etc.)	EPA Toxic Release Inventory
	Estimated total respiratory risk from air toxics	EPA National Air Toxics Assessments (NATA)
a. Because data were not sufficiently available, we were unable to include other environmental measures at the neighborhood level that are important to neighborhood quality, such as water quality, proximity to polluted sites, or availability of open space.		

Table 3. Summary of Walkability/Transit accessibility Indicators

Walkability or Transit Accessibility Concerns	Indicator	Data Source
Automobile dependency	Percent of commuters commuting to work by walking + percent of commuters to work by public transit	U.S. Census (2000)
	Daily vehicle miles traveled per capita (weighted average of all households)	FHA National Household Travel Survey (2001)
Density and walkability	Total population/land area (sq. mi.)	U.S. Census (2000)
	Average block size in census tract (sq. ft.)	U.S. Census (2000)

We do not measure inclusivity at the neighborhood level. As indicators of **inclusivity at the metropolitan level,** we assess the percentage of federally assisted housing units, users of housing choice vouchers, and minority residents that have access to the neighborhoods we define as high walkability/transit accessibility and high opportunity, based upon the indicators discussed above.

(b) Potential synergies and tensions between walkability/transit accessibility and opportunity at a neighborhood level

We applied the metrics of walkability/transit accessibility and opportunity to the New York and Seattle metropolitan areas to assess potential tensions and synergies between the goals. The Seattle area is based on the Census definition and covers the Puget Sound region, namely Island, King, Kitsap, Pierce, Snohomish, and Thurston counties. For simplicity, we refer to this area throughout the paper as Seattle. New York includes the entire city and a selected group of suburbs, including Bergen, Hudson, Nassau, Passaic, Rockland, Suffolk, and Westchester Counties.

We first look at how much high-opportunity and high-walkability/transit accessibility neighborhoods overlap based on an index of all opportunity and walkability/transit accessibility factors; we then look at the correlations between individual opportunity and walkability/transit accessibility factors; and finally, we break our analysis down to the county level to show methodological choices that the analysis reveals are important.

Because we only looked at two of the several hundred metropolitan areas in the country, our results should be considered suggestive. The same analysis may yield different results when applied to other cities. We further caution that, because our indices are relative measures, the definition of the area studied is critical to the results. An older suburb in Westchester County, for example, looks highly walkable and transit friendly compared with an exurb in Connecticut, but looks low on those measures compared with Manhattan.

- *Less than 20 percent of neighborhoods in either Seattle or New York currently offer both above-median degrees of walkability/transit accessibility and above-median social, environmental, and economic opportunities.*

We first look at how individual neighborhoods within those metropolitan areas fare on measures of walkability/transit accessibility and opportunity. If the measures identify different neighborhoods, then policies that direct investments to walkable and transit-friendly neighborhoods may steer resources away from low-opportunity neighborhoods in need of revitalization, or steer housing or other investments away from the high-opportunity neighborhoods that residents of subsidized housing or voucher recipients might most benefit from living in. Accordingly, we analyze how neighborhoods rank on the various measures, then identify how much overlap there is between the neighborhoods that provide different levels of walkability/transit accessibility and those that provide different levels of opportunity.

To do so, we created a single index for opportunity and a single index for walkability/transit accessibility. In each case, the index score for a neighborhood reflects the average of how all indicators for that neighborhood deviate from the mean of all metropolitan-wide tracts.[12] To assess the number of tracts that rank above the median in both indices, we divided all the census tracts in each area into four quartiles according to how they ranked on opportunity measures and walkability/transit accessibility indicators. We then further divided the tracts into a four by four matrix, representing the 16 potential combinations of walkability/transit accessibility and opportunity quartiles.

For some of our analyses, we further simplify by collapsing the matrix into four groups of tracts:

- Low opportunity, low walkability/transit accessibility: those which are below the median on both opportunity and walkability/transit accessibility measures

- Low opportunity, high walkability/transit accessibility: those which are below the median on opportunity and above the median on walkability/transit accessibility

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[12] We weighed all opportunity indicators described in the charts in part (a) equally in determining an overall opportunity score, and all walkability indicators described in the charts equally in determining an overall walkability score. This method, though used by many people who have done opportunity and sustainability indices in the past, may have some drawbacks, and there are potential arguments for unequal weightings.

- High opportunity, low walkability/transit accessibility: those which are above the median on opportunity and below the median on walkability/transit accessibility

- High opportunity, high walkability/transit accessibility: those which are above the median on both opportunity and walkability/transit accessibility.

Table 4 shows the distribution of census tracts in Seattle across those four types of neighborhoods. Table 5 provides these same measures for New York. Figures 1–4 (in appendix E) map the quartiles for both indices in each metro area.

Our analysis suggests several points of tension between walkability/transit accessibility and opportunity at a neighborhood level, while also revealing potential synergies.

Table 4 reveals that only about 18 percent of Seattle neighborhoods are above the median in both walkability/transit accessibility and opportunity. More common are neighborhoods that are above median in walkability/transit accessibility, but below median in opportunity (32 percent) or above median in walkability/transit accessibility, but below median in opportunity (18 percent).

Table 4. Clusters of Walkability/Transit Accessibility and Opportunity Quartiles in Seattle (percent)

	Low walkability/transit accessibility	High walkability/transit accessibility
Low opportunity	18	32
High opportunity	18	18

Table 5 shows that only 11 percent of New York neighborhoods are above the median for both walkability/transit accessibility and opportunity. More common are neighborhoods that are above median in opportunity, but below median in walkability/transit accessibility (39 percent) or above median in walkability/transit accessibility, but below median in opportunity (39 percent).

Table 5. Clusters of Walkability/Transit Accessibility and Opportunity Quartiles in New York City (percent)

	Low walkability/transit accessibility	High walkability/transit accessibility
Low	11	39

opportunity		
High opportunity	39	11

At least in Seattle and New York, policies that encourage families to locate in walkable and transit-friendly neighborhoods without regard to the social and economic opportunities those neighborhoods provide may work against the goal of providing those families with access to better opportunities, and thus must be thought through carefully.

- *Many measures of neighborhood walkability/transit accessibility tend to be inversely related to measures of opportunity.*

To understand better why relatively few neighborhoods currently provide both high levels of walkability/transit accessibility and high levels of other opportunities, we examined the degree to which two different measures of walkability/transit accessibility correlate with measures of opportunity. Tables 6–7 present this analysis for Seattle. Tables 8–9 present the same analysis for New York.[13] These analyses are useful in understanding neighborhood characteristics but do not suggest a causal relationship; that is, the fact that most high-density neighborhoods have lower test scores does not mean that a new high-density neighborhood will also have lower test scores.

These tables divide the neighborhoods of Seattle and New York into quartiles, depending on the degree to which they currently further walkability/transit accessibility goals. The rows of the tables show how each of nine measures of opportunity varies with measures of walkability/transit accessibility.

Table 6. People per Square Mile by Quartile in Seattle

Opportunity Metrics	Q1	Q2	Q3	Q4
Quartile max	1,078.93	3,244.91	5,242.45	45,235.00
Percent of students on free and reduced-price lunch	0.29	0.37	0.42	0.46
Percent of students proficient in state math test	0.58	0.58	0.55	0.55
Percent of students proficient in state reading test	0.76	0.77	0.74	0.73
Number of jobs at associate's degree level within five miles of tract divided by number of people at or below 65 percent of AMI	0.51	0.74	0.7	0.74
Absolute number of jobs at associate's degree level within five miles of tract in 2006	10,964.01	32,681.8	44,539.93	89,190.98

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[13] We provide additional tables in appendix D for the remaining measures of walkability/transit accessibility.

Growth rate for jobs at associate's degree level from 1998 to 2006 within five miles of tract	0.12	0.04	-0.02	-0.05
Number of violent crimes per 1,000 persons	3.86	4.14	3.87	3.93
Number of property crimes per 1,000 persons	38.82	42.39	42.1	43.66
Total toxic releases in tract (TRI)	11,649.7	9,061.12	7,096.16	6,864.72
Total respiratory risk in tract (NATA)	5.29	8	9.25	11.95

Table 7. Average Vehicle Miles Traveled per Capita per Day by Quartile in Seattle

Opportunity Metrics	Q1	Q2	Q3	Q4
Quartile max	81.34	62.10	50.85	42.32
Percent of students on free and reduced-price lunch	0.25	0.34	0.44	0.51
Percent of students proficient in state math test	0.61	0.58	0.55	0.51
Percent of students proficient in state reading test	0.79	0.76	0.74	0.71
Number of jobs at associate's degree level within five miles of tract divided by number of people at or below 65 percent of AMI	0.76	0.75	0.6	0.59
Absolute number of jobs at associate's degree level within five miles of tract in 2006	13,624.74	36,343.93	48,087.4	79,320.66
Growth rate for jobs at associate's degree level from 1998 to 2006 within five miles of tract	0.13	0.02	-0.03	-0.04
Number of violent crimes per 1,000 persons	3.89	3.81	4.08	4.01
Number of property crimes per 1,000 persons	40.46	41.14	43.01	42.36
Total toxic releases in tract (TRI)	696.47	6474.14	10148.38	17352.7
Total respiratory risk in tract (NATA)	5.75	8.07	9.4	11.27

These tables reveal that in Seattle, as density increases, the larger the share of children in local schools eligible for free lunch, the higher the rate of property crime (but not violent crime) in the jurisdiction where the tract is located, and the greater the respiratory risk of the neighborhood. Similarly, tracts where people drive fewer miles overall have slightly higher rates of crime, a significantly greater share of students eligible for free lunch, as well as higher levels of respiratory risk. The relationship between measures of walkability/transit

accessibility and other measures of opportunity—access to jobs, test scores, and toxic releases—is more mixed in Seattle. For example, there are more entry-level jobs in high-walkability/transit accessibility neighborhoods, even when correcting for the fact that there are also more workers competing for those jobs—but the number of jobs is growing more rapidly in lower-walkability /transit accessibility neighborhoods.

Table 8. People per Square Mile by Quartile in New York City

Opportunity Metrics	Q1	Q2	Q3	Q4
Quartile max	7,176.07	24,726.19	50,875.00	223,600.00
Percent of students on free and reduced-price lunch	22.8	56.982	80.48	80.94
Percent of students proficient in state math test	86.06	78.509	74.14	69.52
Percent of students proficient in state reading test	80.17	70.979	63.97	59.43
Number of jobs at associate's degree level within five miles of tract divided by number of people at or below 65 percent of AMI	0.94	0.464	0.4	0.55
Absolute number of jobs at associate's degree level within five miles of tract in 2006	110,137.77	217,141.29	393,117.55	622,400.43
Growth rate for jobs at associate's degree level from 1998 to 2006 within five miles of tract	14.16	15.82	17.54	14.45
Number of violent crimes per 1,000 persons	2.17	3.582	5.69	6.38
Number of property crimes per 1,000 persons	15.06	12.947	14.98	18.65
Total toxic releases in tract (TRI)	1638.39	201.638	84.22	59.15
Total respiratory risk in tract (NATA)	6.42	8.848	10.5	12.32

Table 9. Average Vehicle Miles Traveled per Capita per Day by Quartile in New York City

Opportunity Metrics	Q1	Q2	Q3	Q4
Quartile max	80.24	44.47	30.81	14.00
Percent of students on free and reduced-price lunch	20.05	54.8	73.65	86.36
Percent of students proficient in state math test	87.3	79.73	74.901	67.92
Percent of students proficient in state reading test	81.76	72.16	65.587	57.25
Number of jobs at associate's degree level within five miles of tract divided by number of people at or below 65 percent of AMI	0.92	0.41	0.598	0.35
Absolute number of jobs at associate's degree level within five miles of tract in 2006	72,264.74	143,932.1	484,733.78	516,265.35
Growth rate for jobs at associate's degree level from 1998 to 2006 within five miles of tract	14.14	18.25	15.34	15.26
Number of violent crimes per 1,000 persons	1.99	3.5	5.258	6.48
Number of property crimes per 1,000 persons	15.22	12.72	16.841	15.46
Total toxic releases in tract (TRI)	886.81	1154.42	201.587	62.8
Total respiratory risk in tract (NATA)	5.91	8.33	11.47	11.32

Note: Tracts are not equally distributed because all tracts in Manhattan have identical data due to a limitation in Census data.

Tables 8–9 present our correlation analysis for the New York metropolitan area. In New York, most measures of opportunity trend in the opposite direction of all measures of walkability/transit accessibility.[14] The only opportunity metric generally positively correlated (improves as walkability/transit accessibility improves) is toxic releases. Unlike respiratory risk (our other measure of environmental quality), toxic releases are lower on average in denser areas in Seattle and New York. This result may reflect a tendency of industrial uses, which contribute most toxic releases, to select large parcels isolated from residential areas. We caution, however, that we only measured impacts within two miles of a TRI facility, and therefore do not capture the impact of emissions beyond that buffer. Areas with lower vehicle miles traveled also have lower toxic releases.

The negative correlation between so many measures of walkability/transit accessibility and the measures of opportunity show the importance of the choice of metrics. The measures we have used, for the reasons outlined above, tend to describe denser, more urbanized

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[14] Property crime in New York, and violent crime in Seattle, do not have clear patterns of correlation with walkability/transit accessibility measures.

neighborhoods as walkable and transit accessible, and therefore more environmentally sustainable. An index that instead focused, for example, on environmental quality—like acres of open space, absence of polluted brownfields, or air and water quality, on the other hand, might rank more suburbanized areas higher than urban areas. The negative correlation also suggests that policies that target particular neighborhoods for investment must pay attention to both opportunity metrics and different measures of environmental sustainability, and must be careful to target investments in ways that do not make progress on one goal at the cost of going backwards on the other.

- *There is considerable variation across counties in both the Seattle and the New York metropolitan areas in the availability of neighborhoods that provide both walkability/transit accessibility and opportunity.*

For the metropolitan areas of Seattle and New York, a relatively small share of neighborhoods are both highly walkable and transit friendly and provide rich opportunities, as noted above. The pattern is not consistent across the counties that make up those areas, however. Table 10 presents the percentages of tracts in each county in Seattle that are above the metropolitan-wide median for our indices of opportunity, walkability/transit accessibility, and both. Table 11 presents that information for New York. Both tables reveal that some counties in each metropolitan area have a high percentage of tracts that are both highly walkable/transit accessible and deliver high opportunity. In others, few or no tracts qualify as both.

Table 10. Percent of Tracts above Metropolitan-Wide Median by County in Seattle

County	Above median opportunity	Above median walkability/transit accessibility	Above median opportunity and walkability/transit accessibility
Island	78	28	28
King	50	64	26
Kitsap	66	28	7
Pierce	10	45	1
Snohomish	71	36	13
Thurston	90	30	27

Table 11. Percent of Tracts above Metropolitan-Wide Median by County in New York City

County	Above median opportunity	Above median walkability/transit accessibility	Above median opportunity and walkability/transit accessibility
Bergen	100	0	0
Bronx	1	81	0
Hudson	67	59	46
Kings	12	88	8
Nassau	96	0	0
New York	38	97	38
Passaic	80	14	1
Queens	51	52	20
Richmond	57	9	0
Rockland	76	0	0
Suffolk	95	0	0
Westchester	82	8	1

These tables highlight the importance of the geographic scale of the comparison group. Comparisons of all neighborhoods in the metropolitan area may point to different neighborhoods as walkable and transit friendly (or as providing rich opportunities) than comparisons of neighborhoods at a county or city level would. For example, although no tracts in Bergen County are above median in both walkability/transit accessibility and opportunity when compared to the metropolitan area, 11 percent of tracts in Bergen County are above the median in walkability /transit accessibility and opportunity when compared with other tracts in Bergen County, as shown in the map in appendix E. We provide further information in appendix D, Tables 14 and 15, which show that all counties have at least some tracts with both above-median opportunity and above-median walkability/transit accessibility relative to other tracts within that county. These different scales may be relevant to different HUD programs as some programs operate on a city level, some on a county level, and some on a metropolitan area level. For example, policies aimed at county-level Community Development Block Grant funding might use county-level geographic comparisons instead of metropolitan-wide comparison.

Policies that seek to site housing in, direct voucher holders to, or otherwise encourage low-income and minority residents to live in neighborhoods above the median in opportunity and walkability/transit accessibility will have a small, but not insignificant, set of neighborhoods to work with. These neighborhoods present significant opportunities to leverage federal

investments to encourage greater walkability/transit accessibility and to provide low-income and minority families with greater access to social, environmental, and economic opportunities.

(c) Potential synergies and tensions between walkability/transit accessibility and inclusivity at a metropolitan level

The above analysis shows possible tensions and synergies between policies to encourage more walkable and transit friendly neighborhoods and to increase the opportunities available to lower-income and minority families. In this part, we examine whether similar tensions and leveraging opportunities might arise over policies that seek to encourage walkability/transit accessibility at the scale of a metropolitan area.

Ideally, to answer this question, one would replicate the type of analyses described above in metropolitan areas across the country, examining whether, on a metropolitan-wide level, metropolitan areas that are more walkable and transit friendly also provide better opportunities to low-income or minority families and are more inclusive. Selecting the metrics that should be used to measure walkability/transit accessibility, opportunity, and inclusivity is more complex at the metropolitan level, however, because more data are available and because there are many difficult conceptual questions about how to measure opportunity and inclusivity and about how to compare the walkability/transit accessibility, opportunity, and inclusivity of diverse metropolitan areas.

At a minimum, however, measuring opportunity and inclusivity at a metropolitan level would have to include an analysis of whether low-income or minority families, including families in housing subsidized directly or indirectly through HUD's investments, have access to neighborhoods within the area that provide greater opportunities.

Disparities in access to opportunities are only possible because of racial and economic segregation. If there were no segregation, then groups would be equally exposed to neighborhood conditions and quality within a metropolitan area. Theoretically, a metropolitan area could be highly segregated and still deliver the same opportunity to different groups, but that is almost never the case. Given the difficulty of collecting consistent data to measure opportunity, particularly on a metropolitan level, federal policymakers may want to focus not only on tracking the disparities in access to neighborhoods providing rich social and economic opportunities, but on directly tracking changes in segregation over time.

Definitively answering complex questions about which indicators to use on a metropolitan level is beyond the scope of this project. Instead, this part seeks to frame future discussions by using our two case-study metropolitan areas—Seattle and New York—to assess whether residents of federally assisted homes, recipients of housing vouchers, and minority residents have access to the walkable, transit friendly, and high opportunity neighborhoods that is comparable to the access of the population as a whole. That analysis illustrates the kinds of

issues that HUD and other federal agencies must tackle before using walkability/transit accessibility measures to target federal investments among different metropolitan areas.

- *In New York and Seattle, federally assisted homes disproportionately are located in, and vouchers recipients disproportionately reside in, low-opportunity and high-walkability/transit accessibility neighborhoods.*

Figures 2 and 3, which show the distribution of federally assisted homes and Housing Choice voucher recipients in both metropolitan areas, reveal that federally assisted homes and Housing Choice Voucher recipients in both New York and Seattle are disproportionately located in low-opportunity and high-walkability/transit accessibility neighborhoods. For every category of subsidized unit, as well as for Housing Choice Vouchers, most residents live in such neighborhoods. Indeed, roughly twice the percentage of people living in federally assisted housing live in lower-opportunity, higher-walkability/transit accessibility neighborhoods than for the population as a whole.

