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16. Abstract

Federal, state, and local governments spend billions on transportation infrastructure and affordable housing subsidies, but rarely with complete coordination. States and regional entities are pivotal in shaping transportation and housing systems. State agencies not only spend state-generated revenue but also frequently determine how federal resources are allocated. The largest federal subsidy for affordable, rental housing is the low-income housing tax credit program, but states largely determine the allocation of these credits. With increasing attention on the need to combine affordable housing with mobility options, this report examines which states have incorporated transit proximity into their allocation of low-income housing tax credits. In addition, the report also reviews to what extent low-income residential patterns are included in federally required, regional transportation planning. We find that most states address transportation in their allocation of low-income housing tax credits, with the most common transportation criterion being proximity to transit (e.g., whether a development was .25 or .5 miles from transit). Across metropolitan areas, our scan of regional plan documents revealed inconsistent consideration of the residential locations of low-income households. In both policy areas, we thus observe some attention to the relationship between housing location (for low-income households) and transportation systems. The steps toward integration are still new, without documented efficacy, and even with initial progress and attention across spheres, integration challenges may remain.

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State and Regional Tools for Coordinating Housing and Transportation

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Executive Summary

Federal, state, and local governments spend billions on transportation infrastructure and affordable housing subsidies, but not always with full coordination. States and other sub-national entities are pivotal in shaping transportation and housing systems. State agencies not only spend state-generated revenue but also frequently determine how federal resources are allocated, as in the case of low-income housing tax credits. Furthermore, state designated entities—metropolitan planning organizations (MPOs)—are federally required to lead regional transportation planning. In this report, we compare federally required documents issued by states and MPOs.

The largest federal subsidy for affordable, rental housing is the low-income housing tax credit (LIHTC) program, and states determine the allocation of these credits. Each state must develop a qualified allocation plan (QAP) that outlines their LIHTC strategies and criteria. With increasing attention on the need to combine affordable housing with mobility options, this report examines which states have incorporated transit proximity into their QAPs. We find that most states (39) address transportation in their allocation of low-income housing tax credits, with the majority even assigning specific points related to transportation. The most common transportation criterion was proximity to transit (e.g., whether a development was .25 or .5 miles from transit), while many states also considered frequency.

In addition to transportation's inclusion within a low-income housing program, the report also reviews to what extent low-income residential patterns are included in federally required, regional transportation planning. All urbanized areas have metropolitan planning organizations which issue long-range plans. One of their many requirements is to consider issues related to environmental justice and the spatial patterns of low-income and minority households. Our scan of regional plan documents revealed *some* but inconsistent integration across housing and transportation. Several regional transportation entities conducted environmental justice analysis that considered the residential locations of low-income households. However, the most common type of analysis—using spatial units as a proxy for low-income households—has severe limitations.

In both areas, we thus observe some increasing attention to the relationship between housing location (for low-income populations) and transportation systems. The steps toward integration are still new, without documented impacts, and even with initial progress and attention across spheres, there may still be integration challenges.

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This report overlaps in text and content with a white paper focused solely on qualified allocation plans.

Chapter 1. Problem: The Nexus of Housing and Transportation for Low-Income Households

Transportation provides accessibility to employment, food, medical care, and education, as well as the means to engage in civic activities, social life and recreation. The accessibility provided by transportation, however, is dependent in large part on residential location and the geography of amenities. The interrelationship between housing policy and transportation has thus begun to receive more attention, especially as it relates to low- and moderate- income households. For affordable housing to be truly affordable, the combined cost of housing and transportation warrants consideration as location can affect transportation costs and options. Furthermore, the location of affordable housing also can dramatically shape whether residents can access key opportunities, such as jobs, education and health care.

Oversight and funding for housing and transportation has typically been separate. Federal policies have had intense and interwoven effects on housing and transportation. Thus, new studies and efforts have sought to "de-silo" these arenas. For example, a joint partnership between the Environmental Protection Agency, the Department of Housing and Urban Development, and the Department of Transportation formed in 2009. While a recent report (Pendall, et al., 2013) finds that federal programs can spur some integration, it still identifies barriers and suggests an important role for states in efforts to "de-silo" policy arenas.

States can be critical conduits for federal funds, often determining or at least shaping federal spending. States also often bring their own sources of revenue to affordable housing and transportation policies. This report thus considers how state, and to some extent regional, agencies are connecting the issues of residential location and transportation. Much of the study reviews how states determine the allocation of federal low-income housing tax credits—the largest federal program for affordable housing. To complement the focus on sub-national administration of the low-income housing tax credit program, we also scan how the residential locations of low-income households factor into federally required, regional, long range transportation planning.

Chapter 2. Integrating Housing and Transportation through State and Regional Agencies

This study considers whether the implementation of federal programs—at sub-national but supra-local levels—integrates affordable housing and transportation. Federal policies and funds play a significant role, but key implementation choices occur at the state and regional level. Rather than focus solely on municipal action, the report considered how states may or may not act to integrate housing and transportation through allocation of federal tax credits. Federal rules (that states must formalize criteria for tax credit allocation) make comparison across states possible. Federal rules also require another document that allows comparison across places; metropolitan planning organizations must develop long-range, regional plans. Like states, MPOs are supra-local and situated between the municipal and federal government levels.

The State Role in Federal Low-Income Housing Tax Credits

The low-income housing tax credit program is the largest affordable rental housing program in the United States (Khadduri, Climaco, Burnett, Gould, & Elving, 2012). There is limited research on whether developers and public entities involved with affordable housing consider transportation accessibility at all. The research that does exist broadly "looks at the opportunities to link affordable housing and transportation through the utilization of state and federal programs and funding streams" (Texas Department of Housing and Community Affairs, 2012, p. 1), or "tends to emphasize the costs without an assessment of the variable benefits of accessibility" (Agrawal et al., p. 4).

Transportation costs matter for the siting of affordable housing for two reasons. First, low-income households are more likely to lack access to a private automobile and tend to use transit more than any other segment of the population (Pollack, Bluestone, & Billingham, 2010). Furthermore, location can strongly affect the ease of alternate modes, such as walking and transit. Second, transportation costs (and the need for private vehicle[s]) can vary by location and may make the combined costs of transportation and housing unsustainable for low-income households. These households may experience anxiety over their transportation costs (auto or transit), reshuffle their finances to accommodate transportation costs, or sacrifice other expenditures for travel (i.e. food, social activities) (Agrawal, Blumenberg, Abel, Pierce, & Darrah, 2011).

