Executive Summary

The research focused on understanding transportation equity and clean mobility barriers in Atlanta. The main issue explored was whether all neighborhoods have fair access to public transit and electric vehicle (EV) charging, particularly for residents who are more vulnerable due to factors such as income, race, or housing type. This issue is important because access to clean, reliable transportation can influence individuals' ability to reach work, school, and essential services, and it determines who benefits from new green mobility investments. The goal was to identify where the largest gaps exist so that future investments and policies can be directed to areas where they are most needed

Background / Context

Atlanta has experienced rapid growth, attracting new jobs and residents from diverse backgrounds. However, access to reliable transportation is not uniform across all neighborhoods. While some areas benefit from abundant bus and train services, others have limited options. Historically, decisions regarding the placement of roads, transit lines, and charging stations have often overlooked lower-income neighborhoods and areas with higher rental populations (Wyczalkowski, Welch, & Pasha, 2020). In recent years, the city has increased its focus on these disparities. The 2025 EV Readiness Ordinance was enacted to promote the installation of more electric vehicle charging stations, aiming to make clean transportation accessible to all residents (Atlanta Department of City Planning, 2025). Simultaneously, rising living costs have led many individuals to seek more efficient ways to commute to work, school, or essential services without relying on personal vehicles. As the city moves forward with this ordinance, addressing barriers to clean mobility becomes critical for developing effective policy recommendations. The analysis highlights these challenges by mapping neighborhoods with limited transit and EV charging accessibility, using data from MARTA's transit schedules (MARTA, 2025), the National Renewable Energy Laboratory's charging infrastructure database (National Renewable Energy Laboratory, 2025), and Census data (U.S. Census Bureau, 2023).