Figure 2: Share of Subsidized Housing Units and Vouchers in Seattle in Different Ttypes of Neighborhoods
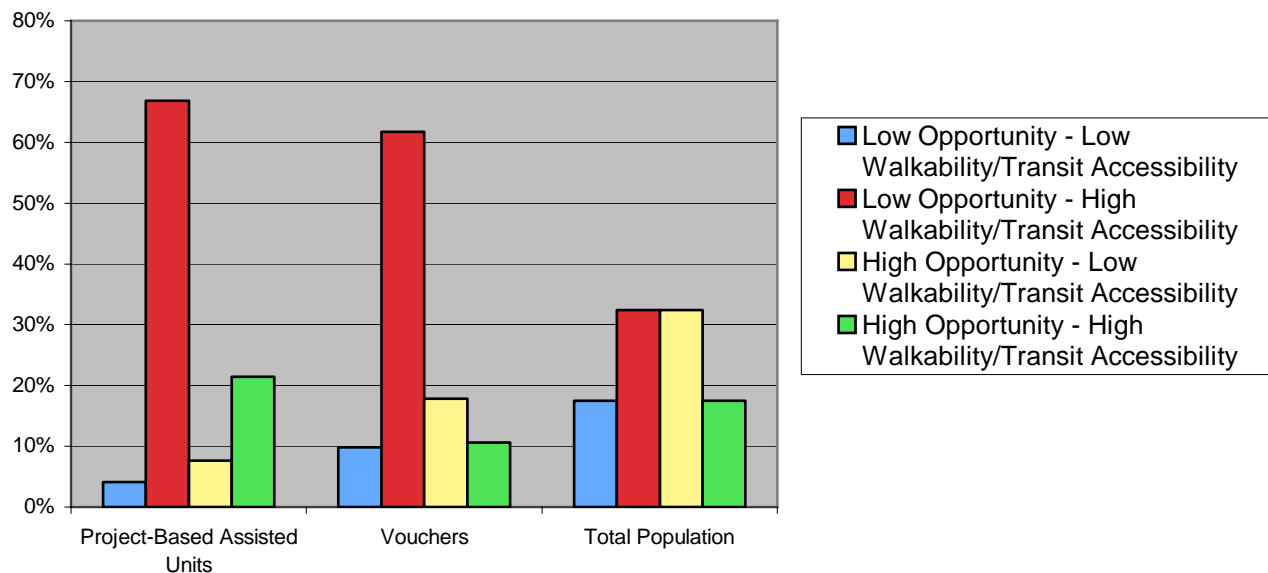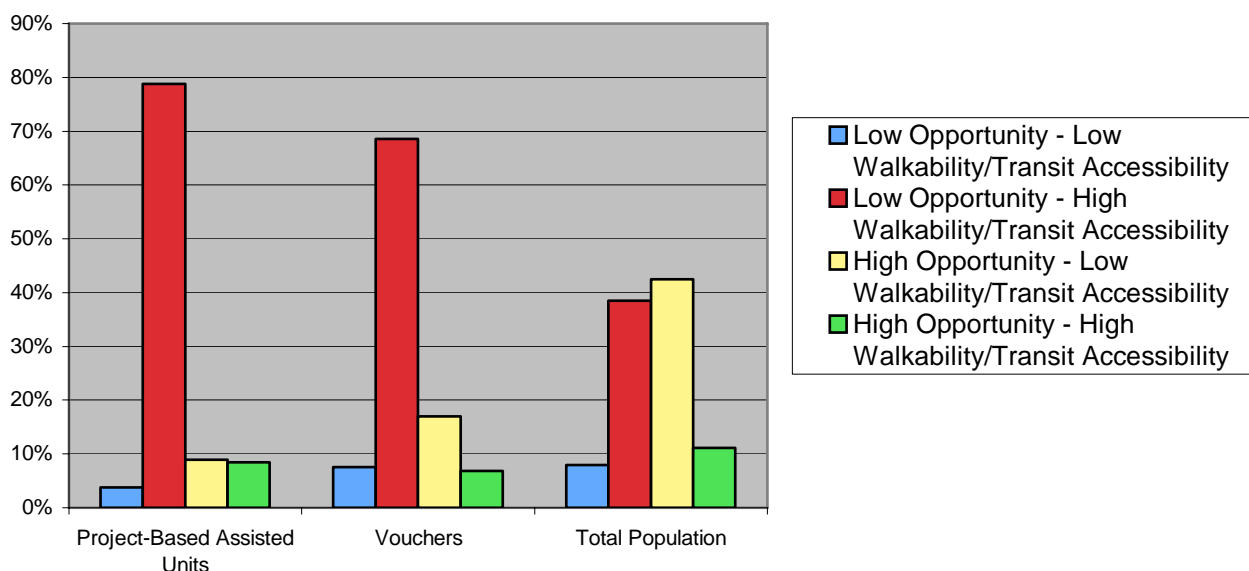
Figure 3: Share of Subsidized Housing Units and Vouchers in New York City in Different Types of Neighborhoods

These results may be shaped in part by inherent biases in the walkability/transit accessibility metrics used. For example, most federally assisted housing is built at a higher density than housing in a metropolitan area as a whole, thus increasing the density score of the tract where it is located. In addition, as noted, lower-income people are more likely to take transit, so transit modal share of tracts with subsidized housing is higher. In Seattle, higher poverty tracts have more people commuting by transit, fewer daily vehicle miles traveled, higher density, and smaller block sizes—so that poorer tracts do better on all four of the walkability/transit accessibility metrics. The story is similar in New York for three of the four walkability/transit accessibility categories—with density being a narrow exception. These data may suggest a need to adjust the walkability/transit accessibility data to account for income factors—an issue we return to in part (d).

For a variety of well-documented reasons, federally assisted project-based housing has disproportionately ended up in high poverty tracts. As a result of those factors, most federally assisted housing is in lower-opportunity, higher-walkability/transit accessibility tracts. Policies to encourage community development in higher-walkability/transit accessibility neighborhoods therefore could increase opportunities for voucher holders and residents of federally assisted housing.

Data on voucher holders are more complex. Significantly more voucher holders in both metro areas are found in high-walkability/transit accessibility, low-opportunity tracts than the distribution of rental units affordable at rents below fair market rent (FMR) would suggest. Thirty-five percent of the total number of rental units affordable to voucher holders in New York and 26 percent in Seattle are in low-walkability/transit accessibility, high-opportunity communities, and even more are likely affordable through exception rent procedures, which

our analysis does not consider. Yet only 17 percent of voucher holders in New York and 18 percent in Seattle live in such communities. This disparity may reflect discrimination based on race and ethnicity or source of income by landlords; a lack of information about these communities available to voucher holders; or a preference of some voucher holders to trade off access to opportunity for proximity to transit or other factors. Voucher policies should attempt to address barriers voucher holders face in choosing these high-opportunity communities, barriers which our data suggest go beyond unaffordable rental units.

- *A significant share of federally assisted units already are located in neighborhoods that are above the median for both opportunity and walkability/transit accessibility.*

Figures 2 and 3 above also reveal that, in both metropolitan areas, a significant share of subsidized units are in neighborhoods above the median for both opportunity and walkability/transit accessibility. In fact,Low Income Housing Tax Credit (LIHTC) units are found in such neighborhoods at a greater rate than the population as a whole. Given that the LIHTC is currently the largest federal housing production program, this finding is particularly important, though data from two areas cannot be assumed to represent the entire country. Policies that prioritize preservation of federally assisted units already in high-opportunity and high-walkability/transit accessibility neighborhoods therefore serve the goals of both walkability/transit accessibility and inclusivity.

Housing Choice Voucher recipients are more rarely found in such neighborhoods. Much of the problem appears to be a lack of supply of affordable units; far fewer units affordable at the FMR are available in high-opportunity, high-walkability/transit accessibility neighborhoods (16 percent of units affordable at the FMR in Seattle and 9 percent in New York) than in low-opportunity, high-walkability/transit accessibility neighborhoods or even high-opportunity, low-walkability/transit accessibility neighborhoods. Efforts to encourage voucher recipients to locate in such neighborhoods, such as making vouchers worth more in those neighborhoods and incentivizing housing authorities to provide information about such neighborhoods to voucher holders, could encourage both walkability/transit accessibility and inclusivity.

- *Racial and ethnic minorities in Seattle and New York tend to live in neighborhoods that offer above-median walkability/*transit accessibility *but below-median opportunity.*

Figures 4 and 5 (and tables 17 and 18 in Appendix D) examine the share of four major racial and ethnic populations (Asian, black, Hispanic, and white) in Seattle and New York that live in the different clusters of neighborhoods. They reveal that relative to whites, minorities tend to live in higher-walkability/transit accessibility, but lower-opportunity, neighborhoods. This pattern is driven in large part by the fact that the higher density and less auto-dependent neighborhoods that score highly on walkability/transit accessibility measures tend to be more urban and disproportionately populated by racial minorities.

Again, this analysis reveals potential tensions and synergies between efforts to promote walkability/transit accessibility and the goals of inclusivity. Policies to direct federal investment to metropolitan areas in which a larger share of minorities currently enjoy more walkable and transit-friendly neighborhoods, for example, could compromise efforts to create more choices for minorities to live in high-opportunity neighborhoods. On the other hand, policies to encourage community development in areas with large shares of minorities in walkable, transit-friendly neighborhoods, or to provide both more housing choices and more transit options in high-opportunity neighborhoods, could leverage investments to achieve walkability, opportunity, and inclusivity.

Figure 4: Share of Seattle's Racial and Ethnic Populations Living in Different Types of Neighborhoods
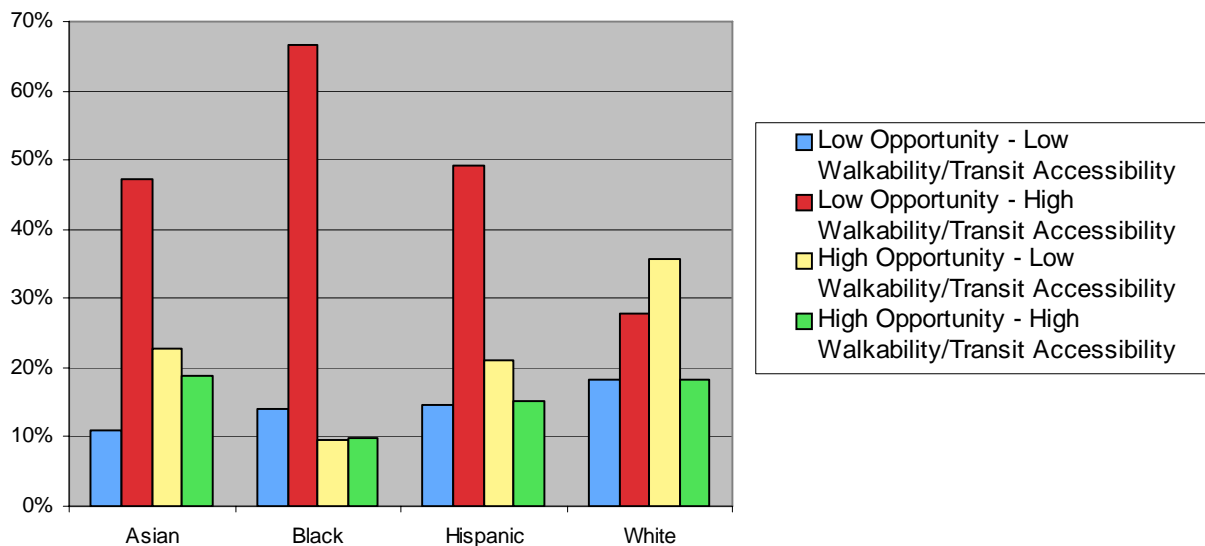
(d) Limits of This Analysis and a Future Research Agenda

From this initial analysis of two metropolitan areas, we have identified several limitations of our work, which form an agenda for further research. The first area for further work concerns data limitations with our methodology which could be addressed with further research. The second area concerns choices made in doing this kind of analysis (e.g., what constitutes the basic geographic unit of comparison) that are critical but also debatable.

Figure 5: Share of New York's Racial and Ethnic Populations Living in Diferent Types of Neighborhoods

Areas in Which Future Research with Better Data Could Be Helpful

1. Analysis of weaker markets and, more generally, extending the analysis to all metro areas.

Other experts have suggested that we conduct a similar analysis in a weaker market city. Such an analysis should be possible without significant additional methodological design and at relatively low cost. More importantly, it would be helpful to investigate how to make the analysis portable and extendible so that the methodology could be easily replicated for any metro area. Because the data are universally available, conducting similar analyses at varying levels of geography should be possible.

2. Considering only universally available data narrows the scope of measures and may limit accuracy.

As noted earlier, we used only measures for which data are universally available at the neighborhood level.[15] These criteria limited not only the scope of our analysis but, in certain cases, the quality and accuracy of the data on which we rely.

We did not include several measures that other opportunity researchers have suggested, because data were either unreliable or unavailable at a tract level across the country. These

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[15] The crime data we used are universally available but only on the jurisdiction level; the jurisdiction-level crime rates were used for each tract within each jurisdiction.

measures include residential building permits, home price appreciation, tax base capacity, incidence of asthma, and civic participation.

Similarly, many indices consider a much wider range of environmental measures than included here. Indices we surveyed considered diversion and production of waste, water supply, infill and land reuse, transit proximity, impervious surface area, as well as neighborhood completeness and accessibility. For each of these policy areas, data meeting our criteria were unavailable. Individual local jurisdictions may be able to provide these data, however. For example, data on local zoning or transit location and service frequency would allow an improved assessment of neighborhood accessibility.

Moreover, local data often may provide a more accurate assessment of a particular measure even if some data are available nationally. For example, crime data in the Uniform Crime Report are gathered only at the jurisdiction level. Some local precincts may be able to provide more accurate data at smaller geographies.

To increase the scope of measures available, federal policymakers should consider incentives and other programs that encourage local jurisdictions to improve data gathering and production. In addition, localities could also draw on data available from nongovernment sources, such as "walk score" or other privately produced datasets. Relying on privately produced (but publicly available) data sources may help expand data availability and increase how often they are provided.

3. Using static, rather than dynamic, indicators ignores trends and projections.

The indicators that we use provide only a static snapshot of each neighborhood at a particular time. However, neighborhoods are not static. People move in and move out, new infrastructure is developed and old infrastructure declines, and employers increase staff or cut back. A system that considers these trends and how indicators change over time would provide a more complete picture of each neighborhood and might result in more efficient investments. It also could examine both relative and absolute trends of inclusivity—that is, examine both whether opportunity for lower-income people and racial minorities is increasing over time on an absolute basis and whether opportunity is increasing over time relative to the population as a whole—and whether neighborhoods remain stably integrated over time.

4. Not explicitly including racial and economic segregation may limit analysis.

Our data do not explicitly measure racial and economic segregation as an opportunity factor in itself; given the difficulty of collecting consistent data to measure opportunity, particularly on a metropolitan level, federal policymakers may choose to focus not only on tracking the disparities in social and economic opportunity that segregation may facilitate, but on directly tracking changes in segregation over time as well and incorporating those changes into funding decisions.

5. Failing to break down subsidized housing by families, elderly, and disabled may overstate inclusion.

As part of our assessment of inclusion, we consider the percentage of subsidized housing in tracts that are high opportunity as well as highly walkable and transit-accessible neighborhoods. We did not, however, break down the subsidized housing data by whether the housing is targeted to families, seniors, or disabled residents. It is unlikely that these types of subsidized housing are equally distributed across neighborhoods. By using the aggregate number of subsidized housing units, our analysis risks overstating or understating the access that particular kinds of subsidized housing tenants have to different kinds of neighborhoods.

6. Not controlling for income in transit usage may over- or understate potential transit usage.

We measure automobile and transit use rather than physical access to transit. Because higher-income households tend to drive more and use transit less than lower-income households, high-income (and often richer in opportunity) tracts will score lower than lower-income tracts with the identical access to transit and similar development patterns.

To assess the extent of the bias, we calculated an income-adjusted version of our walkability and transit-accessibility index.[16] The income-adjusted index identified considerably more tracts that were both high opportunity and high walkability/transit accessibility, particularly in wealthier communities close to transit, such as Nassau and Westchester Counties. The results were particularly striking in Seattle, where adjusting for income boosted the total number of high-opportunity, high-walkability/transit accessibility tracts to 22 percent of the total.

7. A simple radius may not measure access to jobs as well as a commutershed analysis.

Several experts have recommended that the analysis should focus on potential for transit use rather than actual transit usage, which could provide another route to address the income concerns mentioned above. Further, our job measures employ as-the-crow-flies measures of proximity and neglect transit and commute patterns in determining which jobs are accessible to target communities. Improved transit location and quality data would provide a more accurate assessment of both transit accessibility and opportunity. New initiatives to improve the quality of national data about transit may make such analyses more feasible, but even with existing data, further analysis of the relationship between transit accessibility and job opportunities may be possible.

Inherent Challenges with This Type of Analysis

1. Drawing the geographic boundary affects how neighborhoods score.

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[16] To control for income, we estimated simple regression models, regressing each of vehicle miles traveled and non-automobile modal share against tract-level median income. We then calculated z-scores for the residuals from these regressions, which we roughly interpret as the degree to which automobile and transit use in a given tract diverge from what would be expected given the median income of the tract. We then calculated a new index using these z-scores in place of the observed VMT and modal share data. There may be better methods to control for income, such as looking at individual PUMS records to measure the travel behavior of lower-income households in a particular neighborhood, but these more complex methods were beyond the scope of our research.

We rank neighborhoods relative only to other neighborhoods in each metropolitan area. As discussed above, the score of a particular neighborhood is highly dependent on the geographic area considered. If a narrow area is selected, certain tracts will score higher than they would if a broader area is drawn. Similarly, if a broad area is drawn, certain tracts will score worse than they would in comparison to a narrower area. As the data at the end of section (b) show, it may not always make sense in the context of HUD programs that operate on a county wide scale, for example, to compare a suburban county with more urban counties, which could obscure differences between suburban neighborhoods that, while more similar to each other than to urban neighborhoods, still have significant differences in opportunity and walkability/transit accessibility.

HUD-DOT-EPA Livability Principles

✓ Provide more transportation choices.

✓ Promote equitable, affordable housing.

✓ Enhance economic competitiveness.

✓ Support existing communities.

✓ Coordinate and leverage federal policies and investment.

✓ Value communities and neighborhoods.

2. Using quartiles and medians, instead of thresholds, may under- or overstate performance.

Similarly, using only medians and quartiles does not incorporate thresholds policymakers may wish to set for normative reasons, for example, by targeting investments only to neighborhoods that exceed a particular level of opportunity or that have achieved a particular level of racial integration. Similarly, a threshold might be set at a current baseline: federal agencies might adopt a particular policy to increase transit usage only if such investments would not increase segregation, for example.

3. Using census tracts as a unit of analysis may have limitations.

We use census tracts to represent neighborhoods in our analysis because they provide a reasonably consistent unit of comparison. However, census tracts are an imperfect representation of a neighborhood. Especially where local data are available, there may be more accurate ways to define neighborhoods.

The suggestions above highlight cautions about this initial analysis and provide an agenda for future research to more comprehensively assess the relationship between environmental sustainability and inclusivity.

4. Promoting Sustainability and Inclusion: Next Steps for HUD

Recognizing the long-term importance of environmental sustainability, HUD has established a new Office of Sustainable Communities. The agency has also provided new incentives for innovations in planning and development regulation at local and regional levels in its FY2010 budget.

In conjunction with this new commitment to environmental sustainability, HUD's leadership has also emphasized that all people should have free and fair access to opportunity-rich

communities of their choice, rooted in part in HUD's long-standing statutory obligation to affirmatively further fair housing. To promote both environmental and opportunity goals, HUD has entered into a memorandum of understanding with the Department of Transportation and the Environmental Protection Agency, committing all three agencies to use their resources and authority to advance both goals (see box).

Historically, federal policies have fueled and reinforced racial and ethnic exclusion, neighborhood inequality, and sprawling urban growth, undermining both environmental sustainability and fair access to opportunity. At least in principle then, new policies designed to promote environmental sustainability can and should work hand-in-hand with policies to combat discrimination, segregation, and poverty concentration. As discussed earlier, some definitions of sustainability encompass inclusion, equity, and access to opportunity (at least rhetorically). However, the exploratory analysis presented in this report demonstrates that single-minded or myopic efforts to maximize environmental sustainability risk undermining HUD's fair housing goals and obligations. And, at least in the short term, some efforts to maximize inclusion in opportunity-rich communities might run counter to environmental sustainability objectives.

HUD should continue to play a leadership role within the administration to develop a larger framework in which essential environmental, economic, and social goals can be advanced together. The federal government should offer a balanced portfolio of investments and incentives, some aimed at maximizing environmental sustainability—but without undermining inclusion—while others are aimed at maximizing opportunity and fair access to opportunity—with environmental sustainability as a secondary goal.

This section provides recommendations to HUD for achieving such a balance, drawing upon the exploratory analysis presented in Section 3 and on a roundtable discussion held in January with representatives of environmental, smart growth, civil rights, and affordable housing organizations. We focus primarily on the Office of Sustainable Communities' new initiatives. But we also offer key principles to guide other housing and community development programs and investments.

HUD's New Sustainable Communities Investments

This year, HUD's new Office of Sustainable Communities is launching two important initiatives: a program offering regional planning grants and a program (jointly administered with DOT) offering incentive grants to local jurisdictions. Here we present specific recommendations for using these initiatives to advance environmental sustainability and inclusion.

Regional Planning Grants. In 2010, HUD expects to award $100 million to support regional planning efforts aimed at more sustainable metropolitan growth and development. This initiative provides an opportunity to build or strengthen institutional capacity at the regional scale, where it is currently weak in most metropolitan areas. The Department of Education's "Race to the Top" competition illustrates how the application process for a competitive-

grants program of this kind can lead to new collaborations and innovative action among all applicants, regardless of whether their application is successful.

To achieve this transformative effect, HUD's Notice of Funding Availability (NOFA) should articulate ambitious regional goals and invite applicants to explain how their proposed regional planning activities will advance them. We recommend keeping the list of goals short and focusing it on major priorities. In other words, the point is not to micromanage by specifying a long list of "how to do it" objectives, but rather to focus applicants' attention on the need to simultaneously advance major outcome goals at the regional scale, such as reducing carbon emissions, while also reducing segregation and disparities in opportunities across racial and economic groups.

HUD should encourage applicants to develop indicators and to track regional progress on these over-arching outcome goals. In addition, applicants should specify interim objectives (such as increasing transit use or expanding affordable housing in job-rich areas) and metrics for tracking progress. As our exploratory analysis demonstrates, data are available nationally to track some of these goals and objectives, and HUD could encourage basic analysis using common indicators, including those presented in section 3. However, we also recommend that HUD encourage communities to assemble and analyze locally available data in addition to any basic analysis in order to create a more nuanced regional picture.

HUD's NOFA and guidance materials should be explicit about the interconnections among environmental sustainability, opportunity, and inclusion. Given the diversity of challenges, strategies, and institutional capacities across metropolitan areas, this grant program should not dictate particular solutions. However, it should require applicants to address these issues head on. Specifically, applicants should explain how their proposed planning activities will measurably

- Increase the environmental sustainability of neighborhoods while ensuring those neighborhoods either retain existing opportunities for low- and moderate-income households or add such opportunities where they do not currently exist.

