Exploring a Framework for Transportation Justice:
The Case of the Green Line Extension

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ABSTRACT

The extension of the Green Line of Massachusetts Bay Transportation Authority north into Somerville and Medford is a long-awaited transit expansion project that has recently gained the political traction needed to break ground. One of the most prominent factors galvanizing residents to support the project has been conscious framing of the project as a way to alleviate longstanding environmental justice concerns. The significance of this project is the comprehensiveness of this framing, which was used by community groups and public agencies alike. This paper explores the origins and development of this justice focus and evaluates the effectiveness of the proposed extension in meeting a variety of justice objectives. The results of this evaluation are mixed: the system may improve aggregate air quality and expand access for transit-poor residents, but the infrastructure investment also raises equity concerns since many of the most significant benefits do not fall to environmental justice populations. Since transportation equity considerations are relevant to other projects, this paper concludes with recommendations to improve equitable distribution of benefits in the Green Line case and with areas for further study into the policy implications of the project’s environmental justice framing.

In March of 2005, more than five hundred people gathered at a community meeting in Somerville, Massachusetts to express support for a transportation project that the State of Massachusetts had committed to nearly fifteen years earlier. An eight-year-old named Iliana Nilson summed up their argument with the simplicity that only a child could: "I'd like the air in Somerville to be clean,” she said. “Please build the Green Line” (Green Line Meeting, 2005). The Green Line Extension that these residents turned out to support is a project to expand light rail service from the current terminus in Cambridge, Massachusetts to Somerville and Medford, Massachusetts. Since the project was originally agreed to in 1990, environmental justice concerns have shaped the planning process and galvanized project supporters. This paper explores and evaluates the environmental justice framing of the Green Line Extension project to gain increased understanding of the ties between transportation and environmental justice, the reasons why the project has been framed as a matter of justice, and the effectiveness of that justice lens. The paper builds a framework for transportation justice, overviews the Green Line project, explores several facets of the project’s justice framing, and concludes with recommendations for further consideration.

TRANSPORTATION JUSTICE FRAMEWORK

Before approaching the details of the Green Line Extension case, it is important to place the project within a theoretical framework of environmental and transportation justice.
Transportation Justice Definitions

Consideration of equity in transportation decisions is enshrined in State and Federal law in policies that call for environmental justice review of all projects. At the Federal level, Executive Order Number 12898 (1994), *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, was signed during the Clinton administration. This order called for Federal Agencies—including those involved in transportation—to consider “environmental justice part of its mission by identifying and addressing… disproportionately high and adverse human health or environmental impacts of its programs, policies and activities” on low-income and minority populations (p.1).

The State of Massachusetts’ Environmental Justice policy builds on this commitment by applying environmental justice principles to review of projects in areas where “the median annual household income is at or below 65 percent of the statewide median income for Massachusetts; or 25 percent of the residents are minority; or 25 percent of the residents are foreign born, or 25 percent of the residents are lacking English language proficiency” (Environmental justice policy of the executive office of environmental affairs, 2002, p.5). Interestingly, this policy only directly applies to the work of specifically-named State departments, which do not include transportation agencies. The policy does apply to the Massachusetts Environmental Protection Act office, however, so environmental justice concerns can be raised during environmental review of transportation projects (p.2).

In his book, *Just Transportation* (1997), environmental justice scholar Robert Bullard describes the link between transportation and environmental justice, by noting that transportation can lead to “disparate outcomes in planning, operation and maintenance, and infrastructure development” (p.2). Bullard categorizes the unequal outcomes of transportation projects into three categories: procedural, geographic, and social. *Procedural* justice relates to whether the process of making decisions is uniform and fair; *geographic* justice addresses the positive and negative distributive impacts of a
project in space; and *social* justice refers to the tendency for amenities tend to fall to wealthier and more educated, while disamenities fall disproportionately on people of color and low income populations (Bullard, 2002). Transportation injustices can embody any one of these facets or a combination of impacts.

Another definition of transportation as a justice issue was raised by Todd Litman of the Victoria Transportation Policy Institute, who highlighted the importance of transportation equity in his piece, *Evaluating Transportation Equity* (2012). “Equity [also called justice and fairness],” Litman says, “refers to the distribution of impacts [benefits and costs] and whether that distribution is considered fair and appropriate. Transport planning decisions can have significant and diverse equity impacts” (p.2). The equity impacts of transportation development are a matter of justice, because they can impact nearly all aspects of a person’s life, including: impacting economic and social opportunities; causing direct and indirect and external costs, like congestion, pollution, and undesirable land use impacts; apportioning resources unevenly among individuals and groups; and influencing “development, accessibility, land values and local economic activity” (Litman, 2012, p.2).

