# Proximity of Schools to major roads and facilities in Fulton County

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**Abstract**

***Background:***

Which school to go in Fulton County? A school plays really important part in an individual's development starting from early years of their life. Exposure to traffic-generated air and noise pollution causes a wide range of adverse health effects in children due to close proximity to roads, so school location may be an important determinant of exposure. Also, proximity to support facilities like Libraries and bicycle lanes could impact the quality of education and mode choice among students. This has direct impact on the physical and mental growth of children studying at a particular location.

***Data Source and description:***

The list of Data sources for carrying out this analysis for the Fulton, County are as follows:

1. Fulton County School Zones, Fulton County School Fascilities, Library Fascilities in Fulton County, Atlanta's neighborhood data from Neighborhood Nexus Data (http://neighborhoodnexus.org/maps-and-data/data-downloader/)

2. Fulton County Boundaries, Fulton County Bicycle lane Network, Fulton County Major Roads, Georgia State Highway Network data from Atlanta Regional Commission Open Data (http://opendata.atlantaregional.com/)

***Methods:***

Data on schools in Fulton County were obtained from online databases. School addresses were used to conduct proximity analysis to the nearest major road based on measurements of nitrogen oxide concentrations, ultrafine particle counts, and noise levels in Fulton County conservatively defined distances < 1 miles from major roads as the zone of primary interest. Bicycle network and library facility data at the city and neighborhood levels were used to evaluate relationships between school proximity to bicycle lanes, and libraries as indicators of quality to rank these schools on a scale of 1-5. The proximity analysis was carried out by multiple clip, buffer, Table select, Near and other tools from Arcgis which were then exported from the model maker to python code for the same.

***Results:***

Addresses were obtained for 195 schools across Fulton county, 29.23% of schools were located within 1 miles of a major road.The most vulnerable schools were mapped successfully and a list was generated. Also, a map for the best schools in Fulton county on a scale of 1-5 within 1 mile of a library facility and nearby bicycle network was generated successfully.

***Conclusions:***

A substantial fraction of students at schools in Fulton county, particularly students attending schools within 1 miles of major roadway, may be exposed to elevated levels of air pollution and noise while at school. In a similar way, schools in proximity of a library facility and bicycle lane will have a positive impact on their physical and academic growth. As a result, the locations of schools may negatively or positively impact the healthy development and academic performance of children in the Fulton county.

# Introduction

Motor vehicles being a major source of traffic generates air and noise pollution in communities. Epidemiologic studies have indicated that exposure to traffic-generated air pollution causes wide range of adverse effects in children including reduced lung function [1], decrements in lung growth [2], incident asthma [3], otitis media [4], and decreased cognitive function [5]. Chronic exposure to traffic noise among children has been linked with increased blood pressure [6], reduced sleep quality [7], and cognitive deficits [8]. proximity of schools to major roads may be an important determinant of exposure to air pollutants such as diesel soot, ultrafine particles, oxides of nitrogen (NOx), and carbon monoxide are highest within 0.5-1 miles of major roadways [9-13].
The objectives were to: 1) determine the proximities of schools to major roads in order to generate a map and a list of most vulnerable schools; and
2) determine the proximities of schools to Libraries and bicycle lanes in order to generate a map and a list of best schools to attend in Fulton County

# Data Sources and Tools

The list of Data sources for carrying out this analysis for the Fulton, County are as follows:

1. Fulton County School Zones, Fulton County School Fascilities, Library Fascilities in Fulton County, Atlanta's neighborhood data from Neighborhood Nexus Data (http://neighborhoodnexus.org/maps-and-data/data-downloader/)
2. Fulton County Boundaries, Fulton County Bicycle lane Network, Fulton County Major Roads, Georgia State Highway Network data from Atlanta Regional Commission Open Data (http://opendata.atlantaregional.com/)

Tools used are listed as follows:
1. ArcGIS model Builder
2. PyScripter

Python code used:
1. Clip analysis
2. Buffer Analysis
3. Multiple Ring Buffer
4. Near Analysis
5. Table Select

