## CLEARING THE AIR UNIVERSITY A Proposal for Cordon Congestion Pricing in Boston Cartographer: Andrew McFarland UEP 235 | December 2019 **Bus Stop Proximity** Air Quality Social Vulnerability **Traffic Crashes**

## Introduction

It's no secret that traffic congestion has been getting worse in Metro Boston in recent years. Congestion pricing, charging drivers a fee for using high-demand roads, is one proven policy intervention for reducing vehicular trips in urban areas. London's Congestion Charge Zone, which has been in place since 2003, has been associated with significant effects, such as an increase in bus ridership and a reduction in traffic crashes. In addition to

these systemwide benefits, congestion pricing could have considerable impacts for communities that are more vulnerable to traffic emissions exposure, such as children, seniors, people of color, and people with respiratory illnesses. Given these potential effects, which parts of Boston would most benefit from a congestion pricing zone? How can this policy advance equity and livability in the city?

# **Final Proposed Congestion Pricing Zone**

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## Methodology

To answer my questions, I conducted a suitability raster analysis based on 1) who is currently most likely to be negatively impacted by traffic congestion in Boston, and 2) where there is potential for transportation modeshift. The variables that contributed to this analysis were 1) pollutants associated with transportation emissions, 2) rates of traffic crashes, 3) proximity to bus stops, and 4) concentrations of socially vulnerable communities (children, seniors, people of color, and those with respiratory illnesses and other diseases).

To prepare these variables, I created a social vulnerability raster that indicated which communities have the highest rates of children, seniors, people of color, and those with respiratory illnesses and other diseases by block group based on the City of Boston's Climate Ready Boston Social Vulnerability dataset. For air quality data, I converted CMAP CLINE data for (CO, NO2, NOx, PM10, PM2.5, SO2) from points to rasters, which I combined using raster calculator. For the purposes of the analysis, I considered the worst effect of transportation emissions, which was during the AM peak (although PM peak was comparable) during the winter time. To consider the potential for modeshift



effects, I ran a Euclidean distance analysis for MBTA bus stops in Boston, and determined which communities have the highest rates of traffic crashes by block group based on Boston's Vision Zero data (2015-19). These initial maps are featured along the top of the poster.

Before weighing these factors, all rasters were reclassified on a five-scale quantile breakdown. To determine weights for each of these factors, I applied a decision-making matrix, and heaviest weight were given to emissions and social vulnerability. Once my initial suitability analysis was completed, I applied a region overlay and reclassified my results in order to create a zone that would have a cohesive border, similar to cordon zones elsewhere.



## **Results & Conclusion**

A summary of the benefits of my proposed cordon congestion zone are summarized in the table and maps to the right. According to my analysis, my proposed congestion pricing zone could cover the majority of people in the city who are more vulnerable to transportation emission exposure presently. Further, limiting cars entering into this area could be a boon for bus performance and ridership on 93 MBTA routes, many of which travel outside of the zone and into the suburbs. A majority of traffic crashes

also take place within the zone, so bikes and pedestrians would also likely benefit. However, some significant communities would be left out, such as Mattapan, which currently has one of the highest concentrations of social need. There could also be considerable benefits for considering an "Ultra Low Emission Zone," similar to London's, in order to improve air quality in this area. Further analysis is needed to determine the fee(s) for driving into this zone should be relative to roadway capacity.

### References

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## **Potential Transit Benefits**



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