- Create or preserve a reasonable share of affordable housing in neighborhoods that already offer both high levels of environmental sustainability and opportunity.

- Expand access to high-opportunity areas for minority, low-income, and other disadvantaged households, even if these neighborhoods do not (yet) offer high levels of environmental sustainability.

- Upgrade the quality of life and other opportunities in neighborhoods that offer high levels of environmental sustainability but low levels of opportunity.

Metropolitan planning organizations (MPOs) should not be the only entities qualified to apply. The current draft NOFA is open to a wider range of institutional applicants, and we encourage HUD to maintain this flexibility, which could lead to transformative partnerships. The advantage of working with MPOs is that they already exist, with important transportation planning responsibilities and authorities. The disadvantage is that many are narrowly

focused on transportation issues, avoid controversial issues to achieve consensus, lack sensitivity to issues of inclusion, and underrepresent central-city communities. Therefore, it makes sense for HUD to keep its regional planning grant program open, so that it can encourage advancements in the performance of existing regional institutions (including MPOs) but also build the capacity of these organizations and other regional institutions. HUD might specify that eligible consortia must include a region's high-opportunity suburban jurisdictions, a region's central city and/or poor, disproportionately minority jurisdictions, and developed older suburban areas experiencing socioeconomic change, to ensure that the consortia are broadly representative.

Currently, the nation's metropolitan areas are at very different starting points with respect to regional planning capacity and the potential for effective regional action. HUD's grant program should support some regions that are just getting started as well as some where regional plans have more immediate potential to shape the use of local, state, and federal funding streams, including formula funding from HUD, DOT, and EPA. The application process should award extra points for plans that manifest a commitment to using the plans to govern the allocation of federal transportation, housing, and environmental protection dollars. As a supplemental initiative to support this planning process, federal agencies should support regional efforts to plan for and more effectively use their current programs, possibly providing streamlined approvals, bonus awards, or other incentives for grantees that are part of a regional planning collaborative.

HUD-DOT Challenge Grants. As part of their memorandum of understanding, HUD and the Department of Transportation will jointly award grants to local governments to provide incentives for the adoption of regulatory and programmatic tools that promote sustainability. This presents another opportunity for HUD to explicitly address the connections between environmental sustainability and inclusion.

Therefore, we recommend a focus on encouraging opportunity-rich communities to reform their land use regulations and adopt policies that improve both environmental sustainability and housing affordability. Examples include land use and building code reforms that allow for lower-cost and higher density housing options near transit hubs like manufactured housing, townhouses, and accessory apartments.

We also recommend that HUD use this incentive program to encourage the adoption of tools that preserve or expand housing affordability in neighborhoods that are strong (or improving) in environmental sustainability and access to opportunity. This would include programs that enable low-income households to remain in areas where new transit or other investments are likely to push up housing prices and rents. However, HUD should not encourage or require the overconcentration of subsidized housing. This might mean encouraging jurisdictions to establish different requirements for the share of affordable units in new developments, depending on a neighborhood's current stock of subsidized housing. Communities that already offer their "fair share" of affordable housing should be rewarded with opportunity-enhancing amenities or improved transit investments, while new subsidized

housing development is targeted to opportunity-rich neighborhoods that lack affordable options.

HUD should effectively disqualify tools that increase environmental sustainability without attending to housing affordability or racial/ethnic inclusion. For example, zoning or regulatory changes that focus private sector development around transportation hubs, or restrict development elsewhere without addressing housing affordability will likely further exclude low- and moderate-income households from desirable, opportunity-rich communities. Similarly, initiatives that site new transit opportunities and related development exclusively in low-opportunity neighborhoods, without also investing in improved amenities and opportunities, will simply further the concentration of poverty in these areas.

Other HUD Investments

Secretary Donovan has made it clear that advancing the vision of environmentally sustainable, opportunity-rich, and inclusive communities is not just the domain of the new Office of Sustainable Communities, but the goal for all HUD's programs:

> With housing-specific resources like vouchers, counseling, and Choice Neighborhoods, to new financing tools for transit-oriented development, to incentives that encourage the repurposing of polluted land for affordable housing development, we can help communities coordinate the use of all available resources to turn segregated neighborhoods of concentrated poverty into integrated, healthy, sustainable communities.[17]

The remainder of this section offers principles for making the larger portfolio of federal housing and community development investments more supportive of environmental sustainability, inclusion, and access to opportunity.

Investments in Distressed Communities. HUD can help create more neighborhoods that score high on environmental sustainability, inclusion, *and* opportunity indicators by focusing community development efforts on improving opportunities in neighborhoods that offer high walkability/transit accessibility but low opportunity. Efforts to attract jobs, reduce crime, improve schools and other services, and improve air quality could enhance day-to-day life and enrich the life chances of residents in neighborhoods that already offer walkability and transit access.

The Choice Neighborhoods Initiative, targeted to neighborhoods with concentrations of public and assisted housing, offers an important new tool in this effort. Localities will compete for funding under this initiative, proposing strategic investments designed to catalyze lasting neighborhood revitalization. HUD funds will primarily be used for housing demolition and redevelopment, but the initiative is intended to leverage additional investment in schools,

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[17] See prepared remarks for Secretary of Housing and Urban Development Shaun Donovan at the 9th Annual New Partners for Smart Growth: Building Safe, Healthy and Livable Communities Conference, February 4, 2010.
http://portal.hud.gov/portal/page/portal/HUD/press/speeches_remarks_statements/2010/Speech_02042010

infrastructure, and commercial development. The goal is to transform distressed neighborhoods into neighborhoods of opportunity.

If HUD considers environmental sustainability indicators and investments as factors in the Choice Neighborhood selection process, it could help create neighborhoods that are inclusive, opportunity rich, and environmentally sustainable. More specifically, HUD should incorporate environmental sustainability factors into the Choice Neighborhoods NOFA, by giving priority to proposals that incorporate or coordinate with transportation and environmental investments, such as mixed-use development, transit-oriented development, and expansion of parks and pedestrian and bike paths.

Production of New Affordable Housing. Our exploratory analysis suggests that some neighborhoods do offer both walkability and transit accessibility and access to opportunity. HUD and the Treasury Department (which administers the Low Income Housing Tax Credit Program) should give preference to these neighborhoods when establishing rules governing the siting of new subsidized housing. However, at least in the two regions we analyzed, the number of neighborhoods that are both highly walkable/transit accessibile *and* rich in social and economic opportunities is relatively small. It would be infeasible to focus only on these neighborhoods.

Many high-opportunity communities score poorly with respect to walkability/transit accessibility. HUD should nonetheless encourage the development of more affordable housing options in these communities. Low-income and minority families, too long excluded from opportunity-rich communities by discriminatory public policies, should not have to wait for these communities to become environmentally sustainable.

But investments that promote environmental sustainability in these communities can and should go hand-in-hand with investments that improve affordability and inclusion. Therefore, HUD and other agencies should also work, in particular through the new HUD-DOT-EPA partnership, to improve sustainability in high-opportunity, low-sustainability neighborhoods by increasing transit access and encouraging increased density and walkability.

Preservation of Affordable Housing. Our exploratory analysis suggests that a nontrivial number of affordable housing units exist in neighborhoods that offer both walkability/transit accessibility and access to opportunity. These units may be lost when affordability controls expire, because these locations are often very desirable for market-rate development. In contrast, lower-opportunity neighborhoods are more likely to have owners eager to participate in programs such as Mark-to-Market and other preservation efforts, as these neighborhoods have limited market demand.

HUD should place a priority—through extra funding and staff focus—on preserving units in neighborhoods that are high opportunity and high sustainability. Such efforts can help ensure that lower-income households that already have access to these neighborhoods continue to have that access in the future.

Assisted Housing Mobility and Choice. HUD's Housing Choice Voucher program supplements what very low income households can afford to pay for rent, potentially opening up access to

sustainable and opportunity-rich neighborhoods. Although voucher recipients are less likely to live in high-poverty neighborhoods than their public housing counterparts, the program has not lived up to its full potential. In particular, HUD's analysis indicates that minority voucher recipients are more likely than whites to live in central-city and high-poverty neighborhoods (Devine et al. 2003). Jurisdictional boundaries, higher rents, and barriers to housing search all undermine the ability of voucher recipients to move to opportunity-rich neighborhoods. While high rental costs are a significant factor, our analysis of the New York and Seattle areas shows that the percentage of voucher holders moving to opportunity-rich neighborhoods is even less than would be predicted by rents alone.

As discussed earlier, low-income and minority households shouldn't have to wait for opportunity-rich communities to become environmentally sustainable before they can live there. The Housing Choice Voucher program can and should be used to encourage more low-income families to locate in opportunity-rich neighborhoods throughout metropolitan regions. Local housing agencies should be encouraged to identify rental housing in opportunity-rich neighborhoods and neighborhoods where sustainable development investments are under way. One concrete strategy for doing so would be to incorporate indicators of both environmental sustainability and opportunity into the current system of performance measures applied to the Housing Choice Voucher program (SEMAP). These indicators could be coupled with increased payment standards to compensate for the more expensive housing costs in higher-opportunity areas, similar to the current exception rents system, but more streamlined. Decreased payment standards in other areas, such as low-opportunity and low-environmental sustainability areas where rents are likely to be below the FMR anyway, could help provide funding.

In its FY2011 budget proposal, HUD has included a Transforming Rental Assistance initiative, which encourages local housing agencies to transition toward regional administration of the Housing Choice Voucher program and provides resources for housing search assistance. This initiative offers tremendous potential to link mobility assistance with other regional housing, transportation, and environmental planning and investments. As this proposal evolves, opportunities to integrate regional voucher administration with other regional planning and sustainable development efforts supported by HUD should be explored. One approach would be to award extra points to applications that link regional sustainable communities and rental transformation.

CONCLUSION

In summary, our results suggest that HUD can promote its dual policy objectives of encouraging access to opportunity and enhancing environmental sustainability, but only through policies that address both explicitly. Policies that use walkability and transit accessibility (or other environmental sustainability metrics) as their primary focus run the risk of disproportionately concentrating lower-income people in high-poverty, disproportionately minority neighborhoods with relatively meager educational and job opportunities. Accordingly, HUD should, in both its Sustainable Communities Initiative and its core

programs, focus resources on neighborhoods that provide both environmental sustainability and opportunity; invest in improving both environmental sustainability and affordable housing options in high-opportunity communities; and invest in upgrading opportunity in communities that have good environmental sustainability but low opportunity.

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APPENDIX A: NEIGHBORHOOD-LEVEL OPPORTUNITY INDICATORS

This section, as well as appendix B, expands upon our discussion in section 3(a) and provides more detail as to how we chose the neighborhood-level indicators of opportunity and walkability/transit-accessibility, the potential challenges to using those indicators, and why we chose not to use other indicators.

Education

Indicators of local school quality focus on two areas: the composition of the student body (e.g., the percentage of students eligible for free and reduced-price lunch) and student outcomes (e.g., the percentage meeting state standards for math). We use both the percentage of students eligible for free lunch and the percentage of students who pass standardized reading and math tests as indicators of local school quality. In part as a result of the No Child Left Behind Act's reporting requirements, reliable, frequently updated data are now available for every public school in the country in these two areas.

Geography presents a key challenge for education data. Geocoded data are available at the school level from schooldatadirect.org, which provides the street address for every school in the country. However, the location of the school does not give the precise boundaries of the school's catchment area, and, what's more, many school districts offer school choice programs and magnet schools, which mean proximity to a school does not always correlate with attendance at that school.

Still, researchers have found that elementary and middle school proximity is a strong determinant of the school a student attends—even when school choice programs exist at the elementary level.[18] The correlation is less strong at the high school level.[19] As such, we have chosen to use only data for elementary and middle schools. While we recognize the importance of data for high schools, such as high school dropout rates, we do not include

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[18] See Justine S. Hastings, et al., "Parental Preferences and School Competition: Evidence from a Public School Choice Program," 17–18, 19 (National Bureau of Economic Research, Working Paper No. 11805, 2006) (noting, for students starting grades four through eight, "While there are some difference across demographic groups, it is clear that proximity is an important determinant of school choice for the average student," but acknowledging "a large variance in preferences for school test scores, and the idiosyncratic preference for test scores is negatively correlated with the preference for the home school…."). See generally Justine S. Hastings and Jeffrey M. Weinstein, "Information, School Choice, and Academic Achievement: Evidence from Two Experiments," *Quarterly Journal of Economics* 123, no. 4 (2008): 1373, 1376 (reviewing the effect of information on parental school choice, relative import of academic achievement, and the related effect on students; finding "a key predictor of both responding to information by choosing an alternative school and the test score of the school chosen is proximity to high-scoring school alternatives").

[19] Hastings et al., "Parental Preferences," 9, excluded high school data from their analysis of school choice as "high school choice is likely influenced by factors such as graduation rates and athletic programs that are not central to elementary and middle school choices…"

them in this analysis because, due to the larger catchment areas of high schools and magnet programs, the data are less closely correlated with location at the census tract level.

In order to match census tracts to schools, we draw Voronoi polygons[20] separating elementary schools, creating what are in effect modeled catchment areas. We then measure the intersections of each census tract with those Voronoi polygons by land area to estimate the educational opportunity offered in each census tract. In cases in which multiple polygons overlap with a census tract, we weight those multiple values by the percentage of the census tract covered by each polygon. By doing so, we are able to calculate the average public elementary school opportunity that a resident of this census tract faces, using free and reduced-price lunch data and 4th grade math and reading test score data. We choose 4th grade data because it is universally available under No Child Left Behind.[21]

Crime

Safety is high on the list of what households of any income level consider when choosing a home.[22] The most commonly used measure of crime is the FBI's Uniform Crime Report, which tracks both the violent crime rate and property crime rate.[23]

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[20] See generally J. Pearce, "Techniques for Defining School Catchment Areas for Comparison with Census Data," *Computers, Environment, and Urban Systems* 24, no. 4 (2000): 283, 289–294 (describing the use of Voronoi polygons and weighted Voronoi polygons, applying the techniques to school "catchments" within the United Kingdom, and comparing the results to a third computational model).

[21] One concern about test score data arises in metropolitan areas that span multiple states. Because each state has its own testing system under No Child Left Behind, scores across state lines are not comparable. An opportunity index would ideally normalize NCLB results across state lines, using the National Assessment of Educational Progress as a baseline as the Department of Education already is doing.

[22] See Isaac Bayoh et al., "Determinants of Residential Location Choice: How Important Are Local Public Goods in Attracting Homeowners to Central City Locations?" *Journal of Regional Science* 46, no. 1 (2006): 97, 110, 114–16, 117 (finding "higher crime levels … are estimated to have a negative effect on a household's probability of choosing a locality," though crime is less influential on household choice than other factors, even when differences between cities and suburbs are equalized) (internal citations omitted). But see Bayoh et al., "Determinants," at 102 (indicating that research also counters the "flight from blight" hypothesis). Cf. Ingrid G. Ellen and Katherine O'Reagan, "Crime and U.S. Cities: Recent Patterns and Implications," *Annals of the American Academy of Political and Social Science* 626, no. 1 (2009): 22, 32, 36 (stating "relative reductions in crime appear to have contributed to the ability of cities to retain households who otherwise might move to the suburbs, although the measurable direct impact on overall city growth is modest at best," but also discussing the "mixed" nature of research on the relationship between crime and household locations.)

[23] See Federal Bureau of Investigations, Uniform Crime Reports, http://www.fbi.gov/ucr/ucr.htm#cius. Note that information gathered under the Uniform Crime Reporting Program is published annually in *Crime in the United States.* The UCR track "offense information on murder and nonnegligent manslaughter, forcible rape, robbery, aggravated assault, burglary, larceny-theft, motor vehicle theft, and arson." See Federal Bureau of Investigations, UCR Frequently Asked Questions, http://www.fbi.gov/ucr/ucr_general.html. See, for example, Ellen and O'Reagan, "Crime and U.S. Cities," 23, 33, 34; Bayoh, "Determinants," 107 n.5; Neighborhood

The Uniform Crime Report data have one important weakness: they are consistently available only at the political jurisdiction level and not at smaller levels, such as zip codes or census tracts. In some metropolitan areas, with many small local governments, this shortcoming is not all that significant. But in many metropolitan areas, the failure to differentiate between different parts of jurisdictions (especially large central cities, county governments, and large suburbs) produces data with very limited relevance. As such, the crime data in our analysis—which assign every tract in a jurisdiction the same crime rate—are somewhat misleading and arguably less reliable than any of the other data we use.

Many police departments do break out their Uniform Crime Report statistics at the tract, precinct, or zip code level. However, many departments do not, and those that do such a breakout do not use a universal methodology. As such, there are no national data on crime at smaller geographic levels.[24]

As discussed in the section of this appendix recommending next steps on data, the FBI might set a national standard for reporting at smaller levels or encourage local jurisdictions to report local data where they already exist.

Economic Opportunity

Access to employment is an essential part of economic opportunity. Many researchers measuring opportunity have considered job numbers and job growth, based on the commonly used, detailed, and updated Zip Business Patterns from the Census Bureau.

The two key questions are how to define the radius of proximity (that is, how far should we expect workers to travel) and which jobs to count (that is, all jobs or just jobs likely to be accessible to lower-income people).

Most opportunity metrics measure jobs within a five-mile radius, which we have used as well, as an indicator of relatively accessible jobs.[25]

Scout, "Crime Rates: Discover the Safest Neighborhoods in Any City," http://www.neighborhoodscout.com/neighborhoods/crime-rates/ (referring to use of UCR data).

[24] There are some sites that attempt to create such data. See, for example, Neighborhood Scout, "Crime Rates" (offering the opportunity to "discover the lowest crime neighborhoods in any city or town, before you buy a home or site a facility…. Our exclusive crime data are developed for each neighborhood using our mathematical algorithms and municipal crime statistics from the FBI and the U.S. Justice Department"). These types of sites use proprietary algorithms based on assumptions about neighborhood characteristics and correlation with crime, not actual data.

[25] See, for example, Kirwan Institute, "The Geography of Opportunity: Building Communities of Opportunity in Massachusetts," app. at 55 (2009), http://4909e99d35cada63e7f757471b7243be73e53e14.gripelements.com/publications/finalreport_maoppcomm_kirwan_jan2009.pdf; Remedial Phase Expert Report of John Powell in *Thompson v. HUD*, August 19, 2005, app. at 50, *Thompson v. HUD*, No. Civ.A. MJG-95-309, 2004 WL 1058100 (D.Md. Jan. 29, 2004) [hereinafter *Powell Report*].

Specifically, our measure captures job access using three separate components within a five-mile radius:

- **Absolute number of jobs requiring an associate's level degree or below.** Most prior opportunity analyses have looked only at total numbers of jobs. We attempt to filter out only jobs likely to be accessible to people served by HUD's programs by using Bureau of Labor Statistics (BLS) data showing the training required for each job. We only include jobs requiring an associate's degree education or below, or on-the-job training only.[26]

- **Job growth from 1998 to 2006.** We look at job growth to measure both the total number of jobs and job trends.

- **Ratio of total jobs requiring an associate's degree or below within a five mile radius to the total number of households earning under $50,000 per year within a five mile radius.** We add these data to control for likely competition for jobs. For example, if Tract A has twice as many entry-level jobs in a five mile radius as Tract B, but there are five times as many lower-income people in Tract A, then Tract B actually presents more of an opportunity for lower-income people to find jobs.[27]

Combining these three factors gives a fairly comprehensive picture of job opportunities for lower-income people within a five-mile radius.

Other measures considered and rejected include the following:

- **All jobs within a commutershed.[28]** While possible (if somewhat difficult) to calculate, we rejected this approach because we do not consider job opportunities a 10 minute commute away to be the same as those 45 minutes away, even if many people in a metro area do commute 45 minutes. However, commutershed data have the advantage of more accurately showing actual travel times compared with as-the-crow-flies measures, which may miss rivers, traffic bottlenecks, and other hurdles. Furthermore, an alternative methodology that weights closer jobs to a greater extent than further jobs

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[26] We use the BLS Staffing Patterns Matrix data to determine the types of jobs in each Zip Business Patterns NAICS industry group. We weight the industry's jobs by the percent requiring an associate's degree or less training. For example, in the utilities sector, 0.22 percent of all workers are lawyers. Those jobs would be excluded because they require more training. The 0.07 percent of all workers who are paralegals, however, would be included.

[27] This indicator is similar to that used in the Powell report offered in *Thompson v. HUD*: "Ratio of Entry Level and Low Skill Employment Opportunities per 1,000 Residents." See *Powell Report*, at app. 50 ("Calculated by assessing the number of estimated entry level and low skill jobs … per 1,000 residents living within 5 miles of the center of each Census Tracts").

[28] The Census has detailed data on commute patterns for each metropolitan area and from every census tract to every other census tract within that metropolitan area. From these data, it is possible to determine the average commute in a metropolitan area, and which other tracts are within this average commute. In many areas, that would mean including far more tracts than a five-mile radius includes.

could be desirable and resolve some of our concerns. Further research could be useful to determine the potential merits of using commutershed-based data.