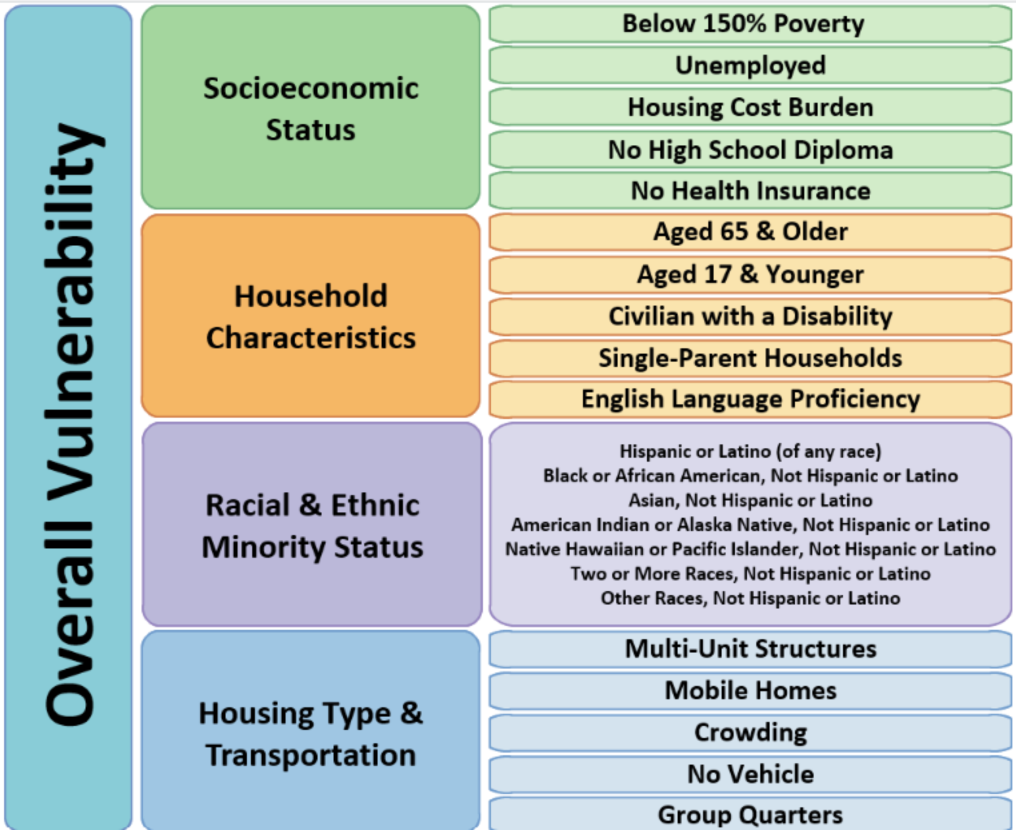
Data Summary

The research collected and analyzed several types of public data to understand transportation equity and clean mobility barriers in Atlanta. Demographic and housing data were obtained from the U.S. Census (U.S. Census Bureau, 2023), public transit schedules and routes were sourced from MARTA's GTFS files (MARTA, 2025), and electric vehicle charging station information was gathered from the National Renewable Energy Laboratory (National Renewable Energy Laboratory, 2025). All data were carefully cleaned and combined to enable fair comparison across neighborhoods. After data collection, a set of scores was created to measure which neighborhoods face the biggest challenges.

Research Methodology

The **Social Vulnerability Index** (SVI) was calculated to measure how different communities may be more or less at risk due to social and economic factors. To do this, data from the U.S. Census Bureau's American Community Survey was used. The **CDC/ATSDR SVI** is the most widely used, research-backed set for social vulnerability, which uses 16 ACS variables (Centers for Disease Control and Prevention, 2021; Doustmohammadi, 2022). These sixteen variables represent important aspects of vulnerability, such as poverty, unemployment, age, disability, minority status, language skills, housing type, and access to transportation. These variables were grouped into four main themes: socioeconomic status, household composition, minority status and language, and housing and transportation.

For each census tract, the value of every variable was ranked as a percentile compared to all other tracts, so that higher values represent greater vulnerability. The percentile ranks for variables within each theme were summed and then ranked again to create a theme-specific score. Finally, the four theme scores were combined and ranked to produce an overall SVI score for each tract, ranging from 0 (least vulnerable) to 1 (most vulnerable). All variables and themes were given equal weight in the calculation. This approach allows for a clear comparison of social vulnerability across different neighborhoods and helps identify areas that may face greater barriers to clean mobility or require additional support.



The **Transit Accessibility Score** was calculated to measure how easily residents in each neighborhood can access public transportation, taking into account both the proximity of transit stops and the quality of service provided. For each census tract, the geographic center (centroid) was identified. The distance from this centroid to every nearby transit stop was computed, and only stops within a reasonable walking time (as defined by a maximum travel time threshold) were considered accessible.

To reflect the true usefulness of each stop, the calculation incorporated two key service quality factors: the frequency of daily transit service and the reliability of the schedule at each stop. Each stop's contribution to the accessibility score was weighted by its daily frequency and adjusted by a reliability bonus, which increases the score for stops with more predictable service. These weighted values were then further adjusted using a gravity model, which applies an exponential decay based on walking time, so that closer and higher-quality stops contribute more to the score. The final accessibility score for each tract was normalized to allow for comparison across all neighborhoods. This approach ensures that areas with more frequent, reliable, and conveniently located transit receive higher accessibility scores, highlighting disparities in transit access across the city.

For each census tract i, the Transit Accessibility Score is calculated as:

$$TransitAccess\_i = \sum\_\{j\}[Freq\_j \times ReliabilityBonus\_j \times e\text{^}\{-\beta \times TravelTime\_\{ij\}\ \}\ ]$$

Where:

- j indexes all transit stops within the maximum walking time threshold.
- Freq_j is the daily frequency of service at stop j.
- ReliabilityBonus_j is a schedule reliability adjustment for stop jj, defined as: ReliabilityBonus_j =

  $$\begin{cases} 1 + 1/(1 + ScheduleReliability\_j), & if\ ScheduleReliability\_j > 0 \\ 1, & otherwise \end{cases}$$

  where ScheduleReliability_j is a measure of the variability in scheduled service at stop j.

