

**Project Proposal for SMART:
Comparative Analysis of Public Transportation and
Bikesharing in New York City**

Prepared for:

Society for Metropolitan Analysis and Research of Transportation (SMART)

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Introduction and Project Overview

New York City's complex transportation network provides a unique opportunity to analyze the performance and synergy of traditional public transportation and modern bikesharing services. The goal of this project is to compare New York's public transit system, including buses and subways, with its bikesharing program, CitiBike. This proposal will offer SMART insights into whether increased investment in bikesharing can complement public transit, thereby enhancing urban transportation in terms of operational efficiency, cost-effectiveness, and environmental sustainability.

SMART, a public interest organization, is focused on improving urban transit's efficiency, environmental sustainability, and fiscal responsibility. To support these goals, we will examine operational costs, fuel and energy consumption, ridership, and funding sources. Through this comparative study, SMART will be better equipped to advocate for strategic investments and improvements in New York City's transportation infrastructure.

Data Sources

Our primary datasets will come from both the National Transit Database (NTA) and the Metropolitan Transportation Authority (MTA) for public transportation data, alongside CitiBike's operational and system reports for bikesharing data.

The NTA Operating Expenses dataset will provide detailed information on the operational costs of New York City's public transit modes, including buses and subways, broken down by cost categories such as fuel, labor, and maintenance. This dataset will help us assess cost per trip and gauge the fiscal demands of maintaining and running public transportation. To understand funding sources, we will also incorporate data from the NTA Funding Sources report, which outlines federal, state, and private contributions to public transit. This will enable us to analyze the reliance of NYC's public transit on different funding streams and the sustainability of these funding models.

For bikesharing, CitiBike Operating Reports provide critical information on ridership levels, station usage, trip durations, and distances traveled. CitiBike's Pricing Data will help us examine its pricing structure (membership and per-ride costs) in comparison to public transportation fares. Finally, the CitiBike System Data, containing historical trip records, start and end station details, and bike types, will allow us to analyze ridership patterns and operational efficiency. Together, these datasets provide a comprehensive view of CitiBike's performance and user trends. Additionally, the MTA Subway and Bus Ridership Data from 2023 will allow us to identify peak usage times and areas of high demand, offering insights into the ridership patterns of traditional transit.

Our target variables will be cost per trip, derived by dividing total operational expenses by ridership, and fuel and energy consumption, measured by fuel type and usage per trip. We will also calculate ridership levels for both transportation modes to assess usage patterns. Predictor variables will include ridership numbers, operating expenses, and funding sources across datasets. We will need to aggregate and harmonize some of this data to align the timeframes for comparison.

Research Questions

Our analysis will center on four key questions to provide SMART with actionable insights. First, we aim to assess how the operating expenses of public transportation compare to CitiBike in terms of cost per trip and revenue generation. By comparing the costs of buses and subways with those of bikesharing, we can determine which system offers a more sustainable fiscal model. Second, we will examine how CitiBike's pricing structure influences ridership compared to public transportation fares. This analysis will reveal how cost differences affect demand and may help identify pricing strategies that could encourage increased bikesharing adoption, reducing congestion on buses and subways. Lastly, we will identify which areas in New York City could benefit most from expanded CitiBike coverage by comparing high-ridership regions in both transit systems. By focusing on these questions, we aim to provide SMART with data-driven recommendations on the cost-effectiveness, environmental sustainability, and potential of bikesharing as a complementary transit option.

For questions involving financial metrics and ridership, we'll cross-reference findings with data from sources like MTA's operating reports and CitiBike's system data to validate consistency. Inconsistencies will prompt a deeper examination of the underlying assumptions and potential data corrections. By applying robustness checks, such as testing our models on different time periods or subsets of data, we'll confirm that our findings remain stable under varying conditions. For instance, in the cost-per-trip analysis, we might adjust for fluctuations in operating expenses or ridership during peak and off-peak seasons to confirm our conclusions. Additionally, we'll seek comparative feedback from peer-reviewed sources to review our methodology and findings, helping identify any overlooked assumptions or areas that need further exploration.

Ethics

Our analysis could benefit NYC commuters, particularly in densely populated or high-congestion areas, by supporting a more reliable and efficient transit network. Additionally, environmental advocacy groups may find this analysis valuable for its focus on emissions reduction in urban settings.

There are, however, potential negative impacts. If resources shift too heavily from public transportation to bikesharing, this may disproportionately impact individuals who depend on

buses and subways for long commutes, as well as those employed by these services. Furthermore, both MTA and CitiBike data may have inherent biases. For example, CitiBike stations are often concentrated in wealthier or more central areas, potentially underrepresenting lower-income neighborhoods

Our findings will be presented transparently, with a focus on accessibility and fairness. We will prioritize recommendations that do not compromise the needs of underserved populations and ensure that any proposed adjustments consider the full spectrum of NYC’s commuting population.

Summary Visualizations and Tables

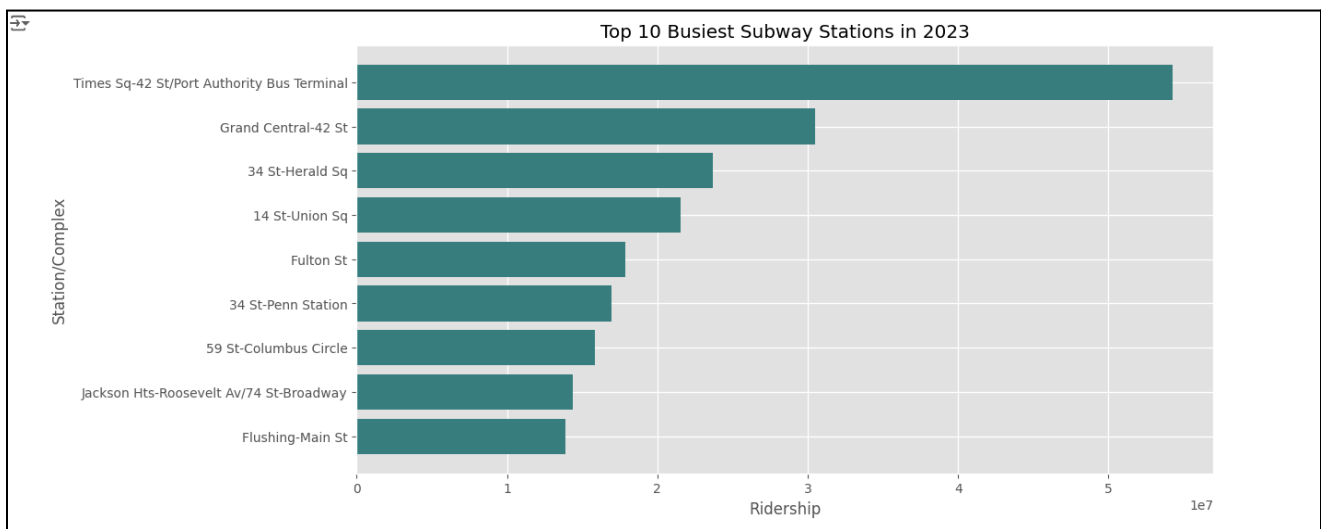


Figure 1: Top 10 Busiest Subway Stations by Ridership in 2023

The figure highlights the top 10 busiest subway stations in New York City based on ridership in 2023. Times Square-42 St/Port Authority Bus Terminal tops the list with the highest ridership, exceeding 50 million passengers. Grand Central-42 St and 34 St-Herald Sq follow, each serving between 30 to 40 million riders annually. The data shows a strong concentration of ridership in major transportation hubs, which are critical in managing the city's daily commuter flow. This concentration of ridership in key stations could offer insight into potential areas where CitiBike expansion could complement subway usage and reduce congestion.

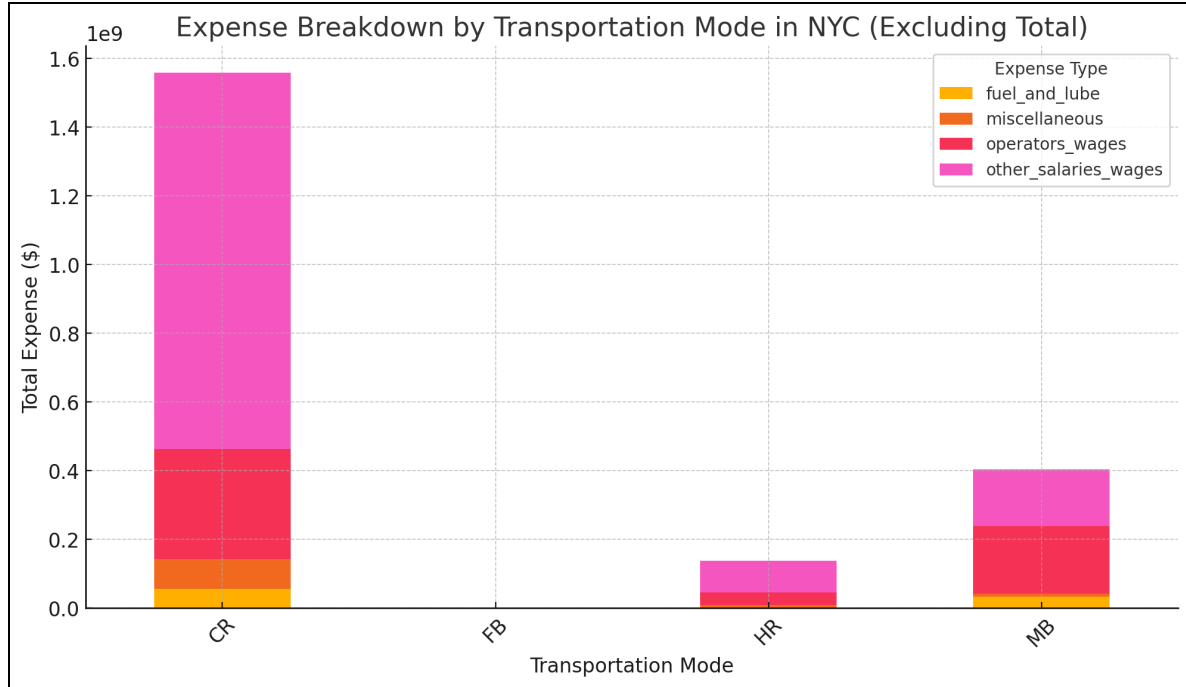


Figure 2. Expenses of Public Transportation Modes in NYC (2023)

This chart breaks down expenses by mode in NYC, showing individual costs like wages and fuel, as given by the NTA in 2023. By highlighting cost structures across the large expenditures on the commuter rail (\$1.6 Billion) compared to the heavy rail, and motorbus, this analysis helps address our first research question: understanding the fiscal sustainability of each transit mode. This comparison reveals opportunities for cost efficiencies, supporting our broader aim to evaluate bikesharing as a potentially more sustainable complement to these traditional transit options, where salaries and wages are the largest expense.

Agency	General Fund	Transportation Fund	Total
MTA Long Island Rail Road	\$314,514,187	\$1,178,139,532	\$1,492,653,719
Metro-North Commuter Railroad Company, dba: MTA Metro-North Railroad	\$537,658,824	\$513,237,935	\$1,050,896,759
New York City Department of Transportation	\$12,213,969	\$50,131,473	\$,1050,896,759

Table 1: Funding Breakdown for Major Transit Agencies in New York City (2023)

The table shows the funding distribution for major transit agencies in New York City for 2023. The MTA Long Island Rail Road has the highest total funding at approximately \$1.49 billion, with most of its funding coming from the transportation fund. The Metro-North Commuter Railroad follows closely, with over \$1.05 billion in total funding, which is also primarily sourced from the transportation fund. The New York City Department of Transportation has a significantly smaller general fund but still receives a substantial portion of its total funding, about \$50 million, from the transportation fund. Understanding these financial allocations will help us assess how public transit's operating expenses compare to CitiBike's model and identify areas where bikesharing could provide a cost-effective alternative.

Agency	Fares	Park and Ride	Advertising	Concessions	Total
Metro-North Commuter Railroad Company, dba: MTA Metro-North Railroad	\$558,735,737	\$1,383,452	\$11,210,834	\$33,465,922	\$604,795,945
MTA Long Island Rail Road	\$568,950,760	\$2,537,062	\$105,56,840	\$525,705	\$582,570,367
MTA Bus Company	\$178,570,855	0	\$3,004,721	0	\$181,575,576
Port Authority Trans-Hudson Corporation	\$134,086,782	\$2,149,521	\$3,579,485	\$7,676,074	\$147,491,862
New York City Economic Development Corporation	\$19,772,375	0	0	0	\$19,772,375

Table 2: Transit Funding Sources for New York City Agencies (2023)

The table highlights the funding sources of major transit agencies in New York City for 2023. The Metro-North Commuter Railroad had the highest funding, primarily from fares, \$558.74 million, while the New York City Economic Development Corporation reported the lowest, with \$19.72 million from fares. Other agencies, like the MTA Long Island Rail Road and the Port Authority Trans-Hudson Corporation, supplemented their fare funding with park-and-ride fees, advertising, and concessions. These financial figures reflect the diversified funding streams supporting public transit operations, which are necessary to manage large-scale infrastructure and ridership demands. Understanding this data helps us compare public transit's operating expenses to CitiBike's linear model and reveals where the most significant resources are

allocated, showing how bikesharing can serve as a complementary mode to enhance public transit.

Revenue Categories	December 2023 YTD
Membership	\$25,758,244.48
Casual Riderships	\$42,953,910.59
Overages	\$288,478.11
Ebike Surcharges & Other Fees	\$35,861,061.43
Classic Bike Refunds & Discounts	-\$3,102,002.83
Ebike Refunds & Discounts	-\$806,665.74
Tax	\$8,916,655.93
Sponsorship	\$9,927,607.95
Lyft Pink	\$10,241,450.50
TOTAL	\$130,038,740.42

Table 3: YTD Revenue Breakdown for Citi Bikes (2023)

The Year-to-Date (YTD) revenue breakdown for the bikesharing program reveals key insights into its financial performance, with a total revenue of approximately \$130 million. The largest revenue contributor is Casual Riderships at \$42.9 million, indicating strong usage by non-members, which may highlight an opportunity to convert these casual users into long-term members. Ebike Surcharges & Other Fees generate significant revenue (\$35.8 million), reflecting the growing popularity of premium e-bike services. In contrast, Memberships bring in \$25.7 million, showing a reliable stream of recurring income, though still falling behind casual riderships. Notably, Classic Bike Refunds & Discounts represent a negative \$3.1 million, which may suggest potential issues related to customer satisfaction or operational challenges. Overall, this revenue breakdown can guide future strategies, particularly in optimizing pricing and enhancing service offerings, with a focus on the rising demand for e-bikes and casual ridership growth.

Conclusion

Our approach aims to analyze New York City's public transportation and bikesharing systems in terms of operational costs, and accessibility. By examining these key areas, we hope to equip

SMART with the insights needed to make strategic recommendations for New York's urban transit infrastructure, and apply these recommendations in similar cities. Our findings will highlight where bikesharing can supplement public transit effectively, reduce congestion, and foster a more sustainable and fiscally responsible transportation network.

Appendix:

For easy reference, we have included links to our data sources:

- [NTA Operating Expenses](#)
- [NTA Funding Sources](#)
- [MTA Ridership Data](#)
- [CitiBike System Data](#)