- **Only jobs accessible by transit.** While intuitively appealing, we reject this approach for both data and policy reasons:
    o It is difficult to define which transit should count—that is, buses that only run a few times a day to accommodate reverse commutes? Privately run van services?
    o A slight majority of even the lowest income groups of American households have a car.[29] Thus, while there are policy reasons for encouraging commuting by transit, limiting employment opportunities to those accessible by transit will not reflect the full range of job choices most lower-income workers face, especially given that in many metro areas, most low-income job growth is in less transit-accessible areas.[30]

Environmental Quality

We employed two measures of air and environmental quality. First, we use the Toxic Release Inventory (TRI), a database that contains detailed information about the total amount of toxic waste released from industrial facilities. To map TRI releases onto census tracts, we used the approach adopted by Powell of creating a buffer of two miles around the address of a TRI

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[29] According to data available through the 2009 National Household Travel Survey, 50.9 percent of households with a derived total income of $20,000–$24,999 counted one car, along with 52.0 percent of households with a total income of $15,000–$19,999, 50.1 percent of households with a total income of $10,000–$14,999, 44.9 percent of households with a total income of $5,000–$9,999 and 39.6 percent of households with a total income of less than $5,000. See U.S. Department of Transportation, Federal Highway Administration, "National Household Travel Survey, Our Nation's Travel," http://nhts.ornl.gov/index.shtml (data analysis available through the "Online Table Designer").

[30] See Harry J. Holzer and Michael A. Stoll, "Where Workers Go, Do Jobs Follow: Metropolitan Labor Markets in the U.S., 1990–2000" (Washington, DC: Brookings Institution, 2007), 1, 5, 7, http://www.brookings.edu/~/media/Files/rc/reports/2007/1231_cities_holzer/1231_cities_holzer.pdf (finding population growth in lower-income suburbs outpaced local job growth, whereas "employment growth exceeded population growth in the higher-income suburbs," and noting "virtually all groups … are net travelers from the lower-income suburbs to employment elsewhere in metropolitan areas," and "the accessibility of residents of lower-income suburbs to jobs in higher-income areas appears to vary greatly across metropolitan areas"). See also Elizabeth Kneebone, "Job Sprawl Revisited: The Changing Geography of Metropolitan Employment" (Washington, DC: Brookings Institution, 2009), 1, http://www.brookings.edu/~/media/Files/rc/reports/2009/0406_job_sprawl_kneebone/20090406_jobsprawl_kneebone.pdf (finding "employment steadily decentralized between 1998 and 2006: 95 out of 98 metro areas saw a decrease in the share of jobs located within three miles of downtown" and "in almost every major industry, jobs shifted away from the city center between 1998 and 2006"). Cf. Harry J. Holzer, et al., "Public Transit and the Spatial Distribution of Minority Employment: Evidence from a Natural Experiment," *Journal of Policy Analysis and Management* 22 (2003): 415, 434 (finding a positive correlation between extension of public transit and the hiring of certain minority workers in suburbs).

emissions source.[31] TRI has the advantage of including air, water, and land emissions. However, it ignores differences in the media into which emissions occur. For example, emissions into a river will disperse differently than those out of a smokestack. Still, it is difficult to construct a universal system of modeling emissions and a buffer is a decent first approximation. Moreover, TRI only includes data on emissions of listed toxic chemicals from facilities for which the annual emissions exceed EPA thresholds. Consequently, many emissions may not be included in TRI data.

Another shortcoming of TRI data is that they do not include any emissions from nonpoint sources, such as automobiles. To gain a greater understanding of the toxicity faced in a particular tract, including from nonpoint sources, we used data from the National-Scale Air Toxics Assessment (NATA), which provides a modeled risk assessment at the tract level from exposure to 180 of the 187 CAA toxics based on TRI emissions, as well as nonpoint sources.[32] However, NATA is a modeled measure so, although it is based on actual measurements, its usefulness diminishes as the geographic units get smaller.[33] Despite these limitations, in light of the differing environmental burdens suffered by different neighborhoods,[34] having some measure of environmental quality is essential to assessing opportunity.

Indicators Not Used

We considered and rejected using several other measures suggested by researchers, for reasons described below.

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[31] See Kirwan Institute, "Geography of Opportunity," at 56 (describing analysis of environmental indicators, including "proximity to toxic waste release sites" and Superfund sites, as being measured by distance from facility-level sources.

[32] See U.S. Environmental Protection Agency, Technology Transfer Network, "2002 National-Scale Air Toxics Assessment," http://www.epa.gov/ttn/atw/nata2002/ (describing the 2002 NATA). See also U.S. Environmental Protection Agency, Technology Transfer Network, "Air Toxics Web Site, National Air Toxics Assessments," http://www.epa.gov/ttn/atw/natamain/ (providing general NATA information) [hereinafter *NATA General Information*].

[33] The EPA recommends against using NATA data for distinctly local issues or planning, as the information is "best used to focus on geographic patterns and ranges of risks across the country." However, EPA does note that NATA assessments can help individual communities to direct their programs and set priorities for local action. See *NATA General Information*. See also Jawad S. Touma, et al., *Air Quality Modeling of Hazardous Pollutants: Current Status and Future* "Directions," *Journal of the Air and Waste Management Association* 56 (2006): 547, 549 (explaining that NATA results are directed at "characterizing average risks across the country" and that more local analyses should be conducted for individual areas).

[34] See Benjamin J. Apelberg et al., "Socioeconomic and Racial Disparities in Cancer Risk from Air Toxics in Maryland," Environmental Health Perspectives 113 (2005): 693, 693 (stating that the environmental justice movement developed in response to "observations that a seemingly unequal burden of pollution [falls] on disenfranchised and disadvantaged communities") (internal citation omitted).

- **Residential building permits**, which the Census Bureau measures monthly (though only on the political jurisdiction level). The idea is to track whether growth in affordable housing is occurring in the same communities as market growth. However, residential building permit data are notoriously unreliable because a large percentage of building permits are not converted into certificates of occupancy (CO).

- **Home price appreciation.** Home price appreciation data are not usually available at the tract level. Also, with the recent downturn in home prices, which has yet to settle out into a consistent pattern, long-term home price appreciation data at this point are likely to be unreliable. Finally, because most HUD programs address rental housing, it is unclear whether home price appreciation reflects a relevant opportunity metric.

- **Concentrations of poverty in a neighborhood.** There is ample evidence that concentrations of poverty have severe neighborhood effects. However, using poverty levels alone can lump together older suburbs that are largely working-class but have low poverty levels with higher-opportunity neighborhoods with much higher incomes. There is evidence that Moving to Opportunity's focus on poverty level alone as its metric of opportunity helped lead to reconcentrations of voucher holders in outer-ring city and older suburban neighborhoods that were below the poverty threshold, but otherwise not high opportunity.

- **Tax base capacity.** Many indices use the tax base capacity of an area to reflect opportunity. In many areas in which the local tax base funds government services, this is indeed an important metric. However, in many states, local property taxes have a lesser impact on funding local services than statewide taxes. Also, different structures of local government make this factor's importance vary widely from state to state.

- **Asthma data.** The key problem with asthma data is the lack of consistency in data collection. Some jurisdictions track hospitalizations,[35] while others rely upon clinical admissions.[36] Results differ significantly based on which approach is taken. Data are further complicated by potential differences across metro areas in access to health care. Finally, because asthma incidence data are gathered at the health care facility, the addresses recorded are often incorrect.[37]

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[35] See, for example, Minneapolis—Living Well, 2007 Sustainability Report 13 (2007), http://www.ci.minneapolis.mn.us/sustainability/docs/LivingWell_2007Sustainability%20Report.pdf.

[36] See, for example, San Francisco Environment. Sustainability Plan for San Francisco 1 (1996).

[37] See Steve Costa et al., Pacific Institute for Studies in Development, Environment, and Security, "Neighborhood Knowledge for Change: The West Oakland Environmental Indicators Project" (Oakland, CA:

- **Civic participation.** The key problem with measures of civic participation, such as number of community groups and voting rates, is the quality of data available on a national basis. We also were concerned about the varying degree to which civic participation is helpful from an opportunity perspective. For example, a civic participation index might equally weight a strong civic group fighting affordable housing that would be hostile to lower-income people and a civic group that bridges different communities.

Pacific Institute, 2002), 23,
http://pacinst.org/reports/environmental_indicators/neighborhood_knowledge_for_change.pdf.

APPENDIX B: NEIGHBORHOOD-LEVEL ENVIRONMENTAL SUSTAINABILITY INDICATORS

This section expands upon the discussion of how we selected indicators for neighborhood-level environmental sustainability, identifies potential challenges to using those indicators, and describes some environmental sustainability indicators we did not use and explains why we chose not to use them.

Transportation

Transit availability is typically captured either by the actual behavior (such as the share of non-car commuting trips or vehicle miles traveled per capita) or by calculating a measure of access, such as the percentage of housing or jobs in close proximity to transit.[38]

Although efforts have begun to standardize data relating to location of transit stops,[39] no national, comprehensive data source currently exists. Moreover, where data are available, databases rarely include the precise physical location of the access to the transit, guidance as to whether the stop is easily accessible from all of the surrounding neighborhood, or the volume or quality of service. Also, access to different transit stops will often provide different access to the rest of the metro area.[40] Thus, we selected modal share and vehicle miles traveled (VMT) as our measures of transportation. As noted in the text, the key concern with these measures is their correlation with income, which means that we might not be measuring each neighborhood's transit access or quality but rather whether neighborhood residents are unable to afford to buy a car and, consequently, have to use transit no matter how far away or poor the service is. As explained previously, we calculated an income-adjusted walkability/transit-accessibility index to address these concerns. In order to assess the accuracy of our measures, we used data compiled by the Furman Center for Real Estate and Urban Policy to examine how modal share and VMT correlated with proximity to transit stops. This analysis confirmed that modal share and VMT were generally correlated with proximity to transit, though we only did this analysis for New York City.

Density and Accessibility

Several environmental benefits may flow from increased density and improved accessibility and connectivity. Residents of neighborhoods that are denser tend to drive less and walk more, consuming less energy for transportation and producing fewer carbon emissions.

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[38] A few initiatives also considered a third characteristic of transit, the number of commuting options provided in a metropolitan area.

[39] See, for example, Google Transit Feed Specification, http://code.google.com/transit/spec/transit_feed_specification.html.

[40] An approach similar to the work of Chapple on jobs, which employs commutersheds, could provide a more complete picture of the true accessibility and quality of transit. See, for example, Karen Chapple,

Density is typically measured either based on population density or the density of residential units. We elected to use population density because using the density of residential units would introduce the complications of household size and composition.

As for accessibility and connectivity, they are typically measured in terms of average block size or number of intersections per square mile.[41] These data are not available at a national level, although shapefiles should be available for many metro areas. Because of this limitation, we used the average census block size. One shortcoming with this approach is that census blocks are defined in part by population density and may not be based on the physical street grid but on natural boundaries. While these concerns are significant, the accessibility of the street grid is an important contributor of walkability. Further investigation as to the extent that the census blocks reflect the physical street grid is an important next step.

We omitted several other relevant metrics of environmental sustainability at the neighborhood level due to lack of consistently available, national data. These metrics include water (quality and consumption), energy and climate (green house gas emissions per capita, energy use per capita),[42] and open space and land reuse. While these measures are not available at the census tract level, they are often available at the metropolitan or county level.

Excluded Neighborhood-Level Indicators

We excluded the indicators listed below, in many cases because they are unlikely to vary across neighborhoods within a metropolitan area.[43]

- **Diversion and production of waste.** Recycling policies and waste production are unlikely to vary among neighborhoods within a metropolitan area.

- **Water supply.** Because water supplies are often provided at a regional scale, the quality of the water supply should not vary at the neighborhood level.

- **Policymaking.** As noted in our discussion of opportunity measures, policymaking metrics rely on a wide variety of assessments and characterizations, including the number of citizen environmental committees, the number of community block

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"Fueling the Fire: Information Technology and Housing Price Appreciation in the San Francisco Bay Area and the Twin Cities," Housing Policy Debate 15 (2008): 347.

[42] Edward L. Glaeser and Matthew Kahn, "The Greenness of Cities", (Boston, MA: Harvard University, 2008). http://www.hks.harvard.edu/rappaport/downloads/policybriefs/greencities_final.pdf.

[43] Although we do include measures of crime that are only available at a larger geographic scale, we do not include the measures listed because, unlike crime, such measures as water and energy usage are less likely to vary across neighborhoods, whereas crime is highly likely to vary among neighborhoods.

associations, or the number of legislative actions motivated by sustainable goals. These metrics are difficult to quantify and may exhibit limited differences at the neighborhood level.

- **Neighborhood Completeness.** Several initiatives considered the mix of land uses, for the most part through calculating the percentage of households within a certain distance of amenities, work, or school. LEED-ND used a more sophisticated measure: Criterion Planners index of neighborhood completeness.[44] EPA's Smart Growth Index program employs a land use diversity calculation.[45] These measures could be a helpful addition to, or replacement for, our walkability/transit-accessibility measure. However, the data necessary to calculate these measures are not widely available.

- **Walk Score.** One measure that has gathered recent attention is Walk Score,[46] which we did not use for two reasons. First, at the time of our data gathering, Walk Score did not take into the account the street grid, a major predictor of walking and accessibility.[47] Second, because Walk Score is not based on a public database, it is of limited use to a public entity.

- **Green Building.** Green building measures typically count the number of buildings that have been certified in the major green building certification schemes.[48] Although these data could be readily compiled for each census tract using building addresses, this measure is of limited usefulness for several reasons. First, the number or percentage of green buildings says little about the majority of buildings in a particular geographic area because, for the most part, these programs have been adopted only for new construction. Second, these databases only list buildings that have been certified or, in some circumstances, registered for certification. Consequently, the measure may exclude buildings with significant green building features, that were unable to satisfy, or that were uninterested in, the LEED standard. Moreover, the measure does not assess the performance of the existing building stock. Finally, and

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[44] See LEED-ND, "LEED 2009 for Neighborhood Development," 110 (2009), http://www.usgbc.org/ShowFile.aspx?DocumentID=6406 (noting that its "diverse uses" considerations are "adapted from Criterion Planners, INDEX neighborhood completeness indicator, 2005").

[45] See http://www.epa.gov/dced/topics/sg_index.htm. Note: the EPA no longer actively maintains the Smart Growth Index.

[46] See "Walk Score, How It Works," http://www.walkscore.com/how-it-works.shtml (noting "Walk Score calculates the walkability of an address based on the distance from your house to nearby amenities").

[47] See "Walk Score, How It Doesn't Work: Known Issues with Walk Score," http://www.walkscore.com/how-it-doesnt-work.shtml.

[48] See, for example, LEED, http://www.usgbc.org/DisplayPage.aspx?CategoryID=19; EnergyStar, http://www.energystar.gov/index.cfm?c=green_buildings.green_buildings_index; Green Globes, http://www.greenglobes.com/; and BREEAM, http://www.breeam.org/.

most fundamentally, the benefits of simply being close to other LEED buildings are unclear. While an argument could be made that the extent of green building in a particular tract reflects some measure of environmental progress, to the extent that there are hurdles to enrollment in a certification program, this measure will under- or overstate this progress.

- **Food.** A few indices of environmental sustainability include measures for food production and consumption, such as the number and availability of farmers markets[49] as well as the existence of community gardens.[50] These food measures may be an important indicator of both environmental sustainability and opportunity. Transportation and production of food contributes a significant percentage of energy to the footprint of a municipality. From an opportunity perspective, access to fresh produce may have an impact on human health. However, the measures as constructed are too crude to fully assess the true impact of farmers markets or community gardens. Moreover, there are no reliable, national data in either area.

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[49] See, for example, Santa Monica, http://www.smgov.net/Departments/OSE/categories/contentFullPage.aspx?id=4215; San Francisco, http://www.sfenvironment.org/downloads/library/spindicators.pdf; Sustainable Calgary, "2004 State of Our City," http://www.sustainablecalgary.ca/files/file/SOOC2004.pdf.

[50] See, for example, LEED-ND, SustainLane, and Sustainable Calgary.

APPENDIX C: RESEARCH AND DATA NEEDS

Opportunity and environmental sustainability rankings are only as good as the underlying data, and our analysis could be more reliable with better data. This section expands upon our discussion of data issues in the main paper and recommends two types of data needs on the neighborhood level: measures that could be created using existing data sets but that we did not have the resources to develop; and data sets that do not exist uniformly across the country and that would provide more reliable indicators if available. This section further recommends general guidelines for constructing opportunity and walkability/transit-accessibility rankings that compare across different metropolitan areas.

(1) Neighborhood-Level Data Needs

Opportunity: Existing Data to Analyze

- **Commutershed data.** The Census has detailed data on commute patterns for each metropolitan area and from every census tract to every other census tract within that metropolitan area. These data would allow a more refined measure of job access than a blunt five-mile radius—which misses factors such as areas that are harder to access (e.g., because of natural or physical boundaries). The data also could be used to create gradations of job access, giving more weight to jobs close by than to jobs further away. A full commutershed analysis of all tracts, while complex, is feasible with existing data and would offer a richer assessment of job access than the methodology we have used.

Opportunity: Data that Do Not Exist Uniformly across the Country

- **Tract-level crime data.** A requirement that police departments report crime data at a census tract or sub-jurisdiction level of geography would represent the single largest potential improvement in the accuracy of our opportunity index.

- **Catchment areas for schools.** National data showing boundaries of catchment areas for schools would allow more accurate measures of school quality.

- **Environmental quality and health.** It would be useful to have consistent data on emissions that consider the medium into which the emission is released (e.g., water, air, or land) and the prevailing wind, current, or groundwater. In addition, data that account for actual emissions from more sources, instead of just modeled emissions, would be preferable.

- **Asthma data.** A national standard and system for data collection for asthma rates could add to the robustness of the public health measures of the opportunity index.

Environmental Sustainability: Existing Data to Analyze

- **Transit usage.** As noted, a significant body of research has suggested that transportation usage is highly correlated with income.[51] An analysis of our data revealed that tract-level VMT and modal share were both highly correlated with tract-level median income for New York and Seattle. Consequently, our walkability/transit-accessibility index may tend to score more highly neighborhoods in which residents are simply lower income and cannot afford to own a car. Consequently, federal investments in those neighborhoods might not achieve expected gains in transit usage because higher-income residents, who may be able to afford cars, may use transit less than our index would predict. Additionally, although we made an initial assessment of the potential effects of income on our index, we controlled for income in a fairly rudimentary way. Conducting a household-level analysis using PUMS data to better understand the relationship between income and automobile use would likely be more accurate.

- **Energy and Climate.** As noted earlier, Glaeser and Kahn have estimated metropolitan-level greenhouse gas production using census data. Using their approach, estimates of greenhouse gas production could be included at the tract level. Although such a calculation would only estimate greenhouse gas production and would rely on many of the same data sources, taking into account other sources of greenhouse gas production, such as heating and cooling, might yield valuable insights as to the potential impact of public investment.

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[51] See, for example, Kay W. Axhausen et al., "Income and Distance Elasticities of Values of Travel Time Savings: New Swiss Results," *Transport Policy* 15, no. 3 (2008): 173, 178 (noting in part "a decreasing sensitivity to travel cost as a function of income," though the study also notes "an effect of income on cost-sensitivity … was only observed for business travelers and commuters"); Cynthia Chen and Clare E. McKnight, "Does the Built Environment Make a Difference? Additional Evidence from the Daily Activity and Travel Behavior of Homemakers Living in New York City and Suburbs," *Journal of Transport Geography* 15, no. 5 (2007): 380, 394 (analyzing homemaker travel behavior, including trip frequency and mode of transport, and finding that variables affecting "activity-related time-use behavior," in descending order, are "activity and travel related effects, such as trip frequencies and time spent on other activities," socioeconomic characteristics (including income), and the built environment); Susan Handy et al., "Correlation or Causality between the Built Environment and Travel Behavior? Evidence from Northern California," *Transportation Research Part D* 10, no. 6 (2005): 427, 429, 442 (noting "most studies have controlled for socio-demographic characteristics, thereby minimizing the possibility that income, for example, creates a spurious relationship between the built environment and travel behavior"; the study found, however, that differencing in driving patterns are "largely explained by attitudes and that the effect of the built environment mostly disappears when attitudes and socio-demographic factors" are considered). See also Patricia S. Hu et al., "Transferring 2001 National Household Travel Survey," 27 (2007), http://nhts-gis.ornl.gov/transferability/TransferabilityReport.pdf (stating "NHTS data shows that travel propensity increases sharply with household income up to a certain point (around $50,000), and then begins to plateau….").

Environmental Sustainability: Data that Do Not Exist Uniformly across the Country

- **Proximity to transit.** Gathering consistent data as to transit location and quality and applying an approach similar to the commutershed analysis discussed earlier would provide a more complete picture of the true accessibility and quality of transit.

- **Walkability and Accessibility**. Several indicator efforts, notably LEED-ND, use maps of the physical street grid to calculate more sophisticated measures of the walkability of particular communities, such as the number of intersections per square mile and the percentage of blocks small enough to support walkability. Measures like these, available at the national level, would be very useful.

- **Neighborhood Completeness.** Consistent, national data on the mix of land uses in a neighborhood would be very useful in assessing likely greenhouse gas production.

- **Infill and Land Reuse.** Nationally consistent measures of land reuse, which are currently only available at the local level, might be helpful in evaluating which jurisdictions are increasing residential density in established neighborhoods.