The low-income housing tax credit program.

The 1986 Tax Reform Act created the low-income housing tax credit program to provide developers with a financial incentive to build affordable rental housing for households earning less than 60 percent of area median income (AMI). Each year, the federal government allots each state's Housing Finance Agency (HFA) credits based on population, and then the state agencies award credits for specific projects. "Developers then sell these credits to investors to raise capital (or equity) for the projects, which reduces the debt that the developer would otherwise have to borrow. Because the debt is lower, a tax credit property can in turn offer lower, more affordable rents" (How Do Housing Tax Credits Work? n.d., para. 1).

Investors must ensure that the properties remain compliant with program requirements in order to receive tax credit for 10 years (compliant means that the property must provide affordable housing for at least 15 years). Project owners are responsible for annually reporting their leasing practices to the Internal Revenue Service (IRS) and the state agency in charge of low-income housing. Projects that fall out of compliance are subject to tax credit recapture, a powerful enforcement mechanism (Khadduri et al. 2012).

Qualified allocation plans.

The QAP is the document that each state annually publishes to specify the various ways developers can earn tax credits for a given development. The document must: a) include the required federal mandates; b) outline a system of its own requirements; and c) indicate how much priority is given to certain project characteristics. In other words, the QAP describes the state's evaluation framework for awarding LIHTCs. This allocation process is highly competitive and, as a result, the QAP largely determines the characteristics of LIHTC housing. Since every state is responsible for creating its own plan, each one is unique and specific to that state (excluding the federal mandates). There are three mechanisms that QAPs use to allocate tax credits:

- *Threshold requirements* set minimum standards for LIHTC projects. Only developments meeting the threshold requirements are eligible to receive credits.
- *Set-asides* are funds from a state's tax credit allocation pool dedicated to specific types of projects.
- *Point-based scoring criteria* are used to rank qualifying development proposals based on state affordable housing priorities. HFAs award extra points to projects with desired characteristics. (Nelson & Sorce, 2013, p. 3)

Most states used point-based scoring for transportation-related criteria.

Metropolitan Planning Organizations, Transportation and Low-Income Populations

Regional, long-range transportation planning is required for the receipt of federal transportation funds. More specifically, federal rules require that states designate a metropolitan planning organization (MPO) for urbanized areas with more than 50,000 residents (FHWA & FTA, 2007). Federal agencies outline many requirements for regional planning and periodically review and certify MPOs in large metropolitan areas.

One requirement is that MPOs address Department of Transportation Environmental Justice principles. The three principles address the participation of, benefits to, and harms experienced by low-income and minority residents.[1] The current primer on MPO certification directs federal staff to

[1] Following an executive order in 1994, the US DOT outlined the following environmental justice principles in 1997: "[1]To avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority populations and low-income populations.[2] To ensure the full and fair participation by all potentially affected communities in the transportation decisionmaking process.[3]To prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority and low-

consider whether: "Minority and low income population concentrations and issues [are] identified" and whether "[s]tandards, measures and benchmarks are reasonable to demonstrate significant disparity of impacts in accessibility to and delivery of transportation facilities/services" (FHWA & FTA, n.d., Sect. 2:12). Thus, transportation agencies, by federal guidance, should consider the residential patterns of low-income and minority groups. This provides a common entity—MPOs—and product—long range plans—to compare how residential locations and transportation are addressed regionally. Recently (2012), the Federal Highway Administration and the Federal Transit Administration have issued documents to help their aid recipients meet environmental justice requirements, but ambiguity remains about how MPOs should analyze the spatial patterns and needs of low-income populations. Furthermore, as noted by Duthie, Cervenka, and Waller (2007), MPOs face several key challenges in conducting environmental justice analysis, specifically limited data on travel behavior and project costs, unresolved questions of what equity is, and uncertainty about the appropriate unit of analysis.

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income populations." Information available at http://www.fhwa.dot.gov/environment/environmental_justice/ej_at_dot/

Chapter 3. Methodology

This report explores housing and transportation integration by considering whether an affordable housing program accounts for transportation and whether transportation plans address the housing locations of low-income populations. In both cases, we examine documents produced by agencies positioned between the local and federal levels.

QAP Analysis

This report explores the subject of transportation accessibility for residents of affordable housing by analyzing each state's LIHTC allocation criteria, known as the Qualified Allocation Plan (QAP), in three phases. First, this research identified which state QAPs include the terms "transportation," accessibility," "mobility," or "transit."[2] The second step calculated the percentage of total points awarded for transportation out of the total possible points. Last, this report discusses the three most common types of transportation criteria: proximity to transit stop/station, service frequency, and geographic context.

Scan of Environmental Justice in MPO plans

We also consider how metropolitan planning organizations address the location of low-income households in regional transportation planning. While transportation and transit provision is affected by and operated by a plethora of different types of institutions that vary by region, the focus on MPOs allowed some consistency in agency type. Thus, we consider one way in which affordable housing policy can incorporate transportation and how transportation agencies, specifically MPOs, indirectly consider this link through environmental justice and accessibility analysis.

We conducted a scan of metropolitan planning organization activities. We focused on whether and how MPOs addressed questions of environmental justice, such as through demographic analysis of low-income populations and the transportation network. While not explicitly linked to housing policy, an environmental justice analysis that considers low-income residential location provides an initial connection to questions about location and housing affordability within the arena of transportation. We reviewed selected MPO plans, focusing on Louisiana, the Southeast (excluding Houston and Atlanta as outliers due to their very large populations) and several MPOs with best practices. We developed a protocol for review of the most recent long-range plans in selected regions (see Appendix 1). We focused on long-range plans as they are required and thus comparable across regions. MPOs or other entities may have produced a unique local product to address low-income residential patterns or accessibility that was not readily apparent or available. Thus, our review may not wholly capture each MPO's activities and actions related to accessibility and low-income residential locations.

[2] This report only looked for specific language in the QAP that referred to transportation accessibility. Many states utilized LEED Building standards that include public transportation, but as these are requirements for a separate entity, they were not considered.