# Methods

School facilities data was obtained from the ARC open data website for Metro Atlanta Region which includes elementary, middle, high school and other academic facilities like kindergarten and academies. This data included the Name, Address, City, Zip Code, Area code, Contact Number, School Type, Method of location extraction, ID and last update. This was then trimmed to limit the scope of the project to Fulton County by using clip analysis tool in python. Similarly, all the other data sets (Major Roads, State Highways, and School Zones) were tailored to the need of the project with the help of clip Analysis tool. Once the data was limited to Fulton county, State Highways and major roadways Buffer dataset was generated using buffer analysis tool in python and the schools within 1 miles of major road network and state highways were clipped. Studies have reflected for children attending a

school within 100 m of a freeway or major road have inverse correlations between concentrations of traffic-related air pollution inside classrooms and distance to the nearest major road. Based on this study the coarse buffer distance was taken to be ¼ miles to create the map for the most vulnerable schools in the proximity of major road network in Fulton county. These were classified into Extreme, High, Intermediate, Moderate, and Low impact schools based on their relative distance from the nearest roadway.
Next Step was gathering Library facilities data and Bicycle Network data from ARC open data website for Metro Atlanta Region which has a compilation of all the Public Libraries based on cities and neighborhoods. It was clipped for Fulton county, and subjected to a multi ring buffer of 2 and 3 miles for identifying schools within 3 mi of a library facility (Schools included for this analysis were not in the vicinity of a major roadway within 1/4 miles). This was accomplished by subtracting the vulnerable schools from the original school data and buffer analysis in python code. These schools were then ranked on a scale of 1-5 with 1 as the Best and 5 as the Low School Quality Index. The symbology was categorized based on the distance of the school from library facility and bicycle network.
A model was created in ArcGIS model builder tool and the code was exported in form of Python Script to PyScripter. The code is attached in the appendix of this report.

## Results

The two major deliverables of this project are generating shapefiles for schools vulnerable to traffic generated air and noise pollution in Fulton county and ranking schools in Fulton county by School Quality Index which is measured on the basis of distance of a school from Library facility and bicycle network. These are then presented in form of two separate maps.

## Conclusions

Addresses were obtained for 195 schools across Fulton county, analysis showed that 57 schools were located within 1 miles of a major road or state highway which comprises of 29.23% of schools in the Fulton county. The most vulnerable schools were further classified based on their near distance from the road network. The analysis also indicated that 7 schools have more than one area adjacent to a major roadway, which could affect the air quality to extreme levels. Also, a map for the best schools in Fulton county on a scale of 1-5 within 1 mile of a library facility and nearby bicycle network was generated successfully. The results showed that 22.05% of schools in Fulton county have the best school quality index based on their proximity analysis while in general 56.23% of all the schools are more than 1 miles away from any major road network. This, data could serve as a basis for further research and is targeted to new students enrolling for schools in Fulton county.

