

Public Transportation Access in High-Need Areas of New York City

Created by Jiepu Li

12/08/15

CEE187: Geographic Information Systems

Professor Laurie Baise

Abstract



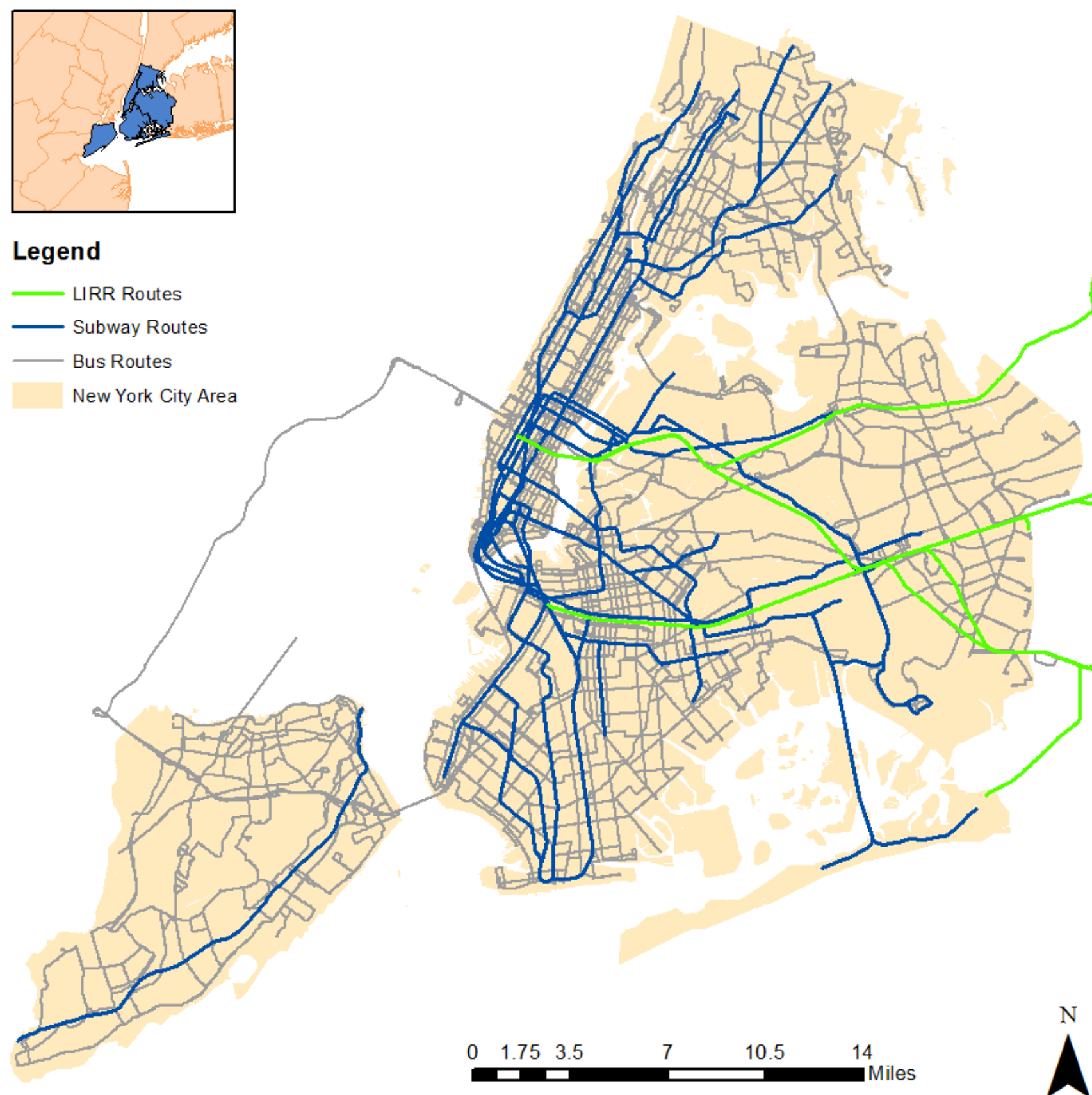
New York city has one of the most advanced public transportation systems in the world, with more than half of the city's residents using public transit to commute to work. While the subway, bus, and LIRR systems are extensive and cover much of the city, there are many areas outside of Manhattan island that lack walking distance public transportation access. The goal of this project was to evaluate the coverage of available public transportation commons in new York city, and determine whether the current system adequately addresses the needs of the city, especially residents who rely on public transportation the most.