Chapter 4. Findings

Transportation in Low-Income Housing Tax Credit Allocation

Utilizing the most recent QAP released by all 50 states and the District of Columbia, the following analysis reviews whether and how states incorporate transportation considerations in their evaluation of LIHTC proposals. While certainly not all of the states consider transportation, a word-search of each QAP revealed that the majority (39) mentions transportation at some point in their respective reports (Table 1). There exists a small but considerable number of states (12) that do not mention the words "transportation," "accessibility," "mobility," or "transit" *at all* in their reports.

Table 1: States considering transportation in their QAP

Yes	State	Yes	State	Yes	State
X	Alabama	X	Kentucky		North Dakota
	Alaska	X	Louisiana	X	Ohio
X	Arizona	X	Maine		Oklahoma
X	Arkansas	X	Maryland	X	Oregon
X	California	X	Massachusetts	X	Pennsylvania
X	Colorado	X	Michigan	X	Rhode Island
X	Connecticut	X	Minnesota		South Carolina
X	Delaware	X	Mississippi		South Dakota
X	D.C.	X	Missouri		Tennessee
X	Florida	X	Montana	X	Texas
X	Georgia		Nebraska	X	Utah
X	Hawaii	X	Nevada	X	Vermont
	Idaho		New Hampshire	X	Virginia
X	Illinois	X	New Jersey	X	Washington
X	Indiana	X	New Mexico		West Virginia
	Iowa	X	New York		Wisconsin
X	Kansas	X	North Carolina	X	Wyoming

Scoring.

As previously stated, although the federal government offers general guidelines that the states must adhere to, states ultimately decide how to allocate tax credits. As a result, there is considerable diversity among QAPs. Of the three mechanisms listed earlier, the point system is the most widely used for transportation related criteria. The percentages listed in Table 2 report the relative weight each state gives to transportation criteria. Many states had clear maximums for each category, others used conditional points so that it was difficult to determine the maximum possible points allowable, and three used a priority system that failed to specify points.

The variability of each state's point structure was overcome by determining the percentage of transportation points out of the total possible points, which ranged from .25 (Indiana) to just over 16 percent (New Jersey) (see Table 2). Pennsylvania follows New Jersey with 14% but the median percent of QAP points allocated to transportation criteria is 2.78%. Others states, like Alabama, only briefly allude to transportation as something mandated by the federal government, but do not offer any specific details that address it. An applicant can receive one point if the project "provides services, and then must provide transportation to those services." This point amounts to 0.63% (Table 2) of the total possible points that Alabama offers.

How states consider transportation accessibility

This section focuses on the three types of transportation criteria most commonly considered: proximity to transit stop or station; frequency of transit service; and geographic context. Arizona, Florida, and Illinois utilize all three categories to distinguish development proposals as they relate to transit. A complete summary of each state's incentives is included in Appendix 2

Proximity to transit

A project's proximity to transit stops is the criterion that states use most commonly to award points (e.g., development must be within ½ mile of public bus stop for transportation points). Of the twenty-two states that included proximity, seven states (CO, CT, LA, NV, NJ, NM, and NY) used this metric as the only transportation-related criteria. Florida breaks down a development's distance from a transit stop into increments maxing out at ½ mile. For example, with bus stops, two points (or 28% of total points) are awarded if the stop is at or less than .2 miles away from the development, 1.5 points if it is between .2 and .3 miles, 1 point between .3 and .4 miles, and .5 points between .4 and .5 miles. No points are awarded if the stop is greater than .5 miles from the proposed development.

Frequency of transit

Sixteen of the 39 states that incentivize transportation in their QAPs (41%) utilize minimum headway times, or frequency of service, for certain times of the day. For example, California awards 5 points for projects located within 1/3 mile of a public bus stop with at least 30-minute frequencies from 7-9AM and 4-6PM. However, five states (PA, TX, UT, VA, and WY) *only* consider service frequency in evaluations.

Table 2: Percent of total QAP points dedicated to transportation			
State	Total Possible Points	Transportation/ Transit Points	Share of Total Points
New Jersey	61	10	**16.4%**
Pennsylvania	145	20	**13.8%**
Arizona	262	20	**7.6%**
Arkansas	140	10	**7.1%**
Georgia	88	6	**6.8%**
Florida	124	7	**5.7%**
California	129	7	**5.4%**
Hawaii	93	5	**5.4%**
Washington	203	10	**4.9%**
Maine	67	3	**4.5%**
Texas	228	10	**4.4%**
Colorado	130	5	**3.9%**
Massachusetts	182	6	**3.3%**
New York	97	3	**3.1%**
D.C.	665	20	**3.0%**
Kentucky	360	10	**2.8%**
Montana	108	3	**2.8%**
Illinois	246	6	**2.4%**
Utah	227	5	**2.2%**
Connecticut	100	2	**2.0%**
Virginia	500	10	**2.0%**
Michigan	251	5	**2.0%**
Delaware	169	3	**1.8%**
Kansas	310	5	**1.6%**
Maryland	315	5	**1.6%**
Minnesota	246	3	**1.2%**
Nevada	136	1	**0.7%**
Alabama	159	1	**0.6%**
Louisiana	159	1	**0.6%**
Wyoming	727	3	**0.4%**
New Mexico	281	1	**0.4%**
Indiana	204	0.5	**0.3%**
North Carolina	112	not specified	
Ohio	100	not specified	
Oregon	100	non-point	
Rhode Island	non-point	N/A	
Vermont	non-point	N/A	

Table 3: How states consider transportation accessibility			
State	Proximity to Transit Stop/Station	Service Frequency	Geographic Context
Alabama			
Arizona	X	X	X
Arkansas			
California	X	X	
Colorado	X		
Connecticut	X		
Delaware	X		X
D.C.	X		
Florida	X	X	X
Georgia	X		
Hawaii	X	X	
Illinois	X	X	X
Indiana	X		
Kansas			
Kentucky			
Louisiana	X		
Maine	X	X	
Maryland	X	X	
Massachusetts	X		
Michigan	X	X	
Minnesota	X	X	
Mississippi			
Missouri	X	X	
Montana			
Nevada	X		
New Jersey	X		
New Mexico	X		
New York	X		
North Carolina			
Ohio			
Oregon			
Pennsylvania		X	
Rhode Island			
Texas		X	
Utah		X	
Vermont			
Virginia		X	
Washington		X	X
Wyoming		X	

Geographic context and considerations.