- TravelTime_{ij} is the estimated walking time (in minutes) from tract i to stop j.
- β is a decay parameter that reduces the influence of distant stops.
- The total score is normalized across all tracts.

A higher Transit Accessibility Score indicates that a tract has more frequent, reliable, and conveniently located transit service, while a lower score highlights areas with limited or less reliable transit options. This methodology ensures that both the quantity and quality of transit access are reflected in the final score, supporting equitable transportation analysis.

The **EV Charging Accessibility Score** was designed to assess how easily residents in each neighborhood can access public electric vehicle (EV) charging infrastructure. For each census tract, the centroid was used as a reference point, and all EV charging stations within a specified radius of 3 miles were identified. The total number of available charging ports was counted, with DC fast charging ports given three times the weight of standard Level 2 ports, reflecting their greater utility for EV users (National Renewable Energy Laboratory, 2025; Mehditabrizi et al., 2024).

$$EVAccess_i = \left(\sum_{k \in Radius} [Level2Ports_k + 3 \times DCFastPorts_k] \right)$$

where:

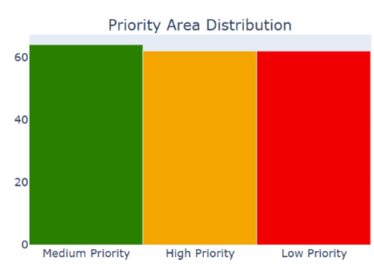
- k indexes all charging stations within the specified radius (e.g., 3 miles) of the tract centroid.
- Level2Ports_kis the number of Level 2 charging ports at station kk.
- DCFastPorts_k is the number of DC fast charging ports at station kk, weighted 3 times higher.

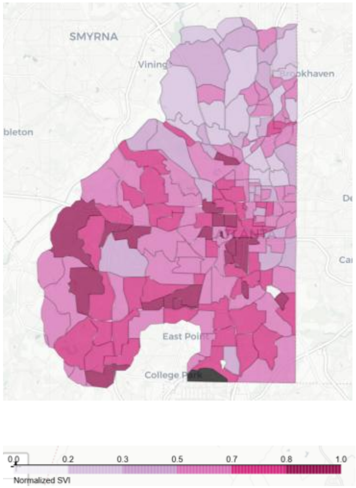
The tract with a higher EV charging accessibility score has more charging stations, indicating better access to EV charging infrastructure for residents, while a lower score shows a tract that has few or no charging stations within reach, signaling limited access to EV charging and a potential barrier for clean mobility adoption.

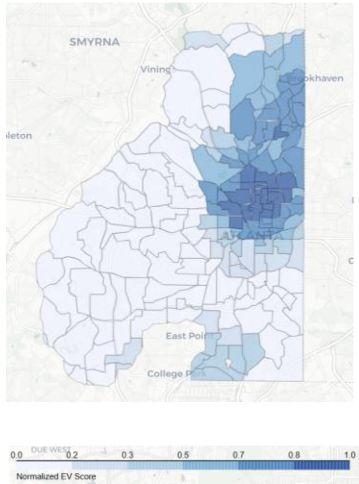
Finally, these scores were combined to identify neighborhoods most in need of assistance (Williams, Kramer, & Keita, 2020; Halimi et al., 2023). Mapping these scores revealed the largest gaps and highlighted areas where Atlanta should focus efforts to promote transportation equity.

