Prioritizing Early Electric School Bus Deployment in New York City

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2026 MIT Libraries Geospatial Data Visualization Contest

Background:

- New York State has mandated a 100% zero-emission electric school bus (ESB) fleet by 2035, banning new non-electric bus purchases as early as 2027. [1]
  - Currently, only 68 of NYC's 10,500 school buses are electric (less than 1% of the fleet). [3]
- Community advocates note a lack of information and limited technical capacity among districts as obstacles to electrification.

- 20+ million students ride school buses in the US annually, and more than 90% of that fleet runs on diesel. Students from low-income families, communities of color, and students with disabilities are disproportionately likely to ride longer routes, increasing their exposure to toxic exhaust linked to asthma, cancer, and reduced academic performance [2, 4].

- Electric school buses offer some relief: zero emissions, lower operating costs over time, and potential grid resilience benefits through vehicle-to-grid technology.
  - However, research shows that wealthier districts are procuring more buses per capita than low-income ones [4].

- Because school districts are largely funded through local taxes, under-resourced districts have less capacity to navigate complex grant applications and upfront capital costs, creating a risk that the ESB transition reinforces rather than reduces existing inequities [4].

Research Question

Where in New York City is most suitable for early electric school bus deployment when considering environmental justice, public health, and infrastructure readiness?

Methods:

- Spatial analysis was conducted in QGIS using NAD83 / New York Long Island (EPSG:2263)
- Datasets were converted to a 100 m × 100 m raster grid to enable weighted overlay.
- 3 indicators were combined into a Priority Index identifying priority areas for early electric school bus deployment.

Data Sources: Borough boundaries sourced from MIT Libraries GeoData Portal

New York City Department of Health and Mental Hygiene. (n.d.). *UHF 42 neighborhood boundaries* [Shapefile]. NYC Environment & Health Data Portal. Retrieved from https://github.com/nychealth/EHDP-data/tree/production/geography/UHF%2042

New York (N.Y.). Department of City Planning. (2011). *New York City borough boundaries* [Polygon shapefile]. MIT GeoData Repository. https://geodata.libraries.mit.edu/record/gismit:US_NY_NYC_F7BOROUGHS_2010

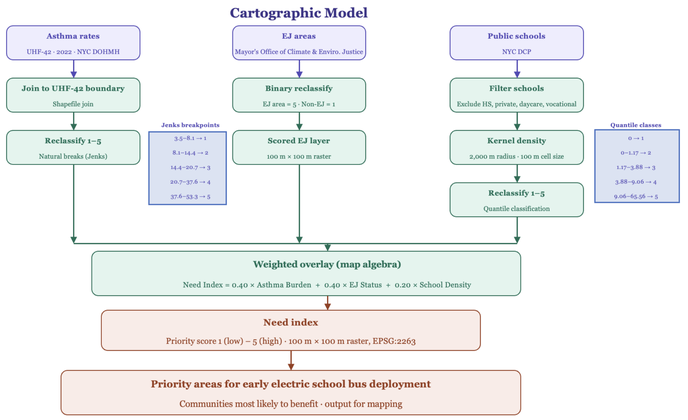
New York City Department of Health and Mental Hygiene. (2022). *Asthma hospitalizations (ages 5–17)* [Data set]. Environment & Health Data Portal. Retrieved from https://a816-dohbesp.nyc.gov/IndicatorPublic/data-explorer/asthma/?id=2381

New York City Mayor's Office of Climate and Environmental Justice. (n.d.). *Environmental justice areas and NYC facilities data explorer* [GeoJSON / data download]. Retrieved from https://experience.arcgis.com/experience/6a3da7b920f248af961554bdf01d668b/page/Data-Explorer/. Used for: (a) Environmental Justice area boundaries; (b) public school facility locations.

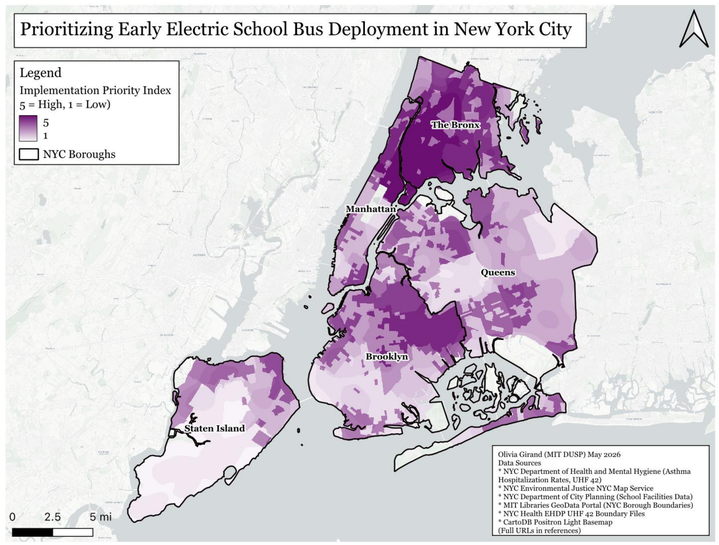
World Resources Institute. (2024, January 4). *Dataset of U.S. school bus depots* [Data set]. WRI Research. Retrieved from https://www.wri.org/research/dataset-us-school-bus-depots