   Energy and Climate. Several indices developed by individual jurisdictions consider per capita energy usage, both by source and use. These jurisdictions generally gather these data from local utilities. New York City recently passed legislation requiring commercial buildings to benchmark their energy usage. At some point in the future, gathering and analyzing building energy usage may be possible, and these data would shed light on a significant portion of our national energy usage.

(2) Considerations for Metropolitan-Level Data

This section discusses general considerations for how HUD could compare the opportunity and walkability/transit-accessibility between metropolitan areas, for example in awarding competitive funding between metropolitan areas.

Choice of metrics

Moving to a metropolitan scale allows for consideration of more policy areas, especially in the choice of metrics for environmental sustainability. While we discuss metrics of inclusion on a metropolitan level within section 3(c) of the paper, we did relatively little work on environmental sustainability metrics at the metropolitan level for this project. Data may be available to compare metropolitan regions as to waste, water, energy use, effects on climate change, availability and conservation of open space, and land reuse. Careful attention must be paid to the choice of metrics. As the analysis of the Seattle and New York metro areas reveals, the potential for, and nature of, tension between inclusion and environmental sustainability may depend upon whether environmental sustainability metrics are based on indicators that favor the urban core or on indicators that tend to favor more suburban neighborhoods, such as air quality measures or acreage of open space.

Trends versus absolute numbers in metrics

Policies to encourage environmental sustainability and inclusivity might reward metropolitan areas that are, in absolute terms, the most environmentally sustainable and present the most opportunities for lower-income or minority people. Alternatively, such policies could reward metropolitan areas that have made the most improvements in both environmental sustainability and access to opportunity. Or, the policies could reward metro areas on the basis of improvements after the metro area achieves a particular "baseline," or could adopt other hybrid systems.

Each approach has advantages and disadvantages. Basing targeting on absolute levels may favor metro areas that start with better "endowments" that affect the metrics. As Ed Glaeser and Matthew Kahn have pointed out, some metro areas are simply more sustainable than others because of factors such as the need for heating and cooling. But targeting on the basis of trends might favor jurisdictions that are late-comers to efforts to increase environmental sustainability and opportunity and thus have more "low-hanging fruit" with which to achieve improvements. Analysis of trends also might reward jurisdictions for improvements that arguably had nothing to do with the government's policy choices, but resulted from broader macroeconomic or social forces. Before adopting any particular system, HUD and other federal agencies should assess how the choice affects the incentive structure created for local governments.

Measuring trends in inclusion

Policymakers could measure trends in the inclusion metrics discussed in section 3(c) using at least two types of metrics. For example, they could look at opportunity available to residents of subsidized housing on the metropolitan level in the following ways:

- First, metrics could assess whether absolute opportunity is improving for lower-income households living in federally assisted housing over time. This measure would improve as test scores in elementary schools and other opportunity measures near federally assisted housing improve.

- Second, metrics could assess how opportunity for lower-income households living in federally assisted housing is changing relative to opportunity for all low-income households in a metropolitan area. For example, this measure would worsen even if the test scores improve in elementary schools near federally assisted housing, if those schools improve less than most elementary schools in the entire metropolitan area.

It may be necessary to use both types of metrics. Further, for both of the metrics, metropolitan areas' opportunity could improve in two ways: a change in the location of federally assisted housing, or a change in where the best opportunities are. In other words, federally assisted housing may increase in high-opportunity neighborhoods, or neighborhoods with significant federally assisted housing may see an increase in opportunity. Again, it may be necessary to account for both kinds of changes to reward both efforts to improve the living conditions and opportunities provided in lower-income neighborhoods as well as programs that help create more housing choices in higher-opportunity areas.

Addressing racial and economic segregation

Prioritizing environmental sustainability as a criterion for targeting subsidized housing investments at the neighborhood and metropolitan level could lead to worsening segregation across the country. First, racial segregation tends to be greater in the older, denser metropolitan areas of the Northeast. Thus, by rewarding the jurisdictions and metropolitan areas that are more sustainable with bonus funding, we would likely also be sending funds to the regions of the country that are more segregated. (However, if federal policymakers focus on targeting incentive funds to areas where environmental sustainability is improving, the expected pattern would be less clear.) Second, our evidence above suggests that sustainable neighborhoods are populated disproportionately by minority residents. Thus, targeting sustainable neighborhoods for subsidized housing will effectively send subsidized tenants (who are disproportionately poor and minority) to neighborhoods with high concentrations of poverty and minority populations, exacerbating racial and economic segregation.

At the most general level, segregation matters because segregation permits—and may even facilitate—disparities in neighborhood opportunity. Considering opportunity as well as

environmental sustainability in targeting neighborhood investments would clearly help blunt potential impacts on racial and poverty concentration. But, as noted, given the difficulty of collecting consistent data to measure opportunity, particularly on a metropolitan level, it may also be appropriate for federal policymakers to focus not only on tracking the disparities in social and economic opportunity that segregation may facilitate, but on directly tracking changes in segregation over time as well and incorporating those changes into funding decisions.

If federal policymakers do wish to track changes in racial segregation in metropolitan areas, they should probably rely on the dissimilarity index, the most widely used measure to capture the unevenness of a population's distribution. For economic segregation, the dissimilarity index can measure the segregation of the poor, while other measures are more appropriate to capture broader economic segregation. Jargowsky (1997) suggests using a Neighborhood Sorting Index instead, which Watson (2006) has also used.

APPENDIX D: SELECTED TABLES

Table D.1: Average Size of Census Block by Quartile in Seattle Metropolitan Area

Opportunity Metrics	Q1	Q2	Q3	Q4
Census Block Size (square feet) Quartile Max	*45,547,466*	*3,918,731*	*1,567,358*	*720,621*
Percentage of students on free and reduced-price lunch	0.3	0.34	0.43	0.48
Percentage of students proficient in state math test	0.58	0.59	0.54	0.55
Percentage of students proficient in state reading test	0.76	0.77	0.73	0.74
Number of jobs at associate's degree level within five miles of tract divided by number of people at or below 65 percent of AMI	0.56	0.7	0.71	0.72
Number of violent crimes per 1,000 persons	3.96	3.92	3.77	4.15
Number of property crimes per 1,000 persons	39.28	41.18	42.25	44.28
Total toxic releases in tract (TRI)	1,840.41	5,519.88	9,824.04	17,487.36
Total respiratory risk in tract (NATA)	5.68	8.1	9.21	11.5

Table D.2: Percentage Not Using a Car to Get to Work by Quartile in Seattle Metropolitan Area

Opportunity Metrics	Q1	Q2	Q3	Q4
Percentage Not Using a Car to Get to Work Quartile Max	*0.04*	*0.07*	*0.14*	*0.80*
Percentage of students on free and reduced-price lunch	0.31	0.36	0.44	0.43
Percentage of students proficient in state math test	0.59	0.58	0.52	0.56
Percentage of students proficient in state reading test	0.78	0.78	0.71	0.74
Number of jobs at associate's degree level within five miles of tract divided by number of people at or below 65 percent of AMI	0.62	0.73	0.62	0.73
Number of violent crimes per 1,000 persons	4.13	3.9	3.79	3.97
Number of property crimes per 1,000 persons	42.5	41.73	40.51	42.23
Total toxic releases in tract (TRI)	1,556.03	2,057.8	6,865.63	24,192.24
Total respiratory risk in tract (NATA)	5.63	7.37	9.31	12.19

Table D.3: Average Size of Census Block by Quartile in New York City Metropolitan Area

Opportunity Metrics	Q1	Q2	Q3	Q4
Census Block Size (square feet) Quartile Max	*12,426,866*	*420,525*	*229,921*	*170,524*
Percentage of students on free and reduced-price lunch	30.65	58.68	74.117	77.77
Percentage of students proficient in state math test	83.99	76	74.85	73.38
Percentage of students proficient in state reading test	77.61	68.05	65.505	63.38
Number of jobs at associate's degree level within five miles of tract divided by number of people at or below 65 percent of AMI	0.83	0.52	0.439	0.56
Number of violent crimes per 1,000 persons	2.62	4.06	5.436	5.69
Number of property crimes per 1000 persons	15.13	14.64	15.378	16.49
Total toxic releases in tract (TRI)	1,661.58	151.76	110.729	59.34
Total respiratory risk in tract (NATA)	6.94	9.44	10.467	11.24

Table D.4: Percentage Not Using a Car to Get to Work by Quartile in New York City Metropolitan Area

Opportunity Metrics	Q1	Q2	Q3	Q4
Percentage Not Using a Car to Get to Work Quartile Max	*20.43*	*47.13*	*69.87*	*100.00*
Percentage of students on free and reduced price lunch	20.72	58.785	82.58	79.12
Percentage of students proficient in state math test	86.53	79.531	73.61	68.55
Percentage of students proficient in state reading test	80.93	71.848	63.07	58.69
Number of jobs at associate's degree level within five miles of tract divided by number of people at or below 65 percent of AMI	0.82	0.52	0.29	0.71
Number of violent crimes per 1,000 persons	1.76	3.736	5.88	6.44
Number of property crimes per 1,000 persons	14.07	12.747	15.12	19.7
Total toxic releases in tract (TRI)	1,299.93	525.779	62.1	95.59
Total respiratory risk in tract (NATA)	6.1	8.86	10.26	12.87

Table D.5: Percentage of Tracts above County-Wide Median for Opportunity and Walkability/Transit-accessibility by County in Seattle Metropolitan Area

County	Higher opportunity and higher walkability/transit-accessibility
Island	28
King	21
Kitsap	14
Pierce	16
Shonomish	13
Thurston	13

Table D.6: Percentage of Tracts above County-Wide Median for Both Opportunity and Walkability/Transit-accessibility by County in New York City Metropolitan Area

County	Higher opportunity and higher walkability/transit-accessibility
Bergen	11
Bronx	12
Hudson	32
Kings	18
Nassau	20
New York	23
Passaic	7
Queens	18
Richmond	13
Rockland	22
Suffolk	18
Westchester	12

Table D.7: Racial and Ethnic Populations (Asian, Black, Hispanic, White) by Cluster in Seattle Metropolitan Area (percentage)

Asian, non-White		
	Lower walkability/transit-accessibility	Higher walkability/transit-accessibility
Lower opportunity	11	47
Higher opportunity	23	19

Black, non-Hispanic		
	Lower walkability/transit-accessibility	Higher walkability/transit-accessibility
Lower opportunity	14	67
Higher opportunity	9	10

Hispanic, non-White		
	Lower walkability/transit-accessibility	Higher walkability/transit-accessibility
Lower opportunity	15	49
Higher opportunity	21	15

White		
	Lower walkability/transit-accessibility	Higher walkability/transit-accessibility
Lower	18	28

opportunity		
Higher opportunity	36	18

Table D.8: Racial and Ethnic Populations (Asian, black, Hispanic, white) by Cluster in New York City Metropolitan Area (percentage)

Asian, non-White		
	Lower walkability/transit-accessibility	Higher walkability/transit-accessibility
Lower opportunity	6	43
Higher opportunity	34	17

Black, non-Hispanic		
	Lower walkability/transit-accessibility	Higher walkability/transit-accessibility
Lower opportunity	12	63
Higher opportunity	20	5

Hispanic, non-White		
	Lower walkability/transit-accessibility	Higher walkability/transit-accessibility
Lower opportunity	7	60
Higher opportunity	22	11

White		
	Lower walkability/transit-accessibility	Higher walkability/transit-accessibility
Lower opportunity	7	19
Higher opportunity	62	12