and determine the level of access to public transportation at every point in new York city, by summing the proximity of each point to LIRR, subway, bus stops. Access at each point was evaluated in conjunction with socioeconomic characteristics with the residents. Finally, access was compared to socioeconomic vulnerability of the residents, and several high vulnerability gaps in the NYC transit system were identified.

There are several current projects that aim to expand the NYC public transportation system. The findings of this study show that while the NYC public transit system is high-y developed, many new Yorkers of lower socioeconomic class who rely on public transportation the most do not have access. Evaluating public transportation through the principles of access vs need allows urban planner to make more informed decision about to how build and expand a city public transportation system to achieve maximum benefits.

Methods

Using ArcGIS, three sets of distance buffers were created for the NYC subway, bus, and LIRR systems respectively. Each set consists of three different distances representing good, moderate, and poor walking distance access to public transportation. The buffer sets for each form of public transportation were weighted and combined to create an access map for public transit in new York city. In addition to distance from public transportation 0other socioeconomic factors, including per capita income, population density, unemployment rates, and means of transportation to work. A score was determined for each of these characteristics in order to evaluate need for public transportation. Finally, a vulnerability assessment was performed on the city by evaluating transportation access relative to need at every point in new York city. The high vulnerability areas in NYC were identified, and evaluated with respect to planned subway extension projects in new York city to determine whether the new public transportation expansion plans address the most significant gaps in the system's coverage.



Access Assessment

$$\text{Access Score} = \text{Buss Access} * 15 + \text{Subway Access} * 25 + \text{LIRR Access} * 5$$

Need Assessment

$$\text{Need Score} = 0.4 * \text{Population Score} + 0.3 * \text{Income Score} + 0.2 * \text{unemployment score} + 0.1 * \text{Usage Score}$$