While proximity and service frequency play large roles in increasing accessibility, five states provide area-specific criteria for varied built environments found in each state. For instance, Arizona, despite being ranked below New Jersey and Pennsylvania in the number of points it allocates to transportation, distinguishes its minimum headway and proximity criteria for public transportation into three categories 1) Greater Phoenix 2) Greater Tucson and 3) Rest of State.[3]

Florida distinguishes between transit-oriented developments (TODs), public bus stops, public bus transfer stops, public bus rapid transit stop, and public rail stations. Ten states (CO, CT, FL, GA, IL, MD, MO, NJ, NY, and OR) specifically incentivize TOD in their QAPs. Proximity to transit, walkability, and mixed-use areas generally characterize a TOD, but several states do not provide specific standards to adhere to. On the other hand, Missouri defines TODs: they must offer increased mobility choices and bicycle/pedestrian options; include significant retail development, contain a mix of housing choices and mixed-use development; and be within 5 blocks of a transit station with 15-30 minute headways. The state does not offer any points for this, but does award a 30% basis boost, which increases the number of tax credits available for a project.[4]

For rural areas without a viable public transit system in place, some states like Illinois, Maine, and Minnesota award points to developments that provide an on-demand or dial-a-ride service for tenants.

Discussion.

Since past studies did not acknowledge this particular topic as a major QAP policy during the 1990s (Gustafson & Walker, 2002), this report began merely as an investigation into whether or not QAPs presently considered transportation in their allocation criteria. The research revealed that there are not only quite a number of states that do, but that many of them use criteria that are designed to specifically address transportation accessibility. As a result, this report documents and categorizes the various methods by which increasing access to transportation was incentivized by state QAPs. While determining the most effective criteria is out of this report's scope, QAPs with clearly specified criteria offer prospective developers a clearer blueprint for selecting sites with accessible transportation options. In general, QAPs tend to become increasingly more specific over time, larger states tend to offer more specific criteria, and changes to QAPs are incremental (ibid). Despite

[3] For Greater Phoenix and Greater Tucson, "Frequent Bus Transit System" stops must be ¼ mile or less from the development, and service must be every 30 minutes from 6 AM – 6 PM on weekdays. On weekends, Phoenix's frequency and times remain the same, while Tucson's service frequency decreases to once every hour. For the Rest of the State, the "Frequent Bus Transit System" must be within ¼ mile of the development, but the criterion only requires service every hour on weekdays from 9 AM – 5 PM. For these areas there is additional language for "High Capacity Transit" which includes any commuter rail service which must be within ½ mile of the development. There is no minimum service frequency required.

[4] Until the Housing and Economic Recovery Act of 2008, only HUD-identified projects located in Qualified Census Tracts (QCTs) or Difficult Development Areas (DDAs) were eligible for this boost. QCTs are tracts where half of the households earn under 60 percent of the Area Median Income (AMI), and DDAs are where the costs of construction, land, and utilities are high compared to relative incomes. Since the Act was signed into law, allocating agencies are now able to decide which projects can be eligible for a basis boost (Khadduri et al., 2012; Shelburne, 2008).

varied geography, infrastructure, and social conditions between and within states, the notable examples discussed in this section can provide examples to those states seeking to refine transportation criteria.

A state can more effectively evaluate projects and available transportation by factoring in a geographic area's spatial context (i.e., urban/rural). Arizona provides some of the most detailed examples with its area-specific criteria. It acknowledges that "Greater Phoenix" and "Greater Tucson" are both denser than the "Rest of the State" and assigns them different requirements accordingly. Such specific criteria minimize confusion when the developer applies for the tax credits and give the state a clearer way to determine how its tax credits are properly allocated.

States with areas without the density to support public transit address this situation as well. The language that Illinois, Maine, and Minnesota use for the dial-a-ride services implies that it is a free service, which would provide an enormous benefit to special-needs, disabled, or elderly tenants. Public transportation options are severely lacking in many areas around the country and so "paratransit and specialized transportation are the only feasible modes of transportation (for the elderly), other than getting a ride from others" (Bailey, 2004, p. 3).

However, some details can raise more questions than provide answers for developers. Stipulating that a transit service maintain certain service frequency during peak hours may increase reliability and minimize wait times for riders. Yet, doing so without specifying that the development be within a certain distance of the stop is questionable given that ridership rates fall the farther away a transit station is regardless of service frequency (Untermann 1984, Cervero 2007, Kolko 2011). In other words, increasing the service frequency of a nearby stop will not necessarily address transit accessibility if that stop is already too far away. However, the five states that only specified frequency times – PA, TX, UT, VA, and WY – are states with large rural areas where robust transit systems might be lacking.

Regional Transportation Planning and Environmental Justice Analyses

We observed highly variable attention to low-income residential locations in our scan of MPO environmental justice activities. As discussed above, like QAPs, regional long-range plans are federally required, but local agencies have discretion in the content of both. Federal rules require that transportation agencies address the distribution of harms and benefits from transportation. As mentioned above, however, MPOs have data constraints, methodological challenges, and unclear standards related to environmental justice. For this report, we are most interested in the extent to which MPOs consider the distribution of low-income housing and transportation facilities, especially transit service.

Among Louisiana long-range MPO plans, we found varied approaches to accessibility and low-income residential locations. On the one hand, the Lafayette Metropolitan Transportation Plan (MTP) 2040 did not explicitly mention equity or accessibility (based on word searches) (Lafayette

Metropolitan Planning Organization, 2012). Similarly, a word search for "equity," in the Capital Region Planning Commission (CRPC) plan produced the word only in reference to federal legislation. The agency released the metro Baton Rouge Transportation Plan in 2007 and described the term "accessibility" as the ability to meet projected trip demand by increasing fleet size.

On the other hand, the Rapides Area Planning Commission conducted spatial analysis of population groups. The commission adopted the Alexandria/Pineville MTP 2035 in 2011. As part of its environmental justice efforts, the commission used geographic information science (GIS) methods to show the distribution of minority and low-income populations relative to proposed projects. The North Louisiana Council of Governments (NLCOG), which includes Shreveport, issued an Environmental Justice Plan. That document describes their long-range plan's compliance with Title VI and considers the distribution of benefits and burdens, with a focus on the needs and patterns of low-income and minority populations. The report included a detailed demographic comparison of the MPO study area with the United States; it revealed that the metro area has a much higher share of these two groups than the nation.

