# Congestion Pricing In Cities

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**Abstract**

A more controversial term emerged in the U.S. recently. Congestion Pricing, depending on who you ask, can come with its own negative or positive connotation. Boiled down to its simplest form, congestion pricing is a simple economic term that refers to the practice of charging users a fee to access a resource during peak demand periods, with the goal of reducing congestion within that resource. The principles of congestion pricing can apply to various sectors and scenarios where demand outstrips supply, leading to overcrowding or overuse. This study aims to look at congestion pricing in terms of traffic congestion. Where a price is attached to using the road, typically within set limits, and could also feature many different parameters such as vehicle size, weight, or occupancy. This is implemented to discourage the use of roads at peak times when there are more motorists traveling than the roads can hold efficiently. Pricing the roads fairly has the potential to reduce overuse and ease congestion. These policies often aim to reduce many other factors that result from traffic congestion, such as poor air quality, noise pollution, and general unpleasantness. Through quantitative analysis, case study research, and policy evaluation, this paper aims to provide a comprehensive understanding of congestion pricing's role in urban traffic management and its broader implications for society and the environment. As well as air quality, economic implications, and public perception

*Keywords:* congestion pricing, urban traffic management, environmental sustainability, and public perception.

# Congestion Pricing In Cities

Congestion pricing represents a dynamic approach to mitigating urban traffic congestion, leveraging economic principles to manage vehicle usage in densely populated areas. This paper explores congestion pricing, its implementation strategies, and its impact on urban traffic flow, economic conditions, environmental sustainability, and public perception.

## Method

### Study

This study focuses on urban areas where congestion pricing has been implemented or proposed, analyzing data from public transportation and city planning departments, academic research, and government policies.

### Assessments and Measures

Quantitative data analysis will be employed to examine traffic volume, pollution levels, and revenue generated from congestion pricing schemes. This approach will be complemented by case study research and policy evaluation to offer a multidimensional understanding of congestion pricing's effects.

#### *Research Questions*

1. How does congestion pricing impact urban traffic flow?
2. What are the economic implications of implementing congestion pricing?
3. How does congestion pricing affect environmental sustainability in urban areas?
4. What are the public's perceptions of congestion pricing, and how can acceptance be increased?

**Data Sources.** Data will be collected from various sources, including public transportation and city planning departments, academic databases, government websites, the State Department of Transportation (DOT), and other academic data sites. Note that, other than major case studies, this paper will primarily focus on data from within the United States.

**Expected Outcomes.** The research anticipates demonstrating the positive impacts of congestion pricing on reducing traffic congestion, improving air quality, and enhancing urban mobility. Furthermore, it will explore the economic benefits, social and equity considerations, and the importance of public engagement in fostering acceptance of congestion pricing.

## Results

### Urban Traffic Flow

Large cities such as New York, London, and Las Angeles face a similar challenge when handling traffic flow through their cities. Everyone is affected as traffic builds, whether that includes private passenger vehicles, freight vehicles, city service vehicles, or public transit. To first get a slight glance at the scale of the problem, here is some data from the *Global Traffic Scorecard*. According to them, "In addition to lost time, negative externalities like freight delay, inflationary pressure, and environmental impact are generally exacerbated due to traffic congestion. While not measured in this report, these externalities decrease the quality of life globally." (Krueger, n.d.) This data primarily utilizes 'lost time' in hours delayed as a primary factor.