**Development of Transportation Justice Framework**

Transportation policy has always been a facet of justice movements, though it has sometimes hidden in plain sight. Though the environmental justice movement did not come to forefront of public discourse until the early 1980s, the movement has roots in the Civil Rights struggle of the 1960s. Gauna and Foster (2003) attest that “like the civil rights movement that preceded it, the US environmental justice movement was propelled into mainstream political discourse and popular consciousness” by a wave of grassroots activism (p. 2). Activists, mostly low-income people of color, began to advocate for improved environmental conditions in all aspects of their lives, including limits on “contaminated land, transportation corridors, concentrated animal feeding operations, mining operations, and contaminated aquifers” (Gauna and Foster, 2003, 2). The movement catapulted to
national recognition in the early 1980s, with a high-profile protest of a polychlorinated biphenyl, or PCB, waste dump in predominantly African American Warren County, North Carolina (Gauna and Foster, 2003). Transportation issues have rarely come to the forefront of the environmental justice narrative, but they have been there, nonetheless. Bullard (1997) says:

“Rosa Parks and the Montgomery Bus Boycott of the 1950s were about just transportation and human dignity. The young John Lewis and his Freedom Riders of the 1960s defined Just Transportation as freedom to travel without feed of intimidation. The Los Angeles-based Bus Riders Union, our modern-day freedom fighters of the 1990s, understand that Just Transportation can only be realized if poor people and people of color receive their fair share of transit services and investments.” (p. 1).

The narrative of transportation and justice can also be found in within the rising prominence of highway building and automobiles in the mid-twentieth century. Schaeffer and Sclar (1980) describe this growing dichotomy, saying that:

“the automobile has given improved mobility primarily to the middle class, middle aged. But these owner-drivers have not merely gained new mobility through the car; they have also rearranged the physical location patterns of society to suit their own private needs, and unwittingly in the process destroyed and severely limited the mobility and access of all others.” (p. 5)

There are a few cases of cities rousing support for transportation as a justice issue. In the 1980s, Cleveland was temporarily successful in capping fares, ensuring discounted fares for seniors and disabled riders, and improving service coverage and frequency (Krumholtz, 1982). In the Boston area, community coalitions have repeatedly attempted to shift the balance of power governing transportation decisions with mixed results. Following a rash of highway building within the Route 128 corridor in the late 1950s and early 1960s, proposals for new highways and hundreds of takings galvanized a diverse coalition of residents to fight back against the transportation injustice of highway building (Shaeffer and Sclar, 1980). In 1970, the Governor of Massachusetts “ordered a moratorium on further highway construction in the Route 128 area, with the exception of the I-93 freeway extension into downtown Boston, where the construction contracts had already been let” (Schaeffer and Sclar, 1980, p.101).

These cases display the increasing alignment of transportation issues and the environmental
justice movement. In 1980, K.H. Schaeffer and Eliott Sclar published their seminal work on equity in transportation, *Access for All*, in which they argued for access over mobility to refocus on people instead of cars. Nearly twenty years later, in 1997, another prominent book on the subject was published: Robert Bullard’s *Just Transportation*, which aimed to “redefine transportation as an environmental, civil rights, and social justice issue” (p. xiv). In Boston, a series of transportation projects, including the Green Line extension, began shaping into environmental justice concerns and literature on transportation justice has slowly grown. In the same timeframe, a host of organizations have popped up to address transportation justice. In the Boston area, these groups include Somerville Transportation Equity Partnership; Medford Green Line Neighborhood Alliance; On the Move: Greater Boston Transportation Justice Coalition; Green Dorchester; and Alternatives for Community and Environment, in Roxbury. Most of these organizations have been founded or have founded their transportation justice projects within the last fifteen years, which indicates a growth in transportation justice activism in recent years.

**GREEN LINE EXTENSION PROJECT OVERVIEW**

The Green Line Extension project is a joint initiative of the Massachusetts Bay Transportation Authority, or MBTA, and the Massachusetts Department of Transportation, or MassDOT, to expand rapid transit service into Somerville and Medford, Massachusetts. The project, shown in *Figure 1*, will add six new stations to the and nearly four miles of track on two spurs. The project is estimated to serve at least 7,500 new daily customers and to provide new transportation service to a majority of Somerville residents (Green Line Fact Sheet, 2012). In addition to the transit expansion, the project will also relocate the existing Lechmere station, the current terminus of the system, and will add an MBTA facility maintenance yard in the Brickbottom area of Eastern Somerville. The project, which currently has an estimated completion date of 2018, bears a $971 million price tag (Massachusetts Department of Transportation [MassDOT], 2012, p. ES-1).
While the Green Line extension project is just beginning construction, the idea of the project is hardly new. The initial proposal to extend a train line into Somerville and Medford was conjured in a 1945 Report of the Legislative Committee on Rapid Transit, though an earlier proposal in the 1920s had supported extension of a rail system to Davis Square through Somerville Junction (Green Line Extension Timeline). Variations on the Green Line project have been the subject of numerous studies over the past fifty years. For example, “one of the objectives of the 1962 North Terminal Area Study was to “design a new transit alignment to permit a future branch extension [of the Green Line] to Somerville and communities northwest along the right-of-way of the Boston and Maine Railroad” (Beyond Lechmere, 2005, 1.1). Similarly, the 1973 Boston Transportation Planning Review Northwest Study also addressed the Green Line corridor by focusing on “identifying and evaluating various bus, commuter rail, and Green Line extension alternatives in the ‘Somerville Radial
Corridor” (Beyond Lechmere, 2005, 1.2).