Among the MPOs known for best practices in environmental justice analysis, there is reliance on travel time modeling. (The MPO plans that we reviewed are listed in the Appendix 1.) Models may project the average travel time to key destinations (e.g., jobs, educational facilities or health care providers) or the total number of such opportunities within a specified travel time via a specific mode (e.g., the number of hospital beds within a 45 minute transit trip). In the plans we examined, spatial units with high concentrations of low income households were used as proxies for low-income groups.

For example, the equity analysis conducted by the Metropolitan Transportation Commission and Association of [San Francisco] Bay Area Governments (2013) used spatial units as proxies. For work and non-work trips, they compared travel time for the region as a whole and neighborhoods with high shares of low-income and/or minority residents. The analysis also looked at transportation affordability, the distribution of government spending, potential displacement from escalating housing prices, and the density of vehicle miles traveled (approximating traffic and vehicle air emissions) in communities with high shares of low-income and/or minority populations. In general, the report found that there were disparities between the region as a whole and communities with high shares of low-income and/or minority residents. However, the analysis found that planned improvements would lessen such disparities, according to model projections. Even as the adopted plan would lessen disparities, other alternative approaches, which were considered but *not selected,* would have better addressed disparities (p. ES-11).

Whether labeled "communities of concern" or environmental justice areas, spatial units with concentrations of low-income and/or minority residents are frequently used as proxies for groups as a whole. Agrawal and others (2011) explain that spatial units have serious limitations as proxies for households or individuals:

> Current analyses that use neighborhood-level data to predict the behavior of households tend to suffer from an "ecological fallacy," that is, they infer individual or household behavior on the basis of aggregate characteristics of an area. However, it is critical to link data for a specific household's travel behavior and expenditures with data on the characteristics of the neighborhood in which that household lives. (Agarwal et al., 2011, p. 63)

Activity models offer one alternative to the problem of using spatial units as proxies for people. Yet, activity models—or fully disaggregated models of individual travel behavior—may lack sufficient precision of travel by income group and thereby also have limits for equity analysis. Bills, Sall and Walker (2012) examined the use of activity-based models (with each household modeled along with key characteristics) for environmental justice analysis. They compared a regional activity-based model and results from a travel survey. The two travel time indicators (commute time and daily total travel time) showed statistical difference across the two datasets, but the mode and median, as well as the shape of the distribution, were similar when divided into income groups. The authors suggest that their "analysis points to activity-based travel models as being a *reasonable* tool for assessing the differences across income classes, although there are some statistical differences between the data generated from the travel model and the observed data" (p. 26, emphasis added).

Chapter 5. Conclusions and Policy Directions

For low-income households, housing and transportation are frequently top expenditures and may dramatically affect quality of life. These interrelated systems, which of course intersect with other issues, can dramatically shape access to opportunity for individuals and facilitate social inclusion. Federal policies and spending have shaped the provision of both systems, but historically, programs for each area have been separately administered. This study has examined to what extent federally required documents for sub-national (but supra-local) agencies integrate across the transportation/housing divide, specifically for low-income groups.

In administering the largest federal program for affordable rental housing, the majority of states incorporates transportation into the allocation of tax credits for low-income housing, as documented in recent qualified allocation plans (QAPs). While typically not heavily weighted, the majority of states (39) have developed a variety of tools to consider transportation in their evaluations. While the terms varied, three primary criteria emerged: proximity to transit, service frequency, and geographic context. The substantial and growing competition for low-income housing tax credits show QAPs' influence on affordable housing characteristics, but it is apparent that many states either have not yet determined that transportation accessibility is an issue for their low-income residents or do not know what steps are needed to address it. This report can serve as a reference for such states. Yet, the report describes QAP criteria from the perspective of the state evaluation, not project implementation and accessibility outcomes. A study by the National Housing Trust that is currently underway may illuminate the project development impacts of QAP elements. Further research could consider how QAP transportation criteria align with transportation costs and transit accessibility experienced by residents of LIHTC projects. Increasing attention by states could encourage federal mandates that require all states to consider how accessible public transportation actually is for new affordable housing developments. Until that time, given the current structure of LIHTC allocations, further emphasis on transportation accessibility likely depends on state and local governments.

For regional transportation planning, there was not a very consistent approach to considering accessibility for and locations of low-income households. Some MPOs incorporate extensive spatial analysis, but others had a limited discussion of it. Like the qualified allocation plans for tax credits, regional transportation plans are federally required, but there is significant latitude in their format and content. Federal rules require attention to low-income and minority populations, but there are not clear directives on how to meet these requirements. Furthermore, as discussed above, existing approaches to measuring transportation-based accessibility have serious limitations. Nonetheless, some MPOs conducted spatial analysis of low-income residential patterns, thereby partially connecting housing and transportation.

Thus, in both types of federally required documents, we saw many agencies tackling the other sector (housing documents incorporating transportation and transportation documents incorporating

housing locations). The current federal system makes decisions at the sub-national level important in the implementation of federal programs. While integration at the federal level remains important, connecting policy arenas at the state and regional levels may increase efficacy of policies in both arenas. However, more research is needed to determine whether the QAP tools result in housing that best meets the accessibility and transportation needs of the target population.

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Appendix 1: Environmental Justice and Accessibility in MPO Plans

Region and MPO	**Equity & accessibility Defined/discussed (y/n)**	**Evaluating and operationalizing equitable accessibility**			
Louisiana		**Formal evaluation of equity approach (y/n)**	**Population groups defined**	**Destinations/ opportunities considered**	**Measures of accessibility**
New Orleans; Regional Planning Commission	Yes & No; Equity is not specifically addressed. Discusses paradigm shift from "mobility" to "accessibility" to gauge transportation improvements	Yes; Project Ranking Scorecard allows for evaluation of Title VI considerations, i.e. does project impact low-income/minority communities?	"Traditionally disadvantaged population (i.e. low income, elderly, or disabled)" in scorecard.	Not explicitly addressed.	Accessibility, as measured by travel time by mode from analysis areas to basic needs
Shreveport; Northwest Louisiana Council of Governments	Yes; EJ report considers relationship between existing transportation/pub transit and low-income/minority groups	Yes; Demographic data comparison with MPO and US; Socioeconomic status and forecast;	Minority population (Blacks, Hispanics, Asian/Pacific Islanders; American Indians/Eskimos); Disability status; over 65yo; Median Income level; Below poverty level.	~	Not specifically addressed
Other Southeastern MPOs					
Beaumont, TX; South East Texas Regional Planning Commission	Yes; EJ data must determine if transportation project will disproportionately affect minority/low-income populations.	No	Yes; Minorities as defined by U.S. Census; Low-income as HHs with incomes below fed. Poverty level.	Not addressed.	Not specified.
Montgomery MPO (AL)	Yes; EJ areas have greatest concentration of low-income minority groups.	Yes; Appendix lists all projects, block groups intersected/adjacent to project, and census	Minority, Senior, poverty, disable, no vehicle.	No	Proximity to bus routes; % of EJ pops near/adjacent to capital projects.

