

GOING OFF THE (COMMUTER) RAILS

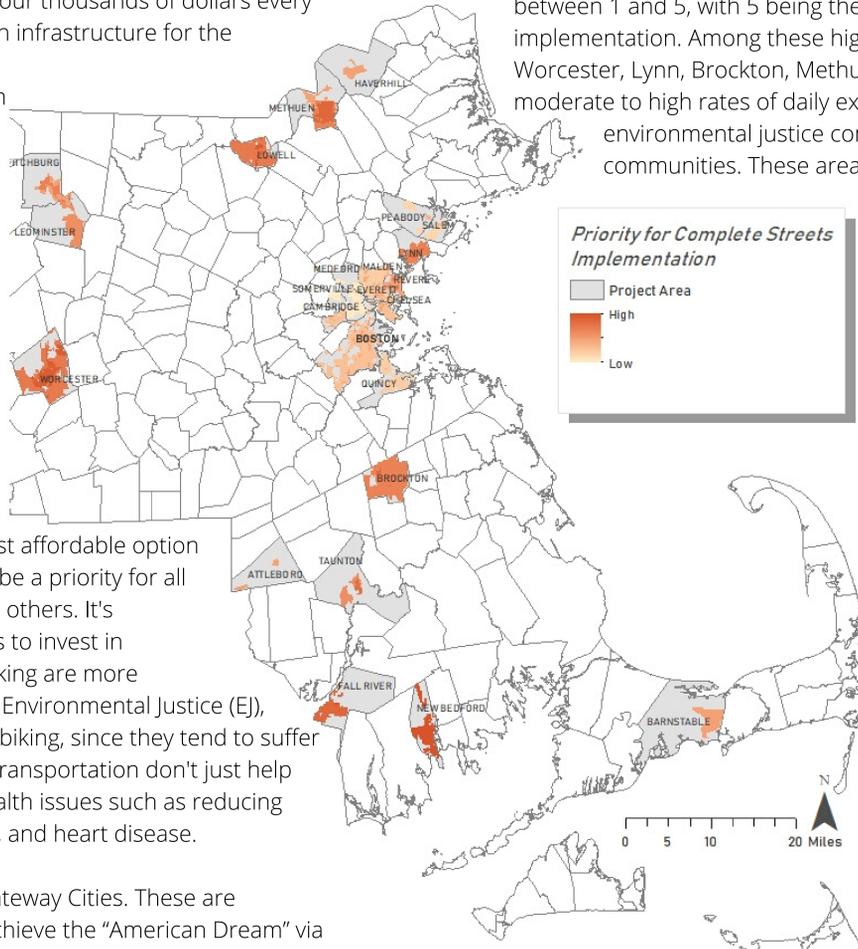
A SUITABILITY ASSESSMENT FOR COMPLETE STREETS IMPLEMENTATION IN EASTERN MASS.

BACKGROUND

Massachusetts has, arguably, some of the best options for transportation in the US. Governmental agencies like Federal Highway, US DOT, MassDOT, and the MBTA pour thousands of dollars every year into improving the quality of transportation and transportation infrastructure for the Commonwealth, with Boston as a shining example of how a city should move. Over the years, there's been an increase in demand for walkable cities and multimodal transportation. This idea is called **"Complete Streets"**-- this idea is centered on shifting the focus from cars to other modes of transportation such as cycling and walking, so cities can move more sustainably and equitably.

A few different types of this infrastructure: bike lanes, protected bike lanes (bike lanes with physical boundaries such as curbs to protect cyclists from traffic), road signage, paved bike shoulders, bicycle/pedestrian priority roadways, marked shared lanes, and shared use paths (paths that are shared between all non-motorized/automotive users). The inclusion of these different transportation options ends up being more environmentally and economically just as well, since owning cars are a huge investment and aren't always the most affordable option for socioeconomically vulnerable communities. Ideally, this should be a priority for all towns, but some towns aren't as serviced or prioritized as much as others. It's especially important for socioeconomically vulnerable communities to invest in pedestrian and bicycle (Bike-Ped) facilities because cycling and walking are more sustainable modes of transportation. Low income and minority, or Environmental Justice (EJ), communities tend to have little to no infrastructure for walking or biking, since they tend to suffer from historic divestment. Investing in these sustainable modes of transportation don't just help these communities economically, they also help mitigate public health issues such as reducing green house gas emissions, obesity, high blood pressure, diabetes, and heart disease.