After years of study, the turning point for Green Line supporters came with the Central Artery/Tunnel project, also known as “the Big Dig.” This megaproject, now known as the most expensive highway project in the United States, aimed to eliminate congestion in downtown Boston by rerouting I-93, the “central artery,” into a depressed tunnel and connecting the city to Logan International Airport through a new third harbor tunnel, the Ted Williams Tunnel (MassDOT, Big Dig Project Background). The six-lane Central Artery was widened to 8-10 lanes in the project, since traffic estimates indicated that by 2010 “severe congestion and queuing” would occur for up to 14 hours each day without increased capacity (U.S. Department of Transportation and Federal Highway Administration, 1982, p. 5).

This increase in lanes, and hence, exacerbation of air quality concerns led to threats from Conservation Law Foundation, to file a lawsuit if air quality mitigation were not promised. The State committed to the Green Line Extension and several other transit improvements in 1990 to avoid the lawsuit (Ryan, 2008). The agreed-upon mitigation measures were outlined in an Administrative Consent Order addressing the project timelines and repeated in the State Implementation Plan prepared to comply with the Clean Air Act (Amended Administrative Consent Order, 2005). The Order has been amended several times since the original 1990 plan, but the transportation commitments remain, including: the now-complete second phase of the Silver Line tunnel under Fort Point Channel, the Green Line Arborway in Jamaica Plain, the Red-Blue connector, and the Green Line Extension into Somerville and Medford (Amended Administrative Consent Order, 2005).

The mitigation commitments promised were difficult for the State to keep, however. Conservation Law Foundation, community groups, and the lead agencies engaged in a delicate dance around the commitments for years, with threats of lawsuits looming whenever the State strayed too far from the project schedule. In 2005, the MBTA bowed to pressure, and commissioned the consultants
at Vanasse, Hangen, and Brustlin, to conduct a study of strategies “for improving mobility and regional access for residents in the northwest corridor communities of Cambridge, Somerville and Medford” (Beyond Lechmere, par. 1.1). Several of the alternatives in the report suggested various alignments for an extension of the Green Line, many of them as far as west Medford (Beyond Lechmere, 2005, par. 4.3.1). Finally, the State moved forward with environmental review, obtained preliminary funding for the project, and broke ground on the initial construction in December 2012 (MassDOT, 2011).

FRAMING AS ENVIRONMENTAL JUSTICE

From the initial threat of lawsuit by Conservation Law Foundation to the modern transportation justice coalition advocating for the Green Line Extension, environmental justice has been a clear focus of the Green Line project. A unique aspect of the Green Line project is that this justice framing is embedded in the project framing produced by the lead agencies. For example, the MBTA’s informational materials describe the project in terms of its justice benefits, stating that bringing “MBTA light rail service to these densely populated cities will address longstanding transportation inequities, result in fewer automobiles on local roads, and help to combat greenhouse gas emissions and other components of air pollution (Green Line Fact Sheet, 2009, p. 1).” A variety of environmental justice arguments have helped to frame this case to varying degrees.

Air Quality

The technical evaluation of the Big Dig mitigation projects was tied to air quality considerations in the environmental review process. Under MEPA, the Massachusetts Environmental Policy Act, projects must “determine the change in project-related vehicle emissions. If emissions from the Proposed Action are greater than the No-Build Alternative, then the project should include all reasonable and feasible emission reduction mitigation measures” (MassDOT, 2011, p. 4-46). Since the Central Artery/Tunnel project added lanes and eased automotive congestion, mitigation was
required to offset the risk of worsened air quality.

The location of the Green Line Extension is “designated non-attainment for ozone by the US Environmental Protection Agency, with a classification of ‘serious’” (Beyond Lechmere, 2005, par. 2.2.2). Motor vehicles are the predominant sources of ozone emissions within the study area and these emissions are exacerbated by heavy truck traffic through the area (Beyond Lechmere, 2005, 3-21). Air quality in the Green Line project area is heavily impacted by an interstate and a series of major arterial roads. In particular, the area bears the impacts of I-93, which carries more than 150,000 vehicles each day, and Route 28, also known as McGrath Highway, which contributes between 40,000 and 60,000 trips per day, including a heavy volume of truck traffic of between 500 and 1,000 trucks per day (Beyond Lechmere, 2005, p. 3-21). These emissions are exacerbated by the diesel-powered commuter rail trains that rumble through up to 200 times a day without stopping. The impacts of concentrated emissions from highways and rail service have had an impact on public health in the area: in the chart included in Figure 2, the Boston MPO names Somerville as the municipality with the highest rates of excess heart attack deaths in region (Boston MPO, as cited in Zamor, 2009).