		totals/percentage in those blocks			Details unknown.[5]
Memphis	Yes; Avoid unnecessary or disproportionate impacts to minority and low-income communities	The data relating to these population groups was examined to determine which areas were impacted by the proposed improvements to the transportation system.	Minority, disabled persons, Limited English Proficiency (LEP), % HH below fed poverty line.	No	No
Birmingham	Yes; census block groups with +50% nonwhite population median HH income < $25,444, 120% below federal poverty level.	Yes; EJ populations proximity to projects and accessibility afterwards.	Minority and low-income	Yes; see measures of accessibility	# of jobs transit dependent/minority populations can access w/in set time frame (from transit improvements); non-motorized improvements - # of opportunities accessible (30min by bike, 20min walking).
Best Practices					
Columbus, OH; Mid-Ohio Regional Planning Commission	Yes; assess if low-income/minority areas receive disproportionate share of adverse impacts.	Yes; Travel demand forecasting with land use and socioeconomic data aggregated at TAZs. (tour based modeling). Use three diff scenarios: 2010 conditions; projected 3035 no-build; projected 2035 w/ MTP projects.	Yes; Minority/Hispanic, low-income, elderly, disabled, zero-car households,	Average number of jobs, shopping, non-shopping; % population near college, hospital, major retail; average travel time to work, school, shopping, other purpose, and all purposes, Columbus CBD	# of opportunities, proximity, travel time, (20 minutes, auto; 40 min. transit)
Boston; Boston MPO	Yes; Environmental justice areas defined disproportionately high shares of low-income and/or minority residents [insert	Yes; regional travel demand model used to compare EJ and non EJ areas; number of destinations available; reviews transit and auto modes; Spatial area	Low income as [below poverty line or area median?], minority (people of color); elderly, others?	Jobs (by wage and industry);z health care (number of hospital beds);	Count of jobs and health care; travel time; finds that EJ areas generally fare better in terms of access and

[5] EJ report doesn't appear to provide specific methodology details that determined analysis outcomes.

	metrics over x %]; EJ one measure for project evaluation	as proxy			benefits from plan
Madison, WI; Madison Area Transportation Planning Board	Yes; areas with concentrations of minority, autoless households, and low-income populations	Yes; A qualitative transportation project analysis was conducted comparing the location of planned projects in relation to areas with concentrations of EJ populations.	Minority (Black, Am. Indian, Asian, Native Hawaiian, etc.); Low-income (age 5 and over, with incomes less than 150% of fed. Poverty Level); Autoless households.	Yes; travel times between several identified EJ areas and selected large educational, employment, medical, and retail centers during the morning peak period.	Geographic proximity to planned projects & bike/ped projects of EJ populations. Quality of transit service as compared with non-minority areas (travel time/transfers). [6]

Plans

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[6] EJ portion is an "interim plan update." This is a qualitative analysis for impacts of proposed projects on EJ populations. Previous Plan (2030) conducted quantitative study using regional travel model for EJ areas to major centers

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Appendix 2: State QAP Summaries Related to Transportation

State (QAP Year)	QAP Max. Points	Transportation Max. Points	Project/Transit Type	Definition	Geographic Area (if specified)	Minimum Distance	Minimum Criteria (e.g. headway, times)	Notes
Alabama (2012)	159	1	Transportation for tenants	Applicant must provide services, and then must provide transportation to those services				
Arizona (2012)	262	15	Frequent Bus Transit System	Transit agency must guarantee stop will not move, route will not change, service will not reduce	Greater Phoenix	≤ 1/4 mile	**Weekday:** 30 minute headways from 6am-6pm & 15 hours of minimum service; **Weekend:** 30 minute headways from 6am-6pm & 12 hours of minimum service	
					Greater Tucson	≤ 1/4 mile	**Weekday:** 30 minute headways from 6am-6pm & 12 hours of minimum service; **Weekend:** 1 hour headways from 6am-6pm & 10 hours of minimum service	
					Rest of State	≤ 1/4 mile	**Weekday:** 1 hour headways from 9am-5pm & 8 hours of minimum service	
	262	20	High Capacity Transit	Light rail, commuter rail, intercity rail and streetcar (excludes bus)		≤ 1/2 mile	*Most* of the existing and proposed rail stations are accepted	
Arkansas (2012)	140	10	Public transportation	Accessibility and proximity to services are evaluated by appropriateness of service to the type of housing proposed. Services include public transportation.				Public transportation is considered a proximity tie-breaker after the applications are tallied for points. It is the second phase of the process and not initially considered .
California (2012)	129	7*	Part of TOD development strategy	Transit Station, rail station, commuter rail station, bus station, or public bus stop		< 1/4 mile	● 30 minute headway from 7-9am & 4-6pm ● Density will exceed 25 units per acre	*15 points is the maximum total allowed for transportation
		6	Transit Station, rail station, commuter rail station, or bus station			< 1/4 mile	30 minute headway from 7-9am & 4-6pm	
		5	Public bus stop			< 1/3 mile	30 minute headway from 7-9am & 4-6pm	
		4	Regular public bus stop or rapid transit system stop			< 500 feet		
		4	Van/dial-a-ride service provided for tenants		Rural set-aside projects		Costs of obtaining/maintain van and service must be included in budget and operating schedule is on-demand or regular schedule is provided	
		3	Regular public bus stop or rapid tranist system stop			< 1500 feet		
		Will vary	Private bus/transit system	● Must be approved by CTCAC Executive Director ● Multiple bus lines may be aggregated for the appropriate points, *only* if multiple lines from designated stop travel to employment center		*see next column*	Must meet relevant headway and distance criteria and be provided free of charge	
Colorado (2012)	min. 130	5	Located at an existing or planned TOD site (fixed rail station)			< 1/4 mile		
			Walk Score/Transit Score of project	Must also provide average walk/transit score of city where project is located				
Connecticut (2012)	100	2	Transit Oriented Development (residential, community, & employment centers)	Train station		< 1/2 mile		
		2		Other public transportation facilities		< 1/4 mile		
	min. 70, max 169	3	Transit Friendly	Designed to prepare sites for possible future transit service			Must have at least 2 of following: ● Bus pull-offs ●Applicable pavement requirements ●Future shelter install ●Future bench install	