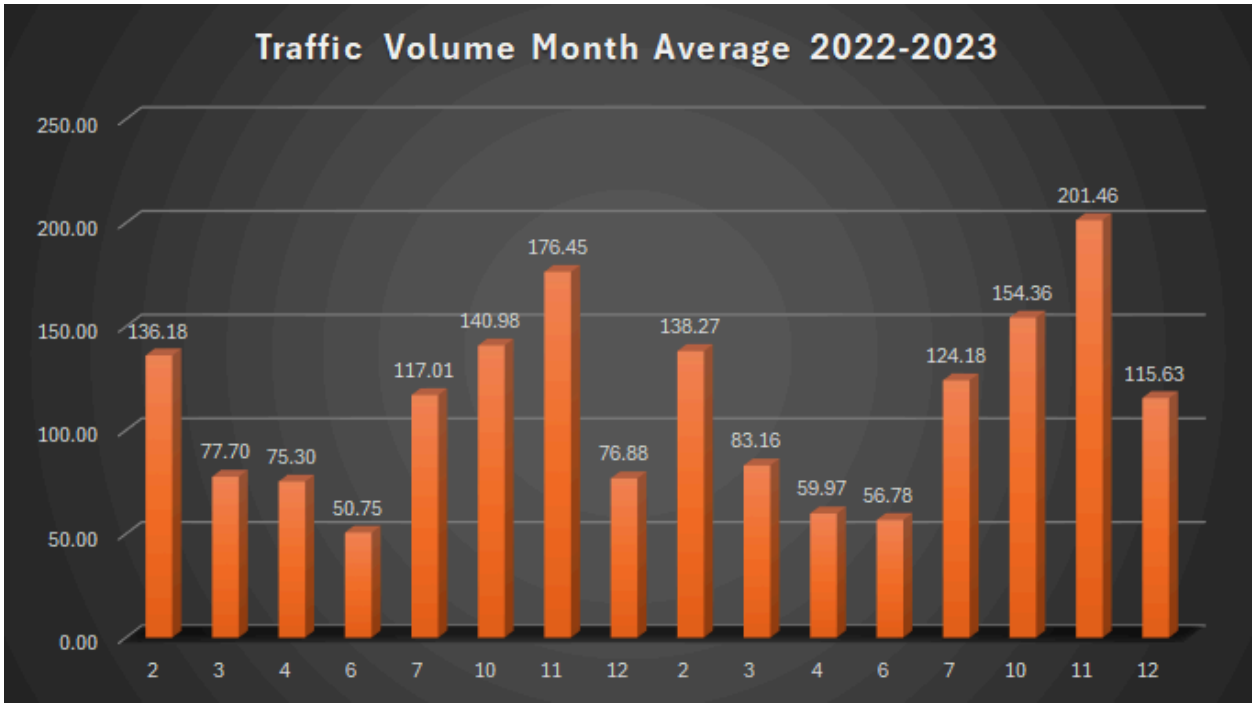
From 2022 data, these are the U.S. cities with the hours of delay:

1. Chicago, IL: 155
2. Boston, MA: 134
3. New York City, NY: 117
4. Philadelphia, PA: 114
5. Miami, FL: 105

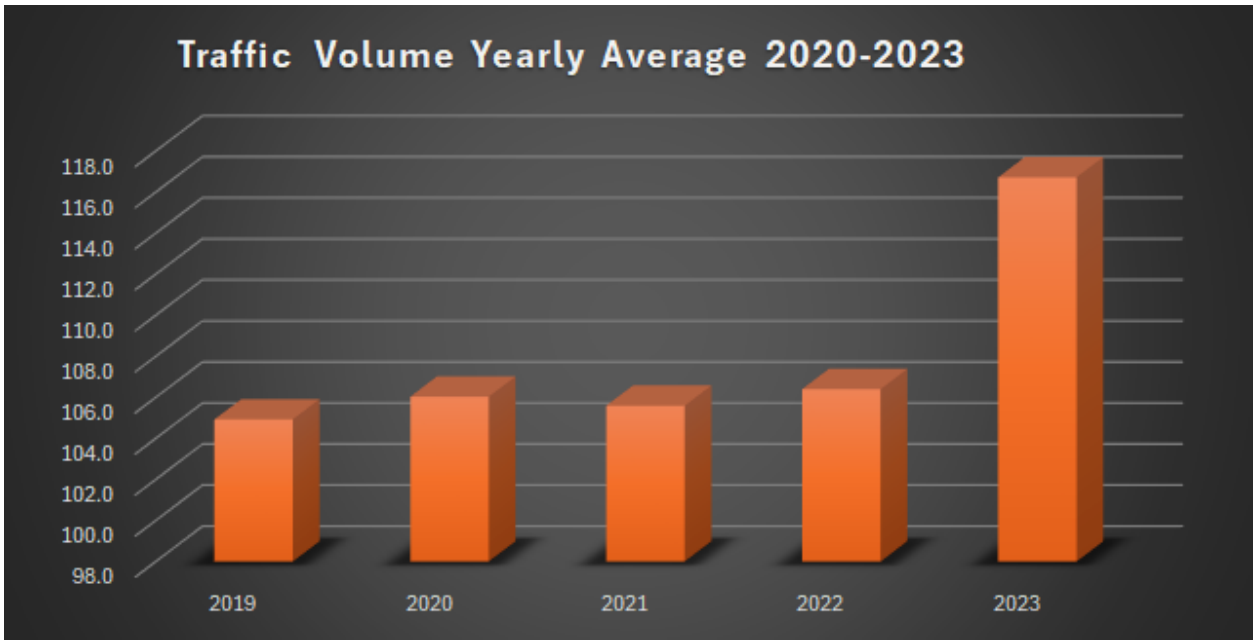
Looking at the percent change in 2022 from 2019 pre-pandemic levels:

1. Miami, FL: 30%
2. Chicago, IL: 7%
3. Boston, MA: -10%
4. New York City, NY: -16%
5. Philadelphia, PA: -20%

This is what Manhattan traffic volume has looked like by month in 2022-2023, according to NYC DOT:

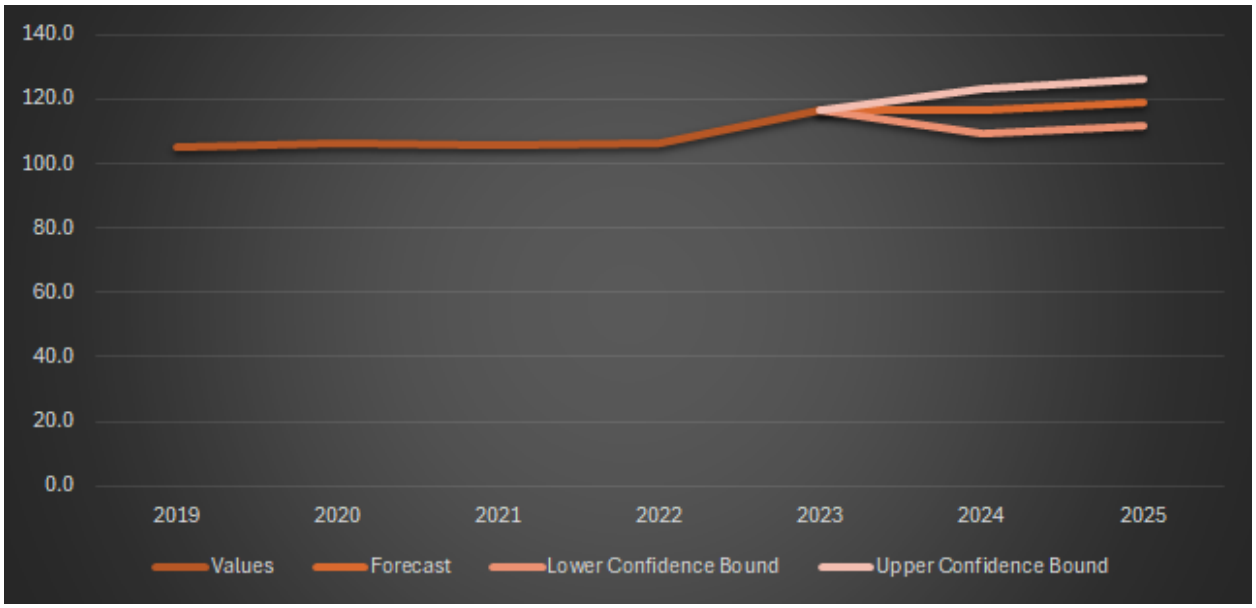



Here is the yearly average from 2019-2023: (NYC DOT, 2024)



In Manhattan, the yearly traffic volume appears to be on the rise from even pre-pandemic levels. For right now, we will focus more on the yearly average. The next page includes the forecast for the next two years.

| Timeline | Values | Forecast | Lower Confidence Bound | Upper Confidence Bound |
|---|---|---|---|---|
| 2019 | 104.9 | | | |
| 2020 | 106.0 | | | |
| 2021 | 105.6 | | | |
| 2022 | 106.4 | | | |
| 2023 | 116.7 | 116.7 | 116.7 | 116.7 |
| 2024 | | 116.3 | 109.5 | 123.2 |
| 2025 | | 119.0 | 111.9 | 126.0 |