## References


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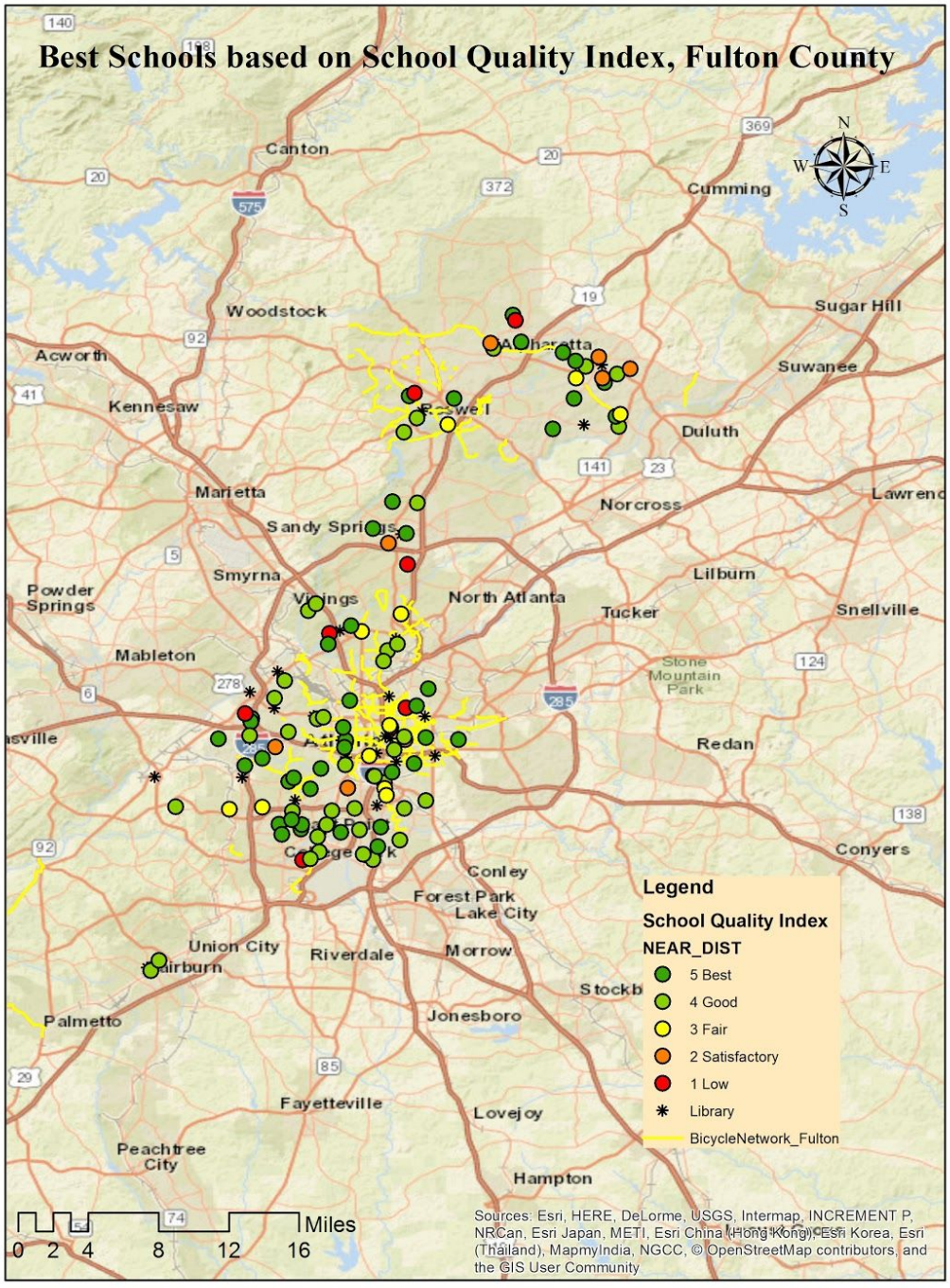
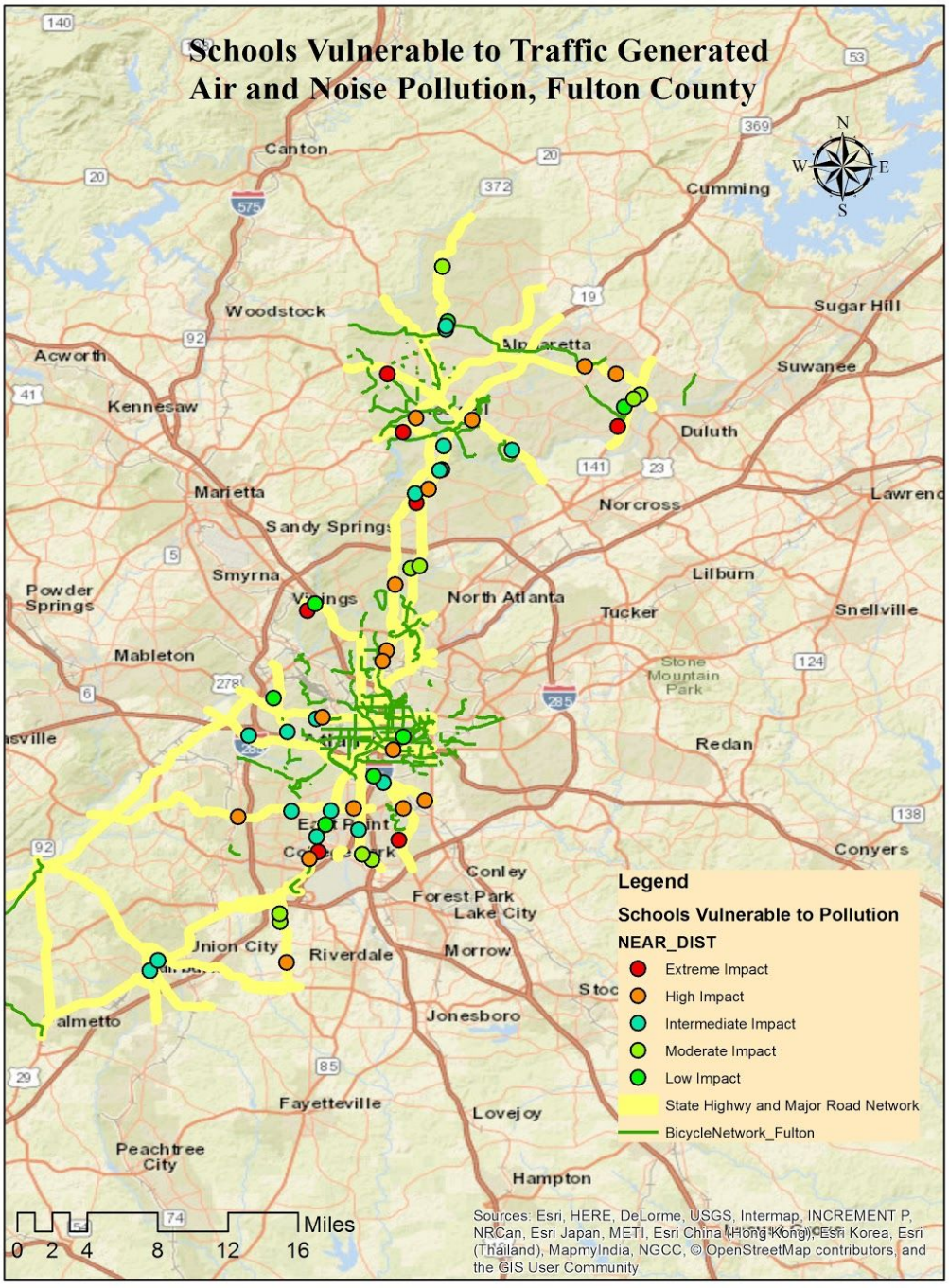
# Appendix