APPENDIX E: MAPS

Figure E.1: Walkability/Transit-accessibility Index in Seattle Metropolitan Area
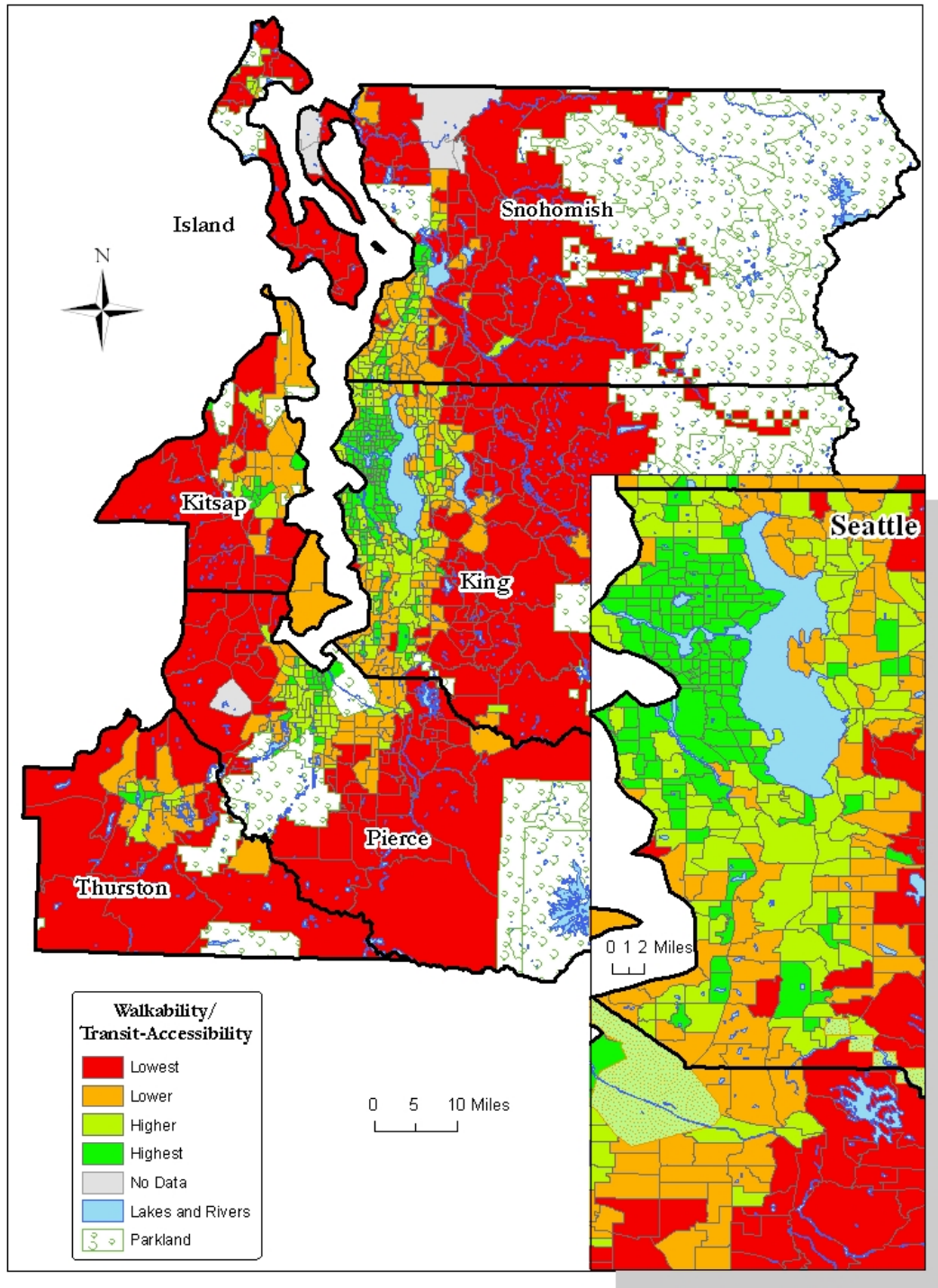
Figure E.2: Opportunity Index in Seattle Metropolitan Area
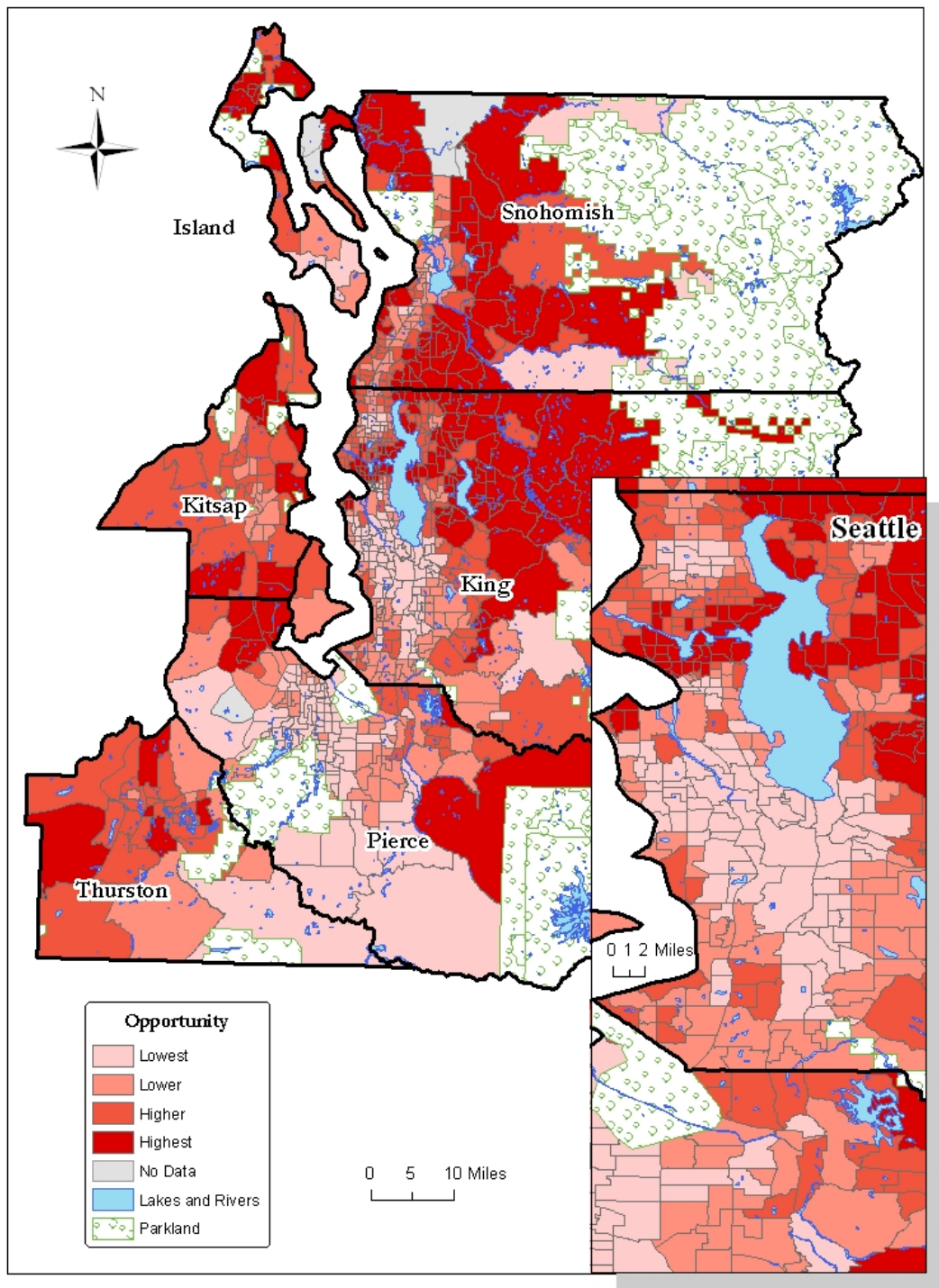
Figure E.3: Walkability/Transit-accessibility Index in New York City Metropolitan Area
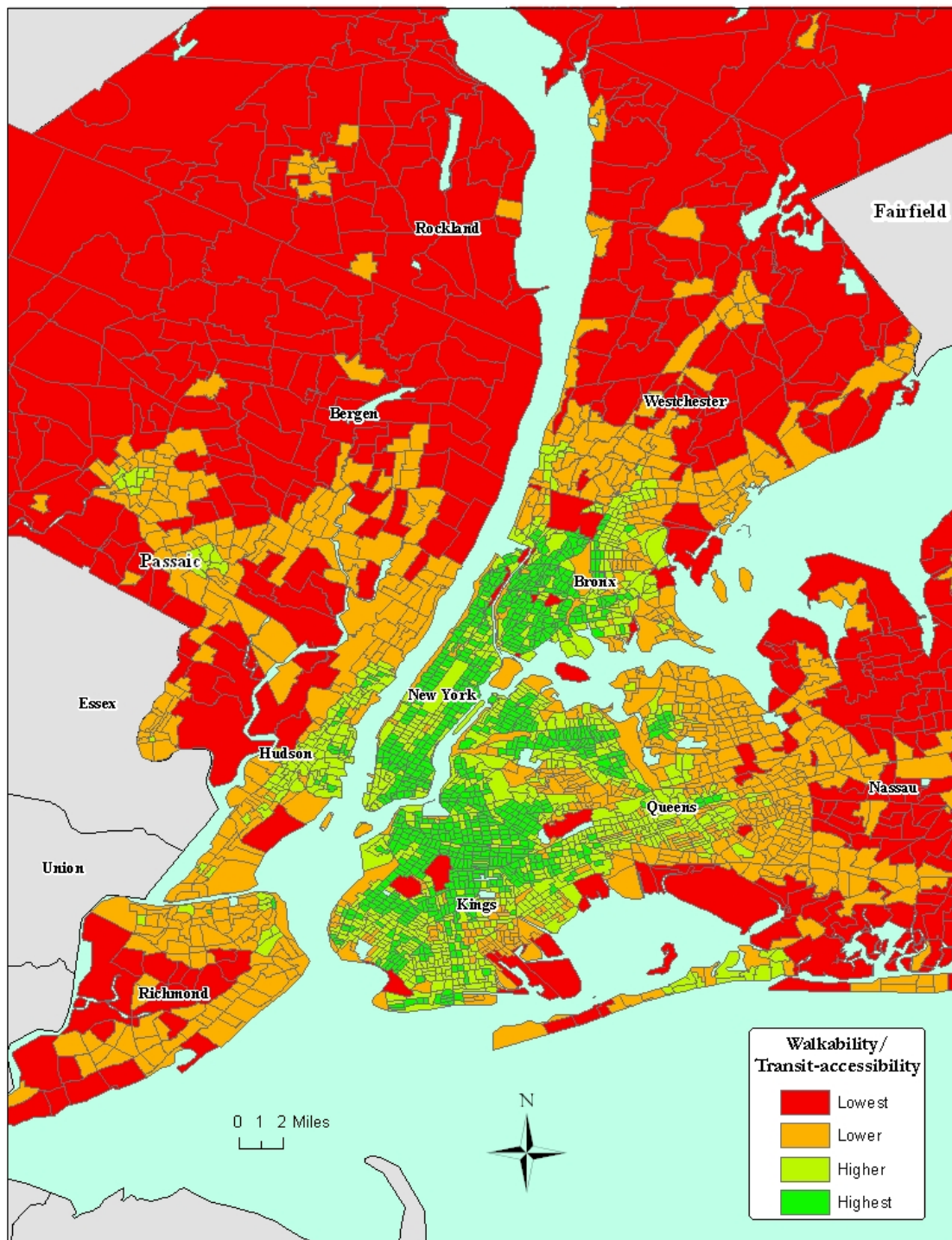
Figure E.4: Opportunity Index in New York City Metropolitan Area
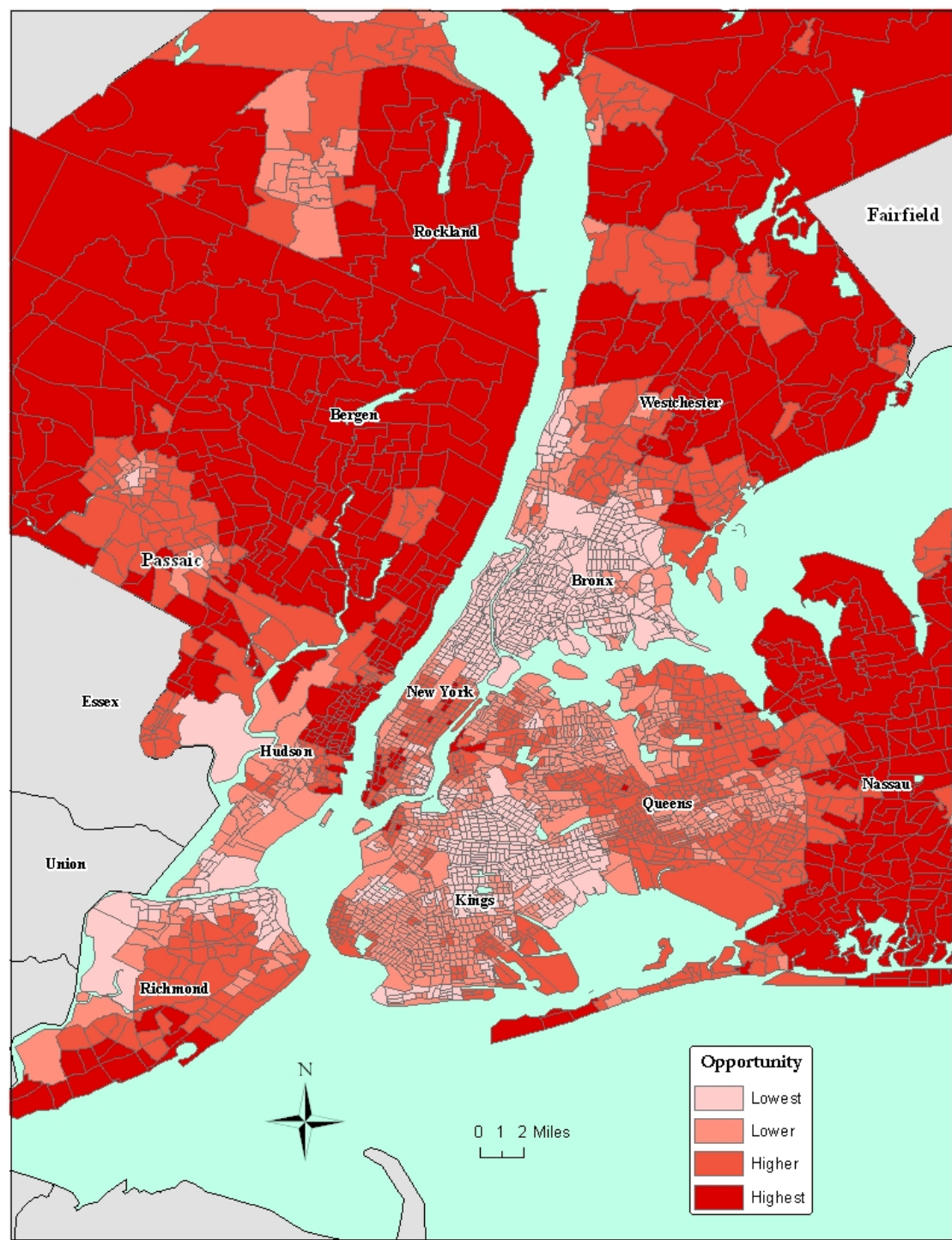
Figure E.5: Walkability/Transit-accessibility Index in Seattle Metropolitan Area with Federally Subsidized Housing Units
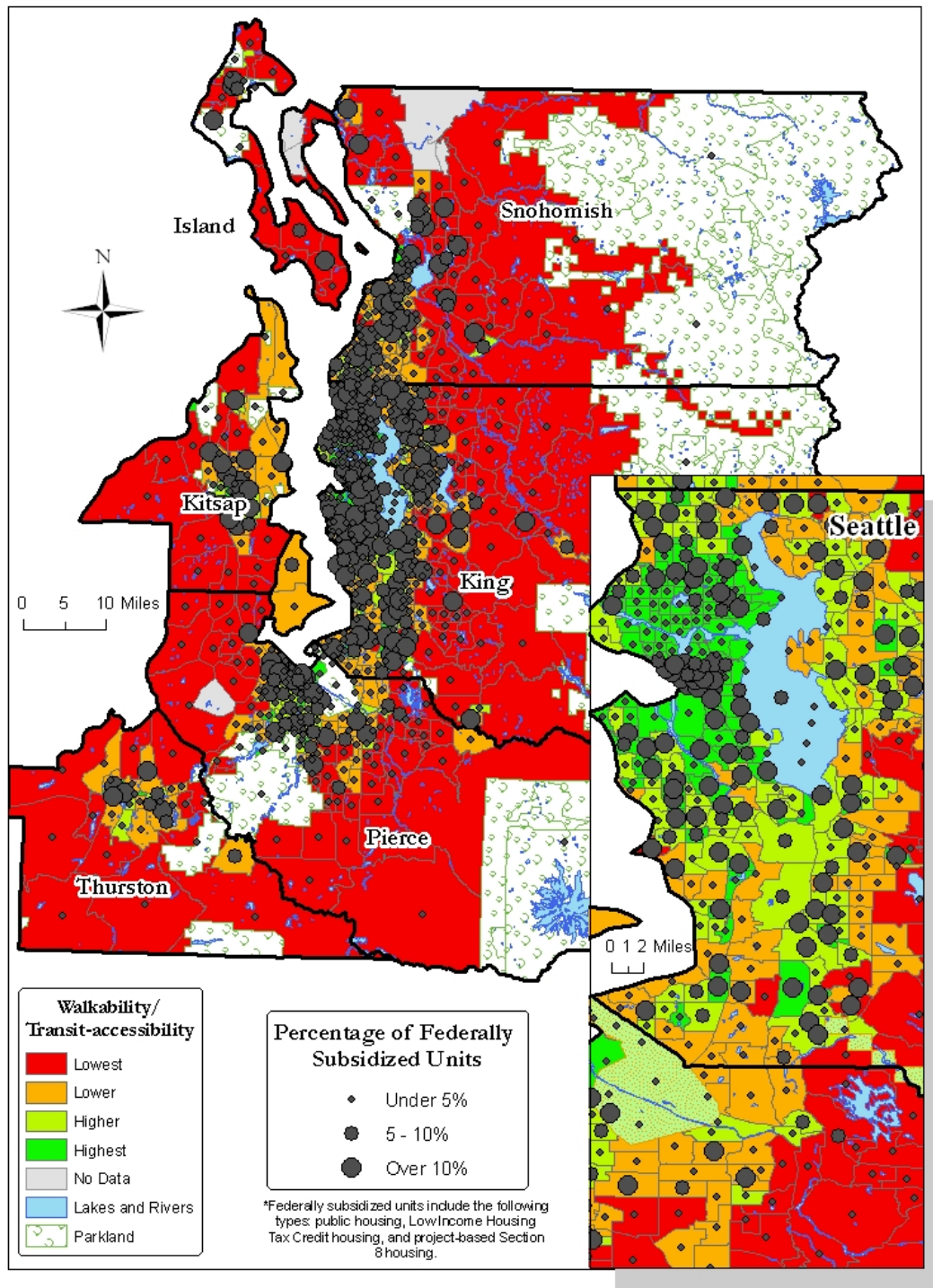
Figure E.6: Opportunity Index in Washington Metropolitan Area with Federally Subsidized Housing Units
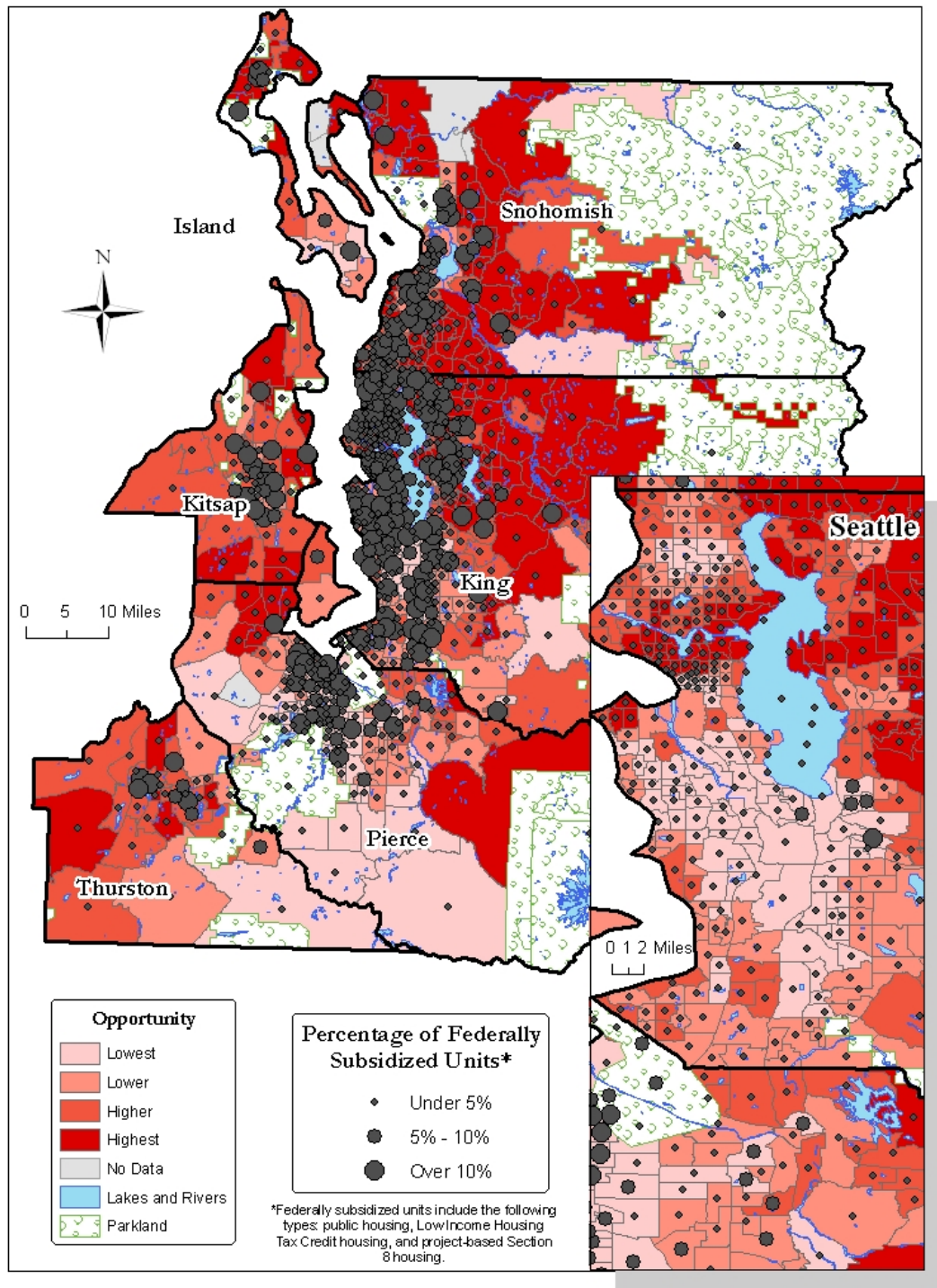
Figure E.7: Walkability/Transit-accessibility Index in New York City Metropolitan Area with Federally Subsidized Housing Units
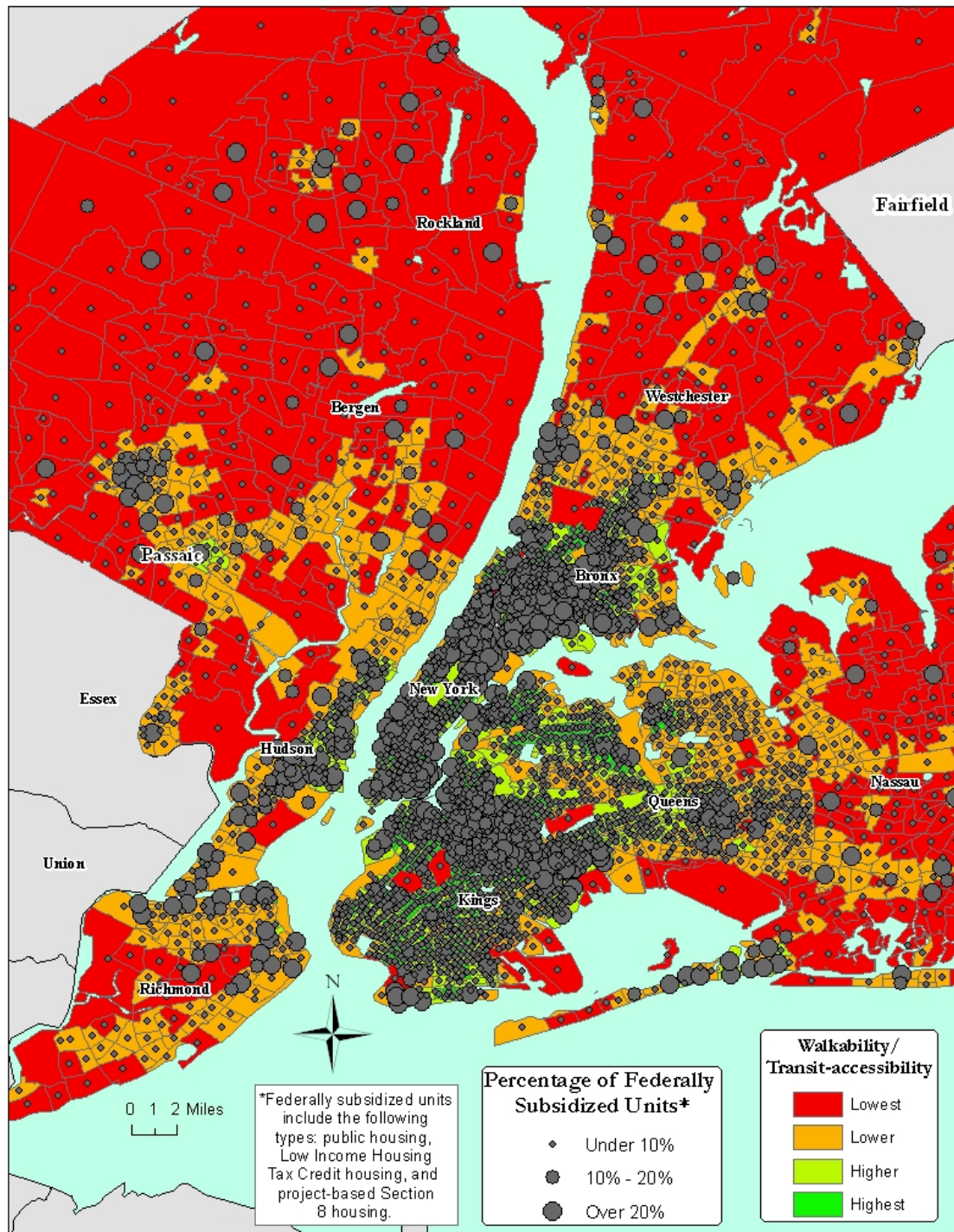
Figure E.8: Opportunity Index in New York City Metropolitan Area Federally Subsidized Housing Units
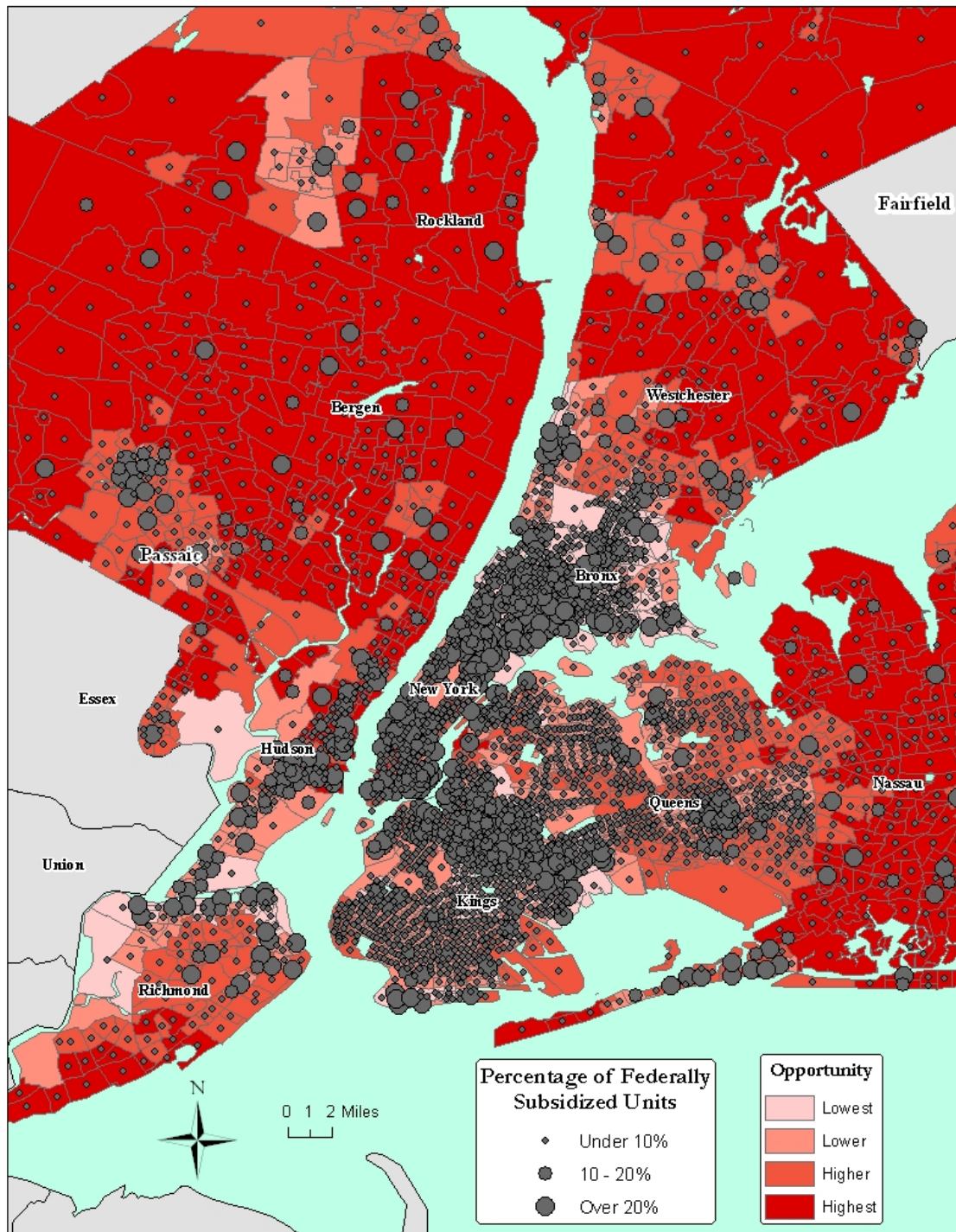
Figure E.9: Walkability/Transit-accessibility Index in Seattle Metropolitan Area with Percentage of Units Rented with Section 8 Voucher
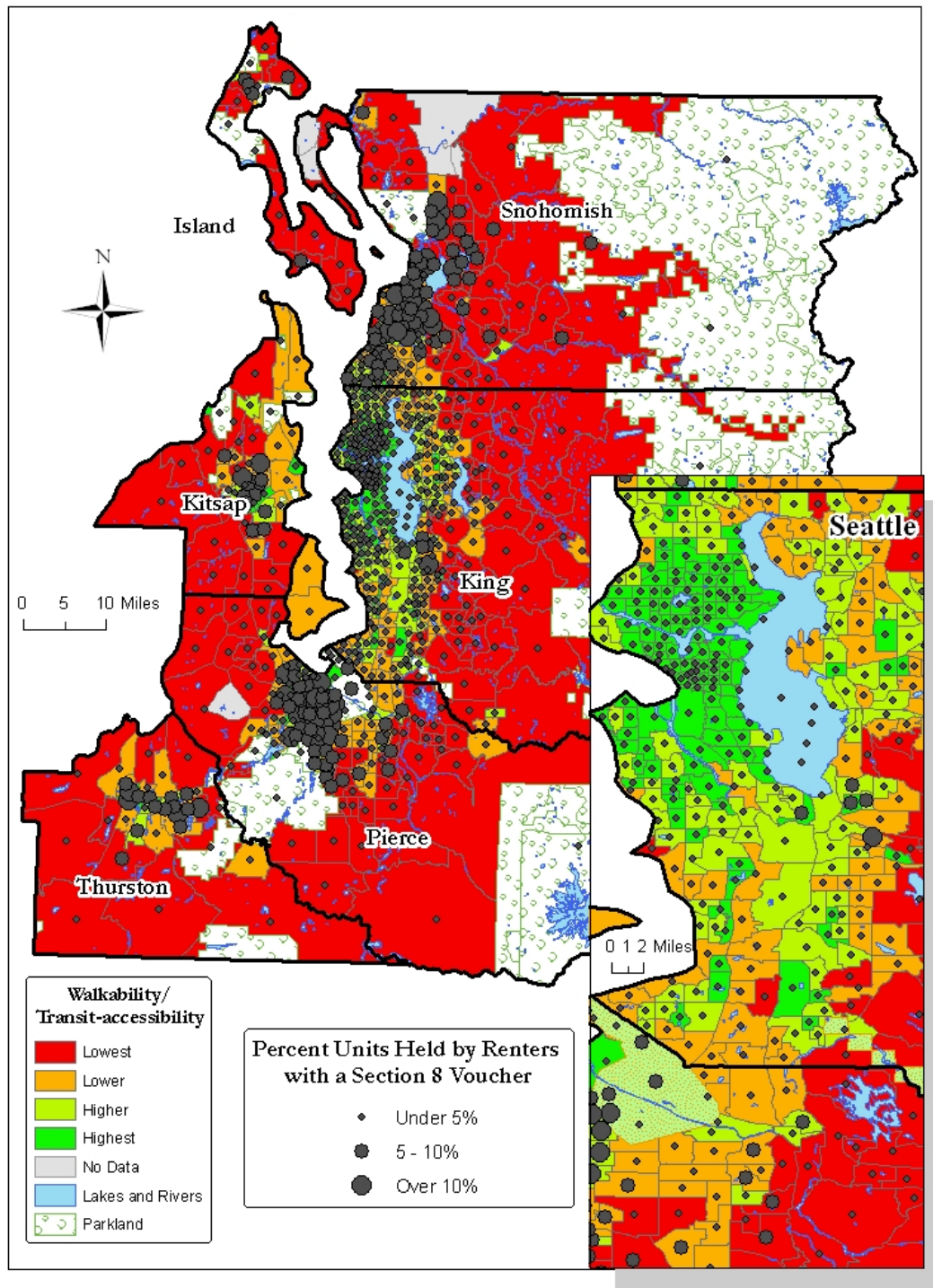
Figure E.10: Opportunity Index in Seattle Metropolitan Area with Percentage of Units Rented with Section 8 Voucher
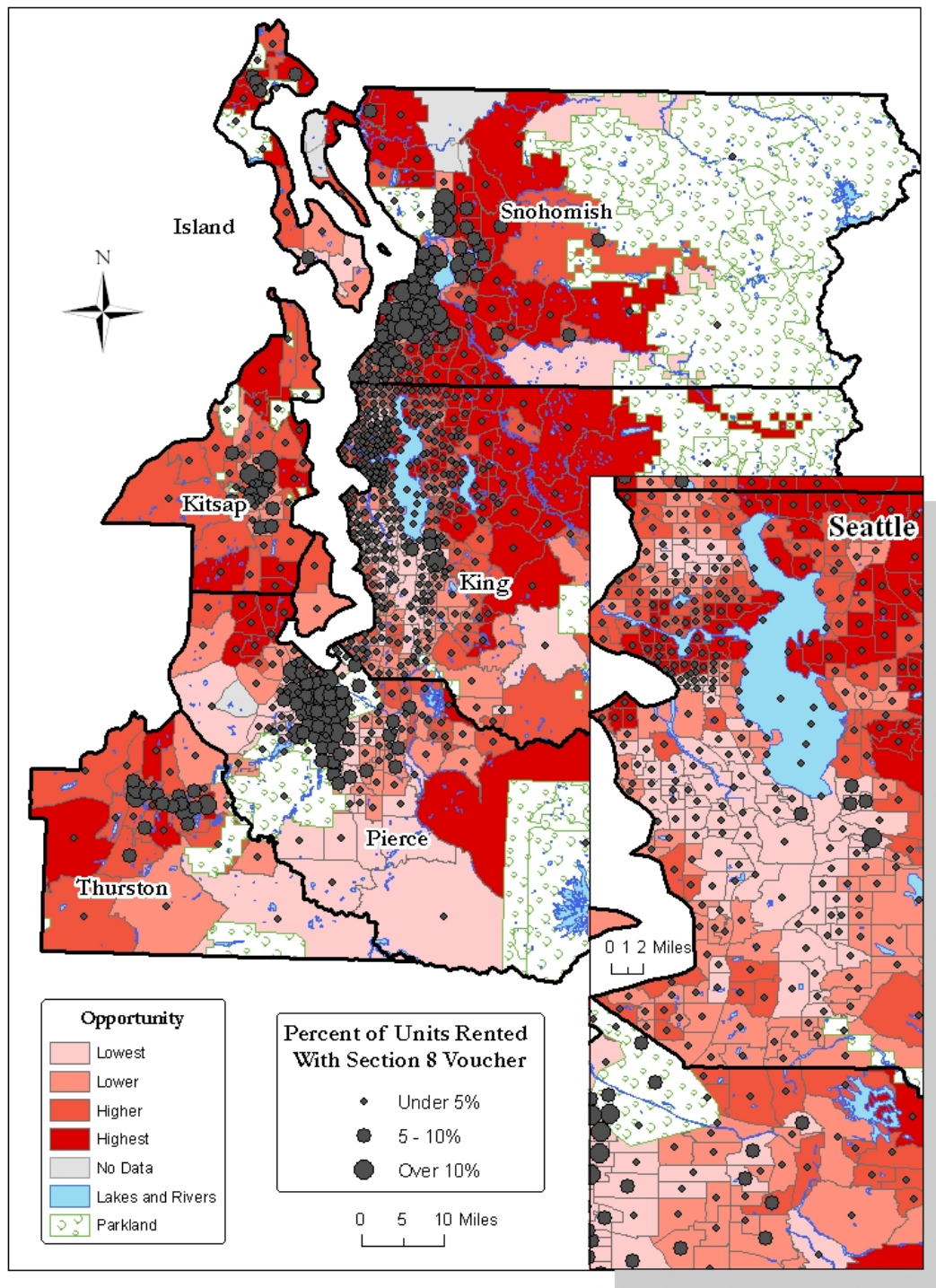
Figure E.11: Walkability/Transit-accessibility Index in New York City Metropolitan Area with Percentage of Units Rented with Section 8 Voucher
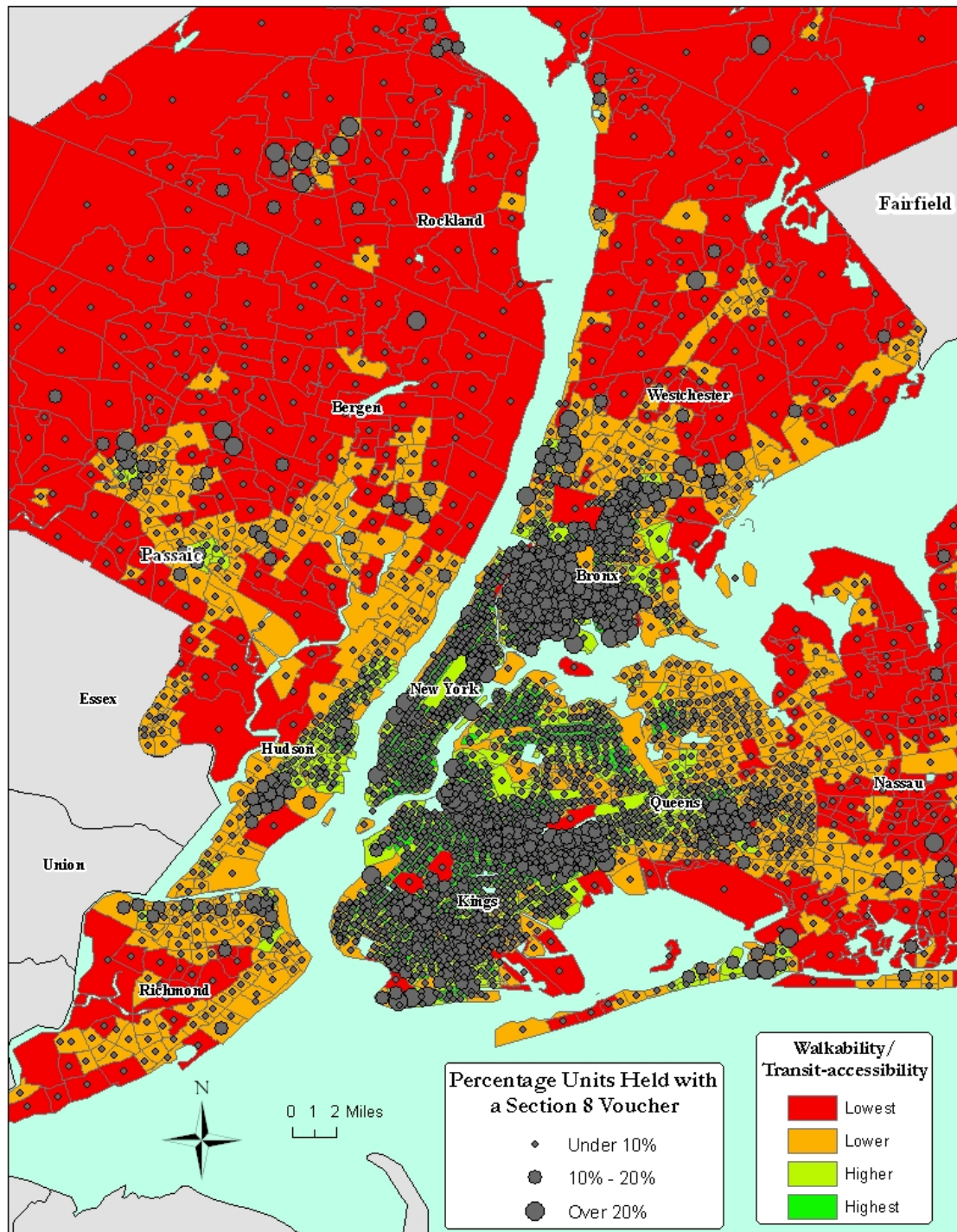
Figure E.12: Opportunity Index in New York City Metropolitan Area with Percentage of Units Rented with Section 8 Voucher
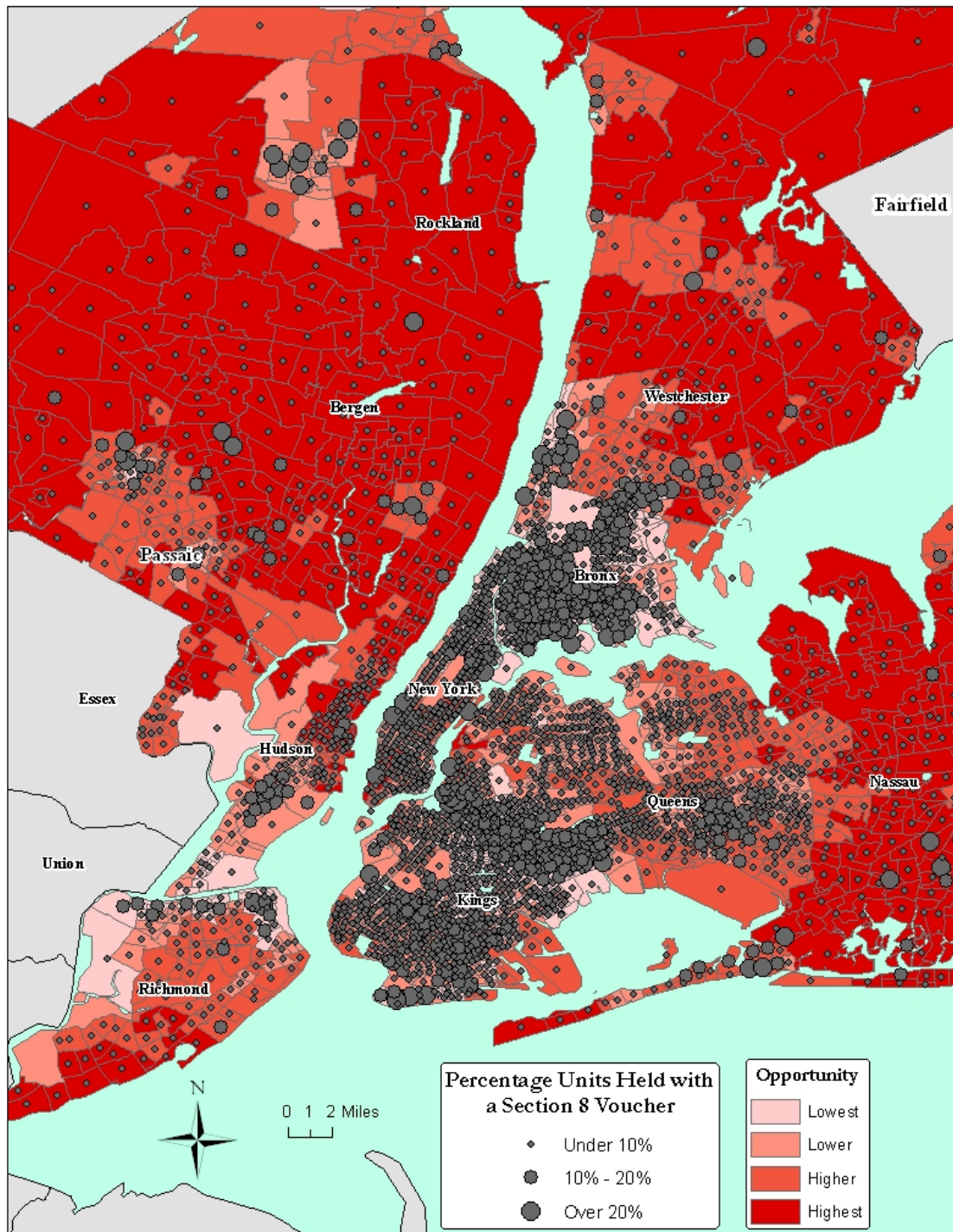
Figure E.13: Metro-Wide Walkability/Transit-accessibility Index versus County-Wide Walkability/Transit-accessibility Index in Bergen County, New Jersey
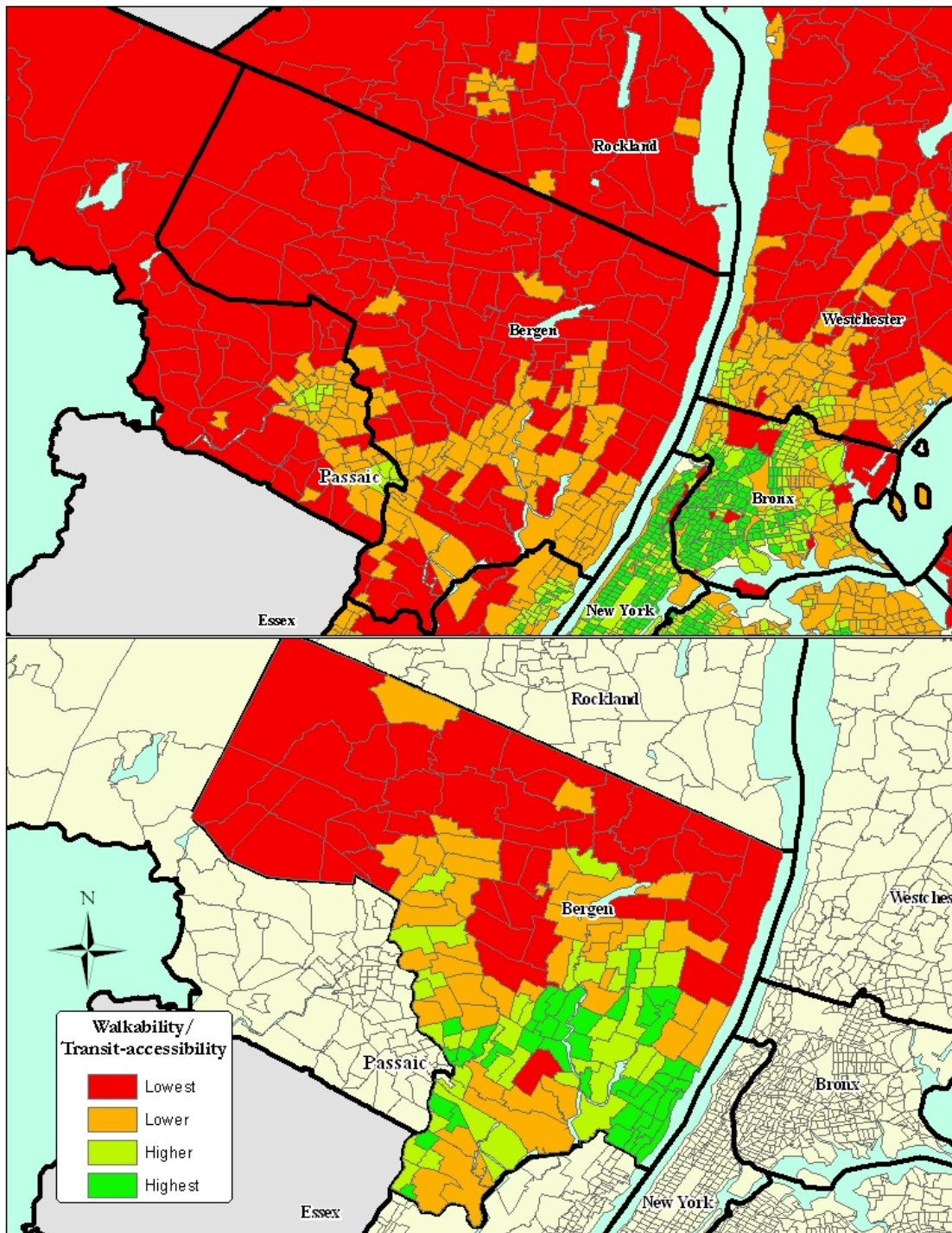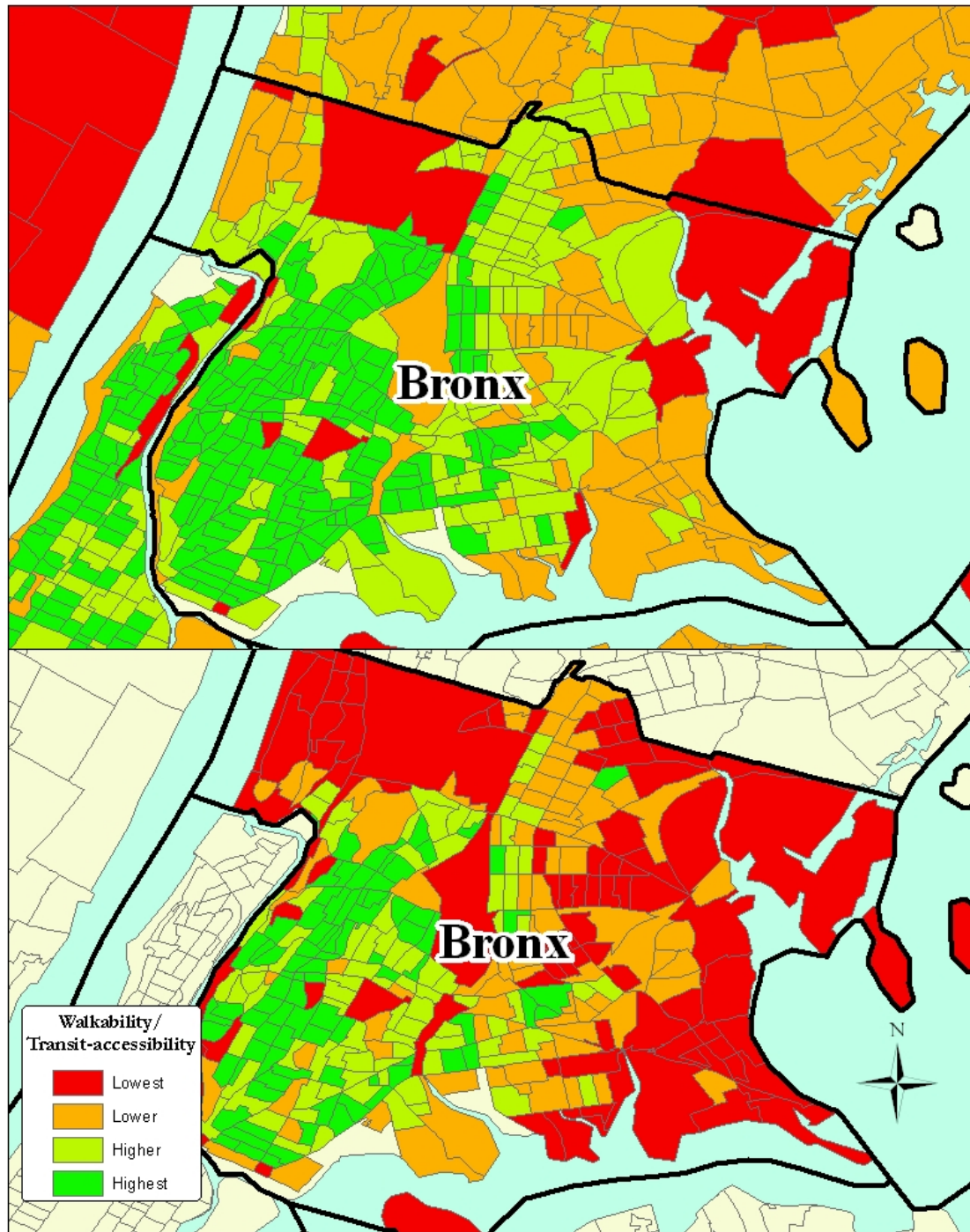
**Figure E.14: Metro-Wide Opportunity Index versus County-Wide Opportunity Index in Bergen County, New Jersey**
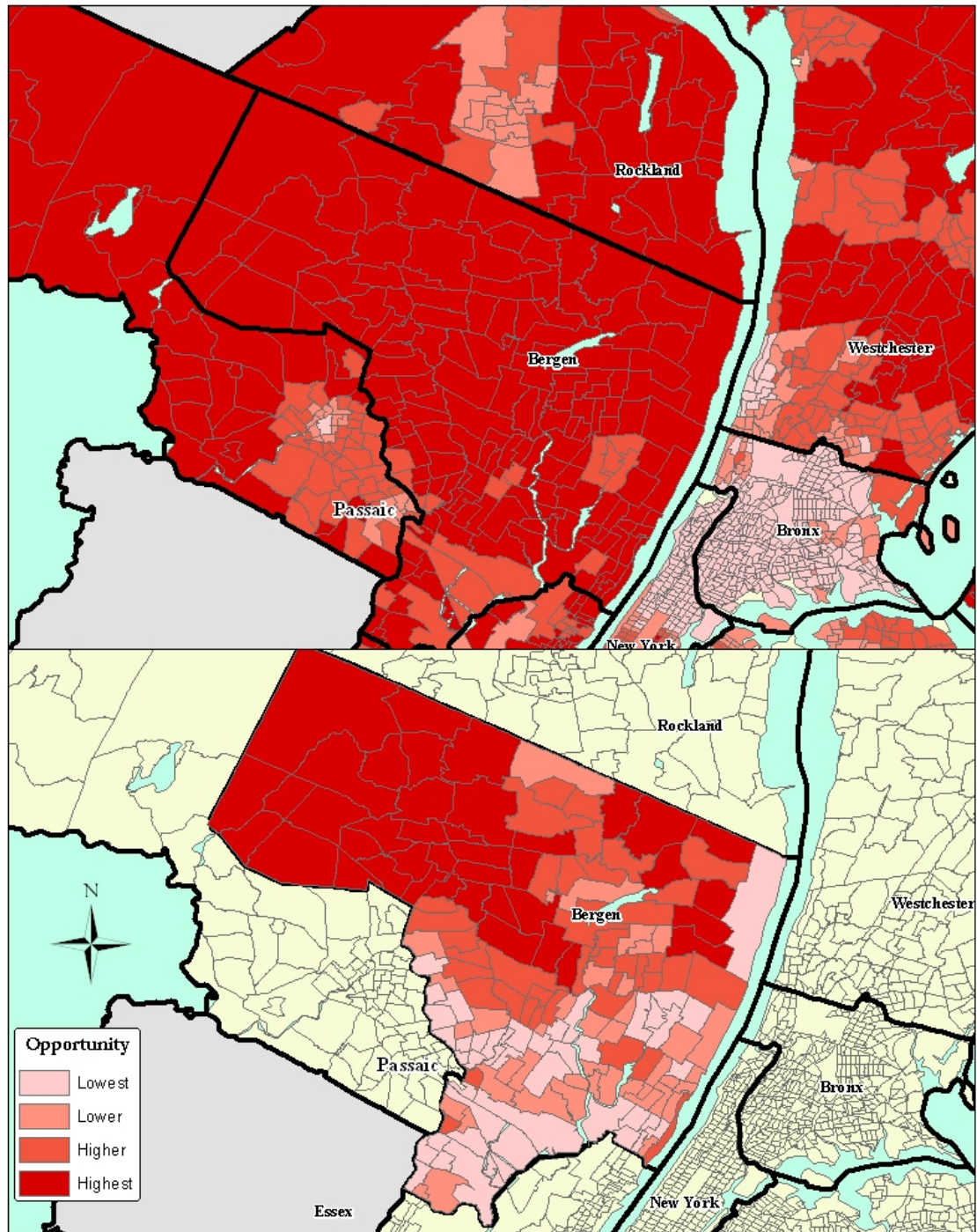
Figure E.15: Metro-Wide Walkability/Transit-accessibility Index versus County-Wide Walkability/Transit-accessibility Index in Bronx County, New York