Traffic congestion is something that has been successfully mitigated by congestion pricing in other cities. Take London for example. According to a case study performed by the San Francisco County Transportation Authority, "Since 2003, drivers traveling in an 8.5 square mile area of central London have been assessed a flat daily fee when driving within the designated zone on weekdays. Prior to adoption, funding for public transport was unreliable, and congestion levels in central London were extremely high." Since then, the study finds that traffic in central london has declined by 30%. At the same time, transit ridership has increased by 38%. The annual net revenue amounted to 182.1 million dollars a year by charging a $15.05 flat fee to drive within the designated area. The pricing hours were set at Monday-Friday, 7 am to 6 pm. However there are also discounts and exemptions set in place to further increase the quality of life for residents living in the city. This includes residential discounts of 90%, 100% discount to vehicles with higher occupancy (9+ seats), and 100% discounts to clean vehicles by Euro standards. There are also exemptions for disabilities, emergency service vehicles, two-wheeled vehicles, and taxis. (*Downtown Congestion Pricing Study*, 2020)

**Economic Implications**

Businesses in urban areas rely heavily on efficient traffic flow to ship and receive goods and bring in commercial traffic. Traffic congestion can increase the cost of delivery due to lost time and lost fuel, especially with fuel prices rising. This also affects drivers.

New York drivers are estimated to pay an extra $1,976 a year due to traffic congestion. (Krueger, n.d.)

1. Chicago: $2,618
2. Boston: $2,270
3. New York: $1,976
4. Philadelphia: $1,925
5. Miami: $1,773

One way to avoid these costs entirely is to take public transit, which needs to be integrated into vehicle traffic. One obvious method is the Subway. New York is home to the most extensive subway system in the United States. It is a vital means of transportation for New York residents, as only around 32% of residents own a car, and the MTA boasts some of the highest ridership in North America. (*NYC DEPARTMENT OF TRANSPORTATION CITYWIDE MOBILITY SURVEY 2018*, 2018)

How economically efficient is the subway, and can congestion pricing revenue help them break even?

**Break-Even Analysis of the New York Subway System**

To identify the break-even point, we must identify the fixed costs, determine the variable costs, and calculate total revenue. For convenience, this will serve as an unofficial estimation of the total operating costs.

New York's subway operating costs are incredibly high, even by international standards. (Levy, 2017)

Cost per mile: $15.10 (NYC subway contains 665 mainline track miles.)

Cost per hour: $275.00 (NYC subway operates a total of 8760 hours in a year)

The total budget for the MTA in 2022 was approximately $19.2 billion, with only $4.6 billion coming from farebox revenue. (Basile, 2023). The subway's annual ridership is around 1.698 billion, with prices being $2.90 per ride. Fares only make up about 23% of the budget, with taxes making up the majority at 37%. Labor costs make up about 58% of the operating expenses (Budget Basics, n.d.).

To determine the price of tickets needed to cover the total operating cost, we can divide the total operating cost by the annual ridership.

**Annual Ridership**: 1.698 billion

**Total Operating Costs**: 19.2 billion

New Fare Per Ride = Total Operating Costs / Annual Ridership

To simply break even on operating costs, New York would have to implement a new fare of $11.31 per ride. This, of course, is an extremely high cost for just one trip, and this could never realistically be implemented. Such is why taxes, federal aid, and toll fees heavily subsidize the budget. (*Budget Basics*, n.d.)

While congestion pricing's primary goal is to discourage driving in certain areas at peak hours to curb traffic buildup, For New York, implementing congestion pricing throughout all of

Manhattan could generate more revenue for the MTA at the same time. Alleviating some of the burden on the taxpayers. It is also worth noting that discouraging motorists from driving into Manhattan and encouraging them to commute in by public transit or bike instead could save them a massive amount of money yearly.

Congestion pricing has the potential to discourage the use of a vehicle and generate funding to improve the quality of efficient public transportation, making it a much more favorable option for commuters into Manhattan. According to a study done by NYC DOT, New Yorkers in total, save an incredible $19 billion dollars a year. What is more interesting is that, instead of residents having to spend money on auto-related expenses such as fuel, we see that a lot of that money is instead invested in the local city economy. (*New York City's Green Dividend*, 2010) As mentioned previously, London's congestion pricing for central london has been able to generate 182.1 million dollars of net revenue annually on average. This raises much-needed investment funds for London's transport system.

The price of car ownership, especially in a dense urban city like New York, with some of the highest parking prices in the world, is an extremely high expense when compared to other modes of transportation.