1. Map for best schools in Fulton county by School Quality Index
2. Map for schools most vulnerable to traffic generated Air and Noise pollution in Fulton county
3. Python Code used for analysis of data in PyScripter


Best Schools based on School Quality Index, Fulton County
N
W
E
S
Canton
Cumming
Woodstock
Sugar Hill
Acworth
Suwanee
Kennesaw
Roswell
Duluth
Marietta
Norcross
Sandy Springs
Smyrna
Lilburn
Powder Springs
Vinings
North Atlanta
Tucker
Snellville
Mableton
Stone Mountain Park
Redan
Conyers
Conley
Forest Park
Lake City
Union City
Riverdale
Morrow
Palmetto
Jonesboro
Fayetteville
Lovejoy
Peachtree City
Hampton
Legend
School Quality Index
NEAR_DIST
5 Best
4 Good
3 Fair
2 Satisfactory
1 Low
Library
BicycleNetwork_Fulton
0 2 4 8 12 16
Miles
Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community


Schools Vulnerable to Traffic Generated
Air and Noise Pollution, Fulton County
N
W
E
S
Canton
Cumming
Woodstock
Sugar Hill
Acworth
Suwanee
Kennesaw
Duluth
Marietta
Norcross
Sandy Springs
Smyrna
Lilburn
Powder Springs
North Atlanta
Tucker
Snellville
Mableton
Stone Mountain Park
Redan
East Point
Conyers
Conley
Forest Park
Lake City
Union City
Riverdale
Morrow
Jonesboro
Fayetteville
Lovejoy
Peachtree City
Hampton
Legend
Schools Vulnerable to Pollution
NEAR_DIST
Extreme Impact
High Impact
Intermediate Impact
Moderate Impact
Low Impact
State Highwy and Major Road Network
BicycleNetwork_Fulton
0 2 4 8 12 16
Miles
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