Figure E.16: Metro-Wide Opportunity Index versus County-Wide Opportunity Index in Bronx County, New York
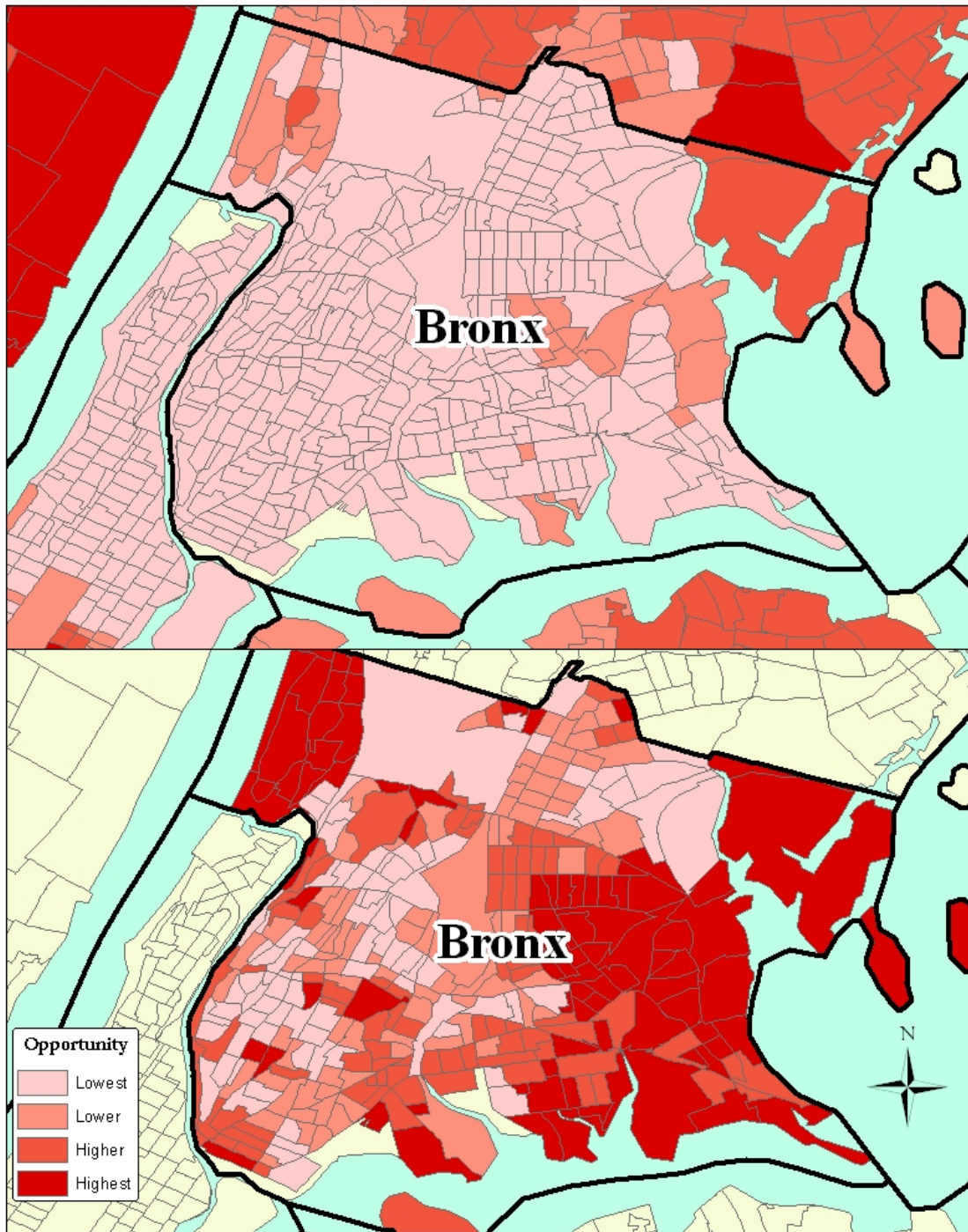
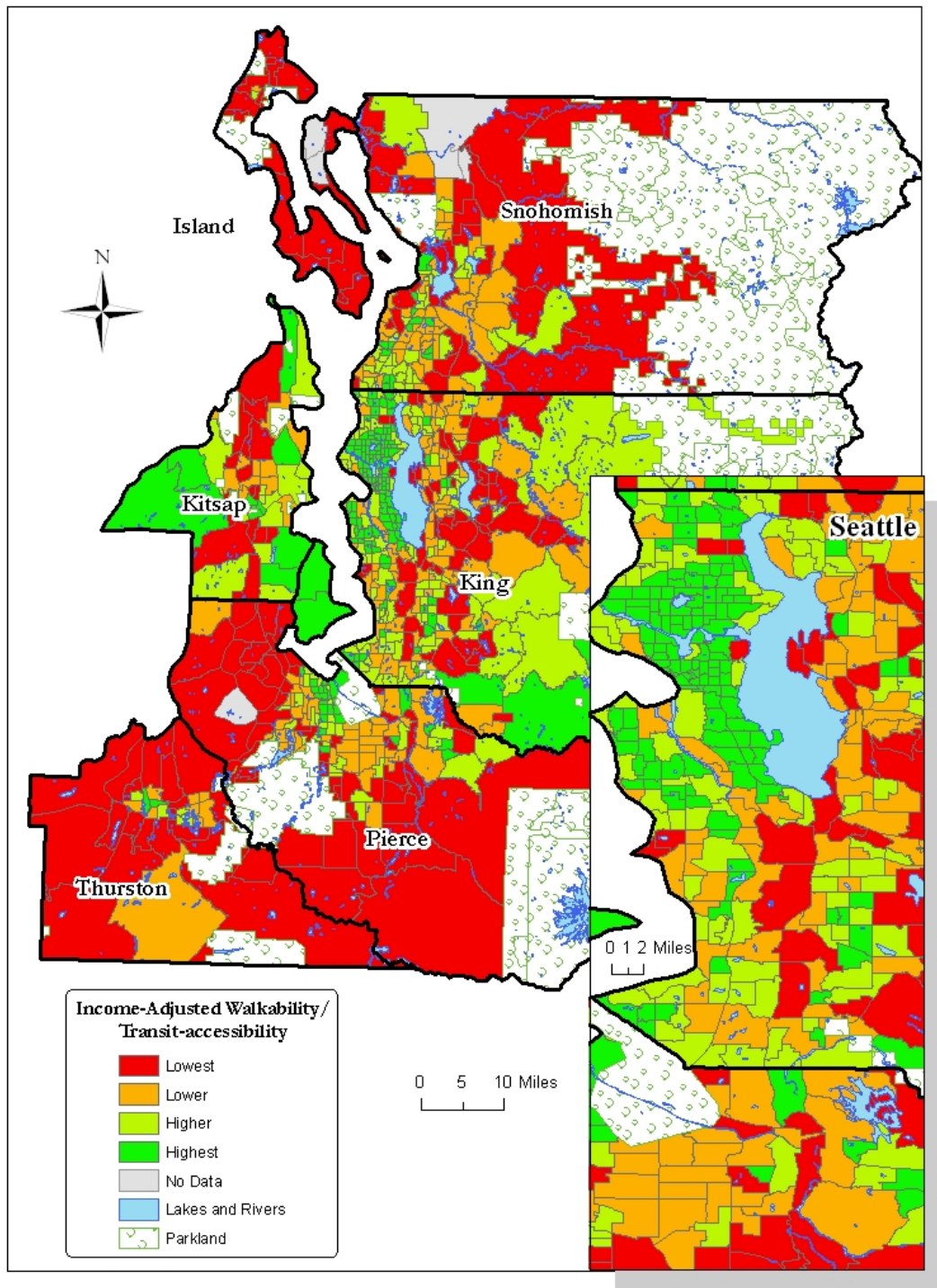Figure E.17: Income-Adjusted Walkability/Transit-accessibility Index in Seattle Metropolitan Area