Figure 2: Boston MPO Chart of Excess Lung Cancer and Heart Disease Deaths (Boston MPO, as cited in Zamor, 2009).
To rectify the air quality concerns noted, transportation agencies in the Boston region are bound by a series of air quality improvement projects outlined in the State Implementation Plan, or SIP. A SIP, “is the federally approved and enforceable plan by which each state identifies how it will attain and/or maintain the health-related primary and welfare-related secondary National Ambient Air Quality Standards” described in the Clean Air Act (United States Environmental Protection Agency, n.d.). The Green Line Extension project is one piece of the solution laid out in the SIP to improve air quality in Somerville and throughout the Boston region.

The Green Line project is estimated to reduce regional daily Vehicle Miles Traveled by 25,728 miles, which could reduce congestion and lessen emissions (MassDOT, 2011, p. ES-3). The air quality monitoring required for the project’s environmental review indicates that this transit project could improve many air quality indicators. In the 2030 scenario, the project is estimated to reduce CO levels at all locations with the proposed project. Even without the project, in a 2030 “no build” scenario, air quality models predict that CO levels would decline due to anticipated technological improvements in automobiles, but more significant decreases are predicted in the Green Line scenario (MassDOT, 2011). For example, at one of the study locations, Monsignor O’Brien Highway, or McGrath Highway, at Charlestown, CO levels were predicted to drop from 8.3 in 2007 to 7.8 in a 2030 no build condition to 6.6 in 2030 with the Green Line extension project (MassDOT, 2011, p. 6-52). Some other emissions would also be reduced by the project: PM-2.5 levels are anticipated to drop, particularly near McGrath Highway. An evaluation of mobile source pollution reductions from the project is included in Table 1.
Table 1: Mesoscale Mobile Source Analysis Results (kilograms per day) (Volume 1, 6.6-8)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Vehicle Miles Traveled (VMT)&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Volatile Organic Compounds (VOCs)</th>
<th>Nitrogen Oxides (NO&lt;sub&gt;x&lt;/sub&gt;)</th>
<th>Particulate Matter 10 (PM&lt;sub&gt;10&lt;/sub&gt;)</th>
<th>Particulate Matter 2.5 (PM&lt;sub&gt;2.5&lt;/sub&gt;)</th>
<th>Carbon Monoxide (CO)</th>
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<tr>
<td>Existing Condition (2007)</td>
<td>105,264,275</td>
<td>56,825</td>
<td>161,463</td>
<td>4,578</td>
<td>2,892</td>
<td>1,465,221</td>
</tr>
<tr>
<td>No-Build Alternative (2015)</td>
<td>110,738,922</td>
<td>28,040</td>
<td>53,752</td>
<td>3,439</td>
<td>1,777</td>
<td>1,093,858</td>
</tr>
<tr>
<td>Proposed Action (2015)</td>
<td>110,715,115</td>
<td>28,033</td>
<td>53,781</td>
<td>3,438</td>
<td>1,777</td>
<td>1,093,672</td>
</tr>
<tr>
<td>Difference</td>
<td>-23,807</td>
<td>-7</td>
<td>-11</td>
<td>-1</td>
<td>1-1</td>
<td>-226</td>
</tr>
<tr>
<td>No-Build Alternative (2030)</td>
<td>119,164,452</td>
<td>22,507</td>
<td>20,046</td>
<td>3,272</td>
<td>1,520</td>
<td>1,053,770</td>
</tr>
<tr>
<td>Proposed Action (2030)</td>
<td>119,158,724</td>
<td>22,499</td>
<td>20,042</td>
<td>3,272</td>
<td>1,519</td>
<td>1,053,521</td>
</tr>
<tr>
<td>Difference</td>
<td>-5,728</td>
<td>-8</td>
<td>-4</td>
<td>Neg&lt;sup&gt;1&lt;/sup&gt;</td>
<td>-1-1</td>
<td>-249</td>
</tr>
</tbody>
</table>

1 Based on the updated CTSP statewide traffic model, August 2010.  
2 The Proposed Action used for the air quality analysis includes the physical and operational mitigation proposed to improve traffic operations (as outlined in Section 6.5, Traffic and Transportation Systems).  
3 VMT represents the vehicle miles traveled on an average weekday.