Delaware (2012)		5	Transit Accessible/Transit Ready	Designed to include facilities to accommodate current/planned fixed route transit			● Designated point of pedestrian site ingress/egress ● DTC confirmation of intent to provide direct service to site ● Ingress/egress point is connected to ADA compliant sidewalk network	
		5	Can be considered Transit Accessible with Off-Site Improvements	ADA accessible walkway from site's main pedestrian access point to nearest bus stop	New Castle County	≤ 1/4 mile	Walking distance must be along accessible route (not direct line)& improvements must be made where needed	Developer can choose to improve the nearest off-site bus stop (bus stop pads, benches, or shelters), or request new bus stop or relocation to achieve walking distance
		5			Kent & Sussex Counties	≤ 1/2 mile	Walking distance must be along accessible route (not direct line) & improvements must be made where needed	Developer can choose to improve the nearest off-site bus stop (bus stop pads, benches, or shelters), or request new bus stop or relocation to achieve walking distance
		5	Can be considered Transit Ready (On-Site Improvements)	Property will be directly served by transit subject to the service development planning process		700 feet max.	● Agreement to connect site's ped access pont to existing bus stop ● Add or relocate stop w/in walking distance	
		2 each, 4 total	"Complete Streets" measures	Designed to enable safe access/use for all users (i.e. pedestrians, bicyclists, motorists, and pub transit users				
			Social services access	If services provided are off-site, MOU must stipulate a transportation plan for regularly scheduled trips to the facility/classes.				
District of Columbia (2012)	665	10	Existing metro stop or commuter rail			< 1/2 mile		
		10	public bus stop			< 1/4 mile		
Florida (2011)	Overall 124*	7	TODs					
		2	Public Bus Stop	Must service at least one bus route		≤ 0.2 miles	Hourly 7am-9am & 4pm-6pm, M-F year round, excluding holidays	
		1.5	Public Bus Stop	"		0.2 < x ≤ 0.3	"	
		1	Public Bus Stop	"		0.3 < x ≤ 0.4	"	
		0.5	Public Bus Stop	"		0.4 < x ≤ 0.5	"	
		0	Public Bus Stop	"		> 0.5	"	
		6	Public Bus Transfer Stop	Fixed location with at least three bus routes		≤ 0.25 miles	"	
		5.5	Public Bus Transfer Stop	"		.25 < x ≤ .5	"	
		5	Public Bus Transfer Stop	"		.5 < x ≤ .75	"	
		4.5	Public Bus Transfer Stop	"		.75 < x ≤ 1.0	"	
		4	Public Bus Transfer Stop	"		1.0 < x ≤ 1.25	"	
		3.5	Public Bus Transfer Stop	"		1.25 < x ≤ 1.5	"	
		3	Public Bus Transfer Stop	"		1.5 < x ≤ 1.75	"	
		2.5	Public Bus Transfer Stop	"		1.75 < x ≤ 2.0	"	
		0	Public Bus Transfer Stop	"		> 2.0	"	
		6	Public Bus Rapid Transit Stop	Must service at least one bus that travels at some point during the route in either a lane or corridor that is exclusively used by buses		≤ 0.25 miles	Every 20 minutes 7am-9am & 4am-6pm, M-F year round, excluding holidays	
		5.5	Public Bus Rapid Transit Stop	"		.25 < x ≤ .5	"	
		5	Public Bus Rapid Transit Stop	"		.5 < x ≤ .75	"	
		4.5	Public Bus Rapid Transit Stop	"		.75 < x ≤ 1.0	"	
		4	Public Bus Rapid Transit Stop	"		1.0 < x ≤ 1.25	"	
		3.5	Public Bus Rapid Transit Stop	"		1.25 < x ≤ 1.5	"	
		3	Public Bus Rapid Transit Stop	"		1.5 < x ≤ 1.75	"	
		2.5	Public Bus Rapid Transit Stop	"		1.75 < x ≤ 2.0	"	
		0	Public Bus Rapid Transit Stop	"		> 2.0	"	
		7	Public Rail Station	Fixed location accessible to scheduled public rail transportation year-round	Only MetroRail located in Miami-Dade County, TriRail located in Miami-Dade, Broward and Palm Beach Counties, and SunRail located in Orange, Seminole and Volusia Counties	≤ .125 miles OR .125 < x ≤ 0.25		
		6.5	Public Rail Station	"	"	.25 < x ≤ .5		
		6	Public Rail Station	"	"	.5 < x ≤ .75		
		5.5	Public Rail Station	"	"	.75 < x ≤ 1.0		