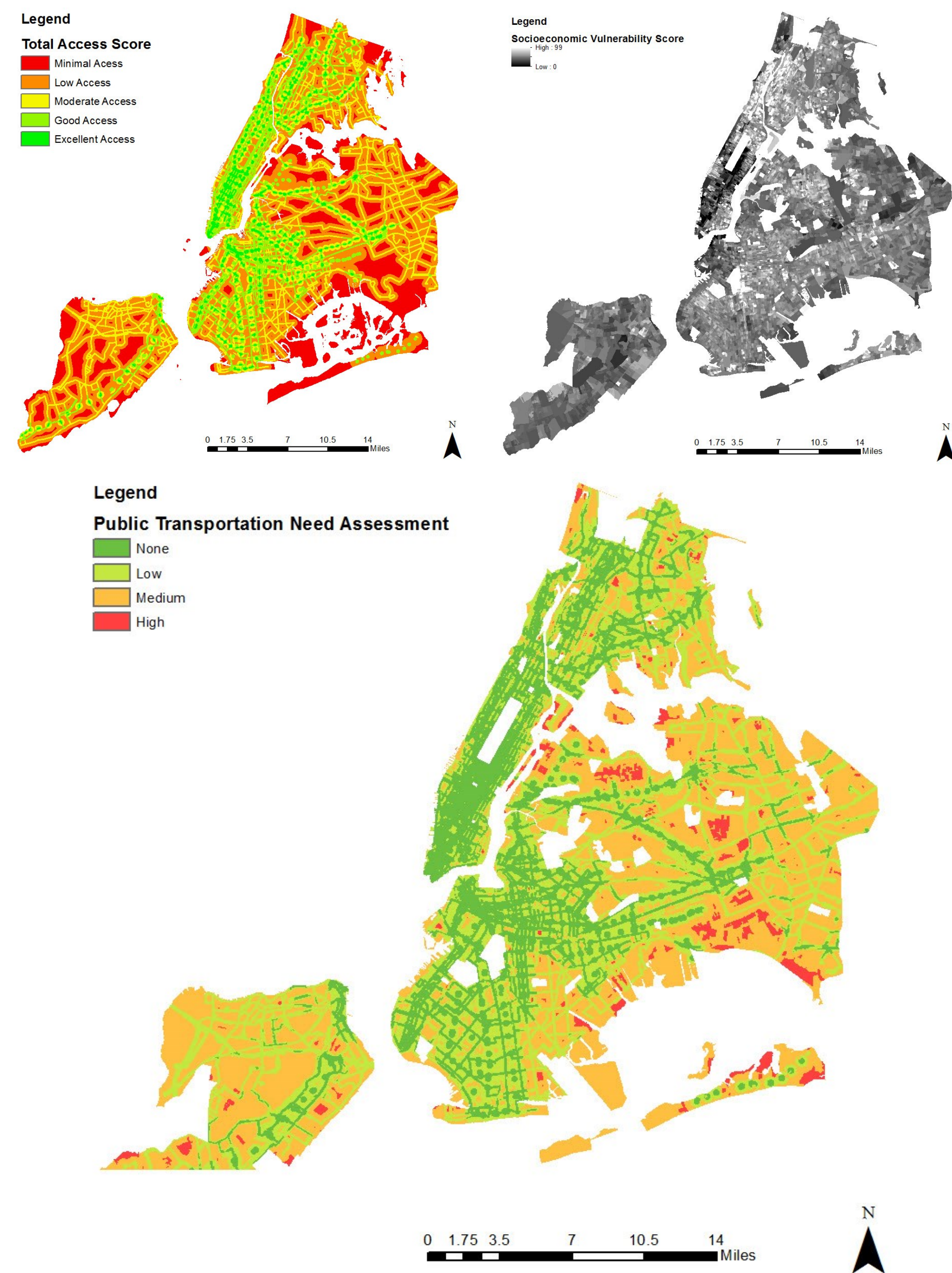
Overall Vulnerability Assessment

$$\text{Vulnerability Score} = \text{Need Score} / 7 - \text{Access Score} / 2$$

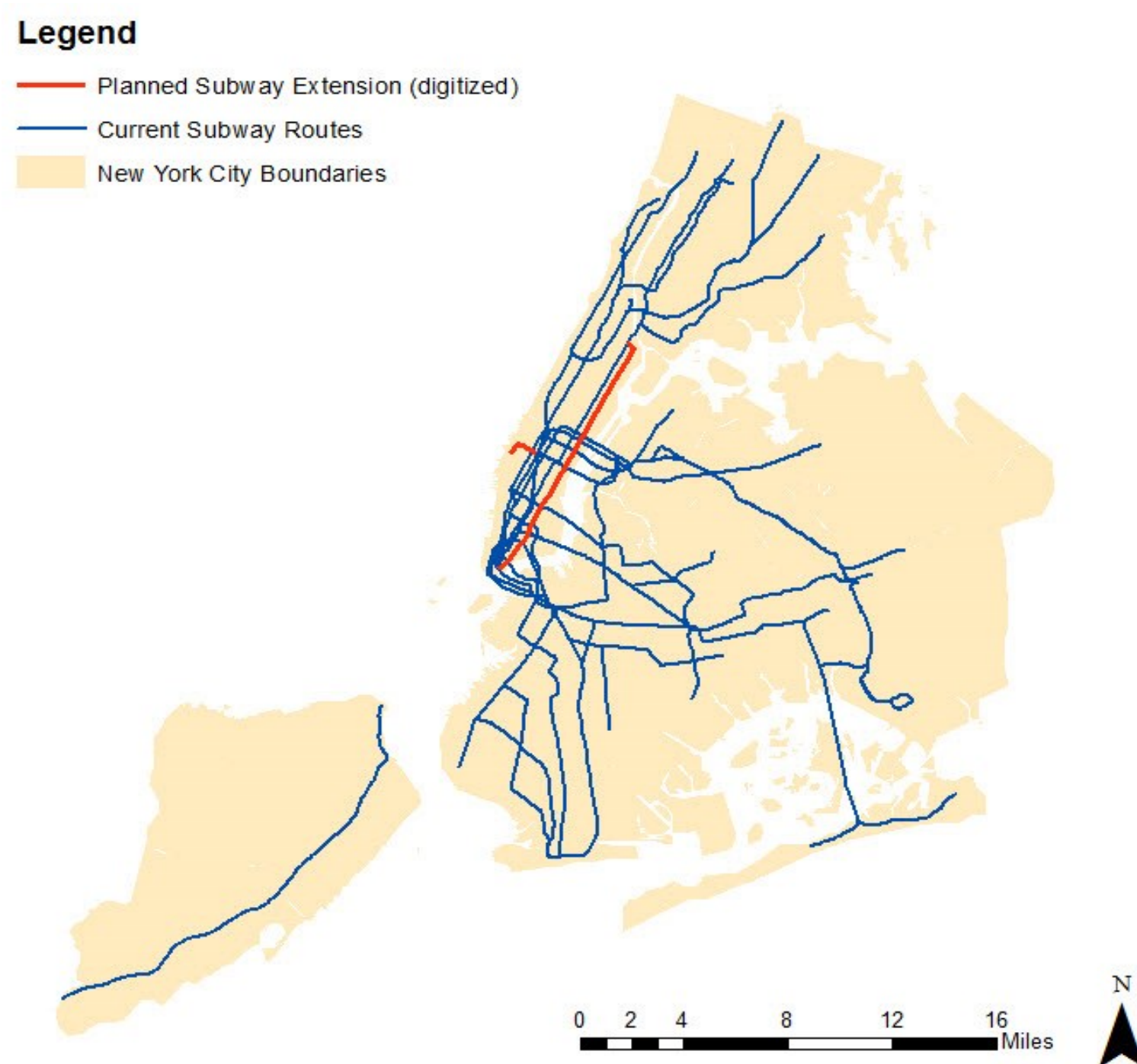
Socioeconomic Factors



Results



Planned Extensions



Conclusions

The spatial assessment performed on the public transportation system shows that the overall coverage of public transportation in NYC is very good, in most of Brooklyn, Manhattan, and the Bronx. Where most of the boroughs are covered in green. Public transportation coverage in queens is comparatively lacking, with most of queens in the yellow to orange range. Furthermore, some gaps do exist in the public transportation system, including many areas in eastern queens, as well as parts of northern Brooklyn. These areas have generally lower socioeconomic status, and are especially vulnerable to the lack of public transportation, as many are not able to own private cars or utilize alternative, often more expensive forms of transportation. While several new projects are now under way in new York city to expand the public transportation system, these projects are focused on areas of highest economic activity in western Manhattan. While these expansion projects benefit the city, they fail to address the most severe needs of the people in the city who need public transportation the most.

Data

Layer	Type	source
Subway	Points, lines (SHP)	MTA
Bus	Points, lines (SHP)	MTA
LIRR	Points, lines (SHP)	MTA
Housing density	Polygons (SHP)	ARCGIS Online
Population density	Polygons (GDBTABLE)	US Census
Median income	Polygons (GDBTABLE)	US Census
Employment status	Polygons (GDBTABLE)	US Census
Race	Polygons (GDBTABLE)	US Census
Average commute time	Polygons (GDBTABLE)	US Census