Access to Transit

One of the ironies pointed out by advocates of the Green Line Extension is that Somerville and Medford bear the impacts of regional transportation networks without the benefits of their service. Somerville has only one MBTA stop: a Red Line Station in Davis Square, at the Western edge of town. Stations on the periphery of the project area provide some residents with service via the Red Line at Davis and Porter Squares, the range Line at Sullivan Square in Boston, and Wellington Station in Medford. Two commuter rail lines, the Lowell Line and the Fitchburg Line, operate with the Green Line project area but do not provide local service. Commuter rail service “can only be accessed at Porter Square via the Fitchburg Line and at West Medford Station via the Lowell Line…. Although the rapid transit lines border the area, there is no rail service that directly serves the [project] study area” (Beyond Lechmere, 2005, p. 1-3). In addition to the inaccessible commuter rail corridor, East Somerville is home to industrial land uses for the MBTA including a rail maintenance facility and the Boston Engine Terminal for commuter rail (City of Somerville, 2008).

Advocates of the Green Line also point out that transportation in Somerville and Medford used to be superior to its current quality. The Boston region’s first rail service, a single car, “began service
between Harvard Square and Union Square in Somerville” in 1852 (Beyond Lechmere, 2005, p. 1-3). By 1910 Somerville was served by eight stops on the Fitchburg and Lowell lines (Green Line Timeline, n.d.). Until the 1940s, when this network of trains began to be supplanted by trackless trolleys, certain routes operated more than 100 trips per day (Beyond Lechmere, p. 1-3). The current bus service in the area has not been able to make up for the dearth of rail access for Somerville and Medford. “Only one of the fifteen bus service routes in the study area meets the MBTA’s current Schedule Adherence Standard on weekdays. Congestion in the corridor contributes to the buses’ inability to meet the current standards for service delivery” (Beyond Lechmere, 2005, p. 2-2). Additionally, transit mode share is significantly higher in pockets closest to rapid transit: 40-57 percent of Somerville residents commute to work by public transit in the Census block groups surrounding Davis Square on the Red Line, though substantially less residents use transit in other parts of the City (City of Somerville, 2008, p. 96). This map is included in Figure 3. The Green Line Extension would expand service to a clear majority of Somerville residents, as shown in Figure 4 (Somerville Community Corporation, 2008, 6).

**Figure 3: Somerville Transit Ridership (City of Somerville, 2008, p.96)**
Demographics

As noted earlier in Robert Bullard’s definition of just transportation, the environmental justice argument for transportation also hinges on the demographics of who is impacted by the distribution of transportation. In the case of Green Line, these impacts are mixed. Though Somerville’s transit service pales in comparison to many neighboring communities, its population density is higher: 18,870 people per square mile compared to 15,760 in Cambridge and 6,850 in Medford (MassDOT, 2011, p. ES-2). At the same time, approximately 26 percent of households in the project area “do not own a vehicle, which suggests a market for a higher level of transit service than exists today” (MassDOT, 2011, p. ES-2).
Maps of the project area help to display the landscapes of injustices in the transit corridor. Figure 5 shows that more than half of Somerville falls within the State-defined parameters for an environmental justice community. Much of the project area runs through or adjacent to these environmental justice regions. In Figure 6, the breakdown of environmental justice communities by which of the State environmental justice criteria they meet helps to nuance the picture of who is at risk. Although many of the tracts adjacent to the Green Line project meet more than one of the criteria, particularly more than 25 percent foreign born and more than 25 percent minority, the low-income populations are almost entirely concentrated in East Somerville (Beyond Lechmere, 2005, p. 3-3). Figure 7 provides yet another interpretation of environmental justice communities, as they are defined by the Boston Metropolitan Planning Organization. This definition removes the foreign-born and linguistic isolation criteria used by the State, and helps to illustrate the concentration of minority populations with low incomes in the eastern portion of the project area (Beyond Lechmere, 2005, p. 3-4).
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Figure 6: Mass. EOEA Environmental Justice Populations (Beyond Lechmere, 2005, Figure 3-3)

Figure 7: Boston MPO Environmental Justice Target Areas (Beyond Lechmere, 2005, Figure 3-4)

Somerville Community Corporation (2008) also mapped the racial breakdown of Somerville against the existing and proposed transit stations. This comparison is important because dependence on
The Green Line project will improve service for environmental justice communities, but the project will also greatly benefit other Somerville residents. The project will benefit environmental justice communities by providing “a one-seat ride from the project corridor to downtown Boston, (eliminating the need for bus and rail transfers at Lechmere Station and at Orange and Red Line
stations)” and by improving travel times within the project corridor by 13 to 17 minutes (MassDOT, 2011, p. ES-2). The project will improve commuting conditions for transit dependent low-income and minority populations, however, non-environmental justice populations will reap greater benefits in almost all categories. For example, environmental justice communities are estimated to gain a 4.8 percent improvement in access to retail employment, while non-environmental justice communities gain a 5.6 percent increase in access to retail jobs (MassDOT, 2011, p. 6-17). The largest improvement in transit access are gained by residents with disabilities, who gain between 2.5 percent and 15.5 percent increases in access to jobs and services located within 40 minutes (MassDOT, 2011, p. 6-17). This revelation does not entirely undermine the justice implications of the project, but it does call into question whether the benefits of the project could have been more evenly distributed. A complete breakdown of project gains, as estimated in the project Environmental Assessment, is included in Table 2.