Let us compare the two. To oversimplify, say you take five trips on public transit a day every day for the whole year. That would cost you $14.5 a day, $449.5 a month, and $5,292.5 a year. However, this would likely be the highest amount estimated. MTA has discounts such as the 30-day unlimited for $132 dollars. Yearly, this would most likely cost around $1,584. So, we will put our number at $2,500 a year to account for express trips, miscellaneous expenses, and car rentals/car shares when needed. Now, let us cover yearly car ownership expenses, which can often vary wildly.

New York Car ownership average yearly expenses (Keefer, 2024)

Insurance: $2,200 for the state of New York.

Fuel costs: $2,000

Maintenance: $150 (very conservative estimate)

Parking: $300

Car payment: $200

Total: $4850


This is a considerably conservative estimate, while there are some studies that have estimated the total yearly average to be around $6,000 to as high as $12,000. Nonetheless, car ownership is still a much more expensive mode of transportation in New York City, but as we saw in the recent traffic trends in Manhattan, these numbers still do not discourage motorists.

**Environmental Implications**

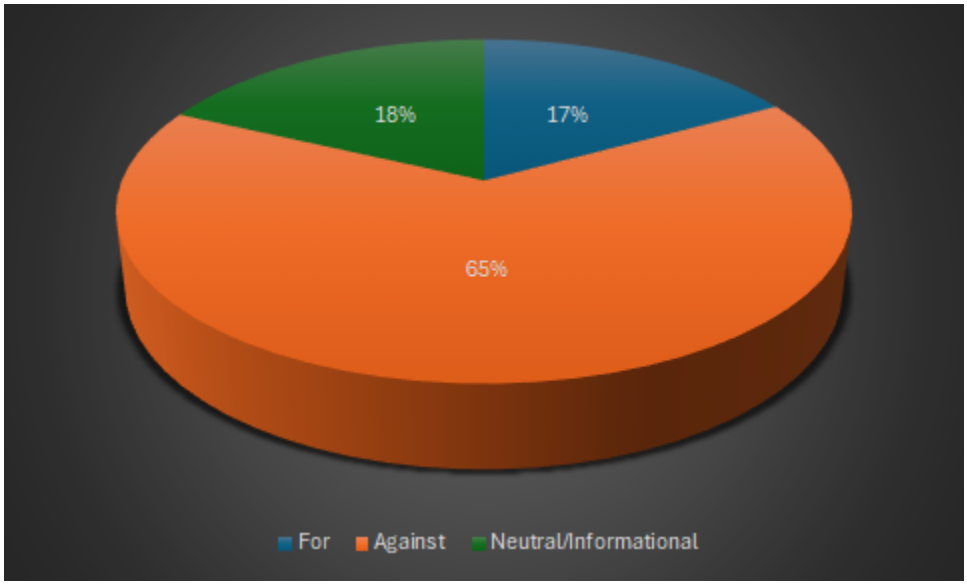
Automobiles are an incredibly significant source of pollution in numerous ways. Of course, there is the increased air pollution attributed to CO2 emissions. However, cars also

produce toxic brake dust, tire chemicals and microplastics, noise pollution, and use up valuable resources. Lessening the number of cars on the road and encouraging greener forms of transportation play a fundamental role in combatting climate change.

After the implementation of congestion pricing in London, it was found that greenhouse gas emissions were down 12%. Stockholm was able to reduce emissions down 14%. (*Downtown Congestion Pricing Study*, 2020)

**Public Perception**

Congestion pricing is certainly a controversial topic, especially in the U.S. With New York City on the verge of establishing congestion pricing for lower Manhattan soon, residents have very mixed opinions. In a sudo attempt to quantify this, I will gather data from the latest tweets in #congestionpricing and rate them either for, against, or neutral. I gathered a total of 100 data points.




Out of one hundred consecutive tweets sampled from 3/27/24 to 4/5/24, it was found that the majority of opinions were strongly against the idea of establishing congestion pricing for

lower Manhattan. This was a similar case in public opinion in Stockholm when they first implemented their system. Since then, negative opinions have greatly decreased.

## Discussion

The discussion of congestion pricing in the U.S., particularly in urban settings, reveals a multifaceted approach aimed at addressing traffic congestion, environmental sustainability, economic implications, and public perception. At its core, congestion pricing is an economic strategy used to manage traffic flow by charging fees for road usage during peak times, thereby discouraging excessive use and mitigating congestion. This strategy not only applies to traffic management but also carries implications for urban planning, public health, and economic efficiency.