		5	Public Rail Station	"	"	1.0 < x ≤ 1.25		
		4.5	Public Rail Station	"	"	1.25 < x ≤ 1.5		
		4	Public Rail Station	"	"	1.5 < x ≤ 1.75		
		3.5	Public Rail Station	"	"	1.75 < x ≤ 2.0		
		0	Public Rail Station	"	"	> 2.0		
Georgia (2012)	88	3	Adjacent to established pub transportation stop along paved roads, sidewalks, established pedestrian walkways/bike trails			< 300 feet of site's main entrance	Stop must rest along a transit line that follows a fixed route and daily schedule	
		2	Public transportation stop			≤1/4 mile	"	
		1	Public transportation stop			≤1/2 mile	"	
		6	TOD	Part of a larger project that the Dept. of Community Affairs feels is "community changing" and "place based." TOD eligibility is based on committee determination.				
Hawaii (2013)	93	5	Green Building Initiative/mass or public transit station, rail station, or bus depot or stop	Part of LEED certification to ensure buildings meet public transit proximity requirements		< 1/2 mile	At-most 30 minute headways 7am-7pm.	Sidewalks/suitable pathways linking project to public spaces and transit stops.
Illinois (2012)	246	6	TOD	Located in "close proximity" to fixed-route public transportation	Chicago	6 blocks		
			"	"	Chicago Metro	1 mile		
			"	"	Other Metro	1.5 miles		
			"	"	Non-Metro	2 miles		
		TBD	Dial-A-Ride	Must available to the public at large		Within service area	Available at-minimum 8am-6pm Monday-Friday	
Indiana (2012)	204	0.5	Public transportation			≤ 1/4 mile		
		0.25	Public Transportation			1/2-1/4 mile	Can have max two stops	
Kansas (2012)	310	1 to 5	Transportation/pedestrian	"Easy access to the site by car, foot or public transit will score high. ...particularly...in elderly development."				
Kentucky (2013)	360	10	Proximity to services, (public transportation)					
Louisiana (2012)	159	1	Public Transportation (excludes shuttle services)	Distance measured by odometer from the automobile entrance of proposed project site.		≤ 1 mile		
		0.5	Public Transportation (excludes shuttle services)	Distance measured by odometer from the automobile entrance of proposed project site.		> 1 mile, ≤ 2 miles		
Maine (2013)	67	3	Demand Response Transportation	On-call transportation services that operate at least 3 days a week, provide all-day service			*Must* be available to all residents of the project	
		8	Fixed-route Public Transportation	Year-round, regularly scheduled public transportation		Safe Walking Route (≤ 1500ft of pick-up location)	regular service at least 5 days/week and during commuter hours (630am-930am, 3pm-6pm, daily)	
Maryland (2012)	315	5	TOD (mass/public transit/rail station)	Density over 25 units per acre, mixed-use, walkable		< 1/2 mile		
		5	TOD (bus depot/stop)	Density over 25 units per acre, mixed-use, walkable		< 1/4 mile	At-most 30 minute headways 630am-7pm	
Massachusetts (2012)	182	6	Proximity to transit	Commuter rail station/stop; subway station/stop; bus station/stop; or ferry terminal		< 1/2 mile		
Michigan (2013)	251	5	Public transportation stop			< 1/10 mile	Would accept any form of dedicated, safe, reliable, time, and regularly scheduled transportation available to all tenants.	
Minnesota (2013)	246	3	First Tier Metro-TOD	LRT, BRT, Commuter Rail Stations (locations finalized)	Hiawatha & Central Corridor LRT, Northstar Commuter Rail, and finalized/completed Cedar Ave and I-35W BRT line stations	< 1/2 mile		
		2	Second Tier Metro-pub trans access	High service public fixed route transportation route stop		< 1/4 mile	30 minute headways 6am-7pm	
		2	Second Tier Metro-pub trans access	Express route bus stop/park and ride lot		< 1/2 mile		
		2	Second Tier Metro-pub trans access	Within Transit Improvement Area		< 1/2 mile radius		
		3	Fixed route transit stop	Includes express bus & park 'n ride	Greater Minnesota	< 1/2 mile		
		3	Access to demand response/dial-a-ride or proximity to facilities, close to jobs	Proximity to 4 facilities OR on demand transport	Greater Minnesota	< 1 mile	On demand: M-F 630am-7pm	
Missouri (2013)		30% basis boost	TOD	Must offer increased mobility choices & bike/ped; significant retail development; mix of housing choices; mixed-use development		< 5 blocks	15-30 minute headways	
Montana (2012)	108	0-3	"Transportation"					
Nevada (2012)	136	1	Local transit route or school bus stop			< 1/4 mile		
	61	2	Public Transportation	Can be one of two amenities to receive points		< 1/2 mile		
	61	7	TOD	Mixed-use development within walking distance of rail, light rail, subway, ferry, or major bus corridor station		< 1/2 mile		

New Jersey (2012)	61	10	Transit Village (Family Cycle)*	Community with bus, train, light rail, or ferry station with developed plans.				*NJ has different application cycles/criteria for various types of development. E.g. Family, Senior, Supportive House, and Final (to which all may apply).
	55	10	Transit Village (Senior Cycle)	"				
New Mexico (2012)	281	1	Public transportation (where applicable)	Only specified for "single room occupancy developments"		< 1/2 mile		
		1	Proximity to public transit stops	Part of Green Building design criteria		< 1/2 mile		
New York (2012)	97	N/N	Public transit service			"Close proximity"		
		see notes	TOD	Projects in close proximity to MTA rail stations outside NYC/communities with completed or implemented TOD plans				Eligible early award projects
			Proximity to public transit service	Must include transportation plan as component of comprehensive service	For "Supportive Housing Projects" - preference to special needs tenants for at least 30% of units			
	7	1-3	Proximity to public transit service	Smart site location as part of green building				
North Carolina (2012)	112	not specified	Access to services (transportation)					
Ohio (2013)	100		Accessible route to public transit stops					
Oregon (2012)	100	N/N	130% basis boost for TOD					
Pennsylvania (2012)	145	(set-aside)	Public transit stop/transportation included in site plan	Part of Supportive Housing Set-Aside		< 2 blocks		
	145	20	TOD initiative	Part of Comm Revitalization Plans				
Rhode Island (2013)		N/N	Priority given for access to transportation					
Texas (2012)	228 min. 130	4 or 30% basis boost	Accessible transit stop for public transportation if available in area which is a criteria for →	Developments proposed in High Opportunity Area:		< 1/2 mile		
		4	Accessible to public transportation/special transit service/specialized elderly transportation	For Qualified Elderly Developments		< 1/2 mile		
		10	Tenant services	On-site or transportation to off-site services must be provided				
Utah (2012)	227	5	Front Runner/Trax Stop			Contiguous to transit stop		
		3	"			< 1/3 mile		
Vermont	n/a	N/N	Project served by public transportation					
Virginia (2012)	see note*	10	Proximity to public transportation	Commuter rail, light rail or subway station		,		*Application for 9% credit must have 500 min points; application for tax-exempt bonds (4%) must have 475 min. points
		10	"	Existing public bus stop		< 1/4 mile		
Washington (2012)	203	5	Public transit service			< 1/4 mile	30 minutes during peak periods	Part of "Evergreen Sustainable Development Standard"
		10	Two or more public transit lines			< 1/4 mile	"	"
		10	Fixed rail/ferry station			< 1/2 mile	"	"
Wyoming (2012)	727*	3	Proximity to public transit			< 1/2 mile		*Not including 70 possible tiebreaker points