Table 2: Changes in Transit Access for Disability and Environmental Justice Populations (MassDOT, 2011, Vol. 1, 6.4-1)

<table>
<thead>
<tr>
<th>Population</th>
<th>Basic Employment</th>
<th>Retail Employment</th>
<th>Service Employment</th>
<th>College Enrollment</th>
<th>Hospital Beds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disability</td>
<td>+7.0%</td>
<td>+0.8%</td>
<td>+8.0%</td>
<td>+15.5%</td>
<td>+2.5%</td>
</tr>
<tr>
<td>Non-Disability</td>
<td>+2.9%</td>
<td>+4.0%</td>
<td>+2.7%</td>
<td>+5.0%</td>
<td>+1.3%</td>
</tr>
<tr>
<td>Environmental Justice</td>
<td>+4.3%</td>
<td>+4.8%</td>
<td>+3.7%</td>
<td>+9.3%</td>
<td>+1.5%</td>
</tr>
<tr>
<td>Non-Environmental Justice</td>
<td>-4.8%</td>
<td>-5.6%</td>
<td>-4.6%</td>
<td>+8.0%</td>
<td>+2.3%</td>
</tr>
</tbody>
</table>

Source: United States Census Bureau, Census 2000. Central Transportation Planning Staff (CTPS) analysis. Analysis is based on number of jobs, average number of enrolled students, and average number of hospital beds within a 40-minute transit trip of the populations listed.
1. Percent improvement in number of “blue-collar” jobs accessible to residents in each census block via transit, within a 40-minute ride distance.
2. Percent improvement in number of retail sales jobs accessible to residents in each census block via transit, within a 40-minute ride distance.
3. Percent improvement in number of “white-collar” jobs accessible to residents in each census block via transit, within a 40-minute ride distance.
4. Percent improvement in number of college accessible to residents in each census block via transit, within a 40-minute ride distance.
5. Percent improvement in number of hospital accessible to residents in each census block via transit, within a 40-minute ride distance.

The Politics of Delays

The politics surrounding the Green Line have been exacerbated by project delays. Though the State originally agreed to the complete project by 2011, minimal progress was made during the
1990s. Conservation Law Fund filed lawsuits against the State in 2000 and 2005 claiming that the State was not on schedule to meet its requirements under the State Implementation Plan. The City of Somerville even threatened to back the 2005 lawsuit (Green Line Project Timeline, n.d.). After a tremendous outpouring of community support for the project, the State again reiterated its commitment to the project and moved forward with planning and environmental review.

The original 2011 deadline for completing the project has been repeatedly pushed back. In 2007, Governor Deval Patrick announced that the line would be completed by 2014 (Green Line Project Timeline, n.d.). In 2011, responding to community pressure to publish an updated project timeline, the State announced that the project would begin in 2012 and would not be finished until 2018 or 2019 (Metzger, 2011). Some frustrated residents attempted to appeal the decision to the EPA in order to block the delay, saying, “a lot of people are feeling abandoned. [Don’t] let this chance to protect the health of our citizens slip away” (Handy, 2008, p. 1). Disappointment with the delays was also acknowledged by the project’s lead agencies, which must mitigate for the delays in the project. In the latest SIP update, MassDOT acknowledged community frustrations, saying they are “painfully aware that the recent announcement about delays in implementing the Green Line Extension project has contributed to a sense of disillusionment among advocates for the Green Line Extension” (MassDOT and MBTA, Agency Response to SIP Comments, 2011, p. 15).

OTHER JUSTICE ISSUES

The justice framing of the Green Line has promoted residents and planning practitioners thinking about a wide array of justice concerns that could stem from the project.

Long-Term Funding

Though the Green Line Extension has now broken ground its first construction phase, questions about the project’s long-term viability linger (MassDOT, 2012). The project has
preliminary approval for $557 million in New Starts funds from the Federal Transportation Administration (FTA), a highly competitive funding source that relies on secured matching funds from the State of Massachusetts. The State currently plans to cover its $777 million portion of the project from a combination of bond funds and contributions from the State General Fund. In an announcement of the initial New Starts funding approval earlier this year, the FTA’s regional transportation administrator, Mary Beth Mello, called out this weakness in the project funding, noting that, "the current financial plan assumes several large new, uncommitted funding sources ...." (Bryne, 2012, p. 1). These weaknesses have led to questions about whether the project will actually be completed or will be stalled by waning funds.