City of New York. (2026, May 12). *NYC EV fleet station network* [Data set]. NYC Open Data. Retrieved from https://catalog.data.gov/dataset/nyc-ev-fleet-station-network

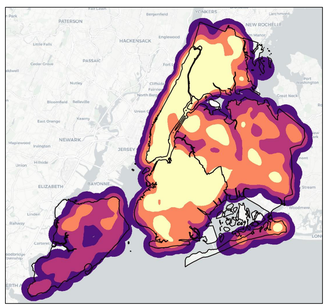
QGIS Workflow



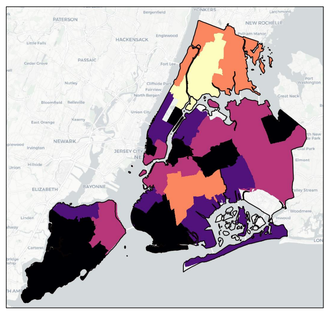
Results



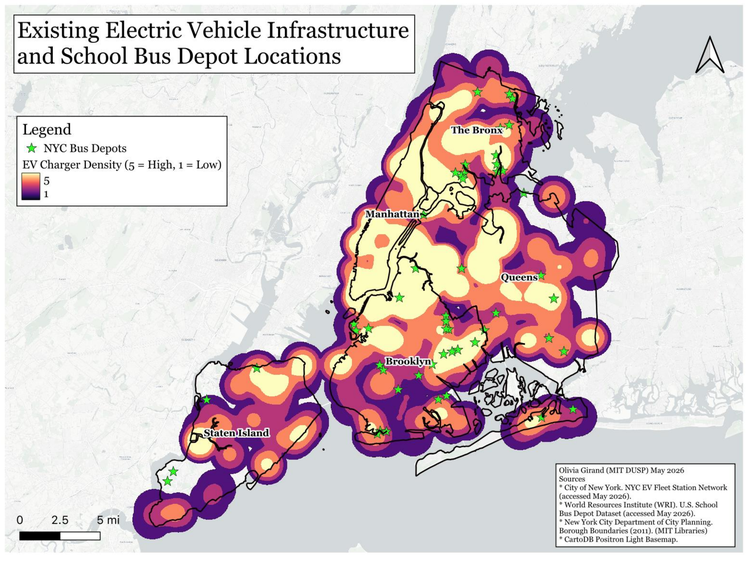
Higher values (darker purple) indicate neighborhoods with greater potential need for early electric school bus deployment based on childhood asthma burden, environmental justice designation, and concentrations of public schools serving bus-eligible students.



NYC Schools Density



Asthma hospitalizations (age 5 to 17)



Public EV charging infrastructure and existing school bus depots were used as proxies for electrification readiness. While school buses are typically charged at depots, areas with existing EV infrastructure may face fewer barriers to future charging deployment.

Conclusions:

- Neighborhoods in the Bronx, upper Manhattan, and central Brooklyn exhibit the highest combined burden of childhood asthma, environmental justice designation, and concentrations of bus-eligible public schools
- The infrastructure readiness layer offers an additional signal: despite EV chargers not being school bus charging infrastructure specifically, the Bronx shows a relatively high density of existing public EV charging stations.
- May indicate more developed electrical grid capacity in the area, which could reduce barriers to future depot electrification compared to areas with sparser infrastructure

Limitations

- ***Data and methods:*** School locations were used as a proxy for bus demand, but students do not necessarily attend schools near their homes, and not all schools use yellow bus service equally.
- Asthma data were available only at the UHF-42 geography, which is coarser than neighborhood-level variation and may mask within-district disparities.
- The binary EJ classification (EJ vs. non-EJ) also simplifies a spectrum of environmental burden.
- ***Cost and technology:*** Electric school buses remain significantly more expensive than diesel alternatives upfront, and performance in cold climates, range, and reliability are still being validated at scale. Funds directed toward ESB deployment compete with other school and community needs, so prioritization needs to weigh tradeoffs.

References:

1. New York State Energy Research and Development Authority (NYSERDA). (n.d.). *Electric school buses* [Program page]. Retrieved from https://www.nyserda.ny.gov/All-Programs/Electric-School-Buses.
2. NYC School Bus Umbrella Services (NYCSBUS). (2025, March). *ESB district ambassador profiles* [Report]. Retrieved from https://electricschoolbusinitiative.org/sites/default/files/2025-06/NYCSBUS_ESB%20District%20Ambassador%20Profiles.pdf. As of March 2025, NYCSBUS had deployed 27 Type A electric school buses and installed 30 charging units across Level 2 and portable configurations.
3. City Limits. (2024). *Tens of thousands of school buses are back on NYC streets — only 68 are electric* [News article]. Retrieved from https://citylimits.org/tens-of-thousands-of-school-buses-are-back-on-nyc-streets-only-68-are-electric/.
4. Slowik, P., & Lutsey, N. (2023). *Electric school buses and equity in the United States* [Insights report]. World Resources Institute. Retrieved from https://www.wri.org/insights/electric-school-buses-equity-us.