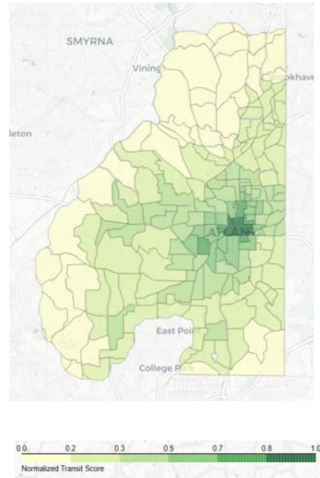
Key Findings

The data showed that access to public transit and EV charging is not distributed equally across Atlanta. Neighborhoods with higher poverty rates, more renters, and more people of color generally had lower transit accessibility. Additionally, 62 neighborhoods were identified as high-priority areas needing urgent investment, based on a combination of social vulnerability, transit access, and EV charging gaps.

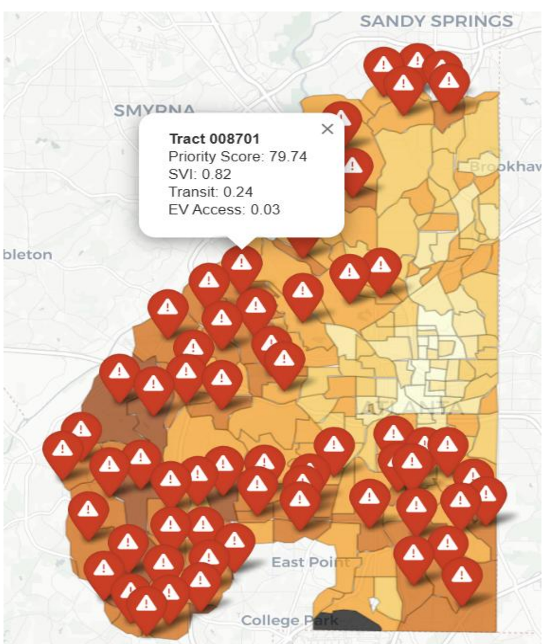








The first map shows which neighborhoods have higher social and economic challenges, such as poverty or fewer people owning cars. Areas with darker colors on this map are places where people might have a harder time getting around. The second map displays how easy it is for people to use public transit in each neighborhood. Neighborhoods with darker colors have better access to buses and trains, while lighter areas have fewer options or longer waits. The third map highlights where electric vehicle charging stations are located. Neighborhoods with darker shades have more charging options nearby, while lighter areas have fewer or none. Together, these maps provide a spatial understanding of where transportation equity challenges are mostly seen and identify 62 priority areas, helping city leaders and community members see where improvements are most needed.



This map highlights the neighborhoods in Atlanta that have been identified as high priority for transportation investment. Each warning symbol marks a census tract where residents face significant barriers to clean mobility. For example, the tract shown here has a high priority score of 79.74, a high SVI of 0.82, low transit accessibility at 0.24, and very limited EV charging access at 0.03. This visual makes it easy to see which parts of the city face the greatest challenges and should be considered first for new investments in public transit and EV infrastructure.

Reports from organizations like the Urban Institute and the Atlanta Regional Commission emphasize that renters and people living in older apartment buildings face extra challenges in accessing EV charging due to higher installation costs, which can go up to $10,000/port, which can slow the adoption of cleaner transportation.

Next Steps and Questions

The next phase of this research will involve validating our findings through direct engagement with residents living in the high-priority neighborhoods identified by our analysis. To accomplish this, we planned to design and distribute a survey that asks community members about their everyday transportation experiences, including challenges with public transit and electric vehicle charging access. The goal of this survey is to ensure that the patterns and gaps revealed by our data are consistent with the lived realities of those most affected.

Following the collection of survey responses, we will conduct hypothesis testing to assess the alignment between our quantitative results and community feedback. Specifically, we will test the hypothesis that our data-driven scores accurately reflect the barriers reported by residents. If a significant majority of survey respondents in a given neighborhood report difficulties that match our predicted scores, this will strengthen the credibility of our analysis.

Key questions remain: Do the barriers reported by residents correspond with the neighborhoods marked as high priority? Are there hidden or less obvious challenges such as cultural, economic, or informational barriers, that our quantitative approach may have missed?

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