**Housing Costs**

The Green Line Extension will have major economic development benefits for Somerville and Medford. The development is “likely to decrease low intensity commercial and light industrial uses in the project study area and increase mixed-use, high density” transit oriented development, particularly near the Lechmere, Washington Street, and Ball Square stations (MassDOT, 2011, p. 6-114). The Green Line will bring much-desired economic development to the region, but there is a potential downside to the development: rising housing costs. A table in the project’s Environmental Assessment, shown in Table 3, illustrates this potential for future equity declines by showing that homes in American cities with transit systems have seen price increases of between $83 (in Portland, Oregon) and $2,300 (in New York City) for every 100 feet closer a unit is transit (MassDOT, 2011, p. 6-116). More locally, “between 1990 and 2000, median incomes in the Red Line station areas increased roughly by 60 percent” (Somerville Community Corporation, 2008, p. 8). A proactive strategy will be needed to maintain affordable housing in the area.
CONCLUSIONS AND RECOMMENDATIONS

Regardless of the outcomes, the project framing has helped to bring transportation justice to the forefront of this infrastructure improvement. Local residents and politicians have pushed hard for the Green Line and the justice framing is reflected in how the project is described by the lead agencies. The project materials showcase this commitment to justice in the project benefits highlighted: the lead agencies highlight that they have minimized procedural justice concerns of taking property by constructing in the existing railroad right of way and have expanded social justice by providing for access that meets or exceeds the Americans with Disabilities Act (ADA) standards (MassDOT, 2011). The prominence of these actions within the Environmental Assessment indicates that justice concerns were carefully considered and actively highlighted to promote the Green Line Extension.

Recommendations

Based on the findings in this paper, a series of recommendations could help to track and improve equity considerations through the next five to ten years of project implementation of the Green Line Extension project.
**Recommendation #1: Track Baseline Data and Report on Changes.** The Green Line Extension was primarily set in motion by a need to mitigate air quality impacts from highway expansion, so monitoring should track whether the project is successful in meeting this stated goal. This should not be a difficult task since air quality data is already gathered throughout the region, but a compilation of this follow-up data could be published to report on whether or not the project lived up to its stated justice goals. Reporting on other neighborhood changes over time could also help to evaluate the success of Green Line project and to identify opportunities for improvement, if needed. Other issues that would be worth tracking over time include the composition of and price of real estate, provision of affordable housing, income and racial demographic changes.

**Recommendation #2: Explore Strategies to Link Transportation and Housing.** The potential for transit oriented development in the project area brings with it substantial risk for gentrification along the new rail corridor. Increases in land values could drive out some small businesses and raise housing costs, particularly for the stations in East Somerville. Planners and policy makers need to plan for this risk now to ensure that the Green Line does not simply drive low-income residents further from transit.

**Recommendation #3: Consider Standardizing Environmental Justice Guidelines.** The breadth and range of transportation justice and environmental justice definitions identified to describe this project indicates the murky nature of defining built environment impacts on specific populations. Federal guidelines differ from those at the State level, State guidelines only directly apply to select agencies and actions, and the Boston Metropolitan Planning Organization uses still another definition. These differing environmental justice guidelines complicate the story of what projects qualify as an environmental justice project.

The State of Massachusetts should consider expanding its environmental justice criteria to all agencies and blatantly incorporating transportation projects into consideration. A single definition could guide the work of all state agencies, and could be incorporated into the local
environmental justice criteria set by the Boston MPO. One potential model to consider for
incorporating transportation concerns into the existing environmental framework is New York’s
GreenLITES program. GreenLITES, which stands for Green Leadership in Transportation
Environmental Sustainability, is a transportation sustainability rating system used by the New
York Department of Transportation to “to measure [their] performance, recognize good practices,
and identify where [they] need to improve. It also provides the Department with a way to
demonstrate to the public how [they] are advancing sustainable practices” (New York Department
of Transportation [New York DOT], GreenLITES, n.d). The program incorporates social concerns
as a facet of its evaluation, and is explicitly outlined as an action item in the State’s Environmental

Recommendation #4: Explore Regional Transportation Equity Coalitions. In the Boston region
transportation equity concerns are raised by a number of small, tightly focused nonprofits working to
address localized injustices and infrastructure projects. Community activism for the Green Line
Extension was organized by a smattering of groups in locally-focused on Somerville and Medford. At
the same time, other separate coalitions lobby for transportation improvements in other parts of Boston
region like Roxbury and Dorchester. Partnerships between organizations could serve to strengthen the
voices for calling for transportation justice throughout the region. Such partnerships could breed
solidarity, shared resources, and could help to avoid pitting projects against each other in competition
for limited funds.

Recommendation #5: Conduct Further Research on Transportation Justice. Significant
research is still needed to define and enumerate the ties between transportation and environmental
justice. The definitions vary, guidelines are limited, and only a handful of case studies have
highlighted justice as a core issue in any transportation project. More research could help to
consolidate definitions, identify the most effective and transformative existing projects, and could help
to suggest standards by which to compare projects. Further consideration should also be given to how best to utilize environmental review processes to address existing pre-existing inequities, since scenarios might only insure that disamenities are not increased. Continued research and documentation related to transportation justice is needed to identify and evaluate more case studies, like this one of the Green Line Extension, and to help bring transportation further under the umbrella of environmental justice.

Conclusions

Transportation projects raise a host of environmental justice concerns about the allocation of resources, the physical concentration of impacts, and the social allocation of amenities and disamenities. Transportation and equity concerns have long been intertwined, but the recent series of transportation mega-projects in the Boston region has brought the issue to the forefront of local transportation planning. The Green Line Extension is certainly not the only transportation project to utilize justice framing, but the clarity and consistency of its messaging is unique and could be indicative of a new frontier for environmental justice.

The Green Line Extension project framing has raises salient environmental justice concerns about concentrated air quality impacts, improved transportation service for low-income and minority populations, access for riders with disabilities, and distribution of the regional costs and benefits of transportation developments. The justice issues the project aims to ameliorate address matters of public health and the distribution of negative externalities to an area with the benefits of transit. Although the project has the potential to transform the lives of low-income, minority, and transit-dependent populations in Somerville and Medford, it is important to note that the benefits of the project will also accrue—often in greater numbers—to those who are white and middle- or upper-income. The project has the opportunity to improve transportation equity and living conditions in the area, but only if a continued focus on justice helps to galvanize transit-oriented low-income housing.
While the many of the political realities and benefits of the Green Line Extension are specific to the project’s Boston-area context, the clear justice framing inherent in its development has implications for a wide array of transportation projects. Transit systems constantly face difficult decisions about how—and to whom—to allocate limited financial resources. In many cases, including the Green Line Extension, the benefits of transit service have not been evenly distributed and have skewed in favor of wealthier and whiter communities. While examples of environmental justice communities fighting to improve transportation access do exist, they are sporadic and inconsistent in their success. Transportation justice coalitions, like those formed to support the Green Line extension, are a growing presence among the stakeholder groups lobbying for transit improvements. This shift will continue to expand conversations about the beneficiaries of transportation infrastructure projects. Around the United States, transit-underserved communities may see their struggles for cleaner air, increased mobility, and access to long-denied resources reflected in the story of Somerville and Medford’s fight for the Green Line Extension. The success of the Green Line Extension in promoting transit improvements using a justice framework has the potential to galvanize support for similar improvements in other underserved communities and may elevate debates about the spatial, social, and economic beneficiaries of transportation investments.
CITATIONS FOR GRAPHICS AND TABLES


Figure 6: “Mass. EOEA Environmental Justice Populations.” In Massachusetts Bay Transportation Authority (2005, August). Beyond Lechmere: northwest corridor study major investment analysis. Retrieved from http://greenlineextension.eot.state.ma.us/docs_beyondLechmere.html, Figure 3-3.

Figure 7: “Boston MPO Environmental Justice Target Areas.” In Massachusetts Bay Transportation Authority (2005, August). Beyond Lechmere: northwest corridor study major investment analysis. Retrieved from http://greenlineextension.eot.state.ma.us/docs_beyondLechmere.html, Figure 3-4.

Table 1: “Mesoscale Mobile Source Analysis Results (kilograms per day).” In “Massachusetts Environmental Justice Communities broken down by type.” “Massachusetts Environmental Justice communities in the vicinity of the Green Line Extension project area.” Massachusetts Department of Transportation. (2011, October) Green line extension environmental assessment and 4(f) evaluation. Retrieved from: http://greenlineextension.eot.state.ma.us/documents/ev_Assess/Volume_1_Text.pdf, Volume 1: Figure 6.6-8

Table 2: “Project Benefits.” In “Massachusetts Environmental Justice Communities broken down by type.” “Massachusetts Environmental Justice communities in the vicinity of the Green Line Extension project area.” Massachusetts Department of Transportation. (2011, October) Green line extension environmental assessment and 4(f) evaluation. Retrieved from: http://greenlineextension.eot.state.ma.us/documents/ev_Assess/Volume_1_Text.pdf, Volume 1: Figure 6.4-1

Table 3: “Rail System Benefits on Real Estate Values.” In “Massachusetts Environmental Justice Communities broken down by type.” “Massachusetts Environmental Justice communities in the vicinity of the Green Line Extension project area.” Massachusetts Department of Transportation. (2011, October) Green line extension environmental assessment and 4(f) evaluation. Retrieved from: http://greenlineextension.eot.state.ma.us/documents/ev_Assess/Volume_1_Text.pdf, Volume 1: Figure 6.15-4
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