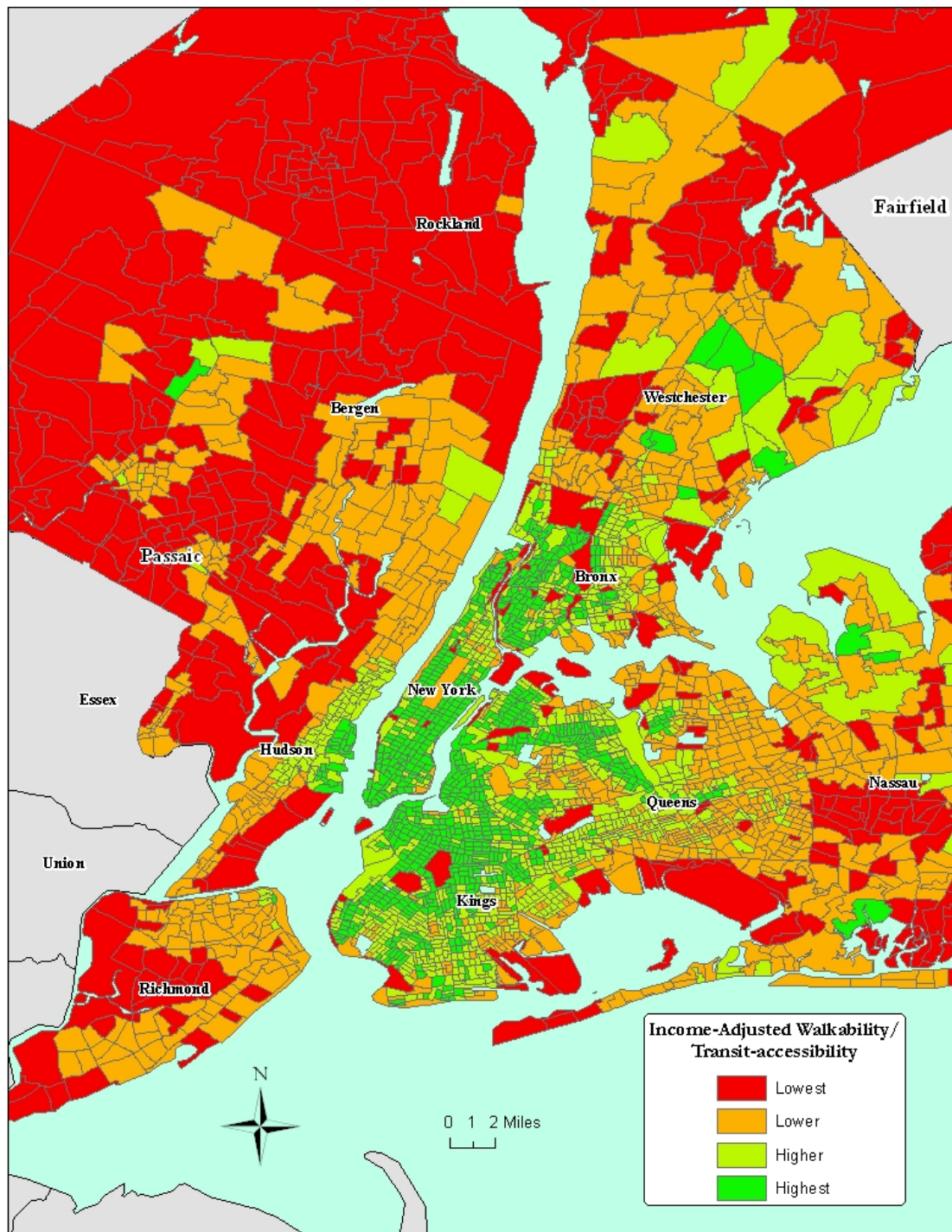**Figure E.18: Income-Adjusted Walkability/Transit-accessibility Index in New York Metropolitan Area**

Figure E.19: Income-Adjusted Walkability/Transit-accessibility Index v. Non-Adjusted Walkability/Transit-accessibility Index in Nassau County, New York
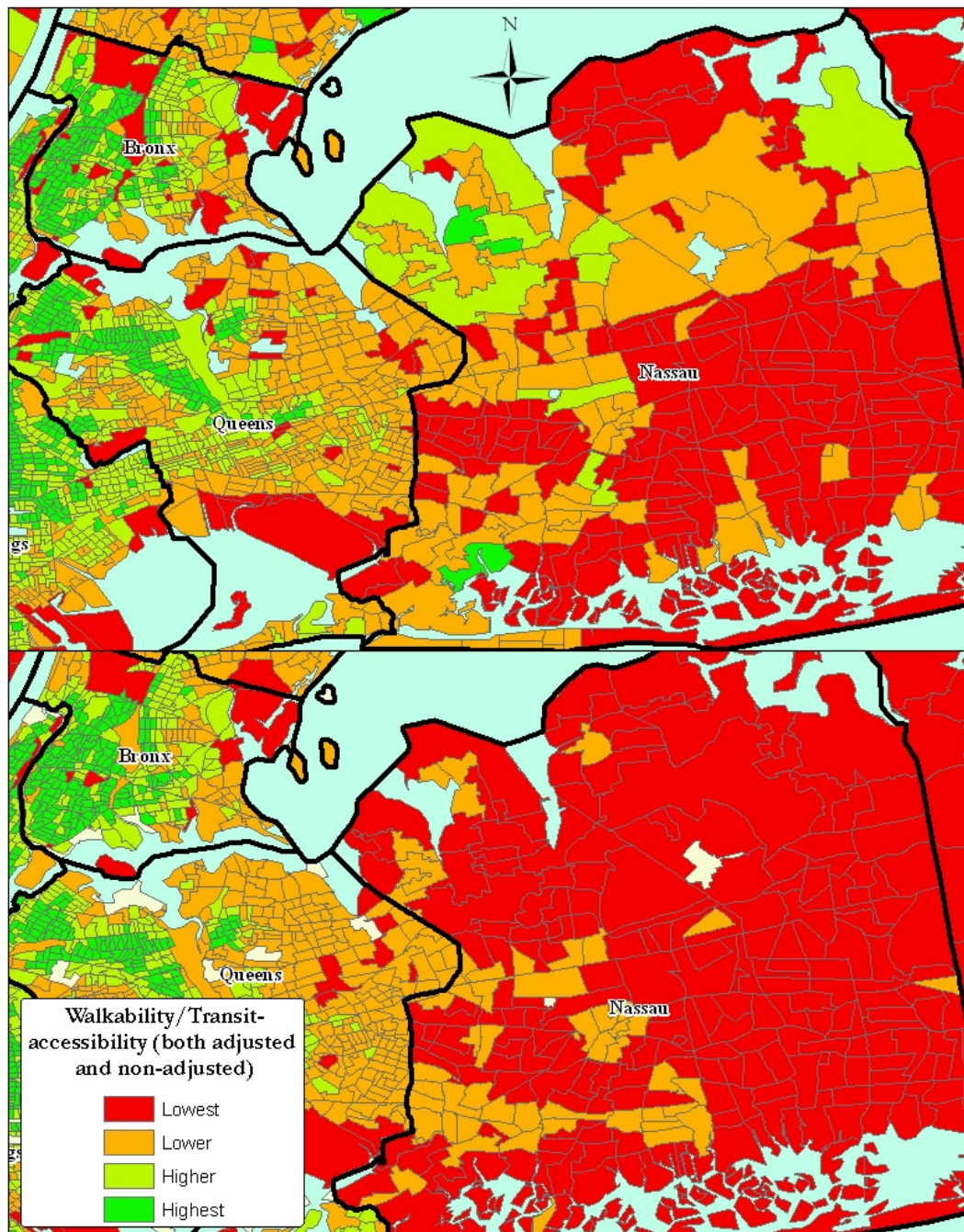
Figure E.20: Income-Adjusted Walkability/Transit-accessibility Index v. Non-Adjusted Walkability/Transit-accessibility Index in Hudson County, New Jersey