A prime example of these cities would be the Massachusetts Gateway Cities. These are midsize cities that historically provided a "gateway" for people to achieve the "American Dream" via good jobs. Today, this idea has mostly disappeared, leaving these cities to be midsize urban centers that are socially vulnerable and lack many important resources. Over time, the Commonwealth has recognized these cities as places with "unrealized potential" and intended to focus on the development of these cities. Diving into the Gateway Cities, specifically the cities in closer proximity to the Greater Boston Area, will offer interesting look into how the government prioritizes areas and populations to improve on when it comes to transportation.



RESULTS

The suitability assessment calculation resulted in a raster containing areas ranked between 1 and 5, with 5 being the high priority locations for Complete Streets implementation. Among these highest priority locations are the towns of Lowell, Worcester, Lynn, Brockton, Methuen, New Bedford, and Fall River. These towns contain moderate to high rates of daily exposure to CO2 and large populations of environmental justice communities, particularly minority and English isolation communities. These areas are also sparse in bike-ped infrastructure, containing the least number of bike lane miles, as well as very limited transit options.

These cities are also have very low median incomes, generally ranging from \$32,000 to about \$53,000.

On the low priority end of the spectrum is, predictably, the Greater Boston Area (spare Lynn). Boston has some of the best transit infrastructure and many various transit options. The city contains the MBTA rapid transit lines, a dense bus route system, and the most bike lane miles in the state. Although these things are all positive factors that contributed to Boston being prioritized on the lower side, there is still room for further implementation of Complete Streets, since Boston still has some of the the highest CO2 emissions and minority populations.

LIMITATIONS

Since the project area was limited to only Gateway cities in Eastern Massachusetts and Greater Boston, it created a more narrow project-- however, isn't truly an analysis of the Gateway Cities as a whole. This was mostly due to the lack of bus route data for Western Massachusetts. Additionally, only considering 4 main factors of transit options and availability, income, environmental justice community status (minority and English isolation primarily), and daily carbon dioxide emissions, doesn't consider the more nuanced and equally important factors in the statuses of these populations such as other health risks (obesity and heart disease), all other air pollutants (particulate matter and nitrogen dioxide), population density, and commute information, and vehicle ownership.

The study also doesn't acknowledge the nuances in pedestrians-- such as the disabled, the elderly, and women, as well as the difference in the time for walkable trips and and bikable trips, and land use and common destinations. Another important factor is to mitigate against pedestrian and bicyclist fatalities and crashes.

The calculations done in this study is also limited in that it only considered total bike lane miles as a total instead of as a percentage of total potential walkable/bikable roads. The overall weighted calculation is also partial to income, CO2 exposure, and environmental justice status over transportation availability. This is a large assumption and, therefore, a limitation in the study.

METHODS

The suitability assessment performed is based off of three factors that largely attribute to the cities being characterized as environmental justice communities in the economic, social, and environmental health aspects, along with quantity of existing transportation infrastructure such as bicycle and pedestrian infrastructure and public transit (buses and trains).

The EJ factors were reclassified and ranked on a scale of 1 to 5, 1 representing the populations least at risk and 5 representing those most at risk. The carbon emissions were also reclassified into a scale of 1 to 5, with 1 representing areas with the least exposure and 5 with the most. Median household income was reclassified on a scale of 1 to 6, with 1 being the least economically vulnerable to 6 being the most vulnerable. A weighted overlay using the reclassified rasters output a raster of ranked values from 1 to 5, weighing the three factors equally. The transportation options and availability data was created using a data set from the Boston Region MPO of total bike lane miles with statistical rankings between 1 (most miles) and 5 (least miles) and the total miles of bus and train routes calculated from the length of the polygons on arc map. The data was consolidated via a weighted sum (weighing bicycle and pedestrian miles at 0.6 and rapid transit at 0.4) and ranked on a scale of 1 to 5 for overall transit availability. A weighted sum was used to create a raster with areas ranked with their final scores between 1 and 5.

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CEE187 Geographic Information Systems

Projection: NAD1983 State Plane Massachusetts FIPS 2001

Data Sources: MassGIS, MA GeoDOT, Boston Region MPO, American

Community Survey, Massachusetts Metropolitan Area Planning Council

Other Sources: Massachusetts Pedestrian Transportation Plan

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A CLOSER LOOK