### *Urban Traffic Management and Environmental Impact*

Studies and data, including those from cities like New York, London, and Stockholm, highlight the severe impact of traffic congestion, ranging from lost time to negative environmental externalities. Congestion pricing has been shown to effectively reduce traffic volumes, as evidenced by London's experience since 2003, which resulted in a 30% traffic reduction and a 38% increase in transit ridership. Such measures not only improve urban mobility but also significantly reduce greenhouse gas emissions and other pollutants, contributing to environmental sustainability.

### *Economic Considerations*

The economic implications of congestion pricing are pretty significant when it comes to traffic reduction. For businesses, reduced traffic congestion means lower delivery costs and more efficient operations. For individuals, it presents a cost-benefit analysis between the expenses of car ownership and the use of public transportation. In cities like New York, where the subway

system is a vital transportation mode, congestion pricing could provide a significant revenue source. This revenue can subsidize public transit, potentially making it more economically viable and reducing the financial burden on taxpayers.

***Public Perception and Engagement***

Public perception of congestion pricing varies widely, with many expressing strong opposition to such measures, particularly in New York City. However, experiences from cities that have implemented congestion pricing suggest that negative opinions can decrease over time, especially if the benefits become more apparent and tangible improvements in traffic flow, environmental quality, and public transportation systems are realized.

***Concluding Thoughts***

Congestion pricing more so represents a concept rather than a concrete plan. It's not a one size fits all as each city faces it's own unique challenges. Such that London and other european cities primarily geared their congestion plans toward emission goals, New York is more so focused on reducing traffic and generating revenue for the subway. Through years of data and research we can see significant implications for environmental sustainability, economic efficiency, and urban livability. However, Its success hinges not only on effective implementation and management but also on public acceptance and engagement. As cities continue to grapple with the challenges of urban congestion, congestion pricing offers a tool that, if used wisely, can contribute to more sustainable and livable urban environments.

**References**

Basile, J. (2023, March 9). *Report on the fiscal 2024 preliminary plan and the fiscal 2023 mayor's management report*. Report on the fiscal 2024 preliminary plan and the fiscal 2023 mayor's management report. Retrieved April 5, 2024, from https://council.nyc.gov/budget/wp-content/uploads/sites/54/2023/03/MTA-Prelim-Report.pdf

*budget basics*. (n.d.). MTA. Retrieved April 5, 2024, from https://new.mta.info/budget/MTA-operating-budget-basics

*Camera Captures and Confirmed Vehicles seen in the Congestion Charge Zone by Month - London Datastore*. (n.d.). London Datastore. Retrieved March 29, 2024, from https://data.london.gov.uk/dataset/vehicles-entering-c-charge-zone-month

*Downtown Congestion Pricing Study*. (2020, February). SFCTA.org. https://www.sfcta.org/sites/default/files/2020-02/Congestion-Pricing-Case-Studies_2020-02-13.pdf

Keefer, A. (2024, January 8). *How Much Does It Cost to Own a Car in New York?* Capital One. Retrieved April 6, 2024, from https://www.capitalone.com/cars/learn/managing-your-money-wisely/how-much-does-it-cost-to-own-a-car-in-new-york/2853

Krueger, P. (n.d.). *Global Traffic Scorecard | INRIX Global Traffic Rankings*. Inrix. Retrieved April 5, 2024, from https://inrix.com/scorecard/

Levy, A. (2017, October 13). *NYC subway operating costs: an analysis*. Curbed NY. Retrieved April 5, 2024, from

https://ny.curbed.com/2017/10/13/16455880/new-york-city-subway-mta-operating-cost-analysis

*New York City's Green Dividend*. (2010, April`). nyc.gov. https://www.nyc.gov/html/dot/downloads/pdf/nyc_greendividend_april2010.pdf

*NYC DEPARTMENT OF TRANSPORTATION CITYWIDE MOBILITY SURVEY 2018*. (2018, November). https://www.nyc.gov/html/dot/downloads/pdf/nycdot-citywide-mobility-survey-report-2018.pdf. https://www.nyc.gov/html/dot/downloads/pdf/nycdot-citywide-mobility-survey-report-2018.pdf

NYC DOT. (2021, August 31). *Automated Traffic Volume Counts*. NYC OpenData. https://data.cityofnewyork.us/Transportation/Automated-Traffic-Volume-Counts/7ym